



**SEMINAR SERIES: “COGNITIVE CAPITAL AND
THE RETURN TO EDUCATION AND SOCIAL
CHANGE: LESSONS FROM THE LAST 50 YEARS”**

Report to Nuffield Foundation

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Longview**

SEMINAR SERIES: “COGNITIVE CAPITAL AND THE RETURN TO EDUCATION AND SOCIAL CHANGE: LESSONS FROM THE LAST 50 YEARS”

Background

The idea for this seminar series arose from the work of an expert group established by Longview¹ - the think tank devoted to the promotion of longitudinal research. A major aim of Longview is to facilitate communications between longitudinal researchers and policy makers about longitudinal research findings. One of the first topics taken up was ‘cognitive capital’ addressing the question of what could be learned from ongoing and new analysis of longitudinal data collected in the British Birth Cohort studies – starting in 1946, 1958, 1970, 1991-1992 and 2000-2001². The aim was to examine changes in the development of cognitive capital and its outcomes in education, the labour market and well-being more broadly in adult life. A seminar series bringing together representatives of the longitudinal research and policy making communities was seen as a valuable way of doing this. In addition the series could be used to promote the scientific value of the birth cohort study data for understanding changes in the life course in Britain set against the changing policy context since the second world war.

Accordingly it was decided to approach the Nuffield Foundation for support for the series including research assistance to undertake the data analysis that would be needed. Six seminars were envisaged. The first would consider the concept of cognitive capital and its historical context especially in the formation of educational policy over the 60 years spanning the period of the birth cohort studies, the next four, the results of analysis of birth cohort study data relating to different stages of development across the life course, and the final seminar, an overview of the seminars’ contribution to knowledge and the implications for education and social policy.

An outline proposal was submitted to the Foundation in March 2005. In the light of guidance from the Foundation, a revised outline was submitted in September 2005 and following further correspondence, a full proposal in March 2006, which was approved subject to certain conditions in June 2006 and a grant awarded of £5K. The main requirement was to reduce the scope of funding with the removal of elements for data analysis and research assistant support. The grant was thus

¹ Michael Wadsworth, John Bynner, Leon Feinstein, Harvey Goldstein, Paul Gregg , Kirstine Hansen, Marcus Richards, Ingrid Schoon

² MRC National Survey of Health and Development (NSHD); National Child Development Study (NCDS); 1970 British Cohort Study (BCS70); Avon Longitudinal Survey of Parents and Children (ALSPAC); Millennium Cohort Study (MCS). For an overview see Bynner and Joshi (2007).

awarded for support for database development on which the analysis could be based³. It was requested too that participation in the seminar be broadened to include researchers using other longitudinal datasets outside the framework of the British birth cohort studies framework proposed, including the Dunedin longitudinal study in New Zealand. The Foundation would host the seminars in the Bedford Square Headquarters, supplying a sandwich lunch and tea and refreshments followed by wine at the end. These conditions were readily accepted by the team drawing also on Longview funds to support the work involved. The only small hitch was that unfortunately none of the Nuffield nominees were able to take part on the days on which the seminars were held.

The original plan was to run the seminars through the Autumn of 2006, finishing at the beginning of 2007. In practice it was not possible to undertake the core analysis needed for the seminars on this timescale and they were re-scheduled to begin in January 2007. They took place on Fridays when the Nuffield premises were available roughly a monthly basis with the last one held in July.

Cognitive capital and the aims of the series

The basis of cognitive capital lies in *cognitive function* concerned with those human faculties such as memory, attention, perception, problem solving and mental imagery that are central to cognitive capacity and adaptive capability in later life. Such faculties originate early in life and continue to develop through adolescence and adulthood before levelling off and starting to decline in old age. Their significance in educational performance extends further to life chances in relation to occupation and income, health and wellbeing, and functioning more generally, during the working years. The related concept of *cognitive reserve* points to a protective role for them in inhibiting physical and mental decline in old age (Richards and Deary, 2005).

The developmental and protective aspects of cognitive function are usefully expressed in terms of the idea of “cognitive capital”, i.e. an accumulating asset that can be drawn upon to create, and take advantage of, opportunities to sustain wellbeing in response to environmental challenge and stress (Henry, 2004). Such capital is differentiated by social background with people who have high socio-economic status tending to accumulate more of it than others, either through their own achievements or endowment from their parents. More broadly, paralleling the use of the term in economics, cognitive capital will be characterised by:

- Investment - in the education of self (or children) to produce a return
- Valuing stocks – test scores, levels of qualification achieved
- Ownership – passing on skills

³ We are grateful to Tamjid Mujtaba who made a major contribution to the work.

- Returns - employability, educability, income, health, citizenship
- Distribution – equality/inequality
- Fungibility - convertibility into other forms of capitals, e.g. human capital

Cohort study evidence across the world suggests that levels of cognitive capital, as measured through IQ tests, are rising (Arbuckle et al., 1998; Emanuelson and Svenson, 1990.; Flynn, 1987, 1999) Comparison of cognitive development measures across the first three British birth cohort studies (1946, 1958, 1970) birth cohort studies) that have followed the individuals involved at regular intervals through to adult life enable us to investigate such shifts in the British context. They also enable us to assess variation in the developmental impact of cognitive capital on later life chances at different times.

In the childhood phases of the first three longitudinal studies (1946, 1958, 1970, change in the circumstances that influence cognitive development was considerable. For example, pre-school educational provision was meagre in the early post-war years, parental education was poor, parental separation was unusual, and nutrition was controlled by food rationing. Opportunities in further and higher education and consequently in occupation and income were limited: and were neither equally available nor expected to be equally available. By the 1970s when the third study began, all these influential circumstances had changed as reported in the book, “Changing Britain, Changing Lives”, which compares the members of the first three birth cohort situations in the early 30s (Ferri, Bynner and Wadsworth, 2003). In the later two studies (1991-1992 and 2000-2001) the shifts have continued, though not on quite the same scale or in quite the same form as in the earlier studies.

The aim of the Longview Seminar Series was to make innovative use of the information from the cohort study Data Resource to show the extent to which differences in the physical and social environment had influenced cognitive function. In turn through the role of cognitive function in the production of cognitive capital, a further aim was to show how birth cohort differences influenced opportunities and the narrowing of equity gaps in education, occupation, income and wellbeing. The comparative results would contextualise such results in terms of education and social policy prevailing at the time each of the cohorts passed through the different stages of life - childhood, adolescence, youth and young adulthood, mature adulthood - with a view to identifying implications of the findings for policy. Apart from the direct impact of the work in building the knowledge base for policy purposes, major methodological challenges arise in the comparison of measures taken at different times. Thus the series as a whole addressed issues across three fronts: the value of cognitive capital in the explanation of the development of the human life course under

changing socioeconomic conditions; methodological challenges in operationalising the relevant variables for cross cohort analysis, appraisal of the results in terms of implications for policy

Organisation

The seminar series was planned and run by members of the Longview expert group who also took responsibility for the series of analyses that were presented. Each seminar comprised two or more main presentations followed by a break and then a policy response usually by a speaker from the relevant policy area to open the discussion. Chris Humphries, Director General of City and Guilds agreed to chair the seminars and made a great contribution to all five of those he was able to attend. All but the last seminar took place in the Foundation's headquarters in Bedford Square, which proved an ideal venue for them. Because the date for the last scheduled seminar had to be put back from June to July the Bedford Square booking was lost and the seminar was moved to the Institute of Education. The seminar went well but attendance was down.

To facilitate the wide ranging discussion that was sought, over 100 invitations were issued to people across the range of longitudinal research experience, cognitive development expertise and policy interest, to participate in the series. The aim was to achieve a core group of 60 individuals who would commit to attending all the seminars. (The full list is shown in Appendix 1)

The response to the invitations was pleasing with over 80% of the 90 invited agreeing to take part, including about a quarter policy people. Attendance was also maintained throughout the series with between 30 and 40 people attending each of the seminars, including a core group of up to 20 who attended most of them. The academic policy balance was not maintained as well as had been hoped. Although a policy person was always involved as discussant, and the second part of each seminar was largely devoted to policy issues, academics heavily outnumbered policy people. However, overall the discussion did meet the aims of the series, i.e. examination of the findings presented in terms of policy implications and some significant messages for policy were identified.

The programme began with a seminar setting the scene by identifying the main characteristics of cognitive function and capital around the theme of "intelligence" and a historical overview of the changing use of such concepts as cognitive ability and IQ in education policy. The longitudinal research resource was also described and a chart giving an overview of the variables used for comparison, plus supplementary information, was also made available to attendees. Subsequent seminars were devoted to findings for each of the four life course stages shown below, addressing methodological issues as they arose and drawing out the policy messages from the results presented:

- early years in primary schooling up to age 8

- childhood and adolescence and schooling up to the age of 15
- youth and young adulthood up to the age of 25
- mature adulthood, 25+

The final seminar gave the speakers and others the opportunity to reflect on the findings presented as a whole and their broader implications for policy, and to consider next steps. Two speakers drawn from the regular attendees also presented their perspectives on the contribution of the series to science and policy respectively.

After each seminar speakers' Powerpoint and written presentations were made available through the Longview website, www.longviewuk.com, so that points could be followed up in the next seminar.

The full programme, including the convenors for each seminar together with other speakers, and for seminars 2-4 the cohort study datasets on which analysis was based are shown in Appendix 2. Appendix 3 charts the main cognitive variables for each cohort study that were used in the different analyses.

Conclusion

The seminars confirmed the value within the overarching multidisciplinary life course perspective, ranging from economics to psychology, of the concept of cognitive capital to characterise the development throughout life of individual cognitive capacity and capability. Cognitive capital was defined in terms test scores collected in infancy, childhood and adolescence, in the five British cohort studies followed up since birth in 1946, 1958, 1970, 1991-1992 and 2000-2001. The seminars used data from these studies to compare differences and similarities between the cohorts in the acquisition of cognitive capital and its role in shaping transitions and consequent life chances in life courses beginning at the different times spanned by the birth cohort studies. The changing context of childhood and in educational policy during the long post war period covered by these studies was a particular focus of comparative analysis.

The evidence presented at the seminars points to clear shifts across the cohorts both in the acquisition of cognitive capital as manifested in test performances and in the returns to cognitive capital as manifested in later adult outcomes. These outcomes included educational attainment, employment, adult socio-economic status, income, housing and health. The evidence showed trajectories identified with increasing chances of escape from the lowest quartile of cognitive scores from the earliest measurements (at ages 5 to 8 years) to adolescence (at ages 10 to 11 and 15 to 16 years) when the cohorts were compared. However there were persistent adverse effects of early social disadvantage on the cognitive scores and their change with age. Even children with persistently high cognitive scores achieved less in terms of educational attainment and progress through

adult life if they came from a disadvantaged family of origin: this seems to have changed remarkably little across the cohorts.

Educational attainment was clearly an essential aspect of all adult outcomes. Thus family, socio-economic and policy contexts are important moderators of cognitive function on life course achievement, pointing to the importance of seeing the process of cognitive development and the cognitive capital accumulated through it as dynamic and supporting an accumulating asset.

The seminars also showed the need for further elaboration of the cognitive capital construct, especially to match new circumstances, e.g. the boundaries around the term *cognitive* comprise core functions such as memory and so on and the wider cognitive skills set embracing educational competences of various kinds, as revealed through tests such as the British Ability Scales. More broadly cognitive attributes interface with the wider set of related (in varying degrees) personal attributes, including awareness, creativity, team work, motivation, aspiration, planning, charisma, typically described as 'soft skills'. The importance of sensitive conceptualisation of cognitive capital was described by one speaker, who noted that in the cohort studies used in this exercise, it had already been possible to relate cognitive development to such later life cognitive processes as memory loss.

The biological foundations of cognitive capital in cognitive function are obviously another significant dimension to be investigated more fully as are the contextual features of influence on cognitive development in a dynamic interactional (family, school, peer group, workplace) sense. The seminars confirm the limitations of the unidirectional linear process of influence from adults to children that has tended to dominate traditional conceptions of child development. The relation between cognitive capital and capability, i.e. in Amartya Sen's sense, the potential to achieve desired goals (Sen, 1990), also needs further elucidation, as does the relation between cognitive capital and the physiological manifestations of cognitive function in old age, 'cognitive reserve'. The protective value of cognitive capital in facilitating key turning points in the life course from childhood, through youth to old age – as a counter to accumulated risk and inevitability of adverse life chances - also needs to be understood. Intergenerational continuities and discontinuities in the acquisition of cognitive capital and the means of its transfer from one generation to the next supply the basis of social and income mobility and immobility and are consequently of major policy importance.

Operationalisation has of course presented the major methodological challenge in relation to the cognitive capital construct itself because of the different measures employed in five cohorts followed at different times. Such measurement variation is inevitable in studies that span such a long time period, since improvement in measures (of all kinds) constantly takes place as the academic disciplines engaged in research in these areas seek to advance their methodology. This emphasises the importance of harmonizing design in such

studies with a view to comparability, as we have recently emphasised in mapping out the case for a proposed new national birth cohort study. It also underlines the need for continual improvement in statistical methodology to handle optimally the kind of comparative analysis involved.

These issues will be the subject matter of a book that is being put together by three contributors to the seminar series convenors - Prof. Leon Feinstein, Dr. Marcus Richards, Prof. Ingrid Schoon, with Marcus Richards lead Editor. The book will present the results of the analyses undertaken for the seminars, complemented by further analysis undertaken in the light of points raised at them. The book will contribute uniquely to understanding cognitive capital and to answering the question of how the process of acquiring cognitive capital and its life course consequences changed over the period of the studies. What were the long term outcomes of both effective and ineffective cognitive capital acquisition and what has the analysis shown about the way that policy can be most effective in supporting it? These questions are also informing proposals for a new programme of research taking forward the work done for the seminar series. Funding will be sought on sufficient scale for the programme of analysis to examine the basis of inequality in cognitive capital and its role in combination with other personal attributes and contextual factors, in driving the “escape from disadvantage” across the life course. The aim is to identify the factors that differentiate those who exhibit such mobility from those locked into disadvantage throughout their lives.

Outstanding issues

The seminar series broadly achieved the aims set for it in helping to assess the value of the construct of cognitive capital and its role in shaping the life course, and to translate the findings into policy messages reflecting changing socio-economic circumstances. Some lessons were also learnt about the seminar series itself and the work needed to support it that are worth recording.

Undertaking the analysis as part of ongoing work proved over ambitious. The construction of datasets required comparable measures across five large and multi-faceted longitudinal studies. The assessment of comparability and the analysis required to achieve robust conclusions, all demanded more time than there was available for the series itself. The postponement for three months at the start gave some breathing space, which was essential for the early seminars in the series. However the conclusion reached is that the time needed to undertake work of this scale and complexity requires a fully funded research programme through which research assistance can be devoted full time to work on data preparation and analysis. The dedicated work on dataset construction proved more limited in output than originally anticipated. Although the work supplied a good foundation for the series, it also served to show how much more needed to be done to produce the high quality data and results, which was the aspiration.

The methodological challenges concerned with comparability of data measured in different ways at different times suggests that the whole programme needs to include work to devise optimum measurement and analysis procedures, e.g. within the framework offered by Structural Equation Modelling (Joreskog and Sorbom, 1979). Such operational research could be worthy of a whole seminar series of its own.

Engaging policy makers fully in a seminar series of this kind also proved more difficult to achieve than anticipated. Policy makers working on specific topics in a given policy area will tend to give priority to internal meetings of direct relevance to the work currently on their desks to which their main attention is directed. It was clear that those attending as discussants though making very valuable contributions to the seminar in which they had a designated role were not prepared to give the kind of commitment to attend all seminars that had originally been sought. The policy and political timetable to which they were working simply made it not feasible to attend more than one or two seminars. A future solution to this problem might well be to involve policy people in the organisation of the series from the beginning so timetabling could work to their agendas as well as those of the academic researchers involved. This said the quality of the policy discussion in each seminar was excellent. It was also greatly aided by Chris Humphries, whose perspective from heading City and Guilds illuminated the empirical research as well as guiding what was always a highly stimulating debate.

Finally there is a danger in the social sciences of devising new constructs or recycling ones in use in other contexts to move a subject on. The added value of such constructs over what exists already always has to be questioned. The conclusion we reach from the work on cognitive capital is the use of the term "capital" derived from economics, i.e. an asset the investment of which produces returns that accumulate in terms of capital stock, has value as a useful extension with dynamic connotations to the more familiar terms current in psychology and education such as 'IQ'. It also has much policy salience in the sense that the transformation of the construct into financial investment is more readily understood and acted upon by policy makers. We therefore believe that the subject matter of the series fully justified the Foundation's support for it. The series has added to knowledge in developing a basis for theoretical development which we believe will have much utility in both science and policy field

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APPENDIX 1 – SEMINAR ATTENDEES CORE GROUP

	CORE GROUP	NUFFIELD SEMINAR SERIES
NAME	SURNAME	ORGANISATION
Richard	Bartholomew	Department for Children, Schools and Families
Mel	Bartley	University College London
David	Batty	University of Glasgow
Richard	Berthoud	University of Essex
Diana	Birch	Youth Support

Jo	Blanden	University of Surrey
David	Blane	Imperial College
Audrey	Brown	Department for Children, Schools and Families
Nick	Buck	University of Essex
Michelle	Byford	University College London
John	Bynner	Longview
Robert	Cassen	London School of Economics
George	Clark	Department for Work and Pensions
Frank	Coffield	Institute of Education
Stephan	Collishaw	Institute of Psychiatry
Peter	Craig	Scottish Executive
Tim	Croudace	University of Cambridge
Ann	Cummins	Longview
Chris	Cuthbert	Cabinet Office
Lorraine	Dearden	Institute of Education
Ian	Deary	University of Edinburgh
Panayotes	Demakakos	University College London
Kathryn	Duckworth	Institute of Education
Judy	Dunn	Department of Child Psychiatry
Lee	Elliot Major	Sutton Trust
Maria	Evandrou	Centre for Research on Ageing
Leon	Feinstein	Wider Benefits of Learning Research Centre
Derek	Flynn	Department for Trade and Industry
Catharine	Gale	University of Southampton
Norman	Glass	National Centre for Social Research
Howard	Glennester	London School of Economics
Harvey	Goldstein	University of Bristol
Paul	Gregg	University of Bristol
David	Halpern	Prime Minister's Strategy Unit
Kirstine	Hansen	Institute of Education
Stephani	Hatch	Institute of Psychiatry
Leo	Hendry	University of Glamorgan
John	Hills	London School of Economics
Chris	Humphries	City & Guilds
Anne	Jamieson	Birkbeck College
Barbara	Jefferis	Institute of Child Health
Andrew	Jenkins	Institute of Education
Heather	Joshi	Institute of Education
Tom	Jupp	Institute of Education
Yvonne	Kelly	University College London
Carli	Lessof	National Centre for Social Research
Lindsey	MacMillan	University of Bristol
Barbara	Maughan	Institute of Psychiatry
Maria	Melchior	Institute of Psychiatry
Ted	Melhuish	Birkbeck College
Chris	Power	Institute of Child Health
Marcus	Richards	University College London
Catrin	Roberts	Nuffield Foundation

Michael	Rutter	Institute of Psychiatry
Amanda	Sacker	University College London
Ingrid	Schoon	City University
Nadine	Simmonds	National Centre for Social Research
George	Smith	University of Oxford
Teresa	Smith	University of Oxford
Stephen	Stansfield	Queen Mary College
Gillian	Sutherland	University of Cambridge
Kathy	Sylva	University of Oxford
John	Temple	Department for Children, Schools and Families
Alan	Tuckett	National Institute of Adult Continuing Education
Anna	Vignoles	Institute of Education
John	Vorhaus	Institute of Education
Michael	Wadsworth	Longview
Richard	White	Department for Children, Schools and Families
Sharon	Witherspoon	Nuffield Foundation
Dieter	Wolke	Warwick Medical School
Tom	Wylie	National Youth Agency

APPENDIX 2 – SEMINAR PROGRAMME

Seminar 1 Introduction: How to think about cognitive function? How to measure it? What to do about it? – Friday 26 January 2007

Convenors: Michael Wadsworth (Longview), John Bynner (Longview)

Speakers: Michael Wadsworth, John Bynner, Ian Deary (U of Edinburgh), Gillian Sutherland (U of Cambridge). Marcus Richards (MRC National Survey of Human Development, University College London)

Policy discussant: Norman Glass National Centre for Social Research

Seminar 2 Cohort differences in the development of cognitive capital during the preschool and early school years (birth to age 8 years) – Friday 23 February 2007

Convenor: Leon Feinstein (Institute of Education)

Speakers: Leon Feinstein, Ingrid Schoon (City University – now at Institute of Education), Kirstine Hansen (Institute of Education)

Policy discussant: Chris Cuthbert (Cabinet Office)

Available data sets with relevant measures are 1946, 1958 and 1970 cohorts and ALSPAC (1991-1992) and MCS (2000-2001)

Seminar 3 Effects of cognitive capital in adolescence (ages 9-15 years) – Friday 16 March 2007

Convenor: Leon Feinstein (Institute of Education)

Speakers: Leon Feinstein, Harvey Goldstein (Longview)

Policy discussant: Audrey Brown (Research and Statistics Branch, Department of Education and Skills)

Available datasets are 1946, 1958, 1970 cohort studies, ALSPAC (1991-1992)

Seminar 4 Cognitive capital and the transition to early adulthood (Ages 16-25 years) – Friday 4 May 2007

Convenor: Ingrid Schoon (City University – now at Institute of Education) Institute of Education)

Speakers: Ingrid Schoon (City University – now at Institute of Education), Marcus Richards (MRC NSHD. UCL), John Bynner (Longview)

Policy discussant: John Temple (Area Director, Learning and Skills Council, South West Region)

Available datasets are the 1946, 1958 and 1970 cohort studies.

Seminar 5 Effects of cognitive capital on employment and income family and citizenship and citizenship in mature adult life (25 plus) – Friday 25 May 2007

Convenor: Paul Gregg (University of Bristol), and Marcus Richards (MRC NSHD,

Speakers: Paul Gregg, Marcus Richards

Policy discussant: Alan Tuckett (National Institute for Adult and Continuing Education NIACE)

Available datasets are the 1946, 1958 and 1970 cohort studies.

Seminar 6 Where next? – Friday 29 June 2007

Devoted largely to policy and scientific issues arising from the previous seminars including, setting the agenda for research that needs to follow

Convenors: John Bynner and Mike Wadsworth

Speakers: Leon Feinstein, Ingrid Schoon, Marcus Richards, Barbara Maughan, Institute of Psychiatry, Tom Jupp, National Research and Development Centre for Adult Literacy and Numeracy

APPENDIX 3 - COGNITIVE MEASURES IN THE BRITISH BIRTH COHORTS: AGE 0-8 YEARS

	<i>MCS</i>	<i>ALSPAC</i>	<i>BCS-70</i>	<i>NCDS</i>	<i>NSHD</i>
4 mo	-	Development score	-	-	-
6 mo	-	Total development score (Denver Developmental Screen: DDST)	-	-	-
15 mo	-	Performance score (Griffiths test)	-	-	-
18 mo	-	Total development score, fine & gross motor (DDST) Overall score locomotor & hand eye Griffiths test	-	-	-
2 yr 6 mo	-	Total development score (DDST) Fine & gross motor (DDST)	-	-	-
3 yr	British ability scale (cognitive functioning) The Bracken Basic Concept scale (concept & language skills)		-	-	-
3 yr 6 mo	-	Fine & gross motor (DDST)	-	-	-
4 yr	-	Wechsler Preschool and Primary Scale of Intelligence Digit span (Gathercole & Pickering)	-	-	-
5 yr	-	Digit span (Gathercole & Pickering) Non-word repetition (Gathercole & Baddeley)	Copying Designs test Human Figure Drawing Vocabulary Profile test Schonell Reading test	-	-
6 yr 9mo	-	Locomotor ability Fine motor Ball skills Cognitive	-	-	-
7 yr	-	Reading Spelling Phoneme task Shapes game	-	Problem Arithmetic test Copying Designs test Human Figure Drawing Southgate Reading Group Test	-
8 yr		Tests of Everyday Attention for Children Diagnostic Analysis of Nonverbal Accuracy (DANVA)	-	-	Non-verbal reasoning Verbal comprehension Pronunciation Vocabulary

	<i>MCS</i>	<i>ALSPAC</i>	BCS-70	<i>NCDS</i>	<i>NSHD</i>
10 yr	-	-	CHES Pictorial Language Comprehension test Thackray Reading Readiness profiles Diagnostic tests of pronunciation, writing, spelling and naming Sequential recall Social judgements Shortened Edinburgh reading test British ability scales (vocabulary, recall of digits, verbal and non-verbal reasoning) Fundamental concepts test Copying Designs test Human Figure Drawing Youngs maths test Friendly maths test	-	-
11 yr	-	-	-	Set completion (reasoning) Reading comprehension Copying Designs test Mathematics	NFER 80 item verbal and non verbal ability test Pronunciation Vocabulary Arithmetic
15 yr	-	-	-	-	AH4 130-item verbal and non verbal ability test Watts-Vernon reading comprehension Mathematics
16 yr	-	-	Reading Spelling Mathematics Vocabulary	-	-

	<i>MCS</i>	<i>ALSPAC</i>	<i>BCS-70</i>	<i>NCDS</i>	<i>NSHD</i>
26 yr	-	-	-	-	Watts-Vernon reading comprehension with 10 extra items of increased difficulty
34 yr	-	-	Literacy Numeracy Dyslexia	-	
43 yr	-	-	-	-	Long-term recall (1989 survey medical examination measures) Verbal memory (15-item word list) Timed letter search (speed and concentration) Visual memory (5 pictures of everyday objects) Timed peg placement (manual speed and dexterity)
53 yr	-	-	-	-	Verbal memory I (15-item word list) Verbal memory II (name and address) Timed letter search (speed and concentration) Prospective memory Verbal fluency (animal naming) National Adult Reading Test (NART: word pronunciation)