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A guide to the cognitive measures in five British birth cohort studies

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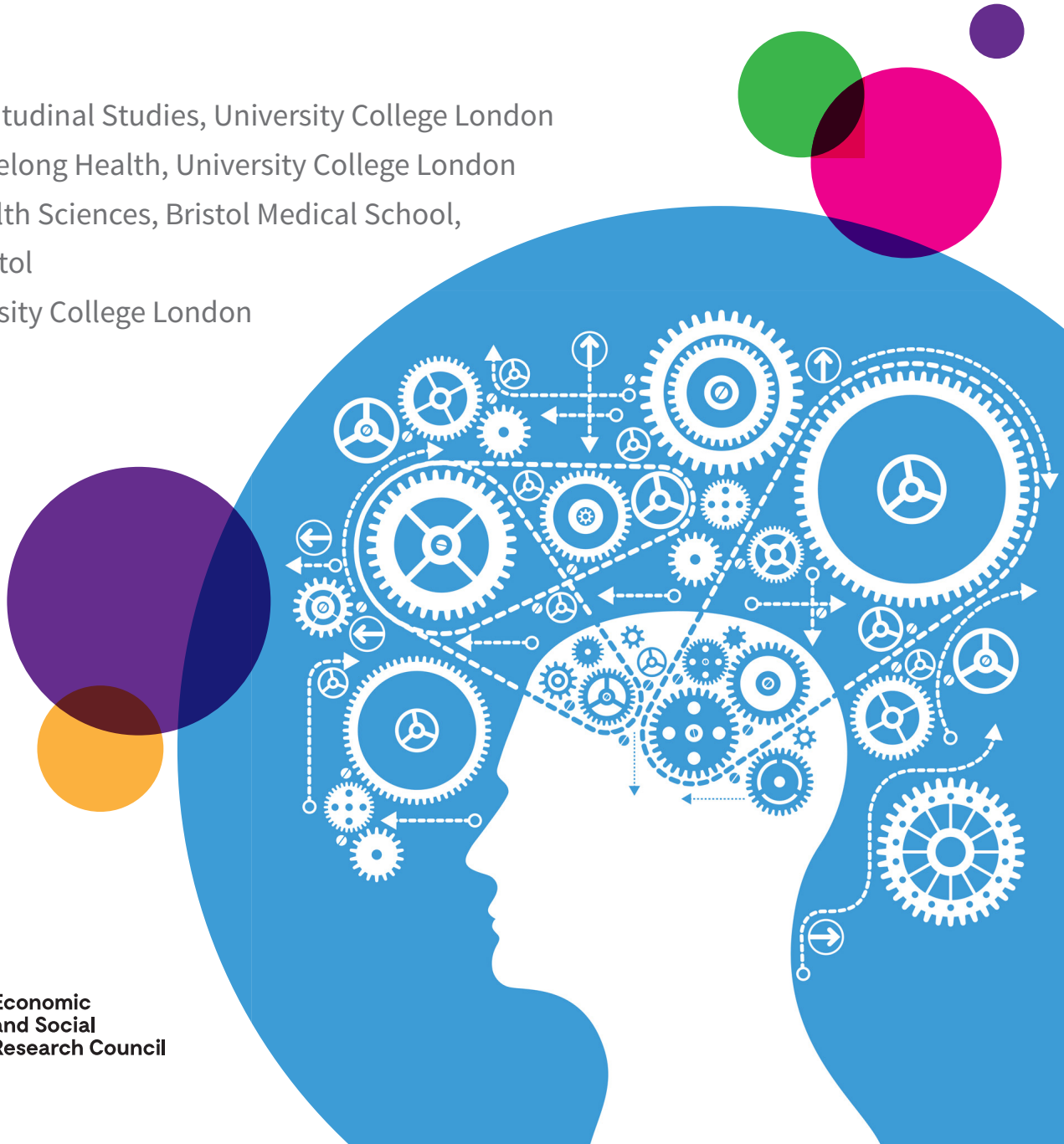

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This resource report is part of a broader work package (CLOSER Work Package #19 'Assessment and harmonisation of cognitive measures in British birth cohorts'), that is supported by CLOSER's Innovation Fund. This initiative supports research that seeks to enhance and extend the research possibilities of data from different longitudinal studies in the UK. Data harmonisation is the process of making data from different studies more comparable. By harmonising data from different UK longitudinal studies, researchers will be able to pool data from multiple studies, an exercise that has many benefits, e.g. increased sample sizes or increased heterogeneity of samples. Moreover, data harmonisation provides us with the opportunity to examine factors that may account for between-study differences, thereby providing insight into societal changes over time.

This project brings together data from five British birth cohorts: i) MRC National Survey of Health of Development (NSHD); ii) the 1958 National Child Development Study (NCDS); iii) the 1970 British Cohort Study (BCS70); iv) the Avon Longitudinal Study of Parents and Children (ALSPAC); and v) the Millennium Cohort Study (MCS). The NSHD is funded by the Medical Research Council and hosted by the MRC Unit for Lifelong Health and Ageing at UCL. The NCDS, BCS70, and MCS receive core funding from the ESRC, and are hosted by the Centre for Longitudinal Studies, UCL. The next NCDS sweep, at age 61, is co-funded by the MRC, the US National Institutes of Health and the Department for Work and Pensions. The most recent sweep of the BCS70, at age 46, received additional funding from the MRC and the British Heart Foundation. The ALSPAC receives core funding from the MRC, the Wellcome Trust, and the University of Bristol, and is hosted by the University of Bristol.

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1. Introduction

Cognition is a broad term that refers to the mechanisms by which we acquire, process, store and ultimately use information from the environment [1]. It encompasses processes such as perception, learning, memory, and reasoning [1]. The CLOSER British birth cohorts contain a wealth of information on cognition over the life course, and the cognitive measures available in these studies have been used to answer research questions in many different fields, e.g. education [2, 3], public health [4, 5], economics [6], psychiatry [7], psychology [8-10], and political science [11]. However, these cognitive tests vary considerably both within and across the cohorts, and this has hindered studies of developmental trends and cross-cohort differences. Moreover, there is considerable heterogeneity in the quality and quantity of the documentation used to describe these cognitive assessments, and, to date, there has been no attempt to develop a uniform description of the key features of these instruments. Therefore, as a first step in facilitating developmental and cross-cohort studies, we provide a comprehensive description of the cognitive measures that are available in five British birth cohorts. A companion report (which will be available at https://www.closer.ac.uk/) will assess the feasibility of harmonising the cognitive measures both within and across the cohorts.

1.1 Cohorts included

This resource report documents the cognitive measures that have been administered in the following studies: i) the MRC National Survey of Health of Development (NSHD); ii) the 1958 National Child Development Study (NCDS); iii) the 1970 British Cohort Study (BCS70); iv) the Avon Longitudinal Study of Parents and Children (ALSPAC); and v) the Millennium Cohort Study (MCS). A brief description of each study follows:

The MRC National Survey of Health of Development: The NSHD is the longest running of the British birth cohort studies. It originally consisted of a socially stratified sample (N=5,362) of men and women born to married parents in England, Scotland or Wales in March 1946. The sample was selected from an initial maternity survey of 13,687 pregnancies, and consisted of all births to non-manual and agricultural families, and a random 1-in-4 sample from manual families. To date, the participants have been followed up in 24 data collections when they were aged 2, 4, 6, 7, 8, 9, 10, 11, 13, 15, 19, 20, 21, 22, 23, 24, 25, 26, 31, 36, 43, 47-54, 60 -64 and 68-69. At age 69, the most recent home visit, 2,149 cohort members participated. More details about this study can be found at: http://www.nshd.mrc.ac.uk/.

The 1958 National Child Development Study: The NCDS follows the lives of 17,415 people born in England, Scotland and Wales in a single week in 1958. The NCDS started in

1958 as the Perinatal Mortality Survey and captured 98% of the total births in Great Britain in a week. The cohort has been followed up a total of ten times at ages 7, 11, 16, 23, 33, 42, 44, 46, 50 and most recently at 55 when 9,137 cohort members took part. Additional information on these sweeps can be found at: https://cls.ucl.ac.uk/cls-studies/1958-national-child-development-study/.

The 1970 British Cohort Study: The BCS70 follows the lives of 17,198 people born in England, Scotland and Wales in a single week in 1970. The BCS began as the British Births Survey and participants have since been followed up nine times at ages 5, 10, 16, 26, 30, 34, 38, 42 and the most recent at age 46, when 8,581 cohort members took part. In addition to the main BCS70 sweeps, the following sub-studies have been conducted: 1) Twins study (2008-2009); 2) Age 21 sweep (1992); 3) Age 7 sweep (1977); and 4) 22 month and 42 month sweeps (1972-1973). For further details of these sub-studies, see https://cls.ucl.ac.uk/cls-studies/1970-british-cohort-study/.

The Avon Longitudinal Study of Parents and Children: The ALSPAC charts the lives of 14,541 people born in the former county of Avon between April 1991 and December 1992. Assessments have been administered frequently, with 68 data collection time points between birth and 18 years of age. Data is collected on both parents and children, and more recently ALSPAC has started to recruit and collect data on the children of the original cohort members. Further information can be found at: http://www.bristol.ac.uk/alspac/.

The Millennium Cohort Study: The MCS follows the lives of 19,517 children born in England, Scotland, Wales and Northern Ireland in 2000 -01. Since the initial birth survey at 9 months, the cohort has been followed up five times at ages 3, 5, 7, 11 and most recently at age 14, when 11,872 cohort members took part. A description of these sweeps is available at: https://cls.ucl.ac.uk/cls-studies/millennium-cohort-study/.

More details on each of the cohorts, including cohort profiles and guidance on accessing the data, can be found at https://www.closer.ac.uk/closer/explore-the-studies/.

1.2 Measuring cognition

Researchers from different disciplines often approach the study of cognition from different perspectives, which can lead to inconsistencies in terminology. For instance, the term *cognitive ability* is most commonly used in the social sciences (e.g. education, economics, psychology), whereas the term *cognitive functioning* appears more often in medical disciplines (e.g. geriatric medicine). Both terms broadly refer to individual differences in mental processes of thinking, and the demarcation between them is poorly defined. At a more specific level, different terms may be applied to different groups of functionally connected cognitive processes. For example, the various cognitive

mechanisms associated with attentional control (i.e. coordinating goal-directed behaviour) have been conceptualized as *executive functioning* by neuropsychologists and as *working memory capacity* by experimental psychologists [12].

Along with differences in terminology, measurement strategies can vary depending on factors such as academic discipline, historical factors, research setting, and characteristics of the population being studied. For instance, researchers with an educational background may be more likely to measure skills and abilities that are developed in the school environment, e.g. pen and paper tests of reading comprehension and arithmetic. Researchers from a cognitive neuroscience background may be more likely to administer instruments that aim to capture specific cognitive processes, e.g. computer-administered tests of working memory and visual processing.

In terms of research setting, due to time and resource constraints, large population-based studies may be forced to rely on short, easy-to-administer cognitive tests (e.g. [13]), whereas smaller-scale studies may have the opportunity to administer more comprehensive assessment batteries (e.g. [14]). Moreover, measures that are ostensibly similar in content may serve radically different purposes, e.g. tests of verbal fluency can be used to profile executive function in the general adult population (e.g. [15]), or as part of a screener for dementia in individual clinical assessments (e.g. [16]).

Given the above described heterogeneity in the study of cognition, we aim to be as inclusive as possible and document all measures of cognition that are available in five key British birth cohorts, regardless of academic discipline, methodology, function or participant (e.g. cohort member, cohort members' mother).

1.3 Conventions in the available tests

In discussing cognitive measures that are available in the cohorts, it is possible to draw a distinction between tests of achievement and tests of ability [17]. Achievement tests are used to measure knowledge and competence accumulated within a particular area, e.g. reading skills, language skills, arithmetic and mathematics [18]. Ability tests typically assess an individual's capability of solving unfamiliar problems, usually by employing some form of reasoning (e.g. verbal, numeric, visuospatial) [18]. This distinction is analogous to the idea of crystallised and fluid intelligence (see section 1.5). Although these types of test may seem well-differentiated, scores tend to correlate highly due to functional overlap [18]. Indeed, Dickens [17] argues that it is impossible to measure ability without also measuring the test taker's reading or verbal comprehension. Furthermore, any reasoning task that involves some form of acquired knowledge (e.g. geometry, arithmetic, general knowledge) will also be impacted by the individual's level of

achievement. As such, the most widely used batteries of cognitive assessment typically include tests of both ability and achievement, e.g. the Wechsler scales [19] and the British Ability Scales [20]. Given this theoretical and functional overlap, this report documents both achievement and ability tests.

The tests that were administered during childhood in the earlier cohorts appear to reflect the curricula of those periods. For example, the early arithmetic tests contain several conventions that are no longer used in the teaching of mathematics. Moreover, we noted a trend whereby tests became more reflective of achievement and attained knowledge as children entered adolescence. We do not, however, include educational qualifications and school educational attainment measures, e.g. key stage national curriculum tests. Educationalists have criticised these tests for various reasons, such as: i) changes in the curricula and tests over time, ii) the high stakes for teachers and schools encouraging a "teaching to the test" mentality, and iii) questions regarding political interference in the monitoring and reporting of national standards (see [21] for a more detailed discussion of this issue).

Prior to the 1970s, no standardised tests of cognitive ability had been developed for use in the British population [22]. As such, many of the tests administered during childhood in the earlier cohorts (NSHD, NCDS) were devised specifically for the cohort studies by educationalists. In particular, many of the childhood tests were developed at the National Foundation for Educational Research (NFER) [23]. Standardised ability tests (e.g. the British Ability Scales) became the primary form of assessment beginning at the age 10 sweep of the BCS in 1980. The exact content of such standardised tests varies in order to be age appropriate for the study children. Moreover, there are important mode effects to consider; traditional pen and paper methods and physical tasks (e.g. block building) were more common in childhood (particularly in the older cohorts), whereas modern assessment formats (e.g. computer-assisted personal interviewing; CAPI) are used more regularly in later sweeps/cohorts. External factors may also have contributed to bias in the tests; e.g. at the age 16 sweep of the BCS, national teacher strikes meant that a smaller than expected number of cognitive tests were returned, and these were completed in different settings (approximately 3,000 in schools, approximately 2,000 in homes).

Regarding the cognitive measures that were administered in adulthood (available only in NSHD, NCDS and BCS), two trends became evident. First, there was a considerable period (when participants were aged in their 20s to early 40's) over which little information on cognition was gathered. In the NCDS and BCS, tests during this period focused on basic skills in adult literacy and numeracy, as well as cognitive measures from the children of the cohort members. Second, the measures of cognition that were administered in mid-life and beyond differed considerably from those used in childhood. Whereas the measures administered in childhood were comprised largely of tests of ability (e.g. novel

problem solving) and achievement (e.g. literacy and numeracy), the measures administered in adulthood (beginning primarily as participants entered their 40s) were more reflective of cognitive skills/abilities that impact on functioning in day-to-day adult life, e.g. short-term memory, visual scanning ability, and verbal fluency. Recent research, however, has demonstrated that these common adult tests demonstrate structural and functional overlap with childhood tests of ability and achievement [24]. As such, in addition to the childhood measures outlined above, we describe all the available measures of general cognitive function in adulthood.

1.4 Overview of the cognitive measures

In spite of the structural and functional overlap mentioned above, the broader differences that exist between the measures administered in childhood and adulthood informed our decision to divide our description of the cognitive measures into two separate sections reflecting these different stages of life. Table 1 presents an overview of the cognitive measures administered in the five cohorts during childhood, whereas Table 2 outlines the instruments used in adulthood. The tables outline the name of each test by cohort, age (or decade), and reporter (with the latter documented in the table footnotes).

Table 1. Overview of cognitive measures available across childhood in five British birth cohorts

Age	NSHD (1946)	NCDS (1958)	BCS70 (1970)	ALSPAC (1991 - 92)	MCS (2000 - 01)
Age 0/1				Age 4 months[1]: - Habituation Task	Age 9 months: - Developmental milestones (incl. motor coordination and vocabulary)
Age 1/2			Age 22 months[1]: - Developmental milestones (incl. fine locomotor test, speech and language, etc.)	Age 18 months[1]: - Griffiths Scales of Mental Development o The Griffiths Locomotor Scale o The Griffiths Personal-Social Scale o The Griffiths Hearing and Speech Scale o The Griffiths Hand and Eye Coordination Scale o The Griffiths Performance Scale Age 25 months[1]: - The Reynell Developmental Language Scale (Verbal	

		Comprehensions Scale only) - Object Naming Assessment (Phonology screening procedure)	
Age 3	Age 42 months[1]: - Developmental milestones		Age 3: - BAS II Naming Vocabulary - Bracken School Readiness Assessment-Revised
Age 4/5	Age 5: - Schonell Reading Test - English Picture Vocabulary Test (EPVT) - Copying Designs Test (CDT) - Human Figure Drawing (HFD) - Complete a Profile Test (CPT)	Age 49 months[1]: - Wechsler Preschool and Primary Scale of Intelligence - Revised (WPPSI -RUK) o Object Assembly (WPPSI -RUK) o Geometric Design (WPPSI -RUK) o Block Design (WPPSI -RUK) o Mazes (WPPSI -RUK) o Picture Completion (WPPSI -RUK)	Age 5: - BAS II Naming Vocabulary - BAS II Pattern Construction - BAS II Picture Similarities

			o Information (WPPSI -RUK) o Comprehension (WPPSI -RUK) o Arithmetic (WPPSI -RUK) o Vocabulary (WPPSI -RUK) o Similarities (WPPSI -RUK) - Short-term memory (Digit Span Test) Age 61 months[1]: - Short-term memory (Digit Span Test) - Short-term memory (Non-word Repetition) - The Reynell Developmental Language Scale (Verbal Comprehensions Scale only) - Bus story - Initial Consonants Detection Test - Multisyllabic Word Repetition

Age 7		Age 7: - Southgate Group Reading Test - Problem Arithmetic Test (NFER devised) - Copying Designs Test (CDT) - Human Figure Drawing (HFD)	Age 7.5: - Basic Reading - Phoneme deletion task - Spelling task - Letter decision task - Motor ability task	Age 7: - BAS II Word Reading - BAS II Pattern Construction - NFER Progress in Maths (adapted)
Age 8/9	Age 8: - Picture Intelligence - Reading Comprehension - Word Reading - Vocabulary		Age 8: - Wechsler Intelligence Scale for Children (WISC-III) - DANVA: Faces subtest - TEA-Ch, the Test of Everyday Attention for Children - Language development: (listening comprehension, Oral Expression, non-word repetition/short-term memory, articulation) Age 9: - Word and non-word reading - Spelling task - Oral reading (NARA II) - Sentence decision task	

Age 10/11	Age 11: - General Ability Test (Verbal and Non-Verbal) - Arithmetic Test - Word Reading - Vocabulary	Age 11: - General Ability Test (Verbal and Non-Verbal) - Reading Comprehension Test (NFER) - Mathematics Test (NFER) - Copying Designs Test (CDT)	Age 10: - Edinburgh Reading Test (Shortened Version) - Friendly Maths Test - Pictorial Language Comprehension Test (PLCT) - Spelling Dictation Task (SDT) - BAS Similarities (Word) - BAS Word Definitions - BAS Recall of Digits - BAS Matrices	Age 10: - Working memory (Counting Span Task) - Inhibition (Stop Signal Task) Age 11: - TEA-Ch, the Test of Everyday Attention for Children - Higher conceptual reasoning (bike drawing task)	Age 11: - BAS II Verbal Similarities - CANTAB Cambridge Gambling Task (CGT) - CANTAB Spatial Working Memory Task (SWM)
Age 12/13				Age 12: - Phonological awareness (spoonerisms) - Test of Word Reading Efficiency/fluency (TOWRE) - Motor Skill and Movement Test Age 13.5: - Reaction time (simple, choice, digit vigilance)	

				- Test of Word Reading Efficiency/fluency (TOWRE)	
Age 14/15	Age 15: - The Alice Heim Group Ability Test (AH4) - The Watts-Vernon Reading Test - Mathematics Test			Age 15.5: - Wechsler Abbreviated Scale of Intelligence (WASI) - Inhibition (Stop Signal Task)	Age 14: - APU Vocabulary test[2] - CANTAB Cambridge Gambling Task (CGT)
Age 16/17		Age 16: - Reading Comprehension Test (NFER) - Mathematics Test (NFER)	Age 16: - Edinburgh Reading Test (Shortened Version) - APU Arithmetic Test - APU Vocabulary Test - Spelling test - BAS Matrices	Age 17.5: - Working memory (N-back task) - Information processing biases (Affective Go/No-Go Task) - Behavioural inhibition (Probability Learning and Reversal Task)	Age 17[3]: Number Analogies (GL Assessment)
Multi-age		Age 3 years, 11 months, and 16 days or older[4,5]: - Peabody Picture Vocabulary Test Revised (PPVT-R) - Peabody Individual Achievement Test (PIAT) Maths - PIAT Reading Recognition subscale	Age 3-5 years 11 months[4]: - BAS Naming Vocabulary - BAS Early Number Concepts - Copying Designs Test (same as BCS70 CDT)		

	- PIAT Reading Comprehension subscale - McCarthy Scale of Children's Abilities - Verbal Memory subscale - WISC Revised Digit Span Subscale	Age 6-16 years 11 months: - BAS Word Reading - BAS Number skills - BAS Spelling

Note. [1] Tests administered to a randomly selected sub-sample. [2] Test administered to cohort member, mother and partner. [3] MCS7 not available at time of writing. [4] Tests administered to the children of cohort members. [5] Tests completed by a sub-sample.

Table 2. Overview of cognitive measures available across adulthood in five British birth cohorts

Age	NSHD (1946)	NCDS (1958)	BCS70 (1970)	ALSPAC (1991 - 92)	MCS (2000 - 01)
20s	Age 26: - The Watts-Vernon Reading Test (with 10 additional words to reduce ceiling effects)		Age 21[5]: - Literacy and numeracy assessments (ALBSU)		
30s		Age 37[5]: - Basic literacy and numeracy skills (ALBSU and NFER)	Age 34: - Basic skills (Literacy and numeracy assessments) - Literacy and numeracy skills		
40s	Age 43: - Verbal Learning/ Word List Recall Test - Long-term Recall - Visual Memory - Timed Letter Search/Letter Cancellation Test - Motor Speed and Praxis		Age 42: - APU Vocabulary Test Age 46 - 47: - Verbal Learning/ Word List Recall Test - Timed Letter Search/Letter Cancellation Test - Verbal Fluency (animal naming) Test		
50s	Age 53: - Verbal Learning/ Word List Recall Test	Age 50: - Verbal Learning/ Word List Recall Test	Age 50[6]: - Proposed repeat of some (and other)	Age 50[7] (Focus on Mother's Clinic 2) - Logic Memory - Digits Backwards	

	- Timed Letter Search/Letter Cancellation Test - Verbal Fluency (animal naming) Test - Prospective Memory - Delayed Verbal Memory - National Adult Reading Test (NART)	- Timed Letter Search/Letter Cancellation Test - Verbal Fluency (animal naming) Test	adult tests within and across cohort(s)	- Spot the Word - Digit Symbol Coding - Verbal Fluency Test Age 52[7] (Focus on Mother's Clinic 3) - Logic Memory - Digits Backwards - Spot the Word - Digit Symbol Coding - Verbal Fluency Test Age 53[7] (Focus on Mother's Clinic 4) - Logic Memory - Digits Backwards - Spot the Word - Digit Symbol Coding - Verbal Fluency Test
60s	Age 60 - 64: - Verbal Learning/ Word List Recall Test - Timed Letter Search/Letter Cancellation Test - Reaction Time Test	Age 61 - 63[6]: - Proposed repeat of tests at age 50		
60s / 70s	Age 68 - 70: - Verbal Learning/ Word List Recall Test			

	- Timed Letter Search/Letter Cancellation Test - Finger Tapping Test - Addenbrooke's Cognitive Examination-III (ACE-III)

Note. [5]Tests completed by a sub-sample. [6]At the time of writing, cognitive tests were provisional pending pilot and fieldwork. [7]Tests administered to the study mothers.

1.5 Specific features documented

In order to provide a comprehensive and consistent description of the cognitive measures in the five British birth cohorts, we document various features of the different tests (Table 4). Furthermore, in order to facilitate the comparison of these measures both within and across the cohorts, we classify each measure at a conceptual level under a common theoretical framework. Although there are multiple theoretical models that are proposed to account for individual differences in cognitive tests, we chose the Cattell-Horn-Carroll (CHC) model of cognitive ability [25] as our overarching framework. There are three primary reasons for this decision:

The CHC model is built into the theoretical framework of (or is at least compatible with) many of the cognitive tests administered in the cohorts, particularly in childhood, e.g. the British Ability Scales, the Wechsler scales.

The CHC model is the most comprehensive and strongly supported, empirically derived taxonomy of cognitive abilities [25, 26].

The CHC model has shown a high degree of generality across different tests, including those designed under other theoretical frameworks; e.g. recent psychometric evidence has demonstrated that neuropsychological tests designed to assess executive function demonstrate structural and functional alignment with the CHC model [24].

This model conceptualises cognitive ability as multidimensional and functionally integrated [25]. The CHC model is hierarchical in nature, ranging from general ability (g) to broad, narrow, and specific abilities [25]. Specific abilities, at the bottom of the hierarchy, are the only observable cognitive abilities, and are usually tied to specific tests (e.g. ability to repeat back sentences). Narrow-stratum abilities are inferred, and are captured in clusters of highly correlated specific abilities (e.g. ability to repeat back sentences and ability to repeat back individual words may reflect a broader memory span ability). Similarly, broad-stratum abilities are reflected in clusters of correlated narrow-stratum abilities. Arguably the two most commonly discussed broad-stratum abilities are 'crystallised intelligence' and 'fluid intelligence'. Crystallised intelligence broadly refers to acquired knowledge, and encompasses narrow-stratum abilities such as general knowledge, lexical knowledge, and language development [26]. Fluid intelligence refers to an individual's ability to solve novel problems, without relying on acquired knowledge [26]. It includes processes such as induction and sequential reasoning. The 'fluid-crystallised' split mirrors the ability vs achievement test distinction previously discussed (see section 1.3). By convention, abilities at the broad-stratum level are denoted with an abbreviation that begins with a capital 'G' (standing for 'general'), followed by lowercase letters, e.g. Gc (crystallised intelligence), Gf (fluid intelligence) [25]. A brief description of each of the broad stratum abilities of the CHC model is provided in Table 3.

Table 3. Broad-stratum abilities as defined in the CHC model of intelligence [27]

Notation	Ability	Description
Gf	Fluid reasoning/ fluid intelligence	Ability to solve 'novel' problems without relying on previously acquired knowledge.
Gsm	Short-term memory	Ability to store and manipulate information in one's immediate awareness.
Glr	Long-term storage & retrieval	Ability to store information in memory and recall this information over periods of time ranging from minutes to years. The main distinction between this and Gsm is that, in Gsm tests, there is a continuous effort to maintain awareness of the information, whereas in Glr tests the info has been placed out of conscious awareness for a specified period of time, and must be 'retrieved'.
Gs	Processing speed	Degree to which cognitive tasks can be performed quickly and without error.
Gt	Reaction time	Speed and accuracy with which decisions/judgements can be made when presented with information.
Gps	Psychomotor speed	Speed and fluidity with which body movements can be made.
Gc	Acquired knowledge/ crystallised intelligence	Skill/knowledge base acquired, e.g. knowledge of the fundamental meaning of words. Highly dependent on culture.
Gkn	Domain-specific knowledge	Mastery of specialised knowledge, e.g. foreign language proficiency, geographical knowledge.
Grw	Reading and writing	Skills related to written language, e.g. reading speed, spelling ability.
Gq	Quantitative knowledge	Knowledge/achievement related to mathematics.
Gv	Visual processing	Ability to mentally simulate and manipulate imagery.
Ga	Auditory processing	Ability to identify and process information from sound.
Go	Olfactory abilities	Ability to detect and process information from odours.
Gh	Tactile abilities	Ability to recognise and process information from touch.

Gk	Kinesthetic abilities	The ability to detect and process meaningful information in proprioceptive sensations.
Gp	Psychomotor ability	Precision, coordination and strength of body movements.

At the highest level of the hierarchy, a general cognitive ability factor (*g*) is posited. Both the structure and validity of this model have been supported in many factor analytic studies [26], and general cognitive ability has been shown to be an important predictor of a wide range of life outcomes across different groups [28].

The key features of each of the cognitive measures are documented as outlined in Table 4. Please be aware that over time some of the features detailed in this report may have subsequently been updated or changed.

Table 4. Outline of the key features documented for each measure of cognitive ability.

Domain:	First, each measure will be classified at the broadest possible level, e.g. does it assess a form of verbal, or non-verbal (i.e. performance) ability.
Measures:	This section will list the more specific areas of cognition that are measured by each test, e.g. lexical knowledge, reading comprehension, general sequential reasoning, quantitative reasoning, short-term episodic memory, visual scanning, simple reaction time etc. This information will be taken from the original source documentation for the measure. If the source documentation is unavailable or does not contain this information, we will consult technical resources documented in the cohort literature.
CHC:	In this section, we will document the broad-stratum ability (e.g. Gc, Gf, Gsm) associated with each test. Again, this will be determined using the source documentation. If the source documentation is unavailable/inadequate, the test/task will be matched with established broad-level cognitive abilities as described in the extant literature, e.g. [24]. For a more detailed description of the CHC model of cognitive ability, see [24, 25, 29].Not all cognitive tests fit within the CHC framework, for

	example developmental tests in early childhood and basic language and numeracy tests in adulthood. In such instances, no broad-stratum ability will be assigned to these tests. In addition, some tests may be associated with more than one broad-stratum.
Administration method:	Here we will describe the key features of how the test was administered, including the test administrator (e.g. teacher, psychologist, trained interviewer) and method used (e.g. CAPI, pen and paper, oral response). This section will help highlight any mode effects to consider when tests are being compared within/across cohorts.
Procedure:	We provide a brief description of the test itself and the administration procedure. Details (where available) include: - Nature of questions/items - Number of questions/items - Number of sub-tasks (if appropriate) - Whether practice trials were administered - Whether prompts or encouragement were used - Duration of the test
Questionnaire:	Where possible we provide links to the original questionnaire documentation (or provide the file name), the majority of which are freely available online.
Scoring:	In this section we provide information on the scoring of the tests (both raw scores and any standardised/normalised scores available).
Item-level variable(s):	Here we list the relevant item-level variable names (where available). For some tests, item level variables were not available as either the test had not been processed or the data were not readily available at the UKDS (for further information please contact the relevant data providers). Note, variables could be in either upper or lower case, so please check for both.
Total score/derived variable(s):	Here we list (where available) any derived variables (i.e. any variables that were constructed by manipulating the original raw data) and summary/total scores for the test. For some tests, total scores were not available.

Descriptives:	Where total scores were available we provide basic descriptive statistics for the tests, including number of available cases (N), mean (M), standard deviation (SD), and range of scores. We also include histograms as a means of quickly assessing the distribution of scores, enabling researchers to identify potential issues such as floor and ceiling effects. Note that, although the descriptive statistics are accurate at the time of writing, ongoing updates and improvements to the raw data by the hosts may lead to minor discrepancies with previous/future documents.
Age of participants:	Here we note the M, SD, and age range (in weeks, months or years, as appropriate) of participants at time of assessment (where available).
Other sweep and/or cohort:	In the instance that the same measure has been administered in multiple waves or cohorts, this information will be recorded here. This may not mean the test is exactly the same. For example, a British Ability Scales (BAS) test previously administered, may have been subsequently revised and updated. There may also be mode effects to consider; e.g. the NSHD, NCDS and BCS all include word list learning tasks in mid-adulthood, however in NSHD the words are presented visually, whereas in NCDS and BCS they are presented aurally. In addition, we have also included references to the same tests, which have been devised by different test developers. For example, in ALSPAC the Wechsler Intelligence Scale for Children (WISC-III) was administered, and includes sub-scales such as Recall of Digits which is also available in the BAS and administered in the BCS. Tests which cover very broad domains such as mathematics and reading which are conceptually similar, but not the same test are not included in this section. For example, the mathematics tests do not cover all the same fields of mathematics i.e. arithmetic, algebra, geometry and include different questions in each of the mathematical fields.
Source:	Here we specify the original source of each test. Typical sources include scale/test manuals, published empirical articles or descriptions of the processes used to create tests specifically for a given cohort study.

Technical resources:	Here we provide details (where available) of useful technical resources and supplementary materials. Examples include user guides and methodological papers/materials (beyond the core source materials).
Reference examples:	Finally, (where available) we provide examples of empirical articles that have made use of the given test (in the five British birth cohorts only). This section is neither an exhaustive list, nor an endorsement of the quality of the reported research or treatment of the cognitive variables therein, rather it serves simply to provide examples of the measures in use.

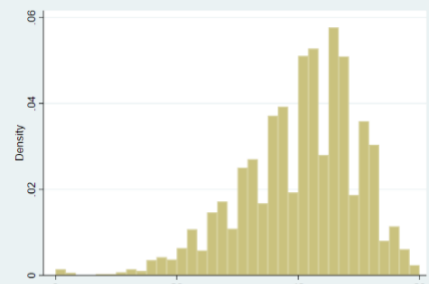
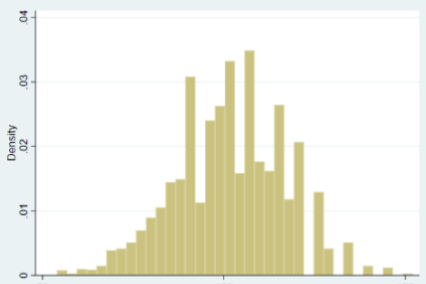
2. MRC National Survey of Health and Development (NSHD)

Along with raw and normalised variables for each cognitive test in childhood, the NSHD contains three standardised summary variables (COG8H, COG11H, and COG15H). These were calculated by transforming the raw scores of each measure to standardised z-scores, summing these z-scores, then re-standardising this total score [29]. Thus, these derived variables provide a simple global cognitive functioning score.

2.1 NSHD (Age 8)

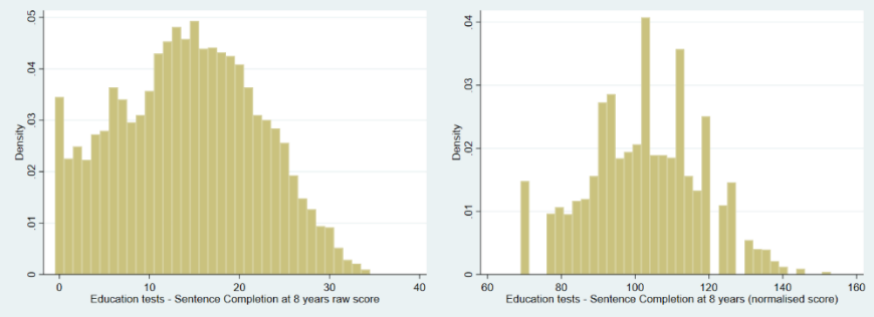
2.1.1 Picture Intelligence

Domain:	Non-verbal (reasoning)
Measures:	- Non-verbal ability - Induction - General sequential reasoning
CHC:	Gf (Fluid intelligence)
Administration method:	Teacher/psychologist/trained individual; face to face; pen and paper
Procedure:	This test was comprised of three sections. In section 1, participants were presented with 15 series, each consisting of 5 images (4 of which were conceptually similar), and were asked to select the 'odd one out'. Section 2 consisted of 20 incomplete picture series, and participants were instructed to select, from 5 different options, the correct picture to complete each series. Section 3 included 25 conceptual similarity tasks. Participants were asked to choose, from 5 options, a picture that corresponded with an established rule, e.g. "foot is to shoe as head is to hat". Each section was preceded by a practice trial. The overall testing session at age 8 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1954_sm_nf2.pdf
Scoring:	One point awarded per correct answer (0 -60).

Item-level variable(s):	Not currently available.
Total score/derived variable(s):	PI8R, PI8R54, PI854, PI8N
Descriptives: (raw and normed data)	N = 4,266 Range = 0 -60 Mean = 40.20 SD = 9.48  N = 4,266 Range = 54-152 Mean = 101.64 SD = 15.02 
Age of participants:	8 years 6 months
Other sweep and/or cohort:	None
Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. BMJ, 322(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. International Journal of Epidemiology, 33(2), 408-413.

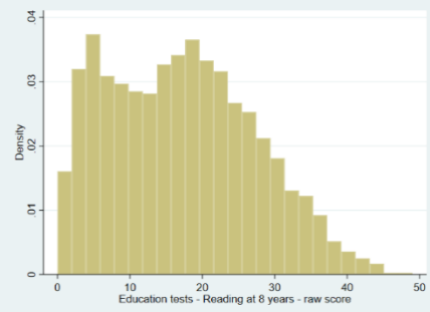
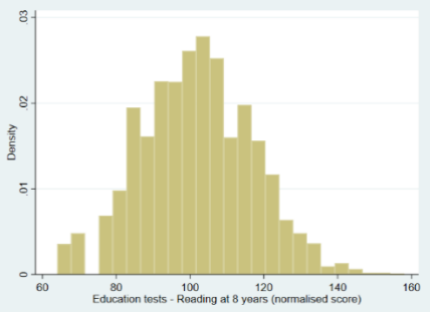
2.1.2 Reading Comprehension

Domain:	Verbal (reading)
Measures:	- Word comprehension/lexical knowledge - Reading comprehension - Reading decoding
CHC:	- Gc (Crystallized intelligence) - Grw (Reading/writing)
Administration method:	Teacher/psychologist/trained individual; face to face; pen and paper
Procedure:	Participants were presented with a list of 35 sentence, and were asked to underline the correct word (from 5 different options) to complete each sentence, e.g. "Come with me to the shops to buy some (fire, water, stone, sweets, motors)". The overall testing session at age 8 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1954_sm_nf2.pdf
Scoring:	One point awarded per correct answer (0 -35).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	SC8R, SC8R54, SC854, SC8N
Descriptives: (raw and normed data)	N = 4,259 Range = 0 - 34 Mean = 14.20 SD = 7.78 N = 4,259 Range = 69 - 153 Mean = 102.16 SD = 15.16

	
Age of participants:	8 years 6 months
Other sweep and/or cohort:	- NCDS (age 11 and 16) - NSHD (age 15 and 26) Watts-Vernon
Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. *International Journal of Epidemiology*, *33*(2), 408-413.

2.1.3 Word Reading

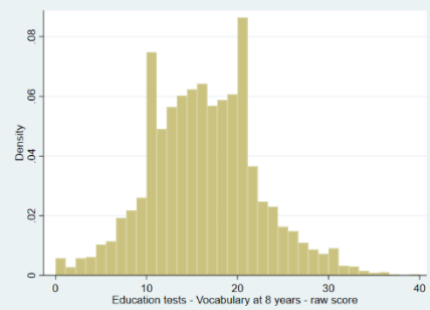
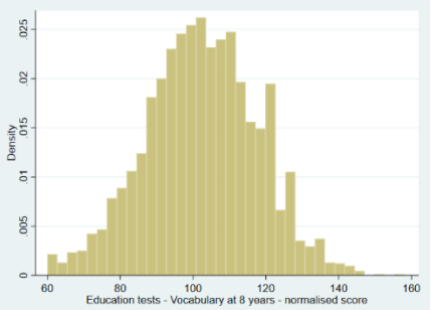
Domain:	Verbal (reading)
Measures:	Reading decoding
CHC:	Grw (Reading/Writing)
Administration method:	Teacher/psychologist/trained individual; face to face; read aloud

Procedure:	Participants were presented with a list of 50 words. They were instructed to read words aloud, one by one, working down the list. The interviewer recorded the number of correct responses (only correct if *usual* pronunciation was used). If a child changed their initial answer to a correct answer, the item was marked as correct. If the child changed their initial answer to a wrong answer, the item was marked incorrect. Interviewers were instructed not to give any indication as to whether answers were right or wrong. In case of a delay, prompts such as "Have a try" were used. The overall testing session at age 8 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1954_sm_nf2.pdf
Scoring:	One point for each correct answer (0 -50).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	R8R, R8R54, R854, R8N
Descriptives: (raw and normed data)	N = 4,259 Range = 0 -49 Mean = 17.02 SD = 10.28  N = 4,259 Range = 64-158 Mean = 102.00 SD = 15.33 
Age of participants:	8 years 6 months
Other sweep and/or cohort:	- NSHD (age 11) - MCS (age 7) similar BAS test - BCS (children of cohort member, multi-age) similar BAS test

Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. *International Journal of Epidemiology*, *33*(2), 408-413.

2.1.4 Vocabulary

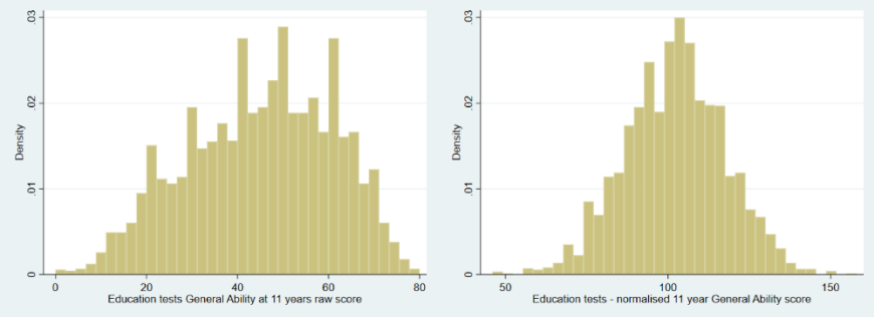
Domain:	Verbal (comprehension)
Measures:	Lexical Knowledge/word understanding
CHC:	Gc (Crystallized intelligence)
Administration method:	Teacher/psychologist/trained individual; face to face; read aloud
Procedure:	After the participant completed the word reading task, the interviewer asked the child whether they knew the meaning of each word, e.g. “What is a ___”, “What do we mean by ___”. The interviewer noted the number of correct responses. The overall testing session at age 8 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1954_sm_nf2.pdf
Scoring:	One mark for each correct response (0 -50).
Item-level variable(s):	Not currently available.

Total score/derived variable(s):	VOC8R, VOC8R54, VOC854, VOC8N
Descriptives: (raw and normed data)	N = 4,259 Range = 0 - 40 Mean = 16.28 SD = 5.99  N = 4,259 Range = 60 - 158 Mean = 102.25 SD = 15.31 
Age of participants:	8 years 6 months
Other sweep and/or cohort:	- NSHD (Age 11) - BCS (Age 10) - ALSPAC (Age 8)
Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. *International Journal of Epidemiology*, *33*(2), 408-413.

2.2 NSHD (Age 11)

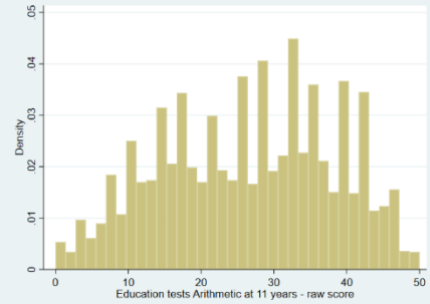
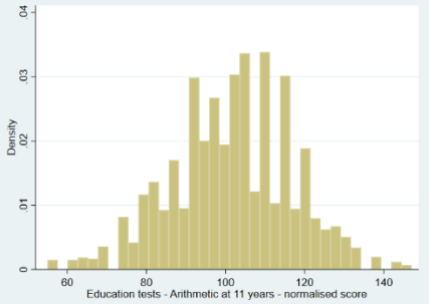
2.2.1 General Ability Test (Verbal and Non-Verbal)

Domain:	- Verbal (reasoning) - Non-verbal (reasoning)
Measures:	- General performance ability - Verbal ability - Non-verbal ability - Induction - General sequential reasoning
CHC:	- Gf (fluid intelligence) - Gc (crystallised intelligence) - G (general ability)
Administration method:	Teacher/psychologist/trained individual; face to face; pen and paper
Procedure:	This test consisted of 40 verbal and 40 non-verbal items. For the verbal items, the children were presented with a list of four words that were associated either logically, semantically, or phonologically, and were asked to select the correct word (out of 5 options) to complete the series. For the non-verbal section, they were required to choose the correct shape/symbol. The overall testing session at age 11 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1957_sm_nf3.pdf
Scoring:	One point was awarded for each correct series (0 -80).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	GA11R, GA11R57, NV11R, NV11R57, V11R, V11R57, GA1157, GA11N, NV1157, NV11N, V1157, V11N
Descriptives:	N = 4,032 Range = 0 -80 Mean = 45.01 SD = 15.88 N = 4,032 Range = 46-158 Mean = 102.09 SD = 15.30

(raw and normed data)	
Age of participants (months):	Mean = 130.33, SD = 1.06, Range = 128-137
Other sweep and/or cohort:	NCDS (Age 11)
Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. *International Journal of Epidemiology*, *33*(2), 408-413.

2.2.2 Arithmetic Test

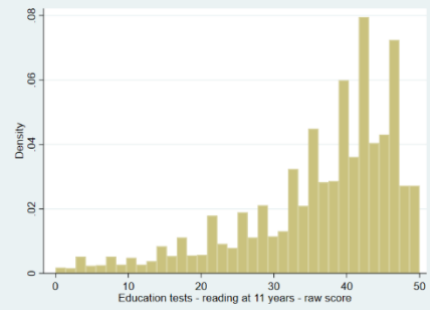
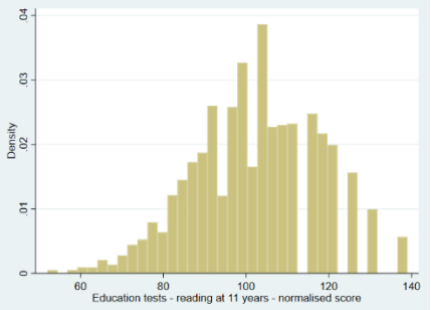
Domain:	- Verbal (problem questions) - Non-verbal (mechanical sums)
Measures:	- Mathematical ability/knowledge - Mathematical achievement
CHC:	Gq (Quantitative Knowledge)

Administration method:	Teacher/psychologist/trained individual; face to face; pen and paper
Procedure:	This test consisted of 50 questions (20 mechanical sums, 30 problem questions). Questions assessed ability to add, subtract, multiply and divide. The overall testing session at age 11 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1957_sm_nf3.pdf
Scoring:	One mark for each solved problem (0 -50).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	A11R, A11R57, A1157, A11N
Descriptives: (raw and normed data)	N = 4,025 Range = 0 -50 Mean = 26.39 SD = 11.74  N = 4,025 Range = 55-147 Mean = 101.84 SD = 15.13 
Age of participants (months):	Mean = 130.33, SD = 1.06, Range = 128 - 137
Other sweep and/or cohort:	None
Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)

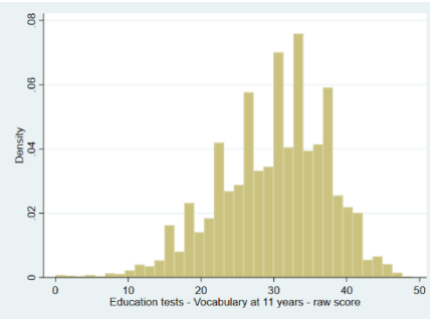
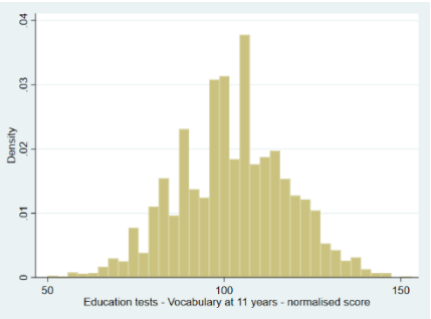
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. *International Journal of Epidemiology*, *33*(2), 408-413.

2.2.3 Word Reading

Domain:	Verbal (reading)
Measures:	Reading decoding
CHC:	Grw (Reading/Writing)
Administration method:	Teacher/psychologist/trained individual; face to face; read aloud
Procedure:	Participants were presented with a list of 50 words. They were instructed to read words aloud, one by one, working down the list. The interviewer recorded the number of correct responses (only correct if *usual* pronunciation used). If a child changed their initial answer to a correct answer, the item was marked as correct. If the child changed their initial answer to a wrong answer, the item was marked incorrect. Interviewers were instructed not to give any indication as to whether answers were right or wrong. In case of a delay, prompts such as "Have a try" were used. The overall testing session at age 11 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1957_sm_nf3.pdf
Scoring:	One point per correct response (0 -50).
Item-level variable(s):	Not currently available.

Total score/derived variable(s):	R11R, R11R57, R1157, R11N
Descriptives: (raw and normed data)	N = 4,027 Range = 0 -50 Mean = 36.43 SD = 10.50  N = 4,027 Range = 52-139 Mean = 101.97 SD = 15.08 
Age of participants (months):	Mean = 130.33; SD = 1.06, Range = 128 - 137
Other sweep and/or cohort:	- NSHD (age 8) - MCS (age 7 - similar BAS test) - BCS70 (children of cohort member, multi-age - similar BAS test)
Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. *International Journal of Epidemiology*, *33*(2), 408-413.

2.2.4 Vocabulary

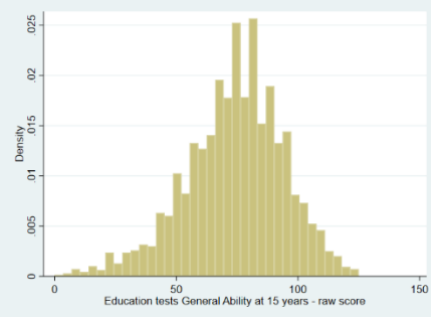
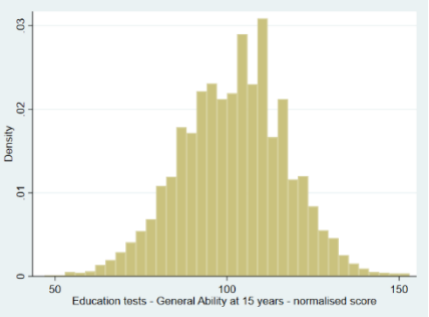
Domain	Verbal (comprehension)
Measures:	Lexical Knowledge/word understanding
CHC:	Gc (Crystallized intelligence)
Administration method:	Teacher/psychologist/trained individual; face to face; read aloud
Procedure:	After the participant completed the word reading task, the interviewer asked the child whether they knew the meaning of each word, e.g. “What is a ___”, “What do we mean by ___”. The interviewer noted the number of correct responses. The overall testing session at age 11 lasted under 2 hours.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1957_sm_nf3.pdf
Scoring:	One mark for each correct word (0 -50).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	VOC11R, VOC11R57, VOC1157, VOC11N
Descriptives: (raw and normed data)	N = 4,027 Range = 0 - 49 Mean = 29.99 SD = 7.45  N = 4,027 Range = 50 - 153 Mean = 102.25 SD = 15.33 
Age of participants (months):	Mean = 130.33, SD = 1.06, Range = 128 - 137

Other sweep and/or cohort:	- NSHD (Age 8) - BCS (Age 10) - ALSPAC (Age 8)
Source:	Pigeon DA. Tests used in the 1954 and 1957 surveys. In: Douglas JWB, ed. The home and the school. London: MacGibbon and Kee, 1964. (Appendix 1.)
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203. - Kuh, D., Richards, M., Hardy, R., Butterworth, S., & Wadsworth, M. E. (2004). Childhood cognitive ability and deaths up until middle age: a post-war birth cohort study. *International Journal of Epidemiology*, *33*(2), 408-413.

2.3 NSHD (Age 15)

2.3.1 The Alice Heim Group Ability Test (AH4)

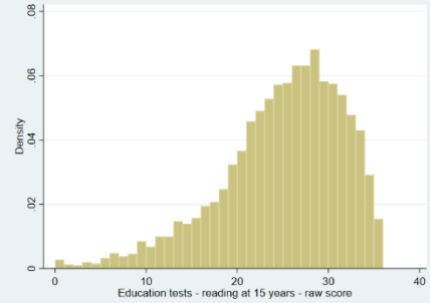
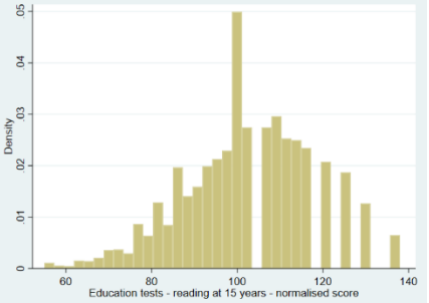
Domain:	- Verbal and non-verbal ability
Measures:	- General ability - Verbal ability - Non-verbal ability - Induction - General sequential reasoning - Quantitative Reasoning
CHC:	- Gf (fluid intelligence) - Gc (crystallised intelligence) - G (general ability)
Administration method:	Teacher; face to face; pen and paper

Procedure:	The AH4 contains 130 items, with 65 items each measuring verbal and non-verbal ability. The items include series completion, mental arithmetic, vocabulary, and reasoning by analogy. Participants were given 10 practice items before the non-verbal section, and 12 practice items before the verbal section. Raw and normalised scores (comparable to a standard IQ score) are available. The total time of administration was approximately 30 minutes.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1961_sm_nf4.pdf
Scoring:	One point per correct answer; 0 -65 (verbal/non-verbal); 0 - 135 (general).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	GA15R, GA15R61, NV15R, NV15R61, V15R, V15R61, GA1561, GA15N, NV1561, NV15N, V1561, V15N
Descriptives: (raw and normed data)	N = 4,019 Range = 0 - 125 Mean = 73.96 SD = 20.19  N = 4,017 Range = 47 - 153 Mean = 101.88 SD = 15.26 
Age of participants (months):	Mean = 174.54, SD = 2.12, Range = 172 - 182
Other sweep and/or cohort:	None

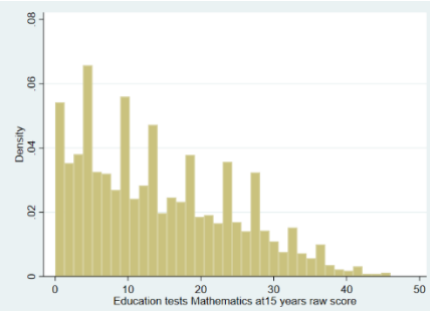
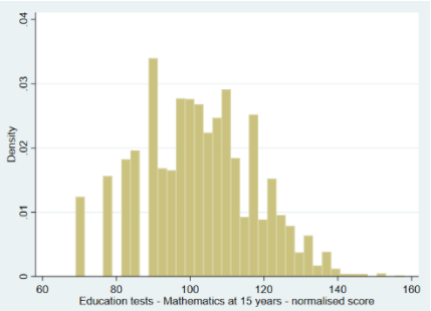
Source:	Heim, A. W. (1955). Manual for the Group test of General Intelligence AH4. *London, England: National Foundation for Educational Research*.
Technical resources:	Pigeon DA. Details of the fifteen years tests. In: Douglas JWB, Ross JM, Simpson HR, eds. *All Our Future*. London: Davies, 1968; Appendix 1.
Reference examples:	- Richards, M., Shipley, B., Fuhrer, R., & Wadsworth, M. E. (2004). Cognitive ability in childhood and cognitive decline in mid-life: longitudinal birth cohort study. *BMJ*, *328*(7439), 552. - Cooper, R., Richards, M., & Kuh, D. (2017). Childhood cognitive ability and age-related changes in physical capability from midlife: Findings from a British birth cohort study. *Psychosomatic Medicine*, *79*(7), 785.

2.3.2 The Watts-Vernon Reading Test

Domain:	Verbal (reading)
Measures:	- Word comprehension/lexical knowledge - Reading comprehension - Reading decoding
CHC:	- Gc (Crystallized Intelligence) - Grw (Reading/Writing)
Administration method:	Teacher; face to face; pen and paper
Procedure:	Participants were presented with a list of 35 sentence, and were asked to underline the correct word (from 5 different options) to complete each sentence, e.g. "You can buy stamps at a post (station, house, shop, man, office)". The total time of administration was approximately 15 minutes (10 minutes working time).
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1961_sm_nf4.pdf
Scoring:	One mark for each correct sentence (0 - 35).

Item-level variable(s):	Not currently available.
Total score/derived variable(s):	R15R, R15R61, R1561, R15N
Descriptives: (raw and normed data)	N = 4,018 Range = 0 - 36 Mean = 24.47 SD = 6.66  N = 4,015 Range = 55 - 138 Mean = 102.24 SD = 15.12 
Age of participants (months):	Mean = 174.54, SD = 2.12, Range = 172-182
Other sweep and/or cohort:	- NSHD (age 8 and 26) - NCDS (age 11 and 16) NFER
Source:	Ministry of Education (1950). Reading Ability. London: HMSO
Technical resources:	Pigeon DA. Details of the fifteen years tests. In: Douglas JWB, Ross JM, Simpson HR, eds. *All Our Future*. London: Davies, 1968; Appendix 1.
Reference examples:	- Richards, M., Shipley, B., Fuhrer, R., & Wadsworth, M. E. (2004). Cognitive ability in childhood and cognitive decline in mid-life: longitudinal birth cohort study. *BMJ*, *328*(7439), 552. - Cooper, R., Richards, M., & Kuh, D. (2017). Childhood cognitive ability and age-related changes in physical capability from midlife: Findings from a British birth cohort study. *Psychosomatic Medicine*, *79*(7), 785.

2.3.3 Mathematics Test

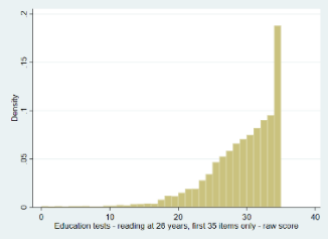
Domain:	Verbal (arithmetic)
Measures:	- Mathematical ability/knowledge - Mathematical achievement
CHC:	Gq (Quantitative Knowledge)
Administration method:	Teacher; face to face; pen and paper
Procedure:	Participants were administered a 47-item mathematics test, which tested arithmetic, geometry, trigonometry, and algebra. Duration: The total time of administration was approximately 30 minutes (25 minutes working time). Data were heavily positively skewed, indicating the test was too difficult.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1961_sm_nf4.pdf
Scoring:	One mark for each correct item (0 -47).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	M15R, M15R61, M1561, M15N
Descriptives: (raw and normed data)	N = 4,015 Range = 0 -46 Mean = 14.26 SD = 10.21  N = 4,015 Range = 69-158 Mean = 102.59 SD = 15.30 

Age of participants (months):	Mean = 174.54, SD = 2.12, Range = 172-182
Other sweep and/or cohort:	None
Source:	Pigeon DA. Details of the fifteen years tests. In: Douglas JWB, Ross JM, Simpson HR, eds. *All Our Future*. London: Davies, 1968; Appendix 1.
Technical resources:	None
Reference examples:	- Richards, M., Shipley, B., Fuhrer, R., & Wadsworth, M. E. (2004). Cognitive ability in childhood and cognitive decline in mid-life: longitudinal birth cohort study. *BMJ*, *328*(7439), 552. - Cooper, R., Richards, M., & Kuh, D. (2017). Childhood cognitive ability and age-related changes in physical capability from midlife: Findings from a British birth cohort study. *Psychosomatic Medicine*, *79*(7), 785.

2.4 NSHD (Age 26)

2.4.1 Watts-Vernon Reading Test

Domain:	Verbal (reading)
Measures:	- Word comprehension/lexical knowledge - Reading comprehension - Reading decoding
CHC:	- Gc (Crystallized Intelligence) - Grw (Reading/Writing)
Administration method:	Trained interviewer; face to face; pen and paper
Procedure:	Participants were presented with a list of 45 sentence (35 from the test administered at age 15, and an additional 10 to increase difficulty and avoid ceiling effects). Participants were asked to underline the correct word (from 5 different options) to complete

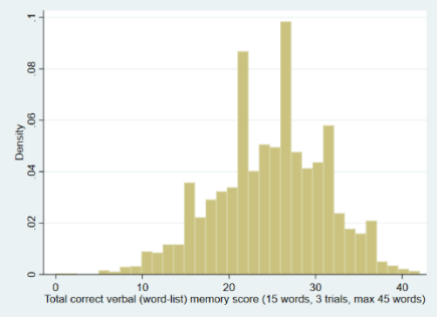
	each sentence, e.g. “You can buy stamps at a post (station, house, shop, man, office)”.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1972_t.pdf
Scoring:	One mark for each correct sentence (0 - 45).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	WV26R, R26R, R26N
Descriptives: (raw data)	N = 3,715 Range = 0 - 35 Mean = 28.76 SD = 5.40 
Age of participants (months):	Mean = 315.88, SD = 6.04, Range = 312-356
Other sweep and/or cohort:	- NSHD (Age 8 and 15) - NCDS (age 11 and 16)
Source:	Ministry of Education (1950). Reading Ability. London: HMSO
Technical resources:	Pigeon, D. A., Douglas, J. W. B., Ross, J. M., & Simpson, H. R. (1968). Details of the fifteen years tests. *All our future.* London: Davies.
Reference examples:	- Lovell, K., Gray, E. A., & Oliver, D. E. (1964). A further study of some cognitive and other disabilities in backward readers of average non-verbal reasoning scores. *British Journal of Educational Psychology*, *34*(3), 275-279.

	- Goldstein, H. (1983). Measuring changes in educational attainment over time: Problems and possibilities. *Journal of Educational Measurement*, *20*(4), 369-377.

2.5 NSHD (Age 43)

2.5.1 Verbal Learning/ Word List Recall Test

Domain:	Verbal (memory)
Measures:	- Attention - Short-term episodic memory - Verbal memory - Free-recall memory
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Research nurse; face to face; pen and paper
Procedure:	Participants were shown a list of 15 words at a rate of one word every two seconds. They were then asked to right down as many words recalled as possible. This trial was done a total of three times, and a total score was calculated as the sum of the words correctly recalled over the three trials.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1989_b_sc.pdf
Scoring:	One point for every correctly recalled word (0 -45).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	WL10189 - WL31589, WLT89
Descriptives:	N = 3,059 Range = 0 - 42 Mean = 24.72 SD = 6.39

(raw data)	
Age of participants (months):	Mean = 521.84, SD = 2.19, Range = 514 - 533
Other sweep and/or cohort:	- NCDS (Age 50, Age 61 - 63)* - BCS (Age 46 - 47)* - NSHD (Age 53, 60 -64, 68 - 70 years) *1 trial only. 10 words, presented aurally.
Source:	This task was developed specifically for this study by the NSHD team led by Prof Bryan Rodgers. Similar tasks have been used to measure verbal learning for decades, e.g. Bush and Mosteller (1955).
Technical resources:	None
Reference examples:	- Richards, M., Kuh, D., Hardy, R., & Wadsworth, M. (1999). Lifetime cognitive function and timing of the natural menopause. *Neurology*, *53*(2), 308-308. - Richards, M., Shipley, B., Fuhrer, R., & Wadsworth, M. E. (2004). Cognitive ability in childhood and cognitive decline in mid-life: longitudinal birth cohort study. *BMJ*, *328*(7439), 552.

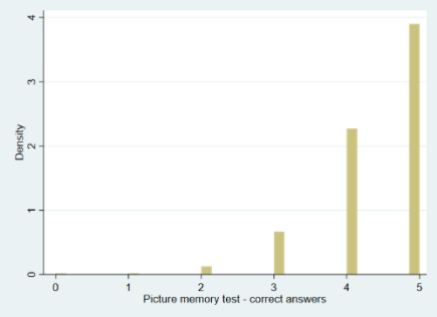
2.5.2 Long-term Recall

Domain:	Verbal (memory)
Measures:	- Long term recall/memory - Episodic memory
CHC:	None

Administration method:	Research nurse; face to face; read aloud
Procedure:	Two sets of questions were used to assess long-term (episodic) memory. At the beginning of the interview, participants were asked to recall: i) the year, ii) the month, and iii) the day of the week in which the last interview was conducted. Later in the interview, participants were asked to recall what specific physical measurements were taken by the nurse at the last interview. Interviewers noted any of the following measures that were taken: i) pulse, ii) blood pressure, iii) lung function, iv) height, v) weight, vi) arm circumference, vii) chest circumference, and viii) abdominal circumference. A note was taken of any additional measures reported by participants that were not taken at the previous interview.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1989_a_main.pdf
Scoring:	One mark for every correctly remembered item (0 - 11).
Item-level variable(s):	LINTY89, LINTM89, LINTD89, MEMAB89, MEMAC89, MEMBP89, MEMCC89, MEMHT89, MEMLG89, MEMOT89, MEMPR89, MEMWT89
Total score/derived variable(s):	None
Descriptives:	None available.
Age of participants (months):	Mean = 521.84, SD = 2.19, Range = 514 - 533
Other sweep and/or cohort:	None
Source:	Designed specifically for the study.
Technical resources:	None
Reference examples:	Unknown

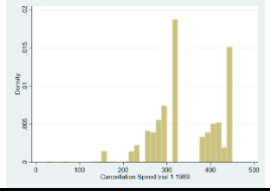
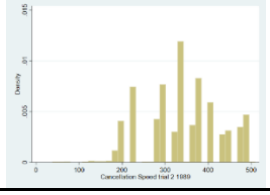
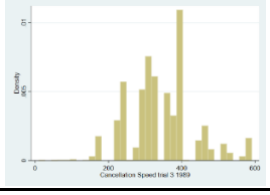
2.5.3 Visual Memory

Domain:	Non-verbal (memory)
Measures:	- Attention - Short-term episodic memory - Visual memory - Free-recall memory
CHC:	- Glr (Long-Term Storage and Retrieval) - Gv (Visual Processing)
Administration method:	Research nurse; face to face; read aloud
Procedure:	Cohort members were presented with 5 cards, each with a unique picture. They were asked to memorise the contents of the cards, and were permitted to look at the cards for 30 seconds. Later in the interview (after medical examination and questions about hearing and diet), participants were asked to recall what was on the five cards.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1989_a_main.pdf
Scoring:	One mark for each correctly recalled picture (0 -5).
Item-level variable(s):	PIC189 - PIC589
Total score/derived variable(s):	PICIN89, PICOK89
Descriptives: (raw data)	N = 3,225 Range = 0 -5 Mean = 4.41 SD = 0.79

	
Age of participants (months):	Mean = 521.84, SD = 2.19, Range = 514 - 533
Other sweep and/or cohort:	None
Source:	This task was developed specifically for this study by the NSHD team led by Prof Bryan Rodgers. Similar measures of visual recall have been used in studies of memory for decades (e.g. Shriffin et al., 1973).
Technical resources:	None
Reference examples:	- Richards, M., Kuh, D., Hardy, R., & Wadsworth, M. (1999). Lifetime cognitive function and timing of the natural menopause. *Neurology*, *53*(2), 308-308. - Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203.

2.5.4 Timed Letter Search/Letter Cancellation Test

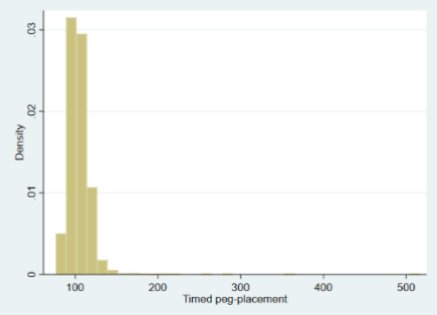
Domain:	Processing speed
Measures:	- Attention/concentration - Mental speed - Visual scanning
CHC:	- Gv (Visual Processing) - Gs (Processing Speed)

Administration method:	Research nurse; face to face; pen and paper
Procedure:	The participant was given a page consisting of three blocks of random letters arranged in rows (15, 17, 20 letters) and columns (all 30 letters). Beginning with the first block, they were instructed to cross out as many target letters ("Ps" and "Ws") as possible within a one-minute timeframe (the interviewer demonstrated). They were instructed to move onto the second block once the first minute was up, and then move to the final block once the second minute was up. The test was stopped at the end of the third minute. Respondents were instructed to work across each row from left-to right as if they were reading a page and they were asked to perform the task as quickly and accurately as possible.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1989_a_main.pdf
Scoring:	The number of hits, misses and row/column reached were recorded, meaning multiple scoring schemes are possible. Although there is no definitive scoring system used, the most widely adopted approach is to calculate speed (number of letters scanned) and accuracy (dividing the number of missed targets for each trial by the corresponding speed score).
Item-level variable(s):	VSCL189 - VSRW389
Total score/derived variable(s):	CANSP189, CANSP289, CANSP389, CANSPa89
Descriptives: (raw data)	(Trial 1) N = 3,151 Range = 25-450 Mean = 343.80 Standard deviation= 76.70  (Trial 2) N = 3,155 Range = 38-509 Mean = 339.41 Standard deviation= 85.12  (Trial 3) N = 3,139 Range = 10 -591 Mean = 342.80 Standard deviation= 90.42 

Age of participants (months):	Mean = 521.84, SD = 2.19, Range = 514 - 533
Other sweep and/or cohort:	- NSHD (Age 53, 60 - 64, 68 - 70)* - NCDS (Age 50, 61 - 63)* - BCS (Age 46)* * 1 trial.
Source:	The letter cancellation test was adapted from the MRC Cognitive Function and Ageing Study (MRC CFA Study, 1998).
Technical resources:	None
Reference examples:	- Richards, M., Kuh, D., Hardy, R., & Wadsworth, M. (1999). Lifetime cognitive function and timing of the natural menopause. *Neurology*, *53*(2), 308-308. - Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203.

2.5.5 Motor Speed and Praxis

Domain:	Motor skills
Measures:	- Psychomotor speed - Manual dexterity - Coordination - Control precision - Aiming
CHC:	Gp (psychomotor abilities)
Administration method:	Research nurse; face to face; physical task
Procedure:	Participants were presented with a set of pegs that were placed in holes on one side of a wooden board. They were then timed as they moved 10 the pegs from one hole to an adjacent hole on the

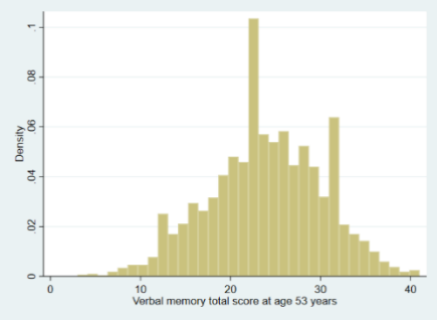
	opposite side. Five trials were conducted for each hand (10 trials total).
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1989_a_main.pdf
Scoring:	Mean speed across the five trials are available for each hand. A log transformed version of the mean scores are also available.
Item-level variable(s):	PGL189 - PGR589
Total score/derived variable(s):	PEG89
Descriptives: (raw data)	N = 3,163 Range = 77- 516 Mean = 104.49 SD = 15.62 
Age of participants (months):	Mean = 521.84, SD = 2.19, Range = 514 - 533
Other sweep and/or cohort:	None
Source:	This task was developed specifically for this study. Similar manual dexterity tasks have been used as screeners for manual dexterity difficulties since the 1940s, e.g. Tiffin and Asher (1948).
Technical resources:	None

Reference examples:	- Richards, M., Hardy, R., & Wadsworth, M. E. (2004). Alcohol consumption and midlife cognitive change in the British 1946 birth cohort study. *Alcohol and Alcoholism*, *40*(2), 112-117. - Richards, M., & Wadsworth, M. E. J. (2004). Long term effects of early adversity on cognitive function. *Archives of Disease in Childhood*, *89*(10), 922-927.

2.6 NSHD (Age 53)

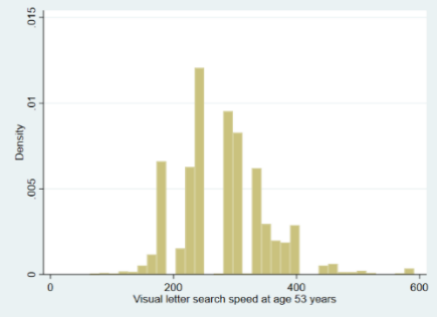
2.6.1 Verbal Learning/ Word List Recall Test

Domain:	Verbal (memory)
Measures:	- Verbal memory - Attention - Short-term episodic memory - Free-recall memory
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Research nurse; face to face; pen and paper
Procedure:	Same as for age 43, however, a delayed recall condition was also added; participants were asked to recall the words again after the letter search task (an interval of approximately 90 seconds). A different word list was given to each half of the cohort at 43 years and these lists were reversed when they were at 53 years of age, to minimize any practice effects.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1999-capi.pdf
Scoring:	A point was awarded for every correct word recalled (0 - 45 [immediate]; 0 - 15 [delayed]).
Item-level variable(s):	wlin199 - wltx99

Total score/derived variable(s):	WLT99
Descriptives: (raw data)	N = 2,887 Range = 3 - 41 Mean = 23.93 SD = 6.30 
Age of participants (months):	Mean = 641.47, SD = 2.09, Range = 636 - 650
Other sweep and/or cohort:	- NCDS (Age 50, 61 - 63)* - BCS (Age 46 - 47)* - NSHD (Age 43, 60 - 64, 68 - 70) *1 trial only. 10 words, presented aurally.
Source:	This task was developed specifically for this study by the NSHD team led by Prof Bryan Rodgers. Similar tasks have been used to measure verbal learning for decades, e.g. Bush and Mosteller (1955).
Technical resources:	None
Reference examples:	- Richards, M., Hardy, R., & Wadsworth, M. E. (2004). Alcohol consumption and midlife cognitive change in the British 1946 birth cohort study. *Alcohol and Alcoholism*, *40*(2), 112-117. - Richards, M., Shipley, B., Fuhrer, R., & Wadsworth, M. E. (2004). Cognitive ability in childhood and cognitive decline in mid-life: longitudinal birth cohort study. *BMJ*, *328*(7439), 552.

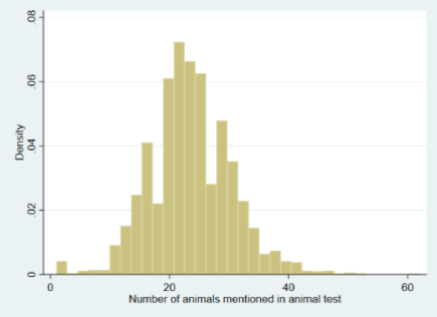
2.6.2 Timed Letter Search/Letter Cancellation Test

Domain:	Processing speed
Measures:	- Attention/concentration - Mental speed - Visual scanning
CHC:	- Gv (Visual Processing) - Gs (Processing Speed)
Administration method:	Research nurse; face to face; pen and paper
Procedure:	Similar to age 43, only 1 trial was given. Moreover, the letters covered a full page, so that a maximal score was obtained, which may have been restricted at age 43 due to the shorter blocks of letters.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1999-capi.pdf
Scoring:	The number of hits, misses and row/column reached were recorded, meaning multiple scoring schemes are possible. Although there is no definitive scoring system used, the most widely adopted approach is to calculate speed (number of letters scanned) and accuracy (dividing the number of missed targets for each trial by the corresponding speed score).
Item-level variable(s):	vscl99 - vsrw99
Total score/derived variable(s):	CANSP99
Descriptives: (accuracy score)	N = 2,932 Range = 64-591 Mean = 281.07 SD = 76.09

	
Age of participants (months):	Mean = 641.47, SD = 2.09, Range = 636 - 650
Other sweep and/or cohort:	- NSHD (Age 43, 60 -64, 68 - 70) - NCDS (Age 50, 61 - 63) - BCS (Age 46)
Source:	The letter cancellation test was adapted from the MRC Cognitive Function and Ageing Study (MRC CFA Study, 1998).
Technical resources:	None
Reference examples:	- Richards, M., Kuh, D., Hardy, R., & Wadsworth, M. (1999). Lifetime cognitive function and timing of the natural menopause. *Neurology*, *53*(2), 308-308. - Richards, M., Hardy, R., Kuh, D., & Wadsworth, M. E. (2001). Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population based study. *BMJ*, *322*(7280), 199-203.

2.6.3 Verbal Fluency (animal naming) Test

Domain:	Verbal fluency
Measures:	- Verbal/semantic fluency - Associational fluency - Executive function
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Research nurse; face to face; read aloud

Procedure:	Participants were asked to name as many different animals as possible within a one-minute timeframe. The interviewer made a note of each named animal and entered the total number into the CAPI programme. Repetitions, named animals (e.g. Bambi), and redundancies (e.g. white cat, black cat) were not included in the total score.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1999-capi.pdf
Scoring:	Total number of animals named.
Item-level variable(s):	None
Total score/derived variable(s):	anin
Descriptives: (raw data)	N = 2,949 Range = 1 - 62 Mean = 23.56 SD = 6.91 
Age of participants (months):	Mean = 641.47, SD = 2.09, Range = 636 - 650
Other sweep and/or cohort:	- NCDS (Age 50, 61 - 63) - BCS70 (Age 46-47)
Source:	Taken from Section B (cognitive assessment) of the Cambridge Mental Disorders of the Elderly Examination (CAMDEX) (Roth et al., 1986).

Technical resources:	None
Reference examples:	- Hatch, S. L., Feinstein, L., Link, B. G., Wadsworth, M. E., & Richards, M. (2007). The continuing benefits of education: adult education and midlife cognitive ability in the British 1946 birth cohort. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *62*(6), S404-S414. - Murray, G. K., Jones, P. B., Kuh, D., & Richards, M. (2007). Infant developmental milestones and subsequent cognitive function. *Annals of Neurology*, *62*(2), 128-136.

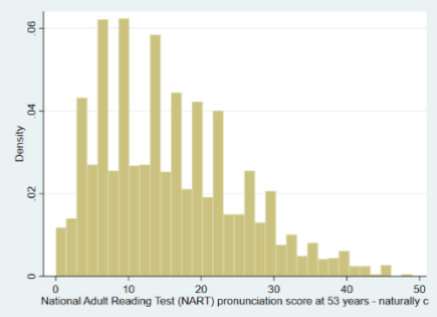
2.6.4 Prospective Memory

Domain	Verbal memory
Measures:	Prospective memory
CHC:	None
Administration method:	Research nurse; face to face; pen and paper; read aloud
Procedure:	Respondents were told that that, later in the interview, they would be given an envelope and asked to write a name and address on it, at which point they should remember to turn it over, seal it, and write their initials on it. After the animal naming task, the interviewer handed the participant an envelope and asked them to write down the name John Brown, 42 West Street, Bedford.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1999-capi.pdf
Scoring:	A 3-point ordinal variable was constructed as follows: - Both actions completed correctly, without prompting (score of 3) - Only one action completed, without prompting (score of 2) - No actions completed, without prompting (score of 1)

Item-level variable(s):	None
Total score/derived variable(s):	Remem
Descriptives: (frequencies)	- Both actions completed correctly, without prompting (N = 2,431) - One action completed, without prompting (N = 310) - No action completed, without prompting (N = 184)
Age of participants (months):	Mean = 641.47, SD = 2.09, Range = 636 - 650
Other sweep and/or cohort:	None
Source:	Developed specifically for the study.
Technical resources:	None
Reference examples:	None found.

2.6.5 National Adult Reading Test (NART)

Domain	Verbal (reading)
Measures:	- Knowledge acquisition - Correlates highly with IQ - Used to estimate premorbid cognitive ability - Reading decoding
CHC:	- Gc (Crystallized intelligence) - Grw (Reading/writing)
Administration method:	Research nurse; face to face; read aloud
Procedure:	Participants were asked to read aloud a list of 50 words that increased in difficulty. The words were 'irregular'; i.e. they do not

	conform to common rules of pronunciation. This was to minimise the likelihood that successful pronunciation was due to intelligent guesswork rather than previous knowledge of the word in question. For example, 'naïve' might be pronounced as 'nave' without any prior knowledge of the word. The interviewer recorded the number of errors (mispronounced words). This score was then inverted by subtracting the number of errors from 50, in order to be consistent with the direction of scoring of other measures administered at this age.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1999-capi.pdf
Scoring:	Number of errors inverted (0 -50)
Item-level variable(s):	Not currently available
Total score/derived variable(s):	nart99
Descriptives:	N = 2,825 Range = 0 -49 Mean = 15.69 SD = 9.54 
Age of participants (months):	Mean = 641.47, SD = 2.09, Range = 636-650
Other sweep and/or cohort:	None
Source:	Nelson, H. E., & Willison, J. (1991). *National Adult Reading Test (NART)*. Windsor: Nfer-Nelson.

Technical resources:	None
Reference examples:	- Richards, M., & Sacker, A. (2003). Lifetime antecedents of cognitive reserve. *Journal of Clinical and Experimental Neuropsychology*, *25*(5), 614-624. - Davies, G., Tenesa, A., Payton, A., Yang, J., Harris, S. E., Liewald, D., ... & McGhee, K. (2011). Genome-wide association studies establish that human intelligence is highly heritable and polygenic. *Molecular Psychiatry*, *16*(10), 996.

2.6.6 Delayed Verbal Memory

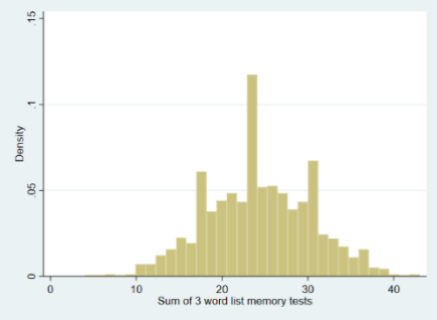
Domain:	Verbal (memory)
Measures:	Delayed verbal memory
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Research nurse; face to face; spoken aloud
Procedure:	After the NART was administered (which followed directly after the envelope task) participants were asked to recall, without prior prompting, the name and address they previously wrote on the envelope.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:1999-capi.pdf
Scoring:	A maximum score of 6 was achievable, with one point given for each element of the address: (i) John (ii) Brown, (iii) 42 (iv) West (v) Street, (vi) Bedford
Item-level variable(s):	naadta1 - naadta6
Total score/derived variable(s):	None

Descriptives:	None
Age of participants (months):	Mean = 641.47, SD = 2.09, Range = 636-650
Other sweep and/or cohort:	None
Source:	Developed specifically for the study.
Technical resources:	None
Reference examples:	None found.

2.7 NSHD (Age 60 -64)

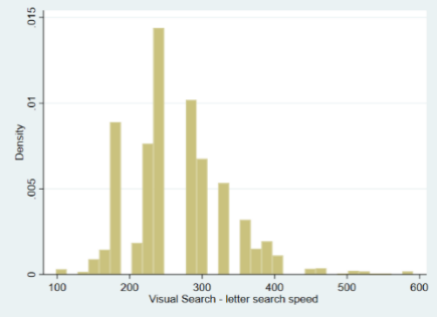
2.7.1 Verbal Learning/ Word List Recall Test

Domain:	Verbal (memory)
Measures:	- Attention - Short-term episodic memory - Verbal memory - Free-recall memory
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Research nurse; face to face; pen and paper
Procedure:	Same procedure as age 53.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:2008_nurse.pdf
Scoring:	A point was awarded for every correct word recalled (0 - 45 [immediate]; 0 - 15[delayed])
Item-level variable(s):	WLE109 - WLTD09

Total score/derived variable(s):	WLT09
Descriptives: (raw data)	N = 2,150 Range = 4 - 43 Mean = 24.26 SD = 6.11 
Age of participants (months):	Mean = 760.24, SD = 13.36, Range = 724 - 780
Other sweep and/or cohort:	- NCDS (Age 50, 61 - 63)* - BCS (Age 46-47)* - NSHD (Age 43, 53, 68 - 70) * 1 trial only. 10 words, presented aurally.
Source:	This task was developed specifically for this study by the NSHD team led by Prof Bryan Rodgers. Similar tasks have been used to measure verbal learning for decades, e.g. Bush and Mosteller (1955).
Technical resources:	None
Reference examples:	- Hurst, L., Stafford, M., Cooper, R., Hardy, R., Richards, M., & Kuh, D. (2013). Lifetime socioeconomic inequalities in physical and cognitive aging. *American Journal of Public Health*, *103*(9), 1641-1648. - James, S. N., Davis, D., O'Hare, C., Sharma, N., John, A., Gaysina, D., ... & Richards, M. (2018). Lifetime affective problems and later-life cognitive state: Over 50 years of follow-up in a British birth cohort study. *Journal of Affective Disorders*, *241*, 348-355.

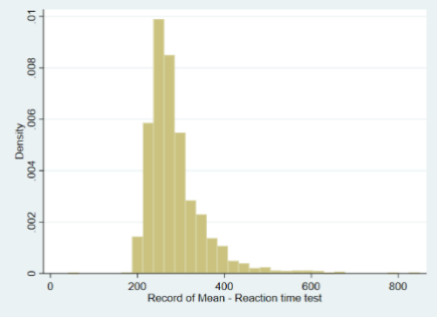
2.7.2 Timed Letter Search/Letter Cancellation Test

Domain:	Processing speed
Measures:	- Attention/concentration - Mental speed - Visual scanning
CHC:	- Gv (Visual Processing) - Gs (Processing Speed)
Administration method:	Research nurse; face to face; pen and paper
Procedure:	Same as at age 53.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:2008_nurse.pdf
Scoring:	The number of hits, misses and row/column reached were recorded, meaning multiple scoring schemes are possible. Although there is no definitive scoring system used, the most widely adopted approach is to calculate speed (number of letters scanned) and/or accuracy (dividing the number of missed targets for each trial by the corresponding speed score).
Item-level variable(s):	VSCL09 - VSRWN09
Total score/derived variable(s):	VSP09
Descriptives: (accuracy score)	N = 2,182 Range = 98 - 591 Mean = 266.71 SD = 71.74

	
Age of participants (months):	Mean = 760.24, SD = 13.36, Range = 724-780
Other sweep and/or cohort:	- NSHD (Age 43, 53, 68-70) - NCDS (Age 50, 61 - 63) - BCS (Age 46)
Source:	The letter cancellation test adapted from the MRC Cognitive Function and Ageing Study (MRC CFA Study, 1998).
Technical resources:	None
Reference examples:	- Hurst, L., Stafford, M., Cooper, R., Hardy, R., Richards, M., & Kuh, D. (2013). Lifetime socioeconomic inequalities in physical and cognitive aging. *American Journal of Public Health*, *103*(9), 1641-1648. - Masi, S., Georgiopoulos, G., Khan, T., Johnson, W., Wong, A., Charakida, M., ... & Deanfield, J. (2018). Patterns of adiposity, vascular phenotypes and cognitive function in the 1946 British Birth Cohort. *BMC Medicine*, *16*(1), 75.

2.7.3 Reaction Time Test

Domain:	Reaction time
Measures:	- Simple reaction time (task 1) - Choice reaction time (task 2)
CHC:	Gt (reaction and decision speed)
Administration method:	Research nurse; face to face; CAPI

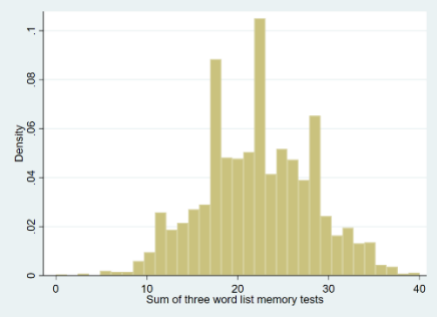
Procedure:	Task 1: Using the CAPI, participants were instructed to press a key as quickly as possible every time the numbers '0' or '8' appeared on screen. Participants were instructed to use 1 finger only. There were delays of 1 - 3 seconds between each letter, to avoid anticipation. The test began with 8 practice trials. For the full test, a total of 20 trials were completed. Task 2: Next, the participants were instructed that the numbers '1', '2', '3', and '4' would appear on screen, and they were to press the corresponding keys as quickly as possible; i.e. if a '1' appeared, they were to press '1'. They were instructed to use both hands. Again, there were 8 practice trials, and the full test consisted of 40 trials.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:2000_nurse.pdf
Scoring:	Mean reaction time of correct trials.
Item-level variable(s):	K0ER09 - K4SD09
Total score/derived variable(s):	RTMN09, RTSD09
Descriptives: (mean reaction time)	N = 2,167 Range = 41 - 849 Mean = 286.11 SD = 68.48 
Age of participants (months):	Mean = 760.24, SD = 13.36, Range = 724 - 780

Other sweep and/or cohort:	None
Source:	Generic reaction time test. Similar reaction time tests have been widely used in psychology for well over a century, e.g. Cattell (1890).
Technical resources:	Masi, S., Georgiopoulos, G., Khan, T., Johnson, W., Wong, A., Charakida, M., ... & Deanfield, J. (2018). Patterns of adiposity, vascular phenotypes and cognitive function in the 1946 British Birth Cohort. *BMC Medicine*, 16(1), 75.
Reference examples:	Masi, S., Georgiopoulos, G., Khan, T., Johnson, W., Wong, A., Charakida, M., ... & Deanfield, J. (2018). Patterns of adiposity, vascular phenotypes and cognitive function in the 1946 British Birth Cohort. *BMC Medicine*, *16*(1), 75.

2.8 NSHD (Age 68-70)

2.8.1 Verbal Learning/ Word List Recall Test

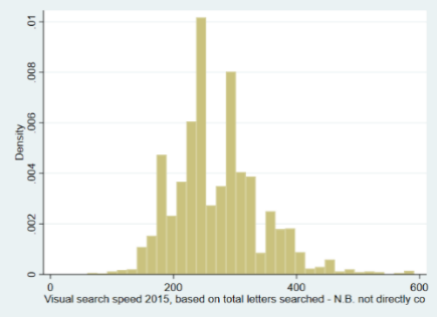
Domain:	Verbal (memory)
Measures:	- Attention - Short-term episodic memory - Verbal memory - Free-recall memory
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Research nurse; face to face; pen and paper
Procedure:	As in sweeps age 53 and 60 -64 years.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:2015_capi.pdf
Scoring:	One point was awarded for each correctly remembered word (0 - 45).

Item-level variable(s):	WLE115x - WLT315x
Total score/derived variable(s):	WLT15x
Descriptives: (raw data)	N = 2,074 Range = 0 -40 Mean = 22.17 SD = 6.07 
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828- 848
Other sweep and/or cohort:	- NCDS (Age 50, 61 - 63)* - BCS (Age 46-47)* - NSHD (Age 43, 53, 60 -64) *1 trial only. 10 words, presented aurally.
Source:	This task was developed specifically for this study by the NSHD team. Similar tasks have been used to measure verbal learning for decades, e.g. Bush and Mosteller (1955).
Technical resources:	None
Reference examples:	- Proitsi, P., Kuh, D., Wong, A., Maddock, J., Bendayan, R., Wulaningsih, W., ... & Richards, M. (2018). Lifetime cognition and late midlife blood metabolites: findings from a British birth cohort. *Translational Psychiatry*, *8*(1), 203. - Tsui, A., Kuh, D., Richards, M., & Davis, D. (2018). Delirium symptoms are associated with decline in cognitive function

	between ages 53 and 69 years: findings from a British birth cohort study. *Alzheimer's & Dementia*, *14*(5), 617-622.

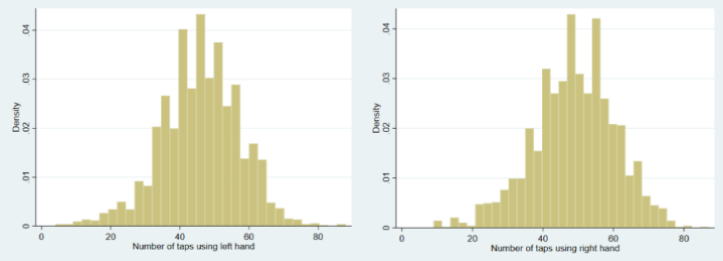
2.8.2 Timed Letter Search/Letter Cancellation Test

Domain:	Processing speed
Measures:	- Attention/concentration - Mental speed - Visual scanning
CHC:	- Gv (Visual Processing) - Gs (Processing Speed)
Administration method:	Research nurse; face to face; pen and paper
Procedure:	As in sweeps age 53 and 60 -64 years.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:2015_capi.pdf
Scoring:	The number of hits, misses and row/column reached were recorded, meaning multiple scoring schemes are possible. Although there is no definitive scoring system used, the most widely adopted approach is to calculate speed (number of letters scanned) and/or accuracy (dividing the number of missed targets for each trial by the corresponding speed score).
Item-level variable(s):	VSCFLAG15x - VSRWTOT15x
Total score/derived variable(s):	VSP15x, VSPTOT15x
Descriptives: (accuracy score)	N = 2,114 Range = 60 -591 Mean = 270.04 SD = 72.60

	
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828 - 848
Other sweep and/or cohort:	- NSHD (Age 43, 53, 60 -64) - NCDS (Age 50, 61 - 63) - BCS (Age 46)
Source:	The letter cancellation test adapted from the MRC Cognitive Function and Ageing Study (MRC CFA Study, 1998).
Technical resources:	None
Reference examples:	- Proitsi, P., Kuh, D., Wong, A., Maddock, J., Bendayan, R., Wulaningsih, W., ... & Richards, M. (2018). Lifetime cognition and late midlife blood metabolites: findings from a British birth cohort. *Translational Psychiatry*, *8*(1), 203. - Tsui, A., Kuh, D., Richards, M., & Davis, D. (2018). Delirium symptoms are associated with decline in cognitive function between ages 53 and 69 years: findings from a British birth cohort study. *Alzheimer's & Dementia*, *14*(5), 617-622.

2.8.3 Finger Tapping Test

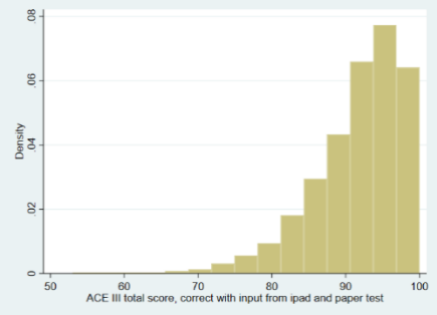
Domain:	Non-verbal
Measures:	- Psychomotor speed/fluidity - Finger dexterity
CHC:	Psychomotor Speed (Gps)
Administration method:	Research nurse; face to face; physical task

Procedure:	With their palm down and fingers extended, participants were asked to tap a lever with their index finger as fast as possible for 10 seconds. They were asked to do this once with their right hand and once with their left.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=questionnaires:2015_capi.pdf
Scoring:	Number of taps per hand (0 -88).
Item-level variable(s):	TAP15x
Total score/derived variable(s):	TAPLF15x, TAPRF15x
Descriptives: (raw data)	N = 2,052 (left hand) Range = 4-88 Mean = 45.98 SD = 11.32 N = 2,050 (right hand) Range = 9-87 Mean = 48.78 SD = 11.69 
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828- 848
Other sweep and/or cohort:	None
Source:	Reitan, R. M., & Wolfson, D. (1985). *The Halstead-Reitan neuropsychological test battery: Theory and clinical interpretation* (Vol. 4). Reitan Neuropsychology.
Technical resources:	Dumont, R., Willis, J. O., Viezel, K., & Zibulsky, J. (2013). Halstead-Reitan Neuropsychological Test Battery. *Encyclopedia of Special*

	Education: A Reference for the Education of Children, Adolescents, and Adults with Disabilities and Other Exceptional Individuals.
Reference examples:	- Morrison, M. W., Gregory, R. J., & Paul, J. J. (1979). Reliability of the Finger Tapping Test and a note on sex differences. *Perceptual and Motor Skills*, *48*(1), 139-142. - Arnold, G., Boone, K. B., Lu, P., Dean, A., Wen, J., Nitch, S., & McPherson, S. (2005). Sensitivity and specificity of finger tapping test scores for the detection of suspect effort. *The Clinical Neuropsychologist*, *19*(1), 105-120.

2.8.4 Addenbrooke's Cognitive Examination-III: Total Score

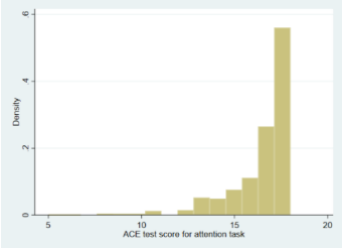
Domain:	- Verbal and non-verbal ability
Measures:	- Attention/Orientation - Memory - Language - Verbal Fluency - Visuospatial Skills
CHC:	G (general ability)
Administration method:	Research nurse. Mostly conducted using ACEmobile app, installed on iPad, with prompts to guide interviewer through the process. Pen and paper used where necessary (e.g. drawing tests).
Procedure:	The ACE-III was designed to detect mild dementia and distinguish between Alzheimer's disease (AD) and Frontotemporal dementia (FTD) (Mathuranath et al., 2000). Although it may be considered a measure of general cognitive ability, it was developed as a screen for impairment for use in clinical settings. It contains tasks/questions that measure 5 different cognitive domains: attention and orientation (scored 0 - 18); verbal fluency (0 - 14); memory (0 - 26); language (0 - 26); and visuospatial function (0 - 16). The tasks/questions used to assess the 5 specific domains are outlined separately in the next sections. Responses from the 5 domains can be summed to create an overall cognitive functioning score (0 - 100). ACE-III was administered by the interviewers via iPad using ACEmobile (http://www.acemobile.org). Where this was not possible,

	a paper version was used. All offline scoring was undertaken by trained personnel.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=mrepo:ace-iii.pdf
Scoring:	One mark per correct item (0 - 100)
Item-level variable(s):	ACESCRAT15x - ACEVISIOTOT15x
Total score/derived variable(s):	ACETOTFIN15x, MINIACE15x
Descriptives: (raw data)	N = 1,762 Range = 53 - 100 Mean = 91.52 SD = 6.01 
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828 - 848
Other sweep and/or cohort:	None
Source:	Mathuranath, P. S., Nestor, P. J., Berrios, G. E., Rakowicz, W., & Hodges, J. R. (2000). A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia. *Neurology*, *55*(11), 1613-1620.
Technical resources:	Noone, P. (2015). Addenbrooke's cognitive examination-III. *Occupational Medicine*, *65*(5), 418-420.

Reference examples:	- Matías-Guiu, J. A., Valles-Salgado, M., Rognoni, T., Hamre-Gil, F., Moreno-Ramos, T., & Matías-Guiu, J. (2017). Comparative diagnostic accuracy of the ACE-III, MIS, MMSE, MoCA, and RUDAS for screening of Alzheimer Disease. *Dementia and Geriatric Cognitive Disorders*, *43*(5-6), 237-246. - James, S. N., Davis, D., O'Hare, C., Sharma, N., John, A., Gaysina, D., ... & Richards, M. (2018). Lifetime affective problems and later-life cognitive state: Over 50 years of follow-up in a British birth cohort study. *Journal of Affective Disorders*, *241*, 348-355.

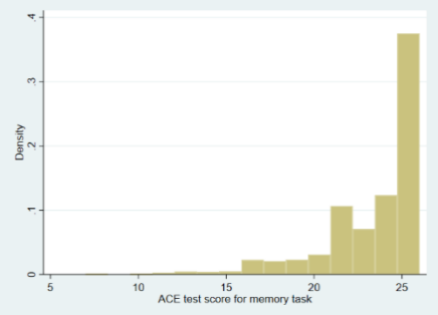
2.8.5 Addenbrooke's Cognitive Examination-III: Attention/orientation Scale

Domain:	Verbal orientation
Measures:	- Attention - Orientation
CHC:	- Q1 - 3: Glr (long term storage and retrieval) - Q4: Counting backwards - Gs (processing speed)
Administration method:	Research nurse. Mostly conducted using ACEmobile app, installed on iPad, with prompts to guide interviewer through the process. Pen and paper used where necessary (e.g. drawing tests).
Procedure:	Participants were asked to: i) State the day, date, month, year and season (0 - 5) ii) State the floor/no., street/hospital, town, county and country (0 - 5) iii) Repeat the three words “lemon”, “key” and “ball” directly after interviewer (0 - 3) iv) Count backwards from 100 in 7s (0 - 5; stops after 5 subtractions)
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=mrepo:ace-iii.pdf
Scoring:	One point per correct answer (0 - 18)
Item-level variable(s):	Not currently available.

Total score/derived variable(s):	ACESCRAT15x
Descriptives: (raw data)	N = 1,786 Range = 5 - 18 Mean = 16.72 SD = 1.85 
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828 - 848
Other sweep and/or cohort:	None
Source:	Mathuranath, P. S., Nestor, P. J., Berrios, G. E., Rakowicz, W., & Hodges, J. R. (2000). A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia. *Neurology*, *55*(11), 1613-1620.
Technical resources:	Noone, P. (2015). Addenbrooke's cognitive examination-III. *Occupational Medicine*, *65*(5), 418-420.
Reference examples:	- James, S. N., Davis, D., O'Hare, C., Sharma, N., John, A., Gaysina, D., ... & Richards, M. (2018). Lifetime affective problems and later-life cognitive state: Over 50 years of follow-up in a British birth cohort study. *Journal of Affective Disorders*, *241*, 348-355. - Matías-Guiu, J. A., Valles-Salgado, M., Rognoni, T., Hamre-Gil, F., Moreno-Ramos, T., & Matías-Guiu, J. (2017). Comparative diagnostic accuracy of the ACE-III, MIS, MMSE, MoCA, and RUDAS for screening of Alzheimer Disease. *Dementia and Geriatric Cognitive Disorders*, *43*(5-6), 237-246.

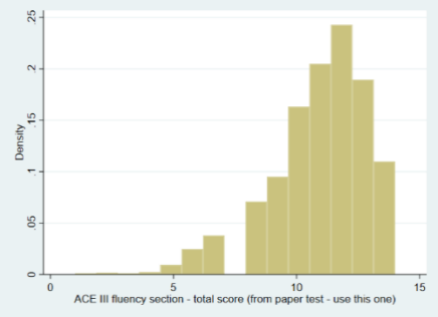
2.8.6 Addenbrooke's Cognitive Examination-III: Memory

Domain:	Verbal memory
Measures:	Memory
CHC:	- Gc (Crystallised Intelligence) - Glr (long-term storage and retrieval)
Administration method:	Research nurse. Mostly conducted using ACEmobile app, installed on iPad, with prompts to guide interviewer through the process. Pen and paper used where necessary (e.g. drawing tests).
Procedure:	After the attention section was completed, participants were asked to recall the three words they were asked to remember ("lemon", "key" and "ball"; 0 - 3). Participants were then asked to memorise an address consisting of 7 elements. They were given two practice trials, and a third trial took place later in the interview; this was the only trial that was scored (0 - 7). Those who remembered all 7 elements of the address were given an additional 5 points. Those who got at least one element of the address wrong were then given primers to help them recall the correct elements (0 - 5). They were then asked to name: (i) the current Prime Minister; (ii) the first woman who was Prime Minister; (iii) the USA president; (iv) the USA president who was assassinated in the 1960 (0 - 4).
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=mrepo:ace-iii.pdf
Scoring:	One point per correct answer (0 - 26)
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	ACESCRMM15x
Descriptives: (raw data)	N = 1,787 Range = 7 - 26 Mean = 23.46 SD = 2.86

	
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828 - 848
Other sweep and/or cohort:	None
Source:	Mathuranath, P. S., Nestor, P. J., Berrios, G. E., Rakowicz, W., & Hodges, J. R. (2000). A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia. *Neurology*, *55*(11), 1613-1620.
Technical resources:	Noone, P. (2015). Addenbrooke's cognitive examination-III. *Occupational Medicine*, *65*(5), 418-420.
Reference examples:	- Matías-Guiu, J. A., Valles-Salgado, M., Rognoni, T., Hamre-Gil, F., Moreno-Ramos, T., & Matías-Guiu, J. (2017). Comparative diagnostic accuracy of the ACE-III, MIS, MMSE, MoCA, and RUDAS for screening of Alzheimer Disease. *Dementia and Geriatric Cognitive Disorders*, *43*(5-6), 237-246. - James, S. N., Davis, D., O'Hare, C., Sharma, N., John, A., Gaysina, D., ... & Richards, M. (2018). Lifetime affective problems and later-life cognitive state: Over 50 years of follow-up in a British birth cohort study. *Journal of Affective Disorders*, *241*, 348-355.

2.8.7 Addenbrooke's Cognitive Examination-III: Fluency

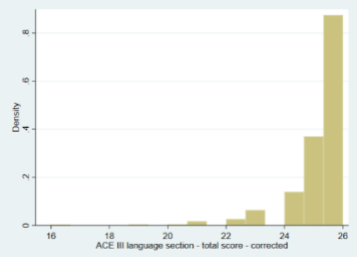
Domain	Verbal fluency
Measures:	Verbal fluency
Domain:	Glr (Long-Term Storage and Retrieval)

Administration method:	Research nurse. Mostly conducted using ACEmobile app, installed on iPad, with prompts to guide interviewer through the process. Pen and paper used where necessary (e.g. drawing tests).
Procedure:	In one minute, participants were asked to name as many words as possible beginning with a specific letter (excluding the names of people and countries). Next, they were given a minute to name as many animals as possible.
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=mrepo:ace-iii.pdf
Scoring:	0 - 14 (number of responses grouped into 7 categories, e.g. 0 - 1 items named = 0 points, 2 - 3 items named = 1 point, etc.).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	ACEFLU15x
Descriptives: (raw data)	N = 2,101 Range = 1 - 14 Mean = 11.00 SD = 2.11 
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828 - 848
Other sweep and/or cohort:	None

Source:	Mathuranath, P. S., Nestor, P. J., Berrios, G. E., Rakowicz, W., & Hodges, J. R. (2000). A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia. *Neurology*, *55*(11), 1613-1620.
Technical resources:	Noone, P. (2015). Addenbrooke's cognitive examination-III. *Occupational Medicine*, *65*(5), 418-420.
Reference examples:	- Matías-Guiu, J. A., Valles-Salgado, M., Rognoni, T., Hamre-Gil, F., Moreno-Ramos, T., & Matías-Guiu, J. (2017). Comparative diagnostic accuracy of the ACE-III, MIS, MMSE, MoCA, and RUDAS for screening of Alzheimer Disease. *Dementia and Geriatric Cognitive Disorders*, *43*(5-6), 237-246. - James, S. N., Davis, D., O'Hare, C., Sharma, N., John, A., Gaysina, D., ... & Richards, M. (2018). Lifetime affective problems and later-life cognitive state: Over 50 years of follow-up in a British birth cohort study. *Journal of Affective Disorders*, *241*, 348-355.

2.8.8 Addenbrooke's Cognitive Examination-III: Language Test

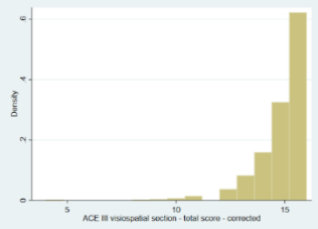
Domain:	Verbal (language ability)
Measures:	- Language comprehension - Lexical knowledge
CHC:	Gc (Crystallized Intelligence)
Administration method:	Research nurse. Mostly conducted using ACEmobile app, installed on iPad, with prompts to guide interviewer through the process. Pen and paper used where necessary (e.g. drawing tests).
Procedure:	First, participants were handed a pencil and paper and asked to follow three commands: (i) "Place the paper on top of the pencil", (ii) "Pick up the pencil but not the paper", (iii) "Ask the subject to "Pass me the pencil after touching the paper" (0 - 3). Second, they are asked to write two complete sentences about his/her last holiday/weekend/Christmas (0 - 2).

	Third, they were asked to repeat the words: 'caterpillar'; 'eccentricity; 'unintelligible'; 'statistician' (0 - 2). Fourth, they were asked to repeat the saying 'All that glitters is not gold' (0 - 1). Fifth, they were asked to repeat the saying 'A stitch in time saves nine' (0 - 1). Sixth, they were shown 12 pictures and asked to name them (0 - 12). Seventh, they were asked to point to certain pictures, e.g. "Which picture relates to the monarchy" (0 - 4). Finally, they were asked to read aloud 5 irregular words, e.g. 'sew', 'pint' (0 - 1).
Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=mrepo:ace-iii.pdf
Scoring:	One or two points per correct answer (0 - 26).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	ACELANGTOT15x
Descriptives: (raw data)	N = 1,765 Range = 16 - 26 Mean = 25.27 SD = 1.17 
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828- 848

Other sweep and/or cohort:	None
Source:	Mathuranath, P. S., Nestor, P. J., Berrios, G. E., Rakowicz, W., & Hodges, J. R. (2000). A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia. *Neurology*, *55*(11), 1613-1620.
Technical resources:	Noone, P. (2015). Addenbrooke's cognitive examination-III. *Occupational Medicine*, *65*(5), 418-420.
Reference examples:	- Matías-Guiu, J. A., Valles-Salgado, M., Rognoni, T., Hamre-Gil, F., Moreno-Ramos, T., & Matías-Guiu, J. (2017). Comparative diagnostic accuracy of the ACE-III, MIS, MMSE, MoCA, and RUDAS for screening of Alzheimer Disease. *Dementia and Geriatric Cognitive Disorders*, *43*(5-6), 237-246. - James, S. N., Davis, D., O'Hare, C., Sharma, N., John, A., Gaysina, D., ... & Richards, M. (2018). Lifetime affective problems and later-life cognitive state: Over 50 years of follow-up in a British birth cohort study. *Journal of Affective Disorders*, *241*, 348-355.

2.8.9 Addenbrooke's Cognitive Examination-III: Visuospatial Skills

Domain:	Non-verbal ability
Measures:	Visuospatial skills
Domain:	Gv (Visual processing)
Administration method:	Research nurse. Mostly conducted using ACEmobile app, installed on iPad, with prompts to guide interviewer through the process. Pen and paper used where necessary (e.g. drawing tests).
Procedure:	Participants were asked to: (i) Copy two objects (0 - 3) (ii) Draw a clock with numbers and hands indicating the time as ten minutes past five (0 - 5) (iii) Count the number of dots in 4 separate pictures (0 -4) (iv) Identify 4 partially complete letters (0 - 4)

Link to questionnaire:	https://skylark.ucl.ac.uk/NSHD/lib/exe/fetch.php?media=mrepo:ace-iii.pdf
Scoring:	0 - 16.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	ACEVISIOTOT15x
Descriptives: (raw data)	N = 1,778 Range = 4 - 16 Mean = 15.05 SD = 1.29 
Age of participants (months):	Mean = 834.14, SD = 2.93, Range = 828 - 848
Other sweep and/or cohort:	None
Source:	Mathuranath, P. S., Nestor, P. J., Berrios, G. E., Rakowicz, W., & Hodges, J. R. (2000). A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia. *Neurology*, *55*(11), 1613-1620.
Technical resources:	Noone, P. (2015). Addenbrooke's cognitive examination-III. *Occupational Medicine*, *65*(5), 418-420.
Reference examples:	- Matías-Guiu, J. A., Valles-Salgado, M., Rognoni, T., Hamre-Gil, F., Moreno-Ramos, T., & Matías-Guiu, J. (2017). Comparative diagnostic accuracy of the ACE-III, MIS, MMSE, MoCA, and RUDAS for screening of Alzheimer Disease. *Dementia and Geriatric Cognitive Disorders*, *43*(5-6), 237-246.

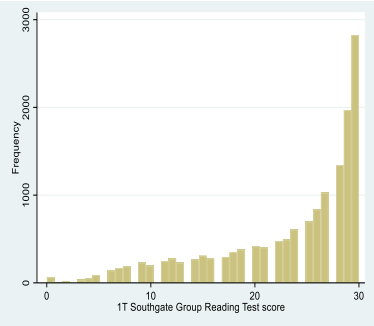
	- James, S. N., Davis, D., O'Hare, C., Sharma, N., John, A., Gaysina, D., ... & Richards, M. (2018). Lifetime affective problems and later-life cognitive state: Over 50 years of follow-up in a British birth cohort study. *Journal of Affective Disorders*, *241*, 348-355.

3. National Child Development Study (NCDS)

3.1 NCDS (Age 7)

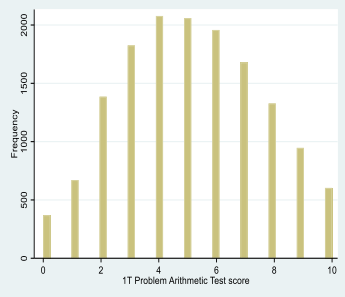
3.1.1 Southgate Group Reading Test (SGRT)

Domain:	Verbal (reading)
Measures:	- Reading ability (word recognition and comprehension) - Particularly suited to identifying children with reading difficulties.
CHC:	- Gc (Crystallised ability) - Grw (Reading/writing)
Administrative method:	Teacher at school in a group; face to face; read aloud and by the child
Procedure:	On 16 (of 30) occasions, the child was given a picture of an object and had to ring the word, from 5 different options describing that object in the picture. On the other 14 occasions, the teacher read out a word and the child had to circle the correct one. Duration: The test lasted approximately 15-20 minutes (expected 60 -90 minutes for all 4 tests at age 7).
Link to questionnaire:	No direct link to pdf. Information can be found in the file 'ncds1_1965_questionnaires_and_codebook.pdf/' which accompanies data download from UK Data Service website.
Scoring:	30 items. Each correct answer receives one mark. The total of possible marks for the test is 30.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	N92
Age of participant (months):	Mean = 85.11, SD = 1.56, Range = 82 - 93
Descriptives:	N = 14,929 Range = 0 - 30 Mean = 23.34 SD = 7.14

(Raw data)	Graphic: histogram 
Other sweep and/or cohort:	None
Source:	Southgate, V. (1962). Southgate Group Reading Tests: Manual of Instructions. University of London Press
Technical resources:	- Shepherd, P. *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012. - Pringle, M. K., Butler, N. & Davie, R. (1966). *11,000 Seven Year Olds*. Longman, in association with National Children's Bureau
Reference examples:	- Currie, J., & Thomas, D. (1999). Early test scores, socioeconomic status and future outcomes (No. w6943). National bureau of economic research. - Richards, M., Power, C., & Sacker, A. (2009). Paths to literacy and numeracy problems: evidence from two British birth cohorts. Journal of Epidemiology & Community Health, 63(3), 239-244.

3.1.2 Problem Arithmetic Test

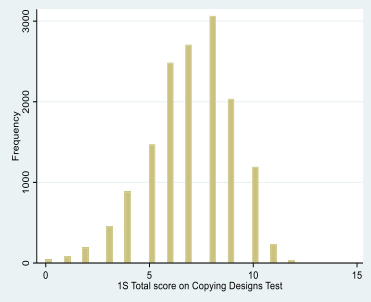
Domain:	Arithmetic (arithmetic problems)
Measures:	Arithmetic
CHC:	Gq (Quantitative Knowledge)
Administrative method:	Teacher at school; face to face; self-completion. However, if necessary, each problem was read to the child if there was difficulty in reading the items.

Procedure:	Ten arithmetic problems graded in level of difficulty. In order to avoid penalising the poor readers, the teachers were asked to read the problems to the children if necessary. The test was discontinued after three successive incorrect answers. Duration: It was expected 60 - 90 minutes would be required for all 4 tests at age 7.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/ncds1.pdf
Scoring:	One mark was awarded for each correct answer, giving a score between 0 and 10.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	N90
Age of participant (months):	Mean = 85.11, SD = 1.56, Range = 82 - 93
Descriptives: (Raw data)	N = 14,897 Range = 0 - 10 Mean = 5.11 SD = 2.49 Graphic: histogram 
Other sweep and/or cohort:	None
Source:	The individual items were chosen in the main from a large number previously used by the National Foundation for Educational Research, so that information was available on their facility values

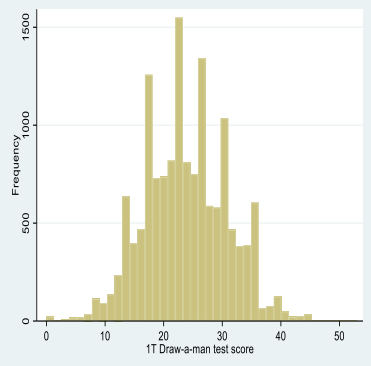
	and it was possible to select those items which on a 7-year-old population would produce a normal distribution of scores.
Technical resources:	- Shepherd, P. *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012. - Pringle, M. K., Butler, N. & Davie, R. (1966). *11,000 Seven Year Olds*. Longman, in association with National Children's Bureau
Reference examples:	- Feinstein, L. (2004). Mobility in pupils' cognitive attainment during school life. *Oxford Review of Economic Policy*, *20*(2), 213-229. - Case, A., & Paxson, C. (2008). Stature and status: Height, ability, and labor market outcomes. *Journal of Political Economy*, *116*(3), 499-532. - Sullivan, A. (2009). Academic self-concept, gender and single-sex schooling. *British Educational Research Journal*, *35*(2), 259-288.

3.1.3 Copying Designs Test (CDT)

Domain:	Visual spatial
Measures:	Visual motor co-ordination (ability to reproduce shapes and hold a pencil)
CHC:	Gv (Visual Processing)
Administrative method:	Teacher at school; face to face; pen and paper
Procedure:	Six designs were presented: a circle, square, triangle, diamond, cross and star. The child was given a booklet, and asked to copy the 6 drawings, one at a time. Duration: It was expected 60 -90 minutes would be required for all 4 tests at age 7.
Link to questionnaire:	No direct link to pdf. Information can be found in the file 'ncds1_1965_questionnaires_and_codebook.pdf/' which accompanies data download from UK Data Service website.
Scoring:	Score 0 - 12. Each drawing is scored 0 or 1. As not all children completed two copies a score of 1 was given if at least one copy was good. Total score is the sum of the score for the individual

	drawings. Zero was awarded when a child attempted to copy at least one design, but all attempts were judged to be poor copies.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	N457
Age of participant (months):	Mean = 85.11, SD = 1.56, Range = 82 - 93
Descriptives: (Raw data)	N = 14,867 Range = 0 - 12 Mean = 7.01 SD = 2.00 Graphic: histogram 
Other sweep and/or cohort:	- NCDS (age 11) - BCS (age 5; less stringent scoring; 8 designs) - BCS (children of cohort member, multi-age; 8 designs; currently no data available)
Source:	- Pringle, M. K., Butler, N. & Davie, R. (1966). *11,000 Seven Year Olds*. Longman, in association with National Children's Bureau. - Davie, R., Butler, N. R., & Goldstein, H. (1972). *From Birth to Seven.* London: Longman Group Limited
Technical resources:	Shepherd, P., *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012.
Reference examples:	- Sheridan, M. D. (1973). Children of seven years with marked speech defects. *International Journal of Language & Communication Disorders*, *8*(1), 9-16. - Ross, A., Schoon, I., Martin, P., & Sacker, A. (2009). Family and nonfamily role configurations in two British cohorts. *Journal of Marriage and Family*, *71*(1), 1-14.

3.1.4 Human Figure Drawing (HFD)

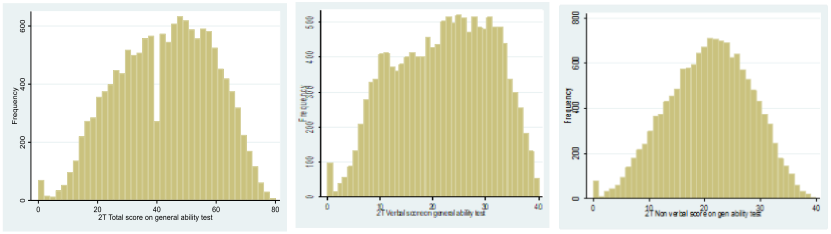
Domain:	General ability (perceptual)
Measures:	General mental and perceptual ability. Purports to measure cognitive maturation.
CHC:	Gv (Visual Processing)
Administrative method:	Teacher at school; face to face; pen and paper
Procedure:	The child was asked to 'make a picture of a man', within the rectangular frame. They were asked to make the best picture they could and to draw a whole person, not just a face or head. Duration: (expected 60 - 90 minutes for all 3 tests at age 7)
Link to questionnaire:	No direct link to pdf. Information can be found in the file 'ncds1_1965_questionnaires_and_codebook.pdf/' which accompanies data download from UK Data Service website.
Scoring:	Awarded a mark out of 100 according to the features that were included.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	N1840
Age of participant (months):	Mean = 85.11, SD = 1.56, Range = 82 - 93
Descriptives: (Raw data)	N = 14,642 Range = 0 - 53 Mean = 23.84 SD = 7.08 Graphic: histogram 
Other sweep and/or cohort:	BCS (age 5)* *different scoring system
Source:	- Modified version of the 'Draw-a-man' test (Goodenough, 1926) and later developed by Harris (1963). - Goodenough, F. L. (1926). The measurement of intelligence by drawings, New York: World Book Company.

	- Harris, D. B. (1963). Children's drawings as measures of intellectual maturity, New York: Harcourt, Brace and World. - Scoring was based on: Koppitz, E M. (1968). Psychological Evaluation of Children's Human Figure Drawings. New York: Grune and Stratton
Technical resources:	Shepherd, P. *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012.
Reference examples:	- Schoon, I., Bynner, J., Joshi, H., Parsons, S., Wiggins, R. D., & Sacker, A. (2002). The influence of context, timing, and duration of risk experiences for the passage from childhood to midadulthood. *Child development*, *73*(5), 1486-1504. - Schoon, I., & Parsons, S. (2002). Competence in the face of adversity: the influence of early family environment and long-term consequences. *Children & society*, *16*(4), 260-272.

3.2 NCDS (Age 11)

3.2.1 General Ability Test (Verbal and Non-verbal)

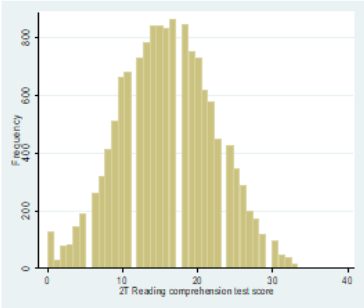
Domain:	- Verbal (reasoning) - Non-verbal (reasoning)
Measures:	Measure of general ability, including verbal and non-verbal elements. Douglas (1964) claims the test correlates highly with IQ-type tests used for secondary school selection.
CHC:	- G (General ability) - Gc (Crystallised) - Gf (Fluid)
Administrative method:	Teacher at school; face to face; pen and paper
Procedure:	The test consisted of 80 multiple choice questions. Before the test was administered the child was shown four examples which the child and teacher completed together. For the verbal items the child was presented with an example set of four words that were linked either logically, semantically or phonologically; for the non-verbal test, fours example shapes or symbols were used. Next to the examples were three word or shapes/symbols with a blank, along with 5 response options to choose from. From the list, the child was required to underline

	the missing item which completed the sequence. Duration: 30 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS2-Guide-to-the-Dataset.pdf
Scoring:	80 items in total; 40 verbal and 40 non-verbal. Each correct answer given 1 mark and 0 for incorrect answer. Total score ranges from 0 to 80, verbal and non-verbal subscales (0 to 40).
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	n914 (verbal); n917 (non-verbal); n920 (general ability)
Age of participant (months):	Mean = 134.25, SD = 1.70, Range = 130 - 152
Descriptives:	<table><tr><th></th><th>General ability</th><th>Verbal ability</th><th>Non-verbal ability</th></tr><tr><td>N</td><td>14,131</td><td>14,131</td><td>14,131</td></tr><tr><td>Range</td><td>0 - 80</td><td>0 - 40</td><td>0 - 40</td></tr><tr><td>Mean</td><td>42.94</td><td>22.06</td><td>20.88</td></tr><tr><td>SD</td><td>16.14</td><td>9.36</td><td>7.61</td></tr></table> 
Other sweep and/or cohort:	NSHD (age 11)
Source:	Pigeon DA. Details of the fifteen years tests. Appendix 1 in Douglas, J.W.B., *The Home and the School: A study of ability and attainment in the primary school*. 1964, London: MacGibbon and Kee.
Technical resources:	Shepherd, P. *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012.

Reference examples:	- Galindo-Rueda, F., & Vignoles, A. (2005). The declining relative importance of ability in predicting educational attainment. *Journal of Human Resources*, *40*(2), 335-353. - Schoon, I., Cheng, H., Gale, C. R., Batty, G. D., & Deary, I. J. (2010). Social status, cognitive ability, and educational attainment as predictors of liberal social attitudes and political trust. *Intelligence*, *38*(1), 144-150.

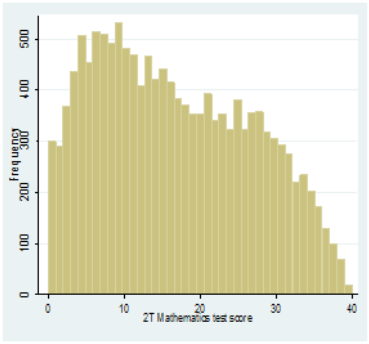
3.2.2 Reading Comprehension Test

Domain:	Verbal (reading)
Measures:	Reading comprehension
CHC:	- Gc (Crystallised) - Grw (Reading/Writing)
Administrative method:	Teacher at school; individually face to face; pen and paper
Procedure:	The test consisted of 35 sentences. Before the test was administered the child was shown two examples which the child and teacher completed together. The child was required to read a sentence and choose from a selection of 5 words the most appropriate to complete the sentence. From the list, the child was required to underline the missing item which completed the sentence. Duration: 20 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS2-Guide-to-the-Dataset.pdf
Scoring:	35 items. Each correct answer receives one mark. The total of possible marks for the test is 35.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	N923

Age of participant (months):	Mean = 134.25, SD = 1.70, Range = 130 - 152
Descriptives: (Raw data)	N = 14,130 Range = 0 - 35 Mean = 15.98 SD = 6.29 Graphic: histogram 
Other sweep and/or cohort:	- NCDS (age 16) - NSHD (age 8, 15 and 26)
Source:	Constructed by NFER specifically for use in the NCDS. The test was designed to parallel the Watts-Vernon test of reading ability (Watts-Vernon, 1947).
Technical resources:	Shepherd, P. *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012.
Reference examples:	- Butler, N. R., & Goldstein, H. (1973). Smoking in pregnancy and subsequent child development. *BMJ*, *4*(5892), 573-575. - Blanden, J., Gregg, P., & Macmillan, L. (2006). *Accounting for intergenerational income persistence: non-cognitive skills, ability and education.* CEEDP (73). Centre for the Economics of Education, London School of Economics and Political Science, London, UK. ISBN 07530 2084 X

3.2.3 Mathematics Test

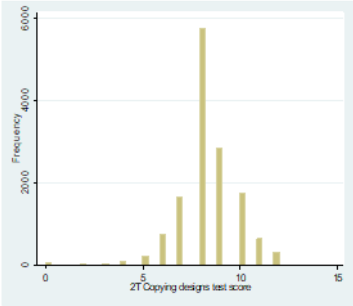
Domain:	Arithmetic
Measures:	Arithmetic

CHC:	Gq (Quantitative Knowledge)
Administrative method:	Teacher at school; individually face to face; pen and paper
Procedure:	The test consisted of 40 items. The test included, number skills, fractions, measures and geometry. Most questions were calculated directly, with a few involving multiple-choice answers.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS2-Guide-to-the-Dataset.pdf
Scoring:	One mark was awarded for each correct answer
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	n926
Age of participant (months):	Mean = 134.25, SD = 1.70, Range = 130 - 152
Descriptives: (Raw data)	N = 14,126 Range = 0 - 40 Mean = 16.63 SD = 10.35 Graphic: histogram 
Other sweep and/or cohort:	None
Source:	Constructed by NFER specifically for use in the NCDS.
Technical resources:	Shepherd, P., *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012.

Reference examples:	- Cherlin, A. J., Furstenberg, F. F., Chase-Lansdale, L., Kiernan, K. E., Robins, P. K., Morrison, D. R., & Teitler, J. O. (1991). Longitudinal studies of effects of divorce on children in Great Britain and the United States. *Science*, *252*(5011), 1386-1389. - Gregg, P., & Macmillan, L. (2010). Family income, education and cognitive ability in the next generation: exploring income gradients in education and test scores for current cohorts of youth. *Longitudinal and Life Course Studies*, *1*(3), 259-280.

3.2.4 Copying Designs Test (CDT)

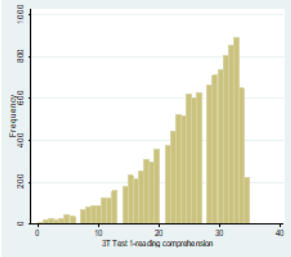
Domain:	Visual spatial
Measures:	- Visual motor co-ordination - Ability to reproduce shapes
CHC:	Gv (Visual Processing)
Administrative method:	Teacher at school; individually face to face; pen and paper
Procedure:	Six designs were presented: a circle, square, triangle, diamond, cross and star. The child was given a booklet, and asked to copy 6 drawings, one at a time.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS2-Guide-to-the-Dataset.pdf
Scoring:	Score 0 - 12. Each drawing is scored 0 or 1. As not all children completed two copies a score of 1 was given if at least one copy is good. Total score is the sum of the score for the individual drawings. Zero was awarded when a child attempted to copy at least one design, but all attempts were judged to be poor copies.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	n929
Age of participant (months):	Mean = 134.25, SD = 1.70, Range = 130 - 152

Descriptives: (Raw data)	N = 14,101 Range = 0 - 12 Mean = 8.34 SD = 1.50 
Other sweep and/or cohort:	- NCDS (age 7) - BCS (age 5; less stringent scoring; 8 designs) - BCS (children of cohort member, multi-age; 8 designs; currently no data available)
Source:	Pringle, M. K., Butler, N., & Davie, R. (1966). *11,000 Seven Year Olds*. Longman, in association with National Children's Bureau.
Technical resources:	Shepherd, P. *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012.
Reference examples:	- Jenkins, A., Vignoles, A., Wolf, A., & Galindo-Rueda, F. (2003). The determinants and labour market effects of lifelong learning. *Applied economics*, *35*(16), 1711-1721. - Lynn, R., & Kanazawa, S. (2011). A longitudinal study of sex differences in intelligence at ages 7, 11 and 16 years. *Personality and Individual Differences*, *51*(3), 321-324.

3.3 NCDS (Age 16)

3.3.1 Reading Comprehension Test

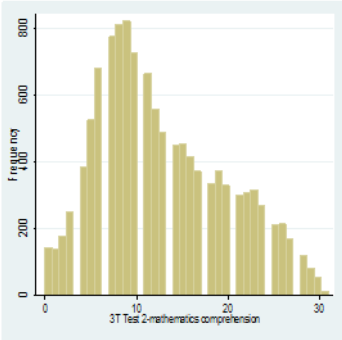
Domain:	Verbal (reading)
Measures:	Reading comprehension
CHC:	- Gc (Crystallised) - Grw (Reading/Writing)

Administrative method:	Teacher at school; individually face to face; pen and paper
Procedure:	The test consisted of 35 sentences. Before the test was administered the child was shown two examples which the child and teacher completed together. The child was required to read a sentence and choose from a selection of 5 words the most appropriate to complete the sentence. From the list, the child was required to underline the missing item which completed the sentence. The test was conducted under timed conditions and within time-limit. Duration: 10 minutes
Link to questionnaire:	No direct link to pdf. Information can be found in the file 'ncds3_1974_questionnaires_and_codebook.pdf' which accompanies data download from UK Data Service website.
Scoring:	35 items. Each correct answer receives one mark. The total of possible marks for the test is 35.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	n2928
Age of participant (months):	Mean = 192.52, SD = 1.36, Range = 190 - 201
Descriptives: (Raw data)	N = 11,986 Range = 0 - 35 Mean = 25.31 SD = 7.09 Graphic: histogram 
Other sweep and/or cohort:	- NCDS (age 11) - NSHD (age 8, 15 and 26)

Source:	Used in NCDS age 11: Constructed by NFER specifically for use in the NCDS. The test was designed to parallel the Watts-Vernon test of reading ability (Watts-Vernon, 1947).
Technical resources:	Shepherd, P. *Measures of ability at ages 7 to 16.* National Child Development Study User Guide, 2012.
Reference examples:	- Goodman, A., & Sianesi, B. (2005). Early education and children's outcomes: how long do the impacts last? *Fiscal Studies*, *26*(4), 513-548. - Power, C., Li, L., & Hertzman, C. (2008). Cognitive development and cortisol patterns in mid-life: findings from a British birth cohort. *Psychoneuroendocrinology*, *33*(4), 530-539.

3.3.2 Mathematics Test

Domain:	Mathematics
Measures:	- Mathematics. - Numerical and geometric skills.
CHC:	Gq (Quantitative Knowledge)
Administrative method:	Teacher at school; individually face to face; pen and paper
Procedure:	The test consisted of 31 items. The test included, number skills and geometry using 27 multiple-choice and 4 true or false questions. Duration: The test was conducted under timed conditions and within time-limit (45 minutes)
Link to questionnaire:	No direct link to pdf. Information can be found in the file 'ncds3_1974_questionnaires_and_codebook.pdf' which accompanies data download from UK Data Service website.
Scoring:	31 items, each correct answer received one mark. The total of possible marks for the test was 31.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	n2930
Age of participant (months):	Mean = 192.52, SD = 1.36, Range = 190 - 201
Descriptives: (Raw data)	N = 11,920 Range = 0 -31 Mean = 12.76 SD = 7.00 Graphic: histogram

	
Other sweep and/or cohort:	None
Source:	Constructed by NFER specifically for use in the NCDS.
Technical resources:	Shepherd, P., Measures of ability at ages 7 to 16. National Child Development Study User Guide, 2012.
Reference examples:	- Fogelman, K. (1978). School attendance, attainment and behaviour. British journal of educational psychology, 48(2), 148-158. - Jeffers, B. J., Power, C., & Hertzman, C. (2002). Birth weight, childhood socioeconomic environment, and cognitive development in the 1958 British birth cohort study. BMJ, 325(7359), 305.

3.4 NCDS Mother and Child Study (Multi-age child respondents)

The child assessments included in the NCDS5 Child Interview (conducted when the Cohort Member was aged 33) applied only to the natural or adopted children of Cohort Members aged 3 years, 11 months, and 16 days or older. Some 3,575 (71 percent) of the cohort children identified were eligible for the Child Interview. The tests were based on those used by the US National Longitudinal Survey of Youth (NLSY) for their 1990 survey of the children of female respondents. These tests were developed in the US and a number of changes (mainly substituting terminology) were made to individual assessments for use in the NCDS.

Prior to administering all of these tests, the interviewer calculated the Peabody Picture Vocabulary Test (PPVT) age of the child (actual age rounded up or down to the nearest whole month) to establish, if the child was eligible for testing, which tests would be administered and, for some tests, the appropriate starting point of the test.

Time at start and completion (24 hour clock) was calculated using the following variables: n520128 n520130 n521935 n521937.

3.4.1 Peabody Picture Vocabulary Test - Revised (PPVT-R)

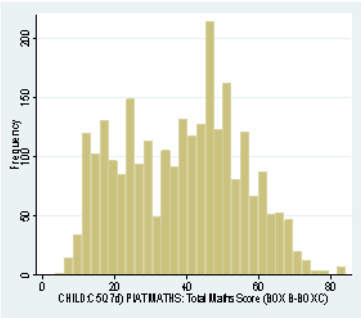
Domain:	Verbal (vocabulary)
Measures:	- Hearing vocabulary - Word knowledge
CHC:	Gc (Crystallised intelligence)
Administrative method:	Interviewer at home; face to face; read and point at picture
Procedure:	The interviewer said a word and the child pointed to one of four pictures which best portrayed the meaning of the word. The difficulty level increased as the child goes through the test. The interviewer: - identified the start point (using the PPVT) - established basal (8 correct answers in a row) and ceiling (6 out of 8 responses wrong) points. If the child did not get the first 8 items correct, then they worked backwards until 8 consecutive correct items were identified. If the child got back to item 1 then this became the basal. The ceiling was identified when 6 out of 8 items were incorrect or if item 175 was reached.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/Ncds5d.pdf
Scoring:	See source materials
Item-level variable(s):	- n520132 (starting item) - n520135 - n520762 (items 1 - 175, correct and response) - n520813 (basal obtained Y/N) - n520814 (ceiling obtained Y/N) - n520124 n520126 (PPVT age in years and months)

Total score/derived variable(s):	No derived variables
Age of participant (months):	Mean = 103.31, SD = 36.89, Range = 47 - 224
Descriptives:	Not available (see technical resources on deriving scores)
Other sweep and/or cohort:	EPVT in BCS (age 5) - English version PLCT in BCS (age 10) - based on EPVT at age 5
Source:	Dunn, L. & Dunn, L. (1981). PPVT-R Manual (Circle Pines, MN American Guidance Service)
Technical resources:	For further details see" BAKER P C and MOTT FL(1988) NLSY Child Handbook 1989 A Guide & Resource Document for the National Longitudinal Survey of Youth (1988) Child Data (Columbus, Ohio Center for Human Resource Research, The Ohio State University)
Reference examples:	- Michael, R. (2003). Children's cognitive skill development in Britain and the United States. *International Journal of Behavioral Development*, *27*(5), 396-408. - Armstrong, A. (2012). Belief in a just world and children's cognitive scores. *National Institute Economic Review*, *222*(1), R7-R19. - Parcel, T. L., & Campbell, L. A. (2017). Can the welfare state replace parents? Children's cognition in the United States and Great Britain. *Social Science Research*, *64*, 79-95.

3.4.2 Peabody Individual Achievement Test (PIAT) Maths

Domain:	Mathematics
Measures:	Mathematics achievement. Covers a wide range from early skills, such as recognising numerals, and progresses to measuring more advanced concepts in geometry and trigonometry.
CHC:	Gq (Quantitative Knowledge)

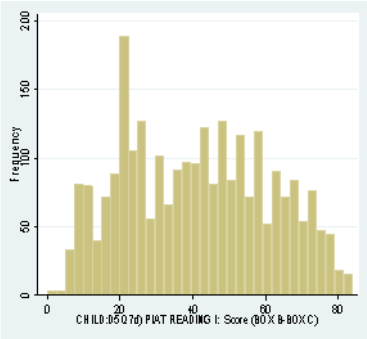
Administrative method:	Interviewer at home; face to face; read and child selects
Procedure:	Consists of 84 multiple-choice items of increasing difficulty. The interviewer read out the question and the child selected an answer from one of four. The interviewer: - identified the start point (using the PPVT age) - established basal (5 correct answers in a row) and ceiling (5 out of 7 responses wrong) points. If the child does not get the first 5 items correct, then they work backwards from the next lower age. The ceiling is identified when 5 out of 7 items are incorrect or if item 84 is reached.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/Ncds5d.pdf
Scoring:	Last item (out of 84) reached on test (ceiling) minus the total number of incorrect responses. (see source materials)
Item-level variable(s):	n520949-n521222 (individual items) n520947 (start PLATE no. - age range (12 months) into which CM falls) n521223 (basal 5/5 right) n521224 (ceiling 5/7 wrong) n521225 (basal plate no.) n521227 (ceiling plate no.) n521229 (total no. errors)
Total score/derived variable(s):	n521231 (total maths score = ceiling-total no. errors)
Age of participant:	Mean = 109.38, SD = 34.40, Range = 48 - 224
Descriptives:	N = 2,632 Range = 1 - 84 Mean = 38.38

(Raw data)	SD = 16.61 Graphic: histogram 
Other sweep and/or cohort:	None
Source:	Dunn, L. M., & Markwardt Jr, F. C. (1970). Peabody Individual Achievement Test Manual (Circle Pines, MN American Guidance Service)
Technical resources:	National Longitudinal Survey of Youth, (1988). Child Data (Columbus, Ohio Center for Human Resource Research, The Ohio State University)
Reference examples:	- Verropoulou, G., & Joshi, H. (2009). Does mother's employment conflict with child development? Multilevel analysis of British mothers born in 1958. *Journal of Population Economics*, *22*(3), 665-692. - Michael, R. (2011). Family caring and children's reading and math skills. *Longitudinal and Life Course Studies*, *2*(3), 301-318. - Parcel, T. L., & Campbell, L. A. (2017). Can the welfare state replace parents? Children's cognition in the United States and Great Britain. *Social science research*, *64*, 79-95.

3.4.3 Peabody Individual Achievement Test (PIAT) Reading Recognition subscale

Domain:	Verbal (oral reading)
Measures:	Word recognition
CHC:	- Gc (Crystallised intelligence) - Grw (Reading/writing)

Administrative method:	Interviewer at home; face to face; child reads and says out loud
Procedure:	Method consists of 84 multiple-choice items of increasing difficulty, beginning with matching and naming letters and moving on to reading single words aloud. Children read a word silently and then said it out loud. Entry to the test is determined by the PIAT Maths score. The interviewer: - identified the start point (using the PPVT age) - established basal (5 correct answers in a row) and ceiling (5 out of 7 responses wrong) points. If the child did not get the first 5 items correct, then the test was moved back 5 words and started from there. The ceiling was identified when 5 out of 7 items were incorrect or if item 84 was reached.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/Ncds5d.pdf
Scoring:	Last item (out of 84) reached on test (ceiling) minus the total number of incorrect responses. (see source materials)
Item-level variable(s):	- n521336 (maths score) - n521339-n521459 (individual items) - n521460 (Basal 5/5 right) - n521461 (ceiling 5/7 wrong) - n521462 (Basal plate no.) - n521464 (Ceiling plate no.) - n521466 (total no. errors)
Total score/derived variable(s):	n521468 (total reading = ceiling-total no. errors)
Age of participant (months):	Mean = 109.67, SD = 34.34 , Range = 47 - 224
Descriptives:	N = 2,616 Range = 1 - 84

(Raw data)	Mean = 41.27 SD = 20.01 Graphic: histogram 
Other sweep and/or cohort:	None
Source:	Dunn, L.M., & Markwardt Jr, F.C. (1970). Peabody Individual Achievement Test Manual (Circle Pines, MN American Guidance Service)
Technical resources:	National Longitudinal Survey of Youth, (1988). Child Data (Columbus, Ohio Center for Human Resource Research, The Ohio State University)
Reference examples:	- Verropoulou, G., & Joshi, H. (2009). Does mother's employment conflict with child development? Multilevel analysis of British mothers born in 1958. *Journal of Population Economics*, *22*(3), 665-692. - Michael, R. (2011). Family caring and children's reading and math skills. *Longitudinal and Life Course Studies*, *2*(3), 301-318. - Parcel, T. L., & Campbell, L. A. (2017). Can the welfare state replace parents? Children's cognition in the United States and Great Britain. *Social science research*, *64*, 79-95.

3.4.4 Peabody Individual Achievement Test (PIAT) Reading Comprehension subscale

Domain:	Verbal (word meaning)
Measures:	Word understanding / lexical comprehension
CHC:	- Gc (Crystallised)

	- Grw (Reading/Writing)
Administrative method:	Interviewer at home; face to face; child reads and says out loud
Procedure:	Consists of 56 items of increasing difficulty. The child read a sentence and selected one of four pictures which best portrayed the meaning of the sentence. Entry to the test was determined by the PIAT Reading Recognition Score. The interviewer: - identified the start point (using the PPVT age) - established basal (5 correct answers in a row) and ceiling (5 out of 7 responses wrong) points. If the child did not get the first 5 items correct, then the test was moved back 5 words and started from there. The ceiling was identified when 5 out of 7 items were incorrect or if item 84 was reached.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/Ncds5d.pdf
Scoring:	(see source materials)
Item-level variable(s):	- n521513 (score from reading Test I) - n521515-n521680 (individual items) - n521713 (Basal 5/5 right) - n521714 (ceiling 5/7 wrong)
Total score/derived variable(s):	None
Age of participant (months):	Mean = 112.42, SD = 33.64, Range = 47 - 224
Descriptives:	Not available (see technical resources on deriving scores)
Other sweep and/or cohort:	None

Source:	Dunn, L. M., & Markwardt Jr, F. C. (1970). Peabody Individual Achievement Test Manual (Circle Pines, MN American Guidance Service)
Technical resources:	National Longitudinal Survey of Youth, (1988). Child Data (Columbus, Ohio Center for Human Resource Research, The Ohio State University)
Reference examples:	Michael, R. (2003). Children's cognitive skill development in Britain and the United States. *International Journal of Behavioral Development*, *27*(5), 396-408.

3.4.5 McCarthy Scale of Children's Abilities: Verbal Memory Subscale (intended for respondents aged 3 - 6years 11 months)

Domain:	Verbal (vocabulary)
Measures:	Short term verbal memory
CHC:	Gsm (Short-term memory)
Administrative method:	Interviewer at home; face to face; interviewer reads and child recalls out loud.
Procedure:	The child repeated words or sentences read to them by the interviewer. The interviewer read a story and the child retold the essential elements.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/Ncds5d.pdf
Scoring:	(see source materials)
Item-level variable(s):	n520838-n520923 (individual items and overall summaries)
Total score/derived variable(s):	None
Age of participant (months):	Mean = 66.05, SD = 10.68, Range = 46 – 124
Descriptives:	Not available (see technical resources on deriving scores)

(Raw data)	
Other sweep and/or cohort:	None
Source:	McCarthy, D. (1972). *Manual for the McCarthy Scales of Children's Abilities.* Cleveland The Psychological Corporation).
Technical resources:	National Longitudinal Survey of Youth, (1988). Child Data (Columbus, Ohio Center for Human Resource Research, The Ohio State University)
Reference examples:	Michael, R. (2003). Children's cognitive skill development in Britain and the United States. *International Journal of Behavioral Development*, *27*(5), 396-408.

3.4.6 Weschler Intelligence Scale for Children – Revised: Digit Span Subscale (intended for respondents aged 7 years and older)

Domain:	Verbal (auditory- working memory)
Measures:	- Memory span - Working memory
CHC:	Gsm (Short-Term Memory)
Administrative method:	Interviewer; spoken and child repeats
Procedure:	Consists of 28 items; 14 forward and 14 backward. The interviewer read out digits (from 3 to 9), the child listened and repeated the sequence of numbers read out. The child then listened to sequences of numbers read out by the interviewer and repeated them in reverse order. In both parts, the length of the sequence of numbers increased as the child responds correctly.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/Ncds5d.pdf
Scoring:	(see source materials)
Item-level variable(s):	- n521738-n521751 (forward items)

	- n521752-n521765 (backward items)
Total score/derived variable(s):	None
Age of participant (months):	M = 124.82, SD = 28.46, range = 64 - 224
Descriptives: (Raw data)	Not available (see technical resources on deriving scores)
Other sweep and/or cohort:	- BCS (age 10) - ALSPAC (age 49 months and 61 months)
Source:	Weschler, D. (1974). *Weschler Intelligence Scales for Children - Revised (New* York The Psychological Corporation)
Technical resources:	National Longitudinal Survey of Youth, (1988). Child Data (Columbus, Ohio Center for Human Resource Research, The Ohio State University)
Reference examples:	Michael, R. (2003). Children's cognitive skill development in Britain and the United States. *International Journal of Behavioral Development*, *27*(5), 396-408.

3.5 NCDS sub-study age 37 (Sub-sample 10% representative sample N = 1,714)

3.5.1 Basic literacy and numeracy skills

Domain:	Adult basic literacy and numeracy
Measures:	(Functional) literacy and numeracy assessment. The assessment covered four levels for communication skills and the three levels for numeracy as defined by Adult Literacy and Basic Skills Unit's (ALBSU) Basic Skills Standards. These emphasise 'functional' performance, i.e. the ability to apply basic skills in everyday life situations (ACACE, 1982).

CHC:	None
Administrative method:	Interviewer; face to face; pen and paper/show cards
Procedure:	There were eight literacy and nine numeracy tasks for study members to complete. The majority of tasks had two or three sub-questions. Each literacy and numeracy assessment item comprised a visual stimulus presented to the cohort member on a 'showcard' about which they were asked a number of questions. If three questions in a row were incorrect for the literacy test the CM moved onto the numeracy questions. Duration: 30 minutes for both tests.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS-37-year-Sample-Survey-%C3%BB-Guide.pdf
Scoring:	A score of 1 was assigned to correct answers and the individual scores aggregated to produce for each cohort member an overall numeracy and literacy score. The aggregate scores were then grouped into a fourfold classification of "very low", "low", "average" and "good" for both numeracy and literacy abilities. See 'NCDS37yearSampleSurveyGuide.pdf/' (accompanying data download) for syntax for literacy and numeracy scores (pp. 156-158).
Age of participant (months):	No age data available.
Item-level variable(s):	- nss1426 - nss1456 (literacy tasks 1 - 8 incl. sub-questions) - nss1470 - nss1535 (numeracy tasks 10 - 18 incl. sub-questions)
Total score/derived variable(s):	- litscor1 (literacy composite test scores 0 - 8) - litscor2 (literacy composite test scores long version) - numscor1 (numeracy composite test scores 0 - 9) - numscor2 (numeracy composite test scores long version) - litscor3, numscor3, litscor4 numscor4 (composite test scores rescaled) - litgrp1 litgrp2 litgrp2a numgrp1 numgrp2 numgrp2a (categorical)

<table>
<tr><td>Descriptives:

(Raw data)</td><td>
<table>
<tr><th></th><th>Literacy composite</th><th>Numeracy composite</th></tr>
<tr><td>N</td><td>1,712</td><td>1,698</td></tr>
<tr><td>Range</td><td>0 - 8</td><td>0 – 9</td></tr>
<tr><td>Mean</td><td>7.21</td><td>5.58</td></tr>
<tr><td>SD</td><td>1.20</td><td>2.36</td></tr>
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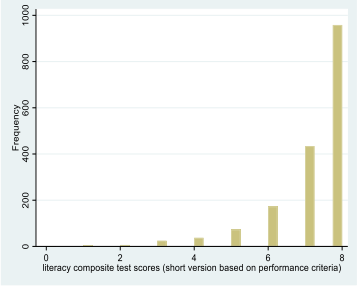
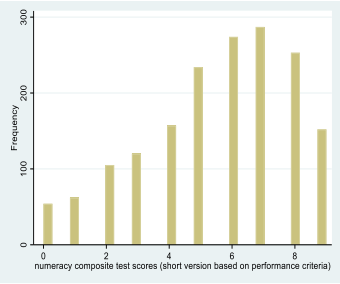


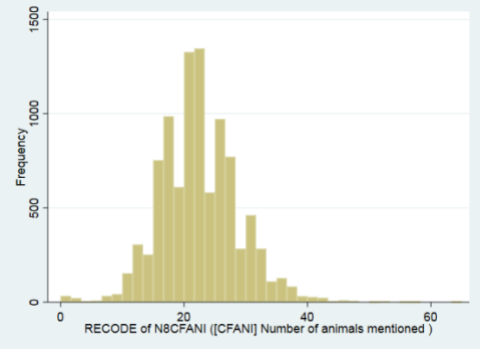


</td></tr>
<tr><td>Other sweep and/or cohort:</td><td>- BCS70 (age 21)*
- BCS70 (age 34) different set of questions covering literacy and numeracy)
**BCS devised to be comparable with NCDS</td></tr>
<tr><td>Source:</td><td>The assessments were created based on development work undertaken on behalf of the Agency by National Foundation for Educational Research (NFER).</td></tr>
<tr><td>Technical resources:</td><td>https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS-37-year-Sample-Survey-%C3%BB-Guide.pdf</td></tr>
<tr><td>Reference examples:</td><td>- Bynner, J., & Parsons, S. (1997). It doesn't get any better: the impact of poor basic skills on the lives of 37 year olds. A summary. London: The Basic Skills Agency.
- McIntosh, S., & Vignoles, A. (2001). Measuring and assessing the impact of basic skills on labour market outcomes. Oxford Economic Papers, 53(3), 453-481.
- Vignoles, A., De Coulon, A., & Marcenaro-Gutierrez, O. (2011). The value of basic skills in the British labour market. Oxford Economic Papers, 63(1), 27-48.</td></tr>
</table>

3.6 NCDS (Age 50)

3.6.1 Verbal Fluency (Animal Naming) Test

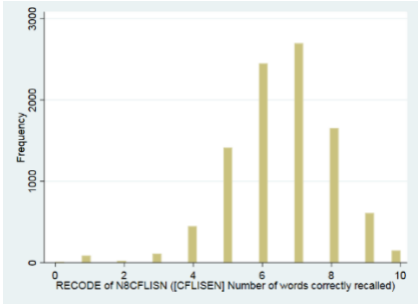
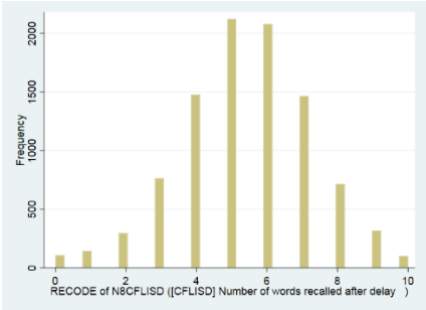
Domain:	Verbal (fluency)
Measures:	- Verbal/semantic fluency - Executive function
CHC:	Glr (Long-term storage and retrieval)
Administration method:	Trained interviewer; CAPI
Procedure:	Participants were asked to name as many different animals as possible within a one-minute timeframe. The interviewer made a note of each named animal and entered the total number into the CAPI programme. Repetitions, named animals (e.g. Bambi), and redundancies (e.g. white cat, black cat) were not included in the total score.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS_8_FINAL_MAINSTAGE_DOCUMENTATION.pdf
Scoring:	Total number of animals named.
Item-level variable(s):	None
Total score/derived variable(s):	N8CFANIT - N8CFANI
Descriptives: (raw data)	N = 9,648 Range = 0 - 65 Mean = 22.28 SD = 6.30

	
Age of participants (months):	Mean = 608.270, SD = 1.92, Range = 598-614
Other sweep and/or cohort:	- NCDS (Age 61 - 63) - NSHD (Age 53 years) - BCS70 (Age 46-47)
Source:	Taken from Section B (cognitive assessment) of the Cambridge Mental Disorders of the Elderly Examination (CAMDEX) (Roth et al., 1986). Cognitive measures at this sweep were taken from the 2002 English Longitudinal Study of Ageing (ELSA; Taylor et al., 2007).
Technical resources:	Brown, M., & Dodgeon, B. (2010). NCDS cognitive assessments at age 50: initial results. London: Centre for Longitudinal Studies.
Reference examples:	- Dregan, A., & Gulliford, M. C. (2013). Leisure-time physical activity over the life course and cognitive functioning in late mid-adult years: a cohort-based investigation. *Psychological Medicine*, 43(11), 2447-2458. - Bowling, A., Pikhartova, J., & Dodgeon, B. (2016). Is mid-life social participation associated with cognitive function at age 50? Results from the British National Child Development Study (NCDS). *BMC Psychology*, 4(1), 58.

3.6.2 Verbal Learning/ Word List Recall Test (Immediate and Delayed)

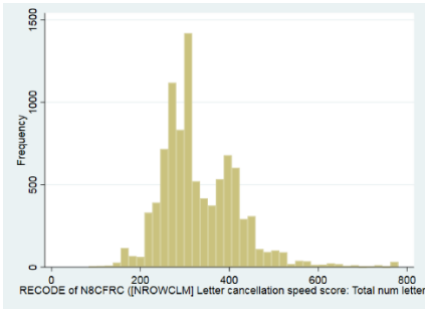
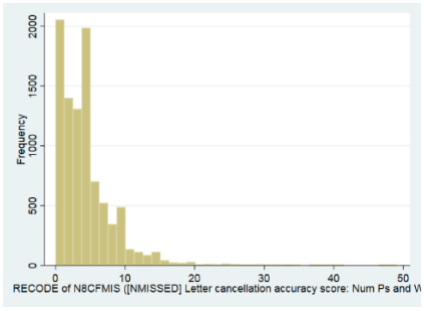
Domain:	Verbal (memory)
Measures:	- Attention - Short-term episodic memory - Verbal memory

CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	CAPI; presented aurally; orally recalled.
Procedure:	One of four lists of 10 common words were selected by the CAPI, and are presented to participant via a recorded voice at a rate of one word every 2-seconds. In cases where the computer voice was not audible, the interviewer read the words, mimicking the pace and clarity of the recorded voice. After the list was read out, the participant was given two minutes to recall as many of the words as they could (in no particular order). The interviewer made a note of the number of correctly recalled words, and entered this total into the CAPI. After additional tests were administered (animal naming and letter cancellation), the interviewer asked the participant to again recall as many words as possible from the original list (words not repeated by CAPI/interviewer). This delayed memory task was done approximately five minutes after the initial recall task. Again, the interviewer made a note of each correctly recalled word, and entered the total number into the CAPI.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS_8_FINAL_MAINSTAGE_DOCUMENTATION.pdf
Scoring:	- Immediate recall: 10 items (scores range 0 - 10) - Delayed recall: 10 items (scores range 0 - 10)
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	N8INTCF - N8CFLISD
Descriptives:	*Recall (immediate)* N = 9,648 Range = 0 - 10 Mean = 6.54 SD = 1.49 *Recall (delayed)* N = 9,591 Range = 0 - 10 Mean = 5.41 SD = 1.84

	 
Age of participants (months):	Mean = 608.27, SD = 1.92, Range = 598 - 614
Other sweep and/or cohort:	- NCDS (2018; Age 61 - 63): Proposed repeat of cognitive measures at age 50 - NSHD (1943; Age 43, 53, 60 -64, 68 - 70)* - BCS (2016; Age 46) * For each of three trials survey members were shown a list of 15 words at a rate of two seconds each, then were asked to write down as many words recalled as possible. A simple total score is available calculated as the sum of the words correctly recalled at each trial.
Source:	Similar tasks have been used to measure verbal learning for decades, e.g. Bush and Mosteller (1955). Cognitive measures at this sweep were taken from the 2002 English Longitudinal Study of Ageing (ELSA; Taylor et al., 2007).
Technical resources:	Brown, M., & Dodgeon, B. (2010). NCDS cognitive assessments at age 50: initial results. London: Centre for Longitudinal Studies.
Reference examples:	- Calvin, C. M., Batty, G. D., Lowe, G., & Deary, I. J. (2011). Childhood intelligence and midlife inflammatory and hemostatic biomarkers: The National Child Development Study (1958) cohort. *Health Psychology*, 30(6), 710. - Dregan, A., & Gulliford, M. C. (2013). Leisure-time physical activity over the life course and cognitive functioning in late mid-adult years: a cohort-based investigation. *Psychological Medicine*, 43(11), 2447-2458. - Bowling, A., Pikhartova, J., & Dodgeon, B. (2016). Is mid-life social participation associated with cognitive function at age 50? Results from the British National Child Development Study (NCDS). *BMC Psychology*, 4(1), 58.

3.6.3 Timed Letter Search/ Letter Cancellation Test

Domain:	Processing speed
Measures:	- Attention/concentration - Mental speed - Visual scanning
Domain:	- Gv (Visual Processing) - Gs (Processing Speed)
Administration method:	Trained interviewer; pen and paper.
Procedure:	Participants were given a page of random letters arranged in rows (N = 26) and columns (N = 30). They were asked to cross out as many target letters ("Ps" and "Ws") as possible within a one-minute timeframe. Respondents were instructed to work across each row from left-to right as if they were reading a page and they were asked to perform the task as quickly and accurately as possible. Once the allotted time was over, they were asked to underline the last letter that reached their eye (any letter, target or otherwise). The total number of letters searched was summed to provide a measure of speed of processing, whereas the total number of target letters missed reflects level of accuracy.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/NCDS_8_FINAL_MAINSTAGE_DOCUMENTATION.pdf
Scoring:	- Speed of processing: summed total of letters scanned (0 -65) - Accuracy: summed total of target letters missed (0 -65)
Item-level variable(s):	None
Total score/derived variable(s):	N8CFLET - N8CFRC
Descriptives:	*Processing speed* *Processing accuracy*

(raw data)	N = 9,442 Range = 84 - 780 Mean = 334.10 SD = 88.83  N = 9,442 Range = 0 - 49 Mean = 4.42 SD = 4.12 
Age of participants (months):	Mean = 608.270, SD = 1.92, Range = 598-614
Other sweep and/or cohort:	- NCDS Sweep 9 (2018; age 61 - 63): Proposed repeat of cognitive measures at age 50 - BCS (2016; age 46) - NSHD (1989; Age 43*, 53, 60 -64, 68-70) * 3 trials.
Source:	The letter cancellation test was initially developed for the NSHD 1946 birth cohort study and has also been used in the MRC Cognitive Function and Ageing Study (MRC CFA Study, 1998). All cognitive measures at this sweep were taken from the 2002 English Longitudinal Study of Ageing (ELSA; Taylor et al., 2007).
Technical resources:	- Banks, J., Breeze, E., Lessof, C., & Nazroo, J. (2006). Retirement, health and relationships of the older population in England: The 2004 English Longitudinal Study of Ageing (Wave 2). - Brown, M., & Dodgeon, B. (2010). NCDS cognitive assessments at age 50: initial results. London: Centre for Longitudinal Studies.
Reference examples:	- Dregan, A., & Gulliford, M. C. (2013). Leisure-time physical activity over the life course and cognitive functioning in late mid-adult years: a cohort-based investigation. *Psychological Medicine*, 43(11), 2447-2458. - Bowling, A., Pikhartova, J., & Dodgeon, B. (2016). Is mid-life social participation associated with cognitive function at age 50? Results from the British National Child Development Study (NCDS). *BMC Psychology*, 4(1), 58.

3.7 NCDS Sweep 9 (2019-21; Age 61 - 63)*

*Note. Data not yet collected. Proposed to re-administer the same cognitive measures as at sweep 8: i) animal naming, ii) word list recall (immediate and delayed), iii) letter cancellation.

4. 1970 British Cohort Study (BCS70)

4.1 BCS70 (Age 22 months - subsample: 2,457)

At age 22 and 42 months, due to medical concerns about the effect of fetal malnutrition in brain cell proliferation, a sub-sample of BCS children were studied. A 10% random sample of all births was included together with those children who were considered to be at risk from fetal malnutrition.

4.1.1 Developmental milestones

Domain:	Developmental milestones
Measures:	- Gross and fine motor coordination - Speech and language - Personal and social - Drawing
CHC:	None
Administrative method:	In clinic; questionnaire completed by a doctor
Procedure:	The child was asked to perform certain tasks, for example walking, balancing (gross-motor), holding a pencil (fine-motor), say 'mama', 'dada', point to facial features (speech and language) and take off their shoes (personal and social). The doctor recorded whether the task was observed and asked the mother if the child could perform each task. In addition, the child was given a pencil and asked to scribble, draw a circle, vertical line and a cross.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/06/22mth_Guide.pdf
Scoring:	No referenced example (see technical resource)
Item-level variable(s):	- b0030 -b0037 (gross-motor) - b0038-b0039 (fine-motor) - b0044-b0063 (speech and language) - b0064-b0082 (personal and social) - b0040 -b0043 (drawing)

Total score/derived variable(s):	None
Age of participant (months):	22 months
Descriptives:	(Individual variables - see questionnaire documentation page 18)
Other sweep and/or cohort:	BCS (age 42 months) - similar
Source:	See technical resource.
Technical resources:	Chamberlain, R., & Davey, A. (1976). Cross-sectional Study of Developmental Test Items in Children Aged 94 to 97 Weeks: Report of the British Births Child Study. *Developmental Medicine & Child Neurology*, *18*(1), 54-70.
Reference examples:	- Cheung, Y. B. (2002). Zero-inflated models for regression analysis of count data: a study of growth and development. *Statistics in Medicine*, *21*(10), 1461-1469. - Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P. & Sexton, H. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428.

4.2 BCS70 (Age 42 months - sub-sample: 2,315)

4.2.1 Developmental milestones

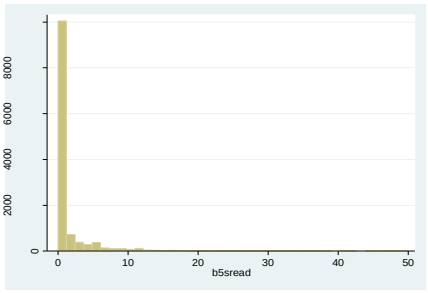
Domain:	Developmental milestones
Measures:	- Gross motor coordination - Speech and language - Copying designs - Drawing a man
CHC:	None
Administrative method:	In clinic, questionnaire completed by a doctor

Procedure:	The child was asked to perform certain tasks, for example copying designs using cubes, point to pictures, balance (gross-motor), and draw shapes and a man. The doctor recorded whether the task was observed.
Link to questionnaire:	No direct link available.
Scoring:	No referenced example (see technical resource)
Item-level variable(s):	- c0040 -c0047e (cube task) - c0048a-c0051b (speech and language) - c0052-c0056 (drawing) - c0057a-c0059 (paper and folding) - c0060 -c0061 (parts of body) - c0062a-c0065 (gross-motor)
Total score/derived variable(s):	None
Age of participant (months):	42 months
Descriptives:	See user guide pp. 207-220
Other sweep and/or cohort:	BCS (age 22 months) - similar
Source:	See technical resource
Technical resources:	Chamberlain, R., & Davey, A. (1976). Cross-sectional Study of Developmental Test Items in Children Aged 94 to 97 Weeks: Report of the British Births Child Study. *Developmental Medicine & Child Neurology*, *18*(1), 54-70.
Reference examples:	- Feinstein, L. (2003). Inequality in the early cognitive development of British children in the 1970 cohort. *Economica*, *70*(277), 73-97. - Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P…. & Sexton, H. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428.

4.3 BCS70 (Age 5)

4.3.1 Schonell Reading Test (SRT)

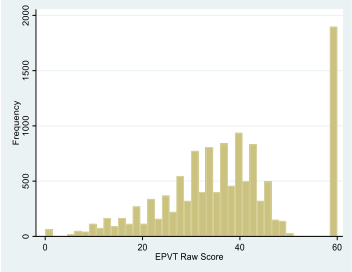
Domain:	Verbal (reading)
Measures:	Children's reading age (of children between age 5 and 14+ years). Reading age is calculated from the number of words read correctly and compared to the child's chronological age.
CHC:	- Gc (Crystallized Intelligence) - Grw (Reading/Writing)
Administrative method:	Health visitor at home; face to face; read aloud
Procedure:	Before the test was administered, the child's mother was asked if she thought the child had begun to read at all. If the mother said the child could read some words or some sentences the child was given a card with 50 words on it, which were read from left to right. When a child struggled with a word, they were asked to sound it out. If the child still couldn't say what the word was, they were asked to try the next one. The test was stopped when the child made five consecutive mistakes.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70_age5_test_booklet.pdf
Scoring:	50 words (first of original 100). Score of one for each word read correctly.
Item-level variable(s):	f099 (can the child read 68% (8,603) could not read or could only read some letters)
Total score/derived variable(s):	f100 (correct responses) f101 (incorrect responses)
Age of participant (months):	Mean = 61.78, SD = 1.33, Range = 60 - 77
Descriptives:	N = 12,646 Range = 0 - 50

(Raw data)	Mean = 1.43 SD = 3.87 Graphic: histogram 
Other sweep and/or cohort:	None
Source:	Shortened version - original 100 words. Schonell & Goodacre (1971). The psychology and teaching of reading. Oliver & Boyd, London.
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Schoon, I., Parsons, S., Rush, R., & Law, J. (2010). Children's language ability and psychosocial development: A 29-year follow-up study. *Pediatrics*, *126*(1), e73-80. - Parsons, S., Green, F., Ploubidis, G. B., Sullivan, A., & Wiggins, R. D. (2017). The influence of private primary schooling on children's learning: Evidence from three generations of children living in the UK. *British Educational Research Journal*, *43*(5), 823-847.

4.3.2 English Picture Vocabulary Test (EPVT)

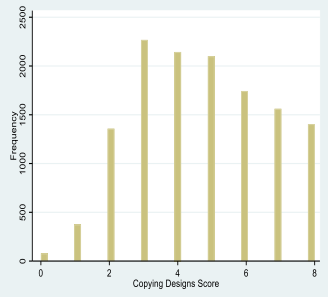
Domain:	Verbal (vocabulary)
Measures:	Language comprehension
CHC:	Gc (Crystallised ability)
Administrative method:	Health visitor at home; face to face; picture and point

Procedure:	56 sets of four different pictures with a particular word associated with each set of four pictures, increasing in difficulty. The child was asked to indicate the one picture that corresponded to the given word until the child made five mistakes in a run of eight consecutive items. The first two words were drum and time, the last two are reel and coast.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70_age5_test_booklet.pdf
Scoring:	56 sets, 1 point for each correct answer. NB. In the original scoring, 64 children did not have a 'base' item, i.e. they did not get 5 of the first eight items correct and 1,897 children did not have a 'ceiling' item, i.e. the test was completed before they had failed to score 5 in a run of eight items. These children were not awarded a score. To include the children who had no ceiling or base item, the number of items that the children correctly identified was used instead, giving a distribution of 0 -56. For further details of the original scoring see the guide to the age 5 data on the Centre for Longitudinal Studies website. **In the derived dataset f117 they appear as 0 and 60.**
Item-level variable(s):	f084 Error Check f085 Base Item f086 Ceiling Item f087 Incorrect Responses
Total score/derived variable(s):	f117 (need to account for ceiling and base items when using the raw data) f120 (standardised)* BD2READ* * variables are currently being updated, please check carefully
Age of participant (months):	Mean = 61.78, SD = 1.33, Range = 60 -77
Descriptives (f117): (Raw data)	N = 12,235 Range = 0 -60 Mean = 36.97 SD = 13.35 Graphic: histogram

	
Other sweep and/or cohort:	- BCS (age 10 PLCT based on EPVT; more items) - NCDS (children of cohort member, multi-age) (US version - PPVT)
Source:	Brimer, M. A., & Dunn, L. M. (1962). English Picture Vocabulary Test: Educational Evaluation Enterprises. English version of the Peabody Picture Vocabulary Test (PPVT; Dunn, 1959).
Technical resources:	- Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper. - Golding, J. (1975). The 1970 Birth Cohort 5-Year Follow-up: Guide to the dataset, University of Bristol: Institute of Child Health.
Reference examples:	- Bijur, P. E., Haslum, M., & Golding, J. (1990). Cognitive and behavioral sequelae of mild head injury in children. *Pediatrics*, *86*(3), 337-344. - Parsons, S., Schoon, I., Rush, R., & Law, J. (2011). Long-term outcomes for children with early language problems: Beating the odds. *Children & Society*, *25*(3), 202-214.

4.3.3 Copying Designs Test (CDT)

Domain:	Visual spatial
Measures:	Visual motor co-ordination. Ability to reproduce shapes.
CHC:	Gv (Visual processing)
Administrative method:	Health visitor at home; drawing
Procedure:	The child was given a booklet, and asked to copy 8 drawings, one at a time twice on two consecutive pages of booklet.

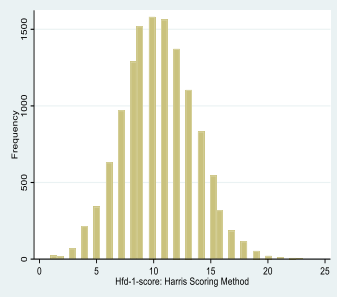
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70_age5_test_booklet.pdf
Scoring:	Score 0 -8. Each drawing was scored 0 or 1. As not all children completed two copies a score of 1 was given if at least one copy was good. Total score was the sum of the score for the individual drawings. Zero was awarded when a child attempted to copy at least one design but all attempts were judged to be poor copies.
Item-level variable(s):	f004-f019
Total score/derived variable(s):	f119 (raw total) f122 (standardised)* *variable currently being updated, please check carefully
Age of participants (months):	Mean = 61.78, SD = 1.33, Range = 60 - 77
Descriptives: (Raw data)	N = 13,028 Range = 0 - 8 Mean = 4.73 SD = 1.98 Graphic: histogram 
Other sweep and/or cohort:	BCS (children of cohort member, multi-age - no data available) NCDS (age 7 and 11) - 6 designs
Source:	Used in previous studies (Davie, et al., 1972; Rutter et al., 1970). - Rutter, M., Tizard, J., & Whitmore, K. (1970). Education, Health and Behaviour. London, Longman.

	- Davie, R., Butler, N.R., & Goldstein, H. (1972). From Birth to Seven. A report of the National Child Development Study. London: Longman.
Technical resources:	- Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper. - Golding, J. (1975). The 1970 Birth Cohort 5-Year Follow-up: Guide to the dataset, University of Bristol: Institute of Child Health.
Reference examples:	- Blanden, J., Gregg, P., & Macmillan, L. (2006). *Accounting for intergenerational income persistence: non-cognitive skills, ability and education.* CEEDP (73). Centre for the Economics of Education, London School of Economics and Political Science, London, UK. - White, J., & Batty, G.D. (2012). Intelligence across childhood in relation to illegal drug use in adulthood: 1970 British Cohort Study. *Journal of Epidemiology and Community Health*, *66*(9), 767-774.

4.3.4 Human Figure Drawing (HFD; Goodenough 1926; Harris, 1963)

Domain:	General ability (perceptual)
Measures:	General mental and perceptual ability. Indicative of 'conceptual maturity' (Harris, 1963)
CHC:	Gv (Visual processing)
Administrative method:	Health visitor at home; draw
Procedure:	The child was asked to 'make a picture of a man or a lady'. (Terms such as 'daddy', 'mummy', 'boy', 'girl', etc., could be used if the child responded better to those). They were asked to make the best picture they could and to draw a whole person, not just a face or head. When the child had finished, if anything was not clear, the child was asked what the various parts of the drawings were and these were labelled.

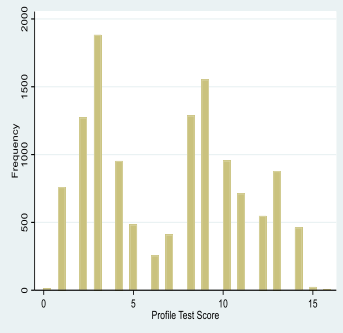
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70_age5_test_booklet.pdf
Scoring:	The scoring scheme adopted was based on 30 developmental items suggested by Koppitz (1968), but used the Harris point system of scoring, whereby one point was awarded for each item represented in the drawing (e.g. presence of a head, eyes, etc.) giving a maximum possible score of 30. Weights were assigned to values of items depending on the frequency with which they appeared in the children's drawings. Items which appeared frequently in drawings were assigned negative weights which were applied if children did not produce them. Items which appeared infrequently in drawings were assigned positive weights which were applied if children did produce them. These are the equivalent of the expected and unexpected Items as described by Koppitz for this age group (see Golding pp. 279-283).
Item-level variable(s):	f020 -f083
Total score/derived variable(s):	f113 (Hfd-1-score: Harris Scoring Method) f114 (Hfd-2-score: Harris Scoring Method) f115 (Hfd-1-score: Koppitz Scoring Method) f116 (Hfd-2-score: Koppitz Scoring Method) f121 (standardised)* * variable currently being updated, please check carefully
Age of participants (months):	Mean = 61.78, SD = 1.33, Range = 60 - 77
Descriptives: (Raw data)	N = 12,784 Range = 1 - 23 Mean = 10.42 SD = 3.15 Graphic: histogram

	
Other sweep and/or cohort:	NCDS (age 7)* *different scoring system
Source:	- Modified version of the 'Draw-a-man' test (Goodenough, 1926) and later developed by Harris (1963). - Goodenough, F. L. (1926). The measurement of intelligence by drawings, New York: World Book Company. - Harris, D. B. (1963). Children's drawings as measures of intellectual maturity, New York: Harcourt, Brace and World. - Scoring was based on: Koppitz, E M. (1968). Psychological Evaluation of Children's Human Figure Drawings. New York: Grune and Stratton.
Technical resources:	- Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper. - Golding, J. (1975). The 1970 Birth Cohort 5-Year Follow-up: Guide to the dataset, University of Bristol: Institute of Child Health.
Reference examples:	- Flouri, E. (2006). Parental interest in children's education, children's self-esteem and locus of control, and later educational attainment: Twenty-six year follow-up of the 1970 British Birth Cohort. *British Journal of Educational Psychology*, *76*(1), 41-55. - Batty, G. D., Deary, I. J., Schoon, I., & Gale, C. R. (2007). Mental ability across childhood in relation to risk factors for premature mortality in adult life: the 1970 British Cohort Study. *Journal of Epidemiology & Community Health*, *61*(11), 997-1003. - Meunier, M., De Coulon, A., Marcenaro-Gutierrez, O., & Vignoles, A. (2013). A longitudinal analysis of UK

	second-generation disadvantaged immigrants. *Education Economics*, *21*(2), 105-134.

4.3.5 Complete a Profile Test (CPT; Kalverboer, 1972)

Domain:	Spatial development
Measures:	Spatial-constructive development (Kalverboer, 1972)
CHC:	Gv (Visual processing)
Administrative method:	Health visitor at home; pen and paper
Procedure:	The child was asked to complete an outline picture of a human face in profile by filling in features (eyes, ears, nostrils, mouth, hair etc.).
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70_age5_test_booklet.pdf
Scoring:	The scoring was based on the number and position of features included on the human face in profile. The scoring details are outlined in Figure 7 in Parsons (2014) and Golding (1975, pp. 268-273). The maximum score available was 16.
Item-level variable(s):	f090 -f098
Total score/derived variable(s):	f118
Age of participants (months):	Mean = 61.78, SD = 1.33, Range = 60 -77
Descriptives: (Raw data)	N = 12,451 Range = 0 - 16 Mean = 6.02 SD = 3.19 Graphic: histogram

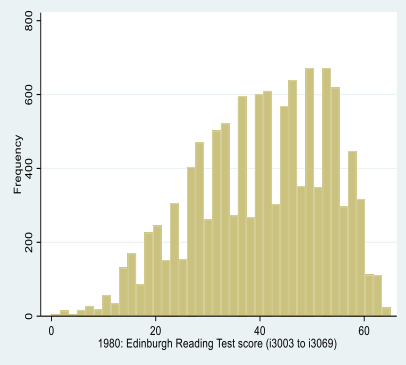
	
Other sweep and/or cohort:	None
Source:	Kalverboer, A.F. (1972). A Profile Test for the Spatial-Constructive Development. Lisse: Switz & Zeitlinger.
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper. Golding, J. (1975). The 1970 Birth Cohort 5-Year Follow-up: Guide to the dataset, University of Bristol: Institute of Child Health.
Reference examples:	Feinstein, L. (2003). Inequality in the early cognitive development of British children in the 1970 cohort. *Economica*, *70*(277), 73-97.

4.4 BCS70 (Age 10)

4.4.1 Edinburgh Reading Test (Shortened Version)

Domain:	Verbal: word recognition
Measures:	A test of word recognition, which examined vocabulary, syntax, sequencing, comprehension and retention. Items were carefully selected to cover a wide age range of ability from seven to thirteen years in a form suitable to straddle the ten-year cohort. Particular attention was paid to the lower limit to allow a score to be allocated for very poor readers.
CHC:	Gc (Crystallised ability) and also elements of Grw (Reading/Writing)

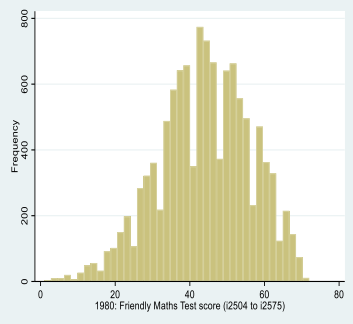
Administrative method:	In schools; part instructed and child self-completion; pen and paper
Procedure:	There were 67 questions broken down into a number of sections. In the first four the interviewer went through an example at the beginning to show the child what to do. Section 1: the child selected one from four words to describe a picture (5 items) Section 2: the child crossed out a word that did not belong in the sequence (5 items) Section 3: the child matched 5 answers to 5 questions (4 items) Section 4: the child completed a picture quiz (5 items) In the remaining sections the child read the question and completed the answers without assistance (48 items). Duration: 30 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS-1980-Edinburgh-Reading-Test.pdf
Scoring:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS-1980-Edinburgh-Reading-Test.pdf
Item-level variable(s):	i3003-13069
Total score/derived variable(s):	- BD3RREAD - BD3READ* - BD3RDAGE* *variables currently being updated, please check carefully
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 11,641 Range = 0 - 65 Mean = 40.23 SD = 12.68 Graphic: histogram

	
Other sweep and/or cohort:	BCS (age 16) *age 10 test adapted for 16 year olds
Source:	Shortened version developed from Edinburgh Reading Test by Godfrey Thompson Unit (GTU) and BCS70 survey team especially for the BCS70 at age 10. GTU (1978) Edinburgh Reading Test. Sevenoaks: Hodder and Stoughton.
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Maughan, B., Taylor, C., Taylor, A., Butler, N., & Bynner, J. (2001). Pregnancy smoking and childhood conduct problems: a causal association? *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(8), 1021-1028. - Schoon, I., Bynner, J., Joshi, H., Parsons, S., Wiggins, R. D., & Sacker, A. (2002). The influence of context, timing, and duration of risk experiences for the passage from childhood to midadulthood. *Child development*, *73*(5), 1486-1504. - Pensiero, N. (2011). Parent-child cultivation and children's cognitive and attitudinal outcomes from a longitudinal perspective. *Child indicators research*, *4*(3), 413-437. - McKnight, A. (2015). Downward mobility, opportunity hoarding and the 'glass floor'. *London: Social Mobility and Child Poverty Commission*.

4.4.2 Friendly Maths Test

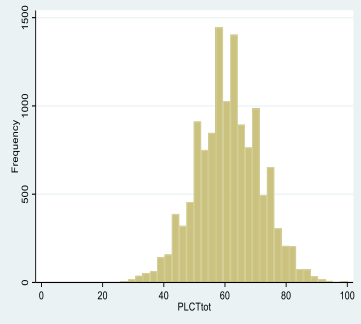
Domain:	Mathematics

Measures:	Mathematical competence, ranging from early awareness of number operations to expected mathematics ability at 13 years old, including arithmetic, number skills, fractions, measures, algebra, geometry and statistics.
CHC:	Gq (Quantitative Knowledge)
Administrative method:	In schools; pen and paper
Procedure:	The test consisted of a total of 72 multiple choice questions. Within each of the areas covered, the questions increased in difficulty. The test was stopped if the child failed six consecutive items. Duration: 30 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS-1980-Reading-Tests.pdf
Scoring:	72 items (Basic arithmetic skills (36 items), measures (16 itemns0, algebra (6 items), geometry (10 items) and statistics (4 items).
Item-level variable(s):	i4001 - i4072
Total score/derived variable(s):	BD3MATHS
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 11,633 Range = 1 - 72 Mean = 43.95 SD = 12.32 Graphic: histogram

	
Other sweep and/or cohort:	None
Source:	Specifically designed for BCS70 age 10, due to a lack of a fully acceptable mathematics test appropriate for ten year olds at the time. .
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Siegler, R. S., Duncan, G. J., Davis-Kean, P. E., Duckworth, K., Claessens, A., Engel, M., ... & Chen, M. (2012). Early predictors of high school mathematics achievement. *Psychological Science*, *23*(7), 691-697. - McKnight, A. (2015). Downward mobility, opportunity hoarding and the 'glass floor'. *London: Social Mobility and Child Poverty Commission*.

4.4.3 Pictorial Language Comprehension Test (PLCT)

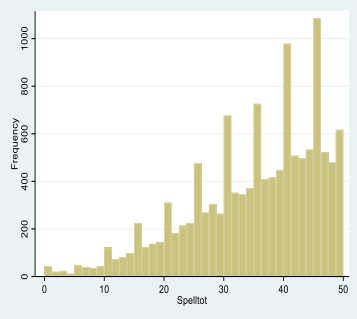
Domain:	Verbal
Measures:	Language comprehension, covering vocabulary, sequence and sentence comprehension.
CHC:	Gc (Crystallised ability)
Administrative method:	In schools, pen and paper
Procedure:	The test consisted of 100 sets of four different pictures with a particular word associated with each set of four pictures, increasing in difficulty. The child was asked to indicate the one picture that corresponded to the given word. For the

	vocabulary Items only, the test continued until the child had five successive failures. Duration: 30 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS-1980-Reading-Tests.pdf
Scoring:	100 items, consisting of vocab 71 items, 16 sentence items and 13 sequence sentence items. One point for each correct answer.
Item-level variable(s):	- i8-i62, i66-i81 (vocab) - i82-i97 (sentence) - i98-i110 (sequence sentence)
Total score/derived variable(s):	None
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 12,790 Range = 2 - 100 Mean = 61.10 SD = 10.69 Graphic: histogram 
Other sweep and/or cohort:	BCS (age 5) EPVT which has 56 items NCDS (children of cohort member, multi-age) (US version - PPVT)
Source:	Based on: English Picture Vocabulary Test (EPVT; Brimmer & Dunn, 1962)

Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Feinstein, L., & Bynner, J. (2004). The importance of cognitive development in middle childhood for adulthood socioeconomic status, mental health, and problem behavior. *Child Development*, *75*(5), 1329-1339. - Conti, G., & Heckman, J. J. (2010). Understanding the early origins of the education-health gradient: A framework that can also be applied to analyze gene-environment interactions. *Perspectives on Psychological Science*, *5*(5), 585-605.

4.4.4 Spelling Dictation Task (SDT)

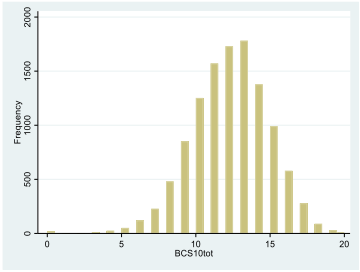
Domain:	Verbal (spelling)
Measures:	Dictation task measuring spelling and phonetic decoding
CHC:	- Gc (Crystallised ability) - Ga (Auditory processing) - Grw (Reading/Writing)
Administrative method:	In schools; pen and paper
Procedure:	A paragraph was dictated to the child including both real and made up words. A sentence could be repeated once and an imaginary word in the middle of the passage could be repeated twice.
Link to questionnaire:	No direct link to questionnaire. Spelling booklet can be found in file 'a3723udb.pdf' accompanying data download from UK Data Service.
Scoring:	Maximum score of 50 where the child was awarded a point for each correct spelling of a real word and a score of 1 for each syllable of the made up words.
Item-level variable(s):	i3815-i3864

Total score/derived variable(s):	None
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 12,489 Range = 0 - 50 Mean = 34.96 SD = 10.73 Graphic: histogram 
Other sweep and/or cohort:	None
Source:	Unknown
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	Miles, T. R., Wheeler, T. J., & Haslum, M. N. (2003). The existence of dyslexia without severe literacy problems. *Annals of Dyslexia*, *53*(1), 340-354.

4.4.5 BAS Similarities (word)

Domain:	Verbal (reasoning)
Measures:	(Acquired) verbal knowledge and verbal reasoning: - Verbal reasoning ability - Expressive language skills, including verbal fluency - Vocabulary knowledge - General knowledge

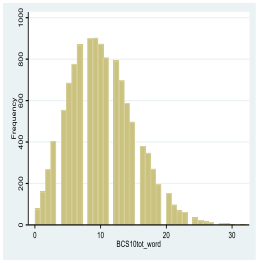
	- Abstract and logical thinking - Ability to distinguish between essential and superficial features
CHC:	Gc (Crystallised ability)
Administrative method:	In schools; pen and paper.
Procedure:	The test consisted of 21 items made up of 3 words e.g. orange, banana, strawberry. The teacher read the three words and asked the child to name another word consistent with the group i.e. another type of fruit. The child then had to say what the words had in common i.e. they are all fruits. When the child was unable to name a group example and name on four successive attempts the test was stopped. Duration: Total 30 minutes for 4 BAS tests
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2018/06/British-ability-scales-annotated.pdf
Scoring:	1 point for every group example and group name, but no points if only one was correct, giving a maximum score of 21.
Item-level variable(s):	- i3575 - i3616 (Item response) - i4201 - i4221 (group and name correct)
Total score/derived variable(s):	None
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 11,482 Range = 0 - 20 Mean = 12.06 SD = 2.61

	
Other sweep and/or cohort:	- MCS (age 11) verbal similarities but MCS5 revised (BASII) version. - ALSPAC (age 4 and 8.5) verbal similarities asked slightly differently
Source:	- Elliott, C. D., Murray, D. J., & Pearson, L. S. (1979). *British Ability Scales*, Slough: NFER. - Elliott, C., Murray, D., & Pearson, L. (1978). *British Ability Scales*. Windsor: National Foundation for Educational Research.
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Case, A., & Paxson, C. (2008). Stature and status: Height, ability, and labor market outcomes. *Journal of political Economy*, *116*(3), 499-532. - Gregg, P., & Macmillan, L. (2010). Family income, education and cognitive ability in the next generation: exploring income gradients in education and test scores for current cohorts of youth. *Longitudinal and Life Course Studies*, *1*(3), 259-280. - Sturgis, P., Read, S., & Allum, N. (2010). Does intelligence foster generalized trust? An empirical test using the UK birth cohort studies. *Intelligence*, *38*(1), 45-54.

4.4.6 BAS Word Definitions

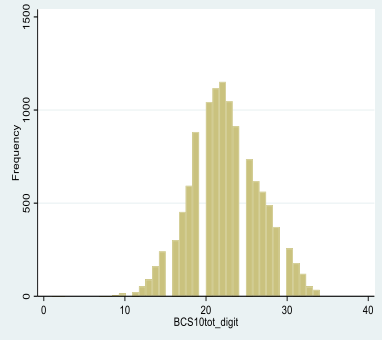
Domain:	Verbal knowledge (acquired and expressive)
Measures:	Verbal ability: - Vocabulary knowledge - Expressive language skills, including verbal fluency

	- General knowledge - Verbal conceptualisation - Abstract thinking - Retrieval of information from long-term memory - Level of language stimulation (may depend on experience as well as education) Low scores may be generally attributable to: - Poor verbal development - Disadvantaged environmental circumstances
CHC:	Gc (Crystallised intelligence)
Administrative method:	In schools; pen and paper
Procedure:	For each item on the scale, a word was orally presented to the child who was asked what the word meant. Items were scored as correct or incorrect according to whether or not the child expressed key concepts of the word's meaning. The assessment was stopped after four successive incorrect or partially incorrect words. Duration: Total 30 minutes for 4 BAS tests
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2018/06/British-ability-scales-annotated.pdf
Scoring:	37 items, the child received 1 point for each correct answer.
Item-level variable(s):	i3504-i3540
Total score/derived variable(s):	None
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 11,526 Range = 0 - 32 Mean = 10.13 SD = 5.01

	Graphic: histogram 
Other sweep and/or cohort:	- NSHD (Age 8 and 11) - ALSPAC (Age 8)
Source:	- Elliott, C. D., Murray, D. J., & Pearson, L. S. (1979). *British Ability Scales*, Slough: NFER. - Elliott, C., Murray, D., & Pearson, L. (1978). *British Ability Scales*. Windsor: National Foundation for Educational Research.
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Bennett, K. E., & Haggard, M. P. (1999). Behaviour and cognitive outcomes from middle ear disease. *Archives of Disease in Childhood*, *80*(1), 28-35. - Connelly, R., & Gayle, V. (2019). An investigation of social class inequalities in general cognitive ability in two British birth cohorts. *The British journal of sociology*,70(1), 90-108.

4.4.7 BAS Recall of Digits

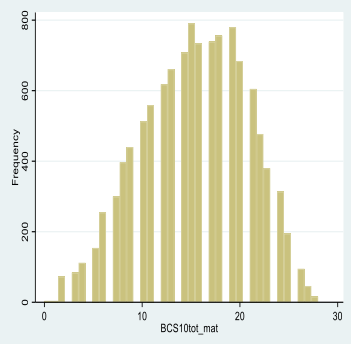
Domain:	Short-term auditory memory
Measures:	Short term auditory sequential recall: - Short-term auditory memory - Facility in verbal expression - Concentration and attention Low scores: - Use of inappropriate strategies for storage or retrieval of numbers

CHC:	Gsm (working memory)
Administrative method:	In school, administered by teacher.
Procedure:	For each item the teacher read out digits and asked the child to repeat them. The exercise increased in difficulty from remembering and repeating two digits to three digits and then up to eight digits. If the child asked for a repeat of the numbers, this was scored as incorrect. The test was stopped after four consecutive incorrect responses. Duration: Total 30 minutes for 4 BAS tests
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2018/06/British-ability-scales-annotated.pdf
Scoring:	34 items, 1 point for each correct recall
Item-level variable(s):	i3541 - i3574
Total score/derived variable(s):	None
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 11,512 Range = 1 - 34 Mean = 22.40 SD = 4.28 Graphic: histogram 
Other sweep and/or cohort:	- NCDS (children of cohort member, multi-age) - ALSPAC (age 5)

Source:	- Elliott, C. D., Murray, D. J. & Pearson, L. S. (1979). *British Ability Scales*, Slough: NFER. - Elliott, C., Murray, D., & Pearson, L. (1978). *British Ability Scales*. Windsor: National Foundation for Educational Research.
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Montgomery, S. M., Ehlin, A., & Sacker, A. (2006). Pre-pubertal growth and cognitive function. *Archives of disease in childhood*, *91*(1), 61-62. - Gale, C. R., Hatch, S. L., Batty, G. D., & Deary, I. J. (2009). Intelligence in childhood and risk of psychological distress in adulthood: the 1958 National Child Development Survey and the 1970 British Cohort Study. *Intelligence*, *37*(6), 592-599.

4.4.8 BAS Matrices

Domain:	Inductive, non-verbal reasoning
Measures:	Non-verbal reasoning: - Non-verbal inductive reasoning, including identification of the rules governing variables in abstract figures, and formulation and testing of hypotheses about these rules - Use of verbal mediation strategies involving labelling of figures - Visuo-spatial analysis, including perception of shape, relative size and orientation Low score: - Poor understanding of verbal instructions or visual cues
CHC:	Gf (Fluid intelligence)
Administrative method:	In school, pen and paper
Procedure:	Each matrix was a square consisting of four or nine cells, with a blank cell in the lower right corner of each matrix. The

	teacher asked the child to complete each item by drawing the appropriate shape in the empty square. There were seven example items, three at the start of the exercise, then four examples when the level of difficulty increased. The task was stopped when four successive items were drawn incorrectly or when it was apparent that the level of difficulty was too great. Duration: Total 30 minutes for 4 BAS tests
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2018/06/British-ability-scales-annotated.pdf
Scoring:	28 items, 1 point for each correct drawing
Item-level variable(s):	i3617-i3644
Total score/derived variable(s):	None
Age of participants (months):	Mean = 121.88, SD = 2.67, Range = 117 - 139
Descriptives: (Raw data)	N = 11,494 Range = 0 - 28 Mean = 15.35 SD = 5.40 Graphic: histogram 
Other sweep and/or cohort:	- BCS70 (age 16) but fewer items at age 16 (11 v 28) and different format (multi-choice v drawing) - ALSPAC (age 15.5) similar
Source:	- Elliott, C. D., Murray, D. J. & Pearson, L. S. (1979). *British Ability Scales*, Slough: NFER.

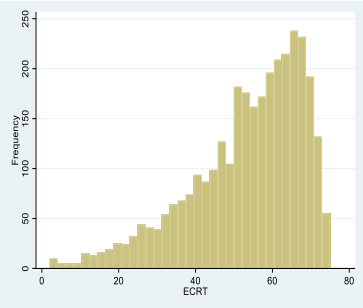
	- Elliott, C., Murray, D., & Pearson, L. (1978). *British Ability Scales*. Windsor: National Foundation for Educational Research.
Technical resources:	Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Deary, I. J., Batty, G. D., & Gale, C. R. (2008). Bright children become enlightened adults. *Psychological Science*, *19*(1), 1-6. - Bourne, M., Bukodi, E., Betthäuser, B., & Goldthorpe, J. H. (2018). 'Persistence of the social': The role of cognitive ability in mediating the effects of social origins on educational attainment in Britain. *Research in Social Stratification and Mobility*, *58*, 11-21.

4.5 BCS70 (Age 16)

4.5.1 Edinburgh Reading Test (Shortened version)

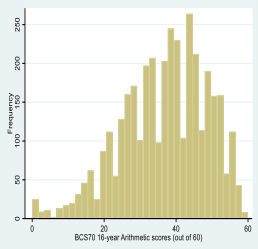
Domain:	Verbal (reading)
Measures:	Reading skills, and includes five sub-scales examining vocabulary, syntax, sequencing, comprehension and retention.
CHC:	- Gc (Crystallised ability) - Grw (Reading/Writing)
Administrative method:	In school; pen and paper; (not included in the home version of the Education Pack).
Procedure	75 question items in total, made up of 5 sections. Section A: Skimming; the child skim read a recipe and responded to multiple choice questions (10 items) Section B: Vocabulary; the child selected one from five words with the same meaning as the underlined word in a sentence (20 items) Section C: the child read a passage and decided whether the statements agreed or disagreed with the passage (15 items)

	Section D: the child read 2 different sets of 5 opinions one set at a time and indicated who of the 5 were most likely to state particular opinions (17 items) Section E: the child read 2 different passages, after reading each one at a time the child chose from a number of options to complete an item to reproduce the sense of the passage (13 items) Skimming (3 mins), vocabulary (11 mins), reading for facts (5-8 mins), points of view (12 mins) and comprehension (12 mins). Duration: 5 sections each with time limits - total 44 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-16-year-Document-B.pdf
Scoring:	75 items, 1 point for each correct answer. Overall and 5 sub-scale scores for skimming (10 items), vocabulary (20 items), reading for facts (15 items), points of view (17 items) and comprehension (13 items).
Item-level variable(s):	- SCR_A1 - SCR_A10 (skimming) - SCR_B1 - SCR_B20 (vocabulary) - SCR_C1 - SCR_C15 (reading for facts) - SCR_D1 - SCR_D17 (points of view) - SCR_E1 - SCR_E13 (comprehension)
Total score/derived variable(s):	- SCR_A - SCR_B - SCR_C - SCR_D - SCR_E - SCRTOTAL* *excludes CM not answering all sections of tests
Age of participants (months):	Mean = 191.28, SD = 1.17, Range = 191 - 206 (N: 2148)* *Derived from completion date of document F
Descriptives	N = 3,108 Range = 6 - 75 Mean = 54.49 SD = 13.41

(Raw data)	Graphic: histogram 
Other sweep and/or cohort:	BCS (age 10)* *age 10 test adapted for 16 year olds
Source:	Shortened version developed from Edinburgh Reading Test by Godfrey Thompson Unit (GTU) and BCS70 survey team especially for the BCS70 at age 10. GTU (1978) Edinburgh Reading Test. Sevenoaks: Hodder and Stoughton.
Technical resources:	- Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper. - Seabrook, G. & Murphy, T. (2017). Reading and Matrices Tests BCS4 (1986), CLS Datanote.
Reference examples:	- Sullivan, A., Parsons, S., Wiggins, R., Heath, A., & Green, F. (2014). Social origins, school type and higher education destinations. *Oxford Review of Education*, *40*(6), 739-763. - Parsons, S., Green, F., Ploubidis, G. B., Sullivan, A., & Wiggins, R. D. (2017). The influence of private primary schooling on children's learning: Evidence from three generations of children living in the UK. *British Educational Research Journal*, *43*(5), 823-847.

4.5.2 APU Arithmetic Test (Applied Psychological Unit)

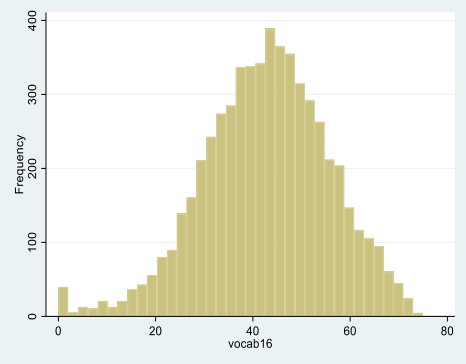
Domain:	General arithmetic achievement
Measures:	General arithmetic attainment (and not aptitude). Designed to test arithmetic concepts through calculation. Covers evaluation of arithmetic expressions, knowledge of proportion, percentage, estimation of area and simple probability. It tests the ability to

	reproduce and therefore the aptitude to learning arithmetic processes.
CHC:	Gq (Quantitative Knowledge)
Administrative method:	In school; pen and paper (Not included in the home version of the Education Pack).
Procedure:	Multiple-choice: each question had five possible answers, only one of which was correct. The test gets progressively harder, starting with simple addition, multiplication, division and subtraction questions and ending with more complex mathematical calculations and problems to solve. Duration: 30 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-16-year-Document-B.pdf
Scoring:	60 items, 1 point for each correct response
Item-level variable(s):	- car1 - car60 (original response) - carx1 - carx60 (individual derived)
Total score/derived variable(s):	- mathscore (raw total) - mathincorrect (number incorrect) - mathanswered (number attempted)
Age of participants (months):	Mean = 194.04, SD = 1.45, Range = 191 - 206
Descriptives: (Raw data)	N = 3,677 Range = 0 - 60 Mean = 36.77 SD = 11.82 Graphic: histogram 

Other sweep and/or cohort:	None
Source:	Closs, S. J. & Hutchings, M. J. (1976). APU arithmetic test, London: Hodder and Stoughton.
Technical resources:	- Dodgeon, B. (2008). Guide to the Dataset: BCS70 16 year follow up: APU arithmetic test, London: Centre for Longitudinal Studies. - Levy, P. & Goldstein, H. *(1984). Tests in Education: a book of critical reviews. London: Academic Press.* - Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Siegler, R. S., Duncan, G. J., Davis-Kean, P. E., Duckworth, K., Claessens, A., Engel, M., ... & Chen, M. (2012). Early predictors of high school mathematics achievement. *Psychological Science*, *23*(7), 691-697. - Sullivan, A., Parsons, S., Wiggins, R., Heath, A., & Green, F. (2014). Social origins, school type and higher education destinations. *Oxford Review of Education*, *40*(6), 739-763.

4.5.3 APU Vocabulary test (Applied Psychological Unit)

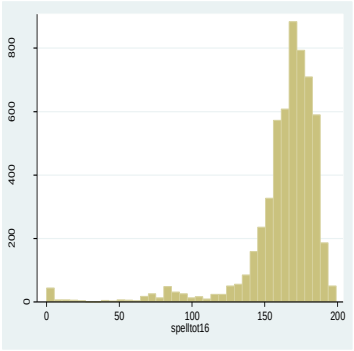
Domain:	Verbal (vocabulary)
Measures:	Vocabulary, meaning of words. Word knowledge
CHC:	Gc (Crystallised ability)
Administrative method:	Administered in schools and home version of the Education Pack. (variable 'bversion' identifies if administered at school (0) or home (1)) Timed conditions; Pen and paper
Procedure:	75 words in the test. Each word was followed by a multiple-choice list of 5 words from which the respondent picked the one with the same meaning as the first word. The test got progressively harder.

	Duration: 15 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-16-year-Document-B.pdf
Scoring:	75 items; 1 point for each correct response
Item-level variable(s):	cvo1 - cvo75
Total score/derived variable(s):	- BD4RREAD* - BD4READ* - BD4RDAGE* *variables currently being updated, please check carefully
Age of participants (months):	Mean = 196.72, SD = 4.49, Range = 189 - 212, (N: 3,967)* *Based on school sample only
Descriptives: (Raw data)	N = 5,756 Range = 0 - 75 Mean = 42.62 SD = 12.81 Graphic: histogram 
Other sweep and/or cohort:	- BCS70 (age 42) shortened version (20 items) - MCS (age 14) shortened version (20 items)
Source:	Closs, S. J. (1976). *APU vocabulary test (multiple choice format, 1986)*. Kent: Hodder and Stoughton Educational Ltd.
Technical resources:	- Levy P & Goldstein H. (1984). Tests in Education: a book of critical reviews. London: Academic Press. - Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.

Reference examples:	- Mostafa, T., & Wiggins, R. (2015). The impact of attrition and non-response in birth cohort studies: a need to incorporate missingness strategies. *Longitudinal and Life Course Studies*, *6*(2), 131-146. - Sullivan, A., & M. Brown. (2015). Reading for pleasure and children's progress in vocabulary and mathematics. *British Educational Research Journal* 41(6):971-991. - Sullivan, A., & Matthew B. (2015). Vocabulary from adolescence to middle age. *Longitudinal and Life Course Studies* 6(2):173-189.

4.5.4 Spelling test

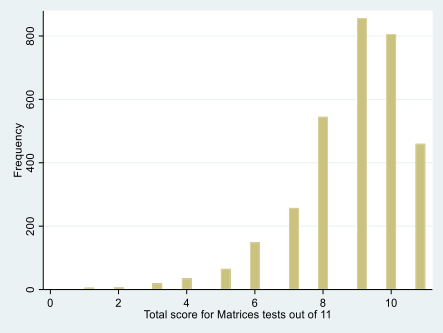
Domain:	Verbal (spelling)
Measures:	Spelling
CHC:	Grw (Reading/Writing)
Administrative method:	Administered in schools and home version of the Education Pack. (variable 'bversion' identifies if administered at school (0) or home (1)). Time limits apply.
Procedure:	Spelling was assessed by two tests (A and B). 100 words for each test - some spelt correctly and some incorrectly, CM identifies whether correct or incorrect. The words get harder as the test progresses. Order of test rotated by odd and even days. Duration: 20 minutes, 10 minutes. each section (A&B)
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-16-year-Document-B.pdf
Scoring:	200 in total, 1 point for each correct answer
Item-level variable(s):	- c7a1 - c7a100 (Test A) - c7b1 - c7b100 (Test B)
Total score/derived variable(s):	None

Age of participants (months):	Mean = 189.36, SD = 4.27, Range = 189 - 213 (N: 3,463)* *Based on school sample only
Descriptives: (Raw data)	N = 5,649 Range = 0 - 199 Mean = 162.71 SD = 28.26 Graphic: histogram 
Measured other sweep and/or cohort:	None
Source:	Unknown
Technical resources:	Parsons, S. (2014) Childhood cognition in the 1970 British Cohort Study, CLS Working Paper.
Reference examples:	- Sullivan, A. (2006). Academic self-concept, gender and single-sex schooling in the 1970 British Cohort Study. *CLS Working Paper*. - Sullivan, A., Parsons, S., Wiggins, R., Heath, A., & Green, F. (2014). Social origins, school type and higher education destinations. *Oxford Review of Education*, *40*(6), 739-763.

4.5.5 BAS Matrices

Domain:	Inductive, non-verbal reasoning
Measures:	Non-verbal reasoning:

	- Non-verbal inductive reasoning, including identification of the rules governing variables in abstract figures, and formulation and testing of hypotheses about these rules - Use of verbal mediation strategies involving labelling of figures - Visuo-spatial analysis, including perception of shape, relative size and orientation Low score: Poor understanding of verbal instructions or visual cues
CHC:	Gf (Fluid ability)
Administrative method:	In schools (not included in the home version of the Education Pack); pen and paper.
Procedure:	Each matrix was a square consisting of four or nine cells, with a blank cell in the lower right corner of each matrix. From five alternatives the child chose the design that correctly completes the matrix. There were six example items, three at the start of the exercise, then three examples when the level of difficulty increased. The child entered their choice of answer in the space provided on a separate 'Student Score Form'. Duration: 7 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-16-year-Document-B.pdf
Scoring:	11 items, 1 point for each correct choice, -1 not answered
Item-level variable(s):	- ANS_M1 - ANS_M11 (item selected) - SCR_M1 - SCR_M11 (1 = correct, 0 = wrong, -1 = not answered)
Total score/derived variable(s):	- SCR_M (total score)
Age of participants (months):	Mean = 193.99, SD = 1.29, Range = 191 - 206 (N: 2458)
Descriptives:	N = 3,208 Range = 1 - 11 Mean = 8.86 SD = 1.67

(Raw data)	Graphic: histogram 
Other sweep and/or cohort:	- BCS70 (age 10), but more items at age 10 (28 v 11) and different format (drawing v multi-choice) - ALSPAC (age 15.5) similar
Source:	- Elliott, C. D., Murray, D. J., & Pearson, L. S. (1979). *British Ability Scales*, Slough: NFER. - Elliott, C., Murray, D., and Pearson, L. (1978). *British Ability Scales*. Windsor: National Foundation for Educational Research.
Technical resources:	- Parsons, S. (2014). Childhood cognition in the 1970 British Cohort Study, CLS Working Paper. - Seabrook, G., & Murphy, T. (2017). Reading and Matrices Tests BCS4 (1986), CLS Datanote.
Reference examples:	- Sullivan, A., Parsons, S., Wiggins, R., Heath, A., & Green, F. (2014). Social origins, school type and higher education destinations. *Oxford Review of Education*, *40*(6), 739-763. - Parsons, S., Green, F., Ploubidis, G. B., Sullivan, A., & Wiggins, R. D. (2017). The influence of private primary schooling on children's learning: Evidence from three generations of children living in the UK. *British Educational Research Journal*, *43*(5), 823-847.

4.6 BCS70 (Multi-age child respondents)

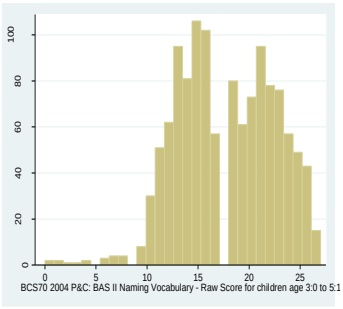
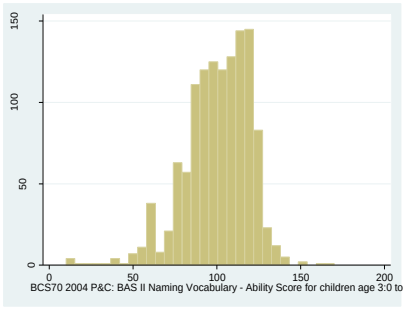
When the Cohort Member was aged 34, child assessments were conducted with the cohort member's children. Each of the Cohort Member's eligible children were asked to complete three exercises designed to measure a range of verbal and numerical abilities. Although dependent on the child's age and abilities, each set of exercises was expected to take an average of 20 minutes to complete.

Appropriate exercises were used for different age groups:

- Early Years exercises (3 - 5 years and 11 months)
    - Naming Vocabulary
    - Early Number Concepts
    - Copying Designs
- School Age exercises (6 - 16 years and 11 months)
    - Word Reading
    - Number Skills
    - Spelling

4.6.1 BAS Naming Vocabulary

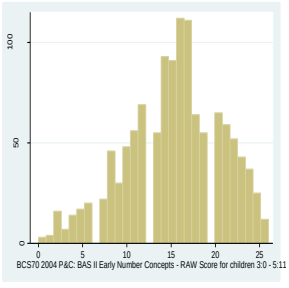
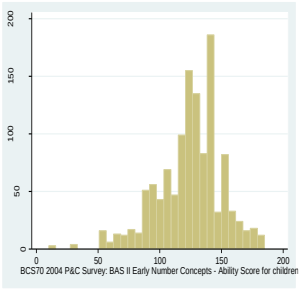
Domain:	Verbal knowledge (expressive)
Measures:	Spoken vocabulary: - Expressive language skills - Vocabulary knowledge of nouns - Ability to attach verbal labels to pictures - General knowledge - General language development - Retrieval of names from long-term memory - Level of language stimulation
CHC:	Gc (Crystallised ability)
Administrative method:	Shown picture, child responds verbally, recorded on Computer Assisted Personal Interviewing (CAPI)
Procedure:	Test item consisted of coloured pictures of objects shown one at a time that the child was asked to name. There were 36 pictures in total, but the number of items a child answered depended on his / her performance. Starting and stopping points based on different ages and performance. These 'rules' were programmed into the computer to minimise the decisions interviewers had to make on the spot.

Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-2004-Guide-to-Child-Assessments.pdf
Scoring:	36 items (pictures of objects) in total. Starting and stopping item depends on age and performance.
Item-level variable(s):	basnv01 - basnv36
Total score/derived variable(s):	- basnvR (raw score) - basnvA (ability and age adjusted)
Age of child (months):	Mean = 58.86, SD = 10.58, Range = 36 - 71
Descriptives:	basnvR (raw score): N 1,238; Range 0 - 27; Mean 17.74; SD 4.80 basnvA (ability and age adjusted): N 1,238; Range 10 - 170; Mean 99.69; SD 19.38  
Other sweep and/or cohort:	- MCS (age 3) - MCS (age 5) - ALSPAC (age 2): similar task involving objects
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.

Technical resources:	- Parsons, S., Bynner, J., & Foudouli, V. (2005). Measuring basic skills for longitudinal study: the design and development of instruments for use with cohort members in the age 34 follow-up in the 1970 British Cohort Study. London: NRDC. - Parsons, S. (2006). British Cohort Study 2004 Follow up: Guide to Child Assessment Data, CLS Working Paper.
Reference examples:	- Cooksey, E., Joshi, H., & Verropoulou, G. (2009). Does mothers' employment affect children's development? Evidence from the children of the British 1970 Birth Cohort and the American NLSY79. *Longitudinal and Life Course Studies*, *1*(1), 95–115. - Crawford, C., Goodman, A., & Joyce, R. (2011). Explaining the socio-economic gradient in child outcomes: the inter-generational transmission of cognitive skills. *Longitudinal and Life Course Studies*, *2*(1), 77-93. - de Coulon, A., Meschi, E., & Vignoles, A. (2011). Parents' skills and children's cognitive and non-cognitive outcomes. *Education economics*, *19*(5), 451-474.

4.6.2 BAS Early Number Concepts

Domain:	Pictorial reasoning
Measures:	Verbal and visuo-spatial processing: - Knowledge of numerical and pre-numerical concepts - Verbal comprehension - Knowledge of basic language concepts - Visual perception and analysis of pictures - Integration of visual and conceptual information
CHC:	Gf (Fluid ability)
Administrative method:	Pointing or counting in response to plastic tiles. And responses to colour pictures in a booklet. Recorded by interviewer on CAPI.
Procedure:	The child answered questions about number, size, or other numerical concepts. Stimuli used for the exercises included ten green plastic tiles and a series of pictures presented to the child. There were different starting and stopping points dependent upon age and performance. Starting and stopping points based on different ages

	and performance. These 'rules' were programmed into the computer to minimise the decisions interviewers had to make on the spot.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-2004-Guide-to-Child-Assessments.pdf
Scoring:	30 questions in total. Starting and stopping item depends on age and performance. Score 1=correct, 2=incorrect, except item 3 (counting tiles) score 0 -6
Item-level variable(s):	basenc01 - basenc30
Total score/derived variable(s):	- basencR (raw score) - basencA (ability and age adjusted)
Age of child (months):	Mean = 53.95, SD = 10.56, Range = 36 - 71
Descriptives:	basencR (raw score): N 1,226; Range 0 - 26; Mean 15.33; SD 5.41 basencA (ability and age adjusted): N 1,226; Range 10 - 185; Mean 124.39; SD 26.47  
Other sweep and/or cohort:	None
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.

Technical resources:	- Parsons, S., Bynner, J., & Foudouli, V. (2005). Measuring basic skills for longitudinal study: the design and development of instruments for use with cohort members in the age 34 follow-up in the 1970 British Cohort Study. NRDC: London - Parsons, S. (2006). British Cohort Study 2004 Follow up: Guide to Child Assessment Data, CLS Working Paper.
Reference examples:	- Cooksey, E., Joshi, H., & Verropoulou, G. (2009). Does mothers' employment affect children's development? Evidence from the children of the British 1970 Birth Cohort and the American NLSY79. *Longitudinal and Life Course Studies*, *1*(1), 95–115. - Crawford, C., Goodman, A., & Joyce, R. (2011). Explaining the socio-economic gradient in child outcomes: the inter-generational transmission of cognitive skills. *Longitudinal and Life Course Studies*, *2*(1), 77-93. - de Coulon, A., Meschi, E., & Vignoles, A. (2011). Parents' skills and children's cognitive and non-cognitive outcomes. *Education Economics*, *19*(5), 451-474. - Mallows, D. (2013). The intergenerational transfer of numeracy skills. *Institute of Education, University of London*.

4.6.3 Copying Designs Test (CDT)

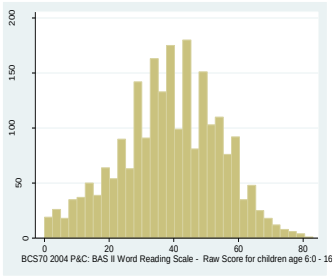
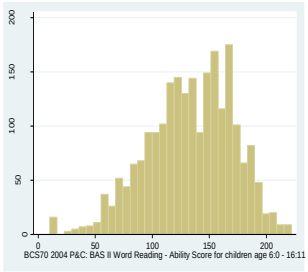
Domain:	Visual spatial
Measures:	Ability to reproduce shapes
CHC:	Gv (Visual processing)
Administrative method:	Child shown picture on CAPI, draws design in booklet
Procedure:	The child was shown a series of line drawings and asked to copy them as accurately as possible. (This exercise was not part of the BAS II, but had been completed by the cohort members themselves when they were age 5).
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-2004-Guide-to-Child-Assessments.pdf

Scoring:	Copy 8 drawings twice on two consecutive pages of booklet. Each drawing is scored 0 or 1.As not all children completed two copies a score of 1 was given if at least one copy is good. Total score is the sum of the score for the individual drawings.
Item-level variable(s):	No data available (tests not coded)
Total score/derived variable(s):	None
Age of participants (months):	No data available
Descriptives:	None
Other sweep and/or cohort:	- BCS70 (age 5) - NCDS (age 7) and NCDS (age 11) - 6 designs
Source:	Osborn, A. F., Butler, N. R., & Morris, A. C. (1984). The Social Life of Britain's Five Year Olds: A report of the Child Health and Education Study. London: Routledge and Kegan Paul.
Technical resources:	- Parsons, S., Bynner, J. & Foudouli, V. (2005). Measuring basic skills for longitudinal study: the design and development of instruments for use with cohort members in the age 34 follow-up in the 1970 British Cohort Study. NRDC: London - Parsons, S. (2006). British Cohort Study 2004 Follow up: Guide to Child Assessment Data, CLS Working Paper.
Reference examples:	None

4.6.4 BAS Word Reading

Domain:	School knowledge - reading (achievement scale)
Measures:	Word decoding ability: Recognition and oral reading of single words (lack of contextual clues): - Recognition of printed words - Visual and auditory working memory

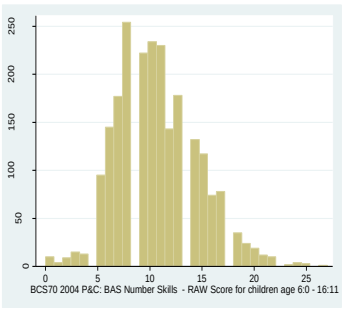
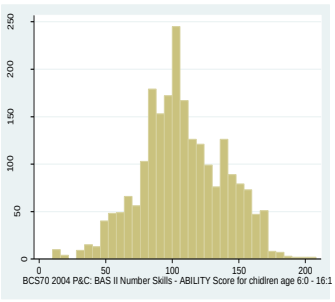
	- Skills in word analysis without additional contextual clues - Vocabulary knowledge Low scores: - Poor visual memory - Short term auditory memory for sequences - Poor skills in phonological segmentation of words into component sounds or syllables - Poor skills in sound blending - Poor auditory discrimination
CHC:	- Gc (Crystallised ability) - Grw (Reading/Writing)
Administrative method:	The child reads aloud a series of words presented on a card.
Procedure:	The assessment consisted of 90 words in total. The words were organised into 9 blocks of 10 words in ascending order of difficulty. The child was asked to read each word in a block out loud to the interviewer. The number of blocks of words the child was asked to attempt to read was dependent on the child's performance during the assessment. This assessment was designed to be used with children aged from 5 years to 17 years and 11 months.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-2004-Guide-to-Child-Assessments.pdf
Scoring:	90 maximum possible score, 1 for each correctly pronounced word.
Item-level variable(s):	baswr01 - baswr90
Total score/derived variable(s):	- baswrR (raw score) - baswrA (ability and age adjusted)
Age of child (months):	Mean = 117.71, SD = 32.97, Range = 72 - 203
Descriptives:	baswrR (raw score) baswrA (ability and age adjusted))

	N	2,248	2,248
	Range	0 - 83	10 - 222
	Mean	38.84	133.30
	SD	15.38	37.86
			
Other sweep and/or cohort:	- MCS (age 7) - NSHD (age 8 and 11). Similar NFER task.		
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.		
Technical resources:	- Parsons, S., Bynner, J., & Foudouli, V. (2005). Measuring basic skills for longitudinal study: the design and development of instruments for use with cohort members in the age 34 follow-up in the 1970 British Cohort Study. NRDC: London - Parsons, S. (2006). British Cohort Study 2004 Follow up: Guide to Child Assessment Data, CLS Working Paper.		
Reference examples:	- Cooksey, E., Joshi, H., & Verropoulou, G. (2009). Does mothers' employment affect children's development? Evidence from the children of the British 1970 Birth Cohort and the American NLSY79. *Longitudinal and Life Course Studies*, *1*(1), 95–115. - Crawford, C., Goodman, A., & Joyce, R. (2011). Explaining the socio-economic gradient in child outcomes: the inter-generational transmission of cognitive skills. *Longitudinal and Life Course Studies*, *2*(1), 77-93.		

4.6.5 BAS Number skills

Domain:	School knowledge - basic competence in arithmetic calculation (achievement scale)

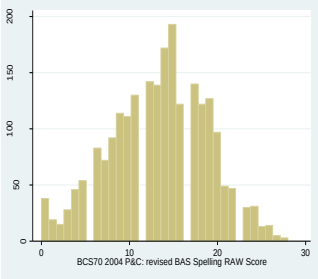
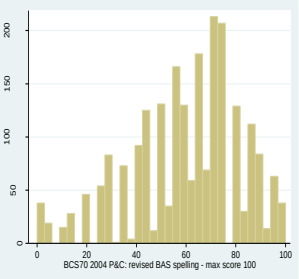
Measures:	Acquired computational skills: - Ability to recognise and express the names of numerals - Arithmetic skills - Knowledge and understanding of basic number concepts
CHC:	Gq (Quantitative Knowledge)
Administrative method:	The numerical tasks were presented in a specially designed booklet.
Procedure:	The child was asked to perform basic arithmetic operations with whole numbers, common fractions and decimals and to convert fractions to decimals and percentages. The task was arranged in six blocks (A to F); the first four blocks consisted of eight items each, and the last two blocks had seven items each. The number of blocks a child attempted depended on the child's age and performance This assessment was designed to be used with children aged from 6 years to 17 years and 11 months. And for children aged 5:0 to 5:11 of above average ability.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-2004-Guide-to-Child-Assessments.pdf
Scoring:	46 items, starting and stopping points were different based on child's age. Start at age equivalent item, if < 5 were correct then starts on easier block until 5 or more items were correct. If 5 or more correct, then child moves to next batch until 3 or fewer items in a black were incorrect.
Item-level variable(s):	- basns01 - basns08 (age 5:0 - 7:11) - basns09 - basns16 (age 8:0 - 9:11) - basns17 - basns24 (age 10:0 - 11:11) - basns25 - basns32 (age 12:0 - 17:11) - basns33 - basns46
Total score/derived variable(s):	- basnsR (raw score) - basnsA (ability and age adjusted)
Age of child (months):	Mean = 117.65, SD = 32.95, Range = 72 - 203

Descriptives:		basnsR (raw score)	basnsA (ability and age adjusted))
	N	2,240	2,240
	Range	0 - 27	10 - 208
	Mean	10.68	107.36
	SD	3.93	31.59
			
Other sweep and/or cohort:	None		
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson. - *NB. Layout and symbols of the tests were adapted from BAS II to reflect change in curriculum since version of BAS was produced.*		
Technical resources:	- Parsons, S., Bynner, J., & Foudouli, V. (2005). Measuring basic skills for longitudinal study: the design and development of instruments for use with cohort members in the age 34 follow-up in the 1970 British Cohort Study. NRDC: London. - Parsons, S. (2006). British Cohort Study 2004 Follow up: Guide to Child Assessment Data, CLS Working Paper.		
Reference examples:	- Cooksey, E., Joshi, H., & Verropoulou, G. (2009). Does mothers' employment affect children's development? Evidence from the children of the British 1970 Birth Cohort and the American NLSY79. *Longitudinal and Life Course Studies*, *1*(1), 95–115. - Crawford, C., Goodman, A., & Joyce, R. (2011). Explaining the socio-economic gradient in child outcomes: the inter-generational transmission of cognitive skills. *Longitudinal and Life Course Studies*, *2*(1), 77-93.		

	- Mallows, D. (2013). The intergenerational transfer of numeracy skills. *Institute of Education, University of London*.

4.6.6 BAS Spelling

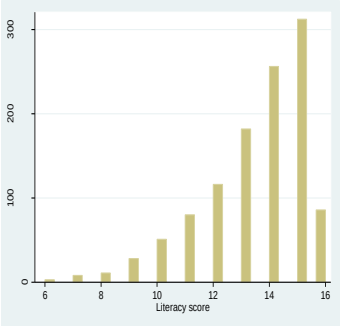
Domain:	School knowledge - spelling (achievement scale)
Measures:	Spelling achievement: - Visual memory for correct spelling of whole words - Knowledge of phoneme-to-grapheme mapping - Knowledge of spelling rules
CHC:	- Gc (Crystallised) - Grw (Reading/Writing)
Administrative method:	Writing and speaking; interviewer enters onto CAPI
Procedure:	All children within a defined age band received a fixed number of words. The child spells the word, then reads their answer to the interviewer, who enters correct or incorrect into CAPI. A stopping rule of 5 failures in a row was applied.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70-2004-Guide-to-Child-Assessments.pdf
Scoring:	- 38 words in total, start and finish point based on age of child. Number of words varied by age: - age 6:0 - 6:11 15 words (1 - 15) - age 7:0 - 8:11 20 words (6 - 25) - age 9:0 - 10:11 20 words (11 - 30) - age 11:0 - 16:11 28 words (11 - 38)
Item-level variable(s):	- bassp01 - bassp15 (age 6:0 - 6:11) - bassp06 - bassp25 (age 7:0 - 8:11) - bassp11 - bassp30 (age 9:0 - 10:11) - bassp11-bassp38 (age 11:0 - 16:11)
Total score/derived variable(s):	- basspR (raw score) - bassp1hr (revised score - maximum of 100)

Age of participants (months):	Mean = 117.71, SD = 32.97, Range = 72 - 203
Descriptives:	<table><tr><th></th><th>basspR (raw score)</th><th>bassp1hr (revised score - max. of 100)</th></tr><tr><td>N</td><td>2,248</td><td>2,248</td></tr><tr><td>Range</td><td>0 - 28</td><td>0 - 100</td></tr><tr><td>Mean</td><td>13.34</td><td>59.91</td></tr><tr><td>SD</td><td>5.56</td><td>21.91</td></tr></table>  
Other sweep and/or cohort:	None
Source:	- Modified version (reduced number of words from 75 to 38 by using the first 5 in 10 of 7 blocks and 3 of 5 of the last block of BAS) of: - Elliott, C. D., Smith, P., & McCulloch, K. (1996). *British Ability Scales Second Edition (BAS II). Administration and Scoring Manual*. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). *British Ability Scales Second Edition (BAS II).* Technical Manual. London: Nelson.
Technical resources:	- Parsons, S., Bynner, J., & Foudouli, V. (2005). Measuring basic skills for longitudinal study: the design and development of instruments for use with cohort members in the age 34 follow-up in the 1970 British Cohort Study. NRDC: London. - Parsons, S. (2006). British Cohort Study 2004 Follow up: Guide to Child Assessment Data, CLS Working Paper.
Reference examples:	Crawford, C., Goodman, A., & Joyce, R. (2011). Explaining the socio-economic gradient in child outcomes: the inter-generational transmission of cognitive skills. *Longitudinal and Life Course Studies*, *2*(1), 77-93.

4.7 BCS70 (Age 21; sub-sample, N = 1,623)

4.7.1 Literacy and numeracy assessments

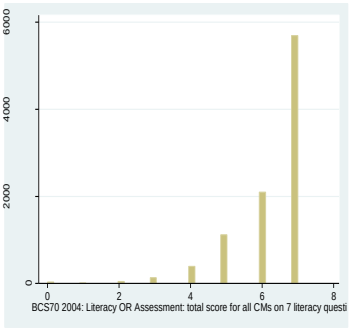
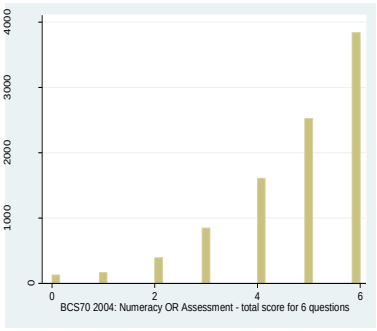
Domain:	Adult basic literacy and numeracy
Measures:	(Functional) literacy and numeracy assessment. The assessment covered four levels for communication skills and the three levels for numeracy as defined by Adult Literacy and Basic Skills Unit's (ALBSU) Basic Skills Standards. These emphasise 'functional' performance, i.e. the ability to apply basic skills in everyday life situations (ACACE, 1982).
CHC:	None
Administrative method:	Face to face interviewer; paper and showcards; pen and paper
Procedure:	Each literacy and numeracy assessment item comprised a visual stimulus presented to the cohort member on a 'showcard' about which they were asked a number of questions. Questions were open response (OR) in format. Duration: 28 minutes for both tests
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70_21-year_Survey-Questionnaire.pdf
Scoring:	Literacy: 25 items - 16 used to derive score comparable with NCDS, 1 point for correct answer - scores grouped 0 – 9 = 1 "very poor", 10 – 11 = 2 "poor", 12 – 13 = 3 "average", 14 – 16 = 4 "good" Numeracy: 16 items - scores grouped 0 – 6 = 1 "very poor", 7 – 8 = 2 "poor", 9 – 10 = 3 "average", 11 – 14 = 4 "good"
Item-level variable(s):	Literacy: vd1a - vd1b, vd2a1 - vd2b2, vd3a1 - vd3b3, vd4a1 - vd4a3, v4dc2, vd5 (16 items) vd4b1 - vd4b4, 4dc1a - 4dc1e (additional 9 items) Numeracy (14 items)

	vd6a1 vd6a2 vd6b1 vd6b2 vd6b3 vd6b4 vd7a1 vd7a2 vd7b1 vd7b2 vd8a1 vd8a2 vd8a3 vd8b1 vd8b2 vd8b3 vd8c1 vd8c2 vd8c3 vd9a vd9b
Total score/derived variable(s):	- litscore (sum of 16 items) - lit4grp (categorical) - numscore (sum of 14 items) - num4grp (categorical)
Descriptives:	litscore (raw score) / numscore (raw score) N: 1,133 / 863 Range: 6 - 16 / 1 - 14 Mean: 13.42 / 9.81 SD: 1.91 / 2.62 Histogram 
Other sweep and/or cohort:	- BCS70 (age 34) - NCDS (age 37)* *BCS devised to be comparable with NCDS
Source:	Assessments devised by consultants, Cambridge Training and Development Ltd designed to operationalise the ALBSU for the BCS70.
Technical resources:	Ekinsmyth, C., & Bynner, J. (1994). The basic skills of young adults. London: Basic Skills Agency
Reference examples:	- Bynner, J., & Steedman, J. (1995). Difficulties with basic skills: Findings from the 1970 British Cohort Study. London: Basic Skills Agency. Available at http://www.cls.ioe.ac.uk/shared/get-file.ashx?id=611&itemtype=document - Parsons, S., & Bynner, J. (2005). Does numeracy matter more? London: NRDC.

4.8 BCS70 (Age 34)

4.8.1 Basic skills (Literacy and numeracy assessments)

Domain:	Adult basic literacy and numeracy
Measures:	(Functional) literacy and numeracy assessment.
CHC:	NA.
Administrative method:	CAPI and paper
Procedure:	The interviewer showed the cohort member a visual stimulus on a specified show card, for example a map or a page from the Yellow Pages, and then asked a question. When the cohort member gave their answer, the interviewer coded it as "Correct" or "Incorrect" (including "Don't Know" responses). For two items that were considered challenging for interviewers to code, there was a third option "Interviewer cannot code" which allowed interviewers to record the cohort members verbatim response. Interviewers used this code if they were unsure whether the cohort member's response was correct or incorrect. These verbatim responses were coded by the CLS research team.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS-2004-Follow-up-CAPI-Questionnaire.pdf
Scoring:	13 items, 7 literacy and 6 numeracy; 1 point for correct answer
Item-level variable(s):	litor01a litor01b litor02a litor02b litor03a litor03b litor03c numor01a numor01b numor02a numor03a numor04a numor04b
Total score/derived variable(s):	litort (sum of literacy) numort (sum of numeracy)
Descriptives:	litort (raw score) / numscore (raw score) N: 9,521 / 9,510 Range: 0 - 7 / 0 - 6 Mean: 6.31 / 4.80 SD: 1.06 / 1.37

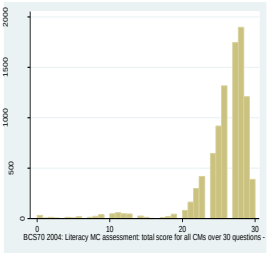
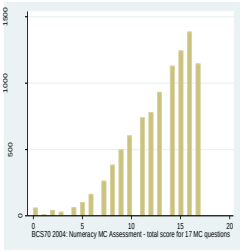
	 
Other sweep and/or cohort:	- BCS70 (age 21) - NCDS (age 37)* *BCS devised to be comparable with NCDS
Source:	Derived from BCS70 (age 21) survey.
Technical resources:	- Parsons, S. (2012). User guide to accompany the 1970 British Cohort Study 2004 adult literacy and numeracy assessment data. CLS, working paper. - For further details on the design of the new assessment and initial results see: Parsons, S. and Bynner, J. (2005). Measuring Basic Skills for Longitudinal Study: The design and development of instruments for use with cohort members in the age 34 follow-up in the 1970 British Cohort Study (BCS70). London: National Research and Development Centre for adult literacy and numeracy.
Reference examples:	- Bynner, J. & Parsons, S. (2005). New Light on Literacy and Numeracy. London: National Research and Development Centre for adult literacy and numeracy. - Schoon, I., Parsons, S., Rush, R., & Law, J. (2010). Childhood language skills and adult literacy: A 29-year follow-up study. *Pediatrics*, *125*(3), e459-e466.

4.8.2 Literacy and numeracy skills

Domain:	Basic adult literacy and numeracy skills
Measures:	The multiple-choice assessments measured adult literacy and numeracy based on items from the Skills for Life Survey (2003) using the National Standards of adult literacy and numeracy.

	The adult literacy core curriculum covers 'Speaking and Listening', 'Reading' and 'Writing'. This assessment covered Reading and Writing (and not speaking and listening). In the reading domain the questions measured: Reading Comprehension (RC), Grammar and Punctuation (GP) and Vocabulary, Word Recognition, Phonics (VWRP); while the writing domains were: Writing Composition (WC), Grammar and Punctuation (GP) and Spelling and Handwriting (SH). As with the Skills for Life Survey, item selection was heavily concentrated on the many aspects of 'Reading Comprehension'. The numeracy assessment covered seven aspects of number skill from the numeracy curriculum, using items in the original Skills for Life Survey. The items included: Basic Money (BM), Whole Numbers and Time (NT), Measures and Proportions (MP), Weights and Scales (WS), Length and Scaling (LS), Charts and Data (CD) and Money Calculations (MC).
CHC:	None
Administrative method:	CASI self-completion (Where the cohort member was unable or reluctant to use the laptop, the interviewer assisted, and if necessary administered the self-completion as an interview).
Procedure:	The assessment consisted of 20 questions assessing literacy skills and 17 questions assessing numeracy skills. Each question consisted of a visual image and some text. The question always appeared at the top of the screen, the image at the centre, and the four (in most cases) possible answers appeared at the bottom of the screen. The cohort member read the question on the screen and entered his / her answer, and then the next item appeared automatically. For most interviews, the multiple-choice was completed as a CASI, but there was an option for the interviewer to enter the cohort member's responses if he / she was asked to do so. Literacy: The literacy assessment consisted of 'two tiers' (upper and lower tier). A total of 20 multiple-choice literacy questions were asked, the first 10 were screening questions (Entry Level 3) covering Reading Comprehension x 7, Spelling and Handwriting (SH) x 2 and Writing Composition (WC) x 1. Respondents failing to answer at least six of these questions correctly went on to answer ten Entry Level 2 questions on the lower tier (RC x 4; WC x 2; GP x 2; SH x 1; VWRP x 1). Respondents who answered between six and ten screening questions correctly proceeded to

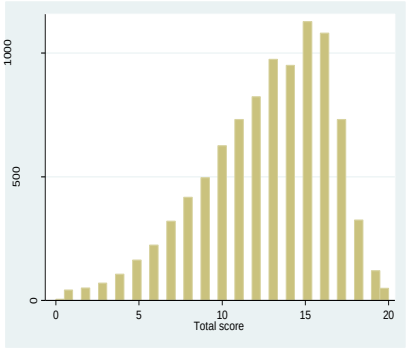
	the upper tier and answered five Level 1 (RC x 3; GP x 1; SH x 1) and five Level 2 (RC x 2; GP x 2; WC x1) questions. Numeracy: 17 multiple-choice questions were administered in order of difficulty within each curriculum topic. The order was as follows: Whole Numbers and Time (NT) x 2, Measures and Proportions (MP) x 2, Weights and Scales (WS) x 3, Length and Scaling (LS) x 3, Charts and Data (CD) x1, Money Calculations (MC) x 4, Basic Money (BM) x2. The assessment started and finished on an 'Entry level 3 question' (Parsons, 2012).
Link to questionnaire:	Not available: Examples in Parsons (2012)
Scoring:	Literacy: Scored ranged from 0 to 20 for each of the two tiers, where any correct answer was given a 1, any incorrect answer 0. However, to calculate an overall score including all participants, those who answered the lower tier i.e. less difficult section were assumed not to have been able to answer the higher tier questions and accordingly scored 0, while those completing the higher tire received a score of 1. Numeracy: Scores ranged from 0 to 17; any correct answer was given a 1, any incorrect answer 0 (See bcs70_2004_user_guide.pdf pp. 25-38 for details on scoring).
Item-level variable(s):	N/A
Total score/derived variable(s):	Literacy: litmc20 (raw score 0 - 17) litmc30 (total raw score: lower tier 0 - 15 and upper tier 16 - 30) litall27, litall37 (total raw MC and OR score) litlev, litlevg (banded by National Standards level) Numeracy: nummct (raw score 0 - 17) numall (total raw MC and OR score 0 - 23) NUMLEV, numlevg (banded by National Standards level)

Descriptives:		litmc30 (raw score)	nummct (raw score)
	N	9,568	9,562
	Range	0 - 30	0 - 17
	Mean	25.72	12.86
	SD	4.24	3.41
			
Other sweep and/or cohort:	None		
Source:	- Williams, J., Clemens, S., Oleinikova, K., & Tarvin, K. (2003). The Skills for Life survey: A national needs and impact survey of literacy, numeracy and ICT skills. DfES Research Report 490. - Devised by the Centre for the Development and Evaluation of Lifelong Learning (CDELL) at the University of Nottingham. Carried out by BMRB on behalf of the Department for Education and Skills in 2002.		
Technical resources:	- Parsons, S. (2012). User guide to accompany the 1970 British Cohort Study 2004 adult literacy and numeracy assessment data. CLS, working paper. - For further details see Parsons, S., & Bynner J. (2006) 'Measuring Basic Skills for Longitudinal Study' Literacy and Numeracy Studies.		
Reference examples:	- de Coulon, A., Meschi, E., & Vignoles, A. (2011). Parents' skills and children's cognitive and non-cognitive outcomes. *Education economics*, *19*(5), 451-474. - Vignoles, A., De Coulon, A., & Marcenaro-Gutierrez, O. (2011). The value of basic skills in the British labour market. *Oxford Economic Papers*, *63*(1), 27-48.		

4.9 BCS70 (Age 42)

4.9.1 APU Vocabulary Test (Applied Psychological Unit)

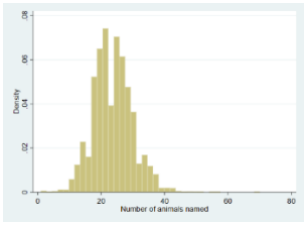
Domain:	Verbal (vocabulary)
Measures:	- Vocabulary - Meaning of words - Word knowledge
CHC:	Gc (Crystallised ability)
Administrative method:	Timed conditions; CAPI and paper
Procedure:	There were 20 words in the test. Each word was followed by a multiple-choice list of 5 words from which the respondent picked the word with the same meaning as the original word. The test got progressively harder. Duration: 4 minutes.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/BCS70_Mainstage_FULL_QUESTIONNAIRE_final.pdf
Scoring:	20 items; 1 point for each correct response, 0 for incorrect or not attempted
Item-level variable(s):	B9VQ1A - B9VSQ20
Total score/derived variable(s):	- B9VSCORE - B9VSCORB (banded variable)
Age of CM (months):	Mean = 509.35, SD = 2.76, Range = 500 - 517
Descriptives: (Raw data)	N = 9,433 Range = 0 - 20 Mean = 12.60 SD =3.71

	
Other sweep and/or cohort:	- BCS (age 16) - MCS (age 14) shortened version (20 items)
Source:	Shortened version (20 of original 75 items) of Closs, S. J. (1976). *APU vocabulary test (multiple choice format, 1986)*. Kent: Hodder and Stoughton Educational Ltd.
Technical resources:	Levy P & Goldstein H. (1984). Tests in Education: a book of critical reviews. London: Academic Press.
Reference examples:	- Sullivan, A. & Brown, M. (2015). Vocabulary from adolescence to middle age. *Longitudinal and Life Course Studies* 6(2):173-89. - Cheng, H., & Furnham, A. (2019). Correlates of Adult Vocabulary Task Performance: Findings from a British Cohort. *Journal of Intelligence*, *7*(1), 2.

4.10 BCS (Age 46-47)

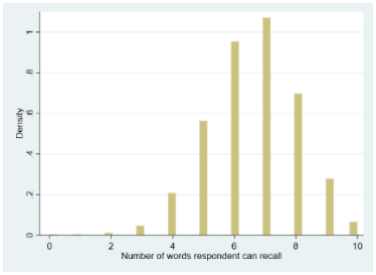
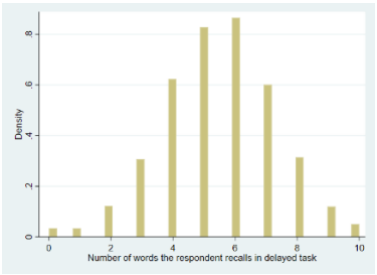
4.10.1 Verbal Fluency (animal naming) test

Domain:	Verbal fluency
Measures:	- Verbal/semantic fluency - Executive function
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Trained interviewer; CAPI
Procedure:	Participants were asked to name as many different animals as possible within a one-minute timeframe. The interviewer made a note of each named animal and entered the total number into the

	CAPI programme. Repetitions, named animals (e.g. Bambi), and redundancies (e.g. white cat, black cat) were not included in the total score.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2018/10/BCS70_collated-CAPI-specs_FINAL.pdf
Scoring:	Total number of animals named
Item-level variable(s):	None
Total score/derived variable(s):	B10CFANI
Descriptives: (raw data)	N = 8,498 Range = 1 - 70 Mean = 23.63 SD = 6.19 
Age of participants (months):	Mean = 563.26, SD = 8.26, Range = 542 - 578
Other sweep and/or cohort:	- NCDS (Age 50, 61 - 63) - NSHD (1999; Age 53 years)
Source:	Taken from Section B (cognitive assessment) of the Cambridge Mental Disorders of the Elderly Examination (CAMDEX) (Roth et al., 1986). Cognitive measures at this sweep were taken from the 2002 English Longitudinal Study of Ageing (ELSA; Taylor et al., 2007).
Technical resources:	Banks, J., Breeze, E., Lessof, C., & Nazroo, J. (2006). Retirement, health and relationships of the older population in England: The 2004 English Longitudinal Study of Ageing (Wave 2).
Reference examples:	Not available at time of writing.

4.10.2 Verbal Learning/ Word list recall test (immediate and delayed)

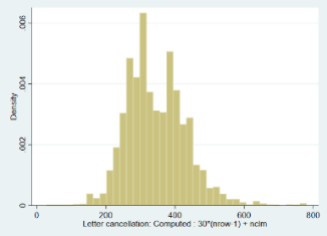
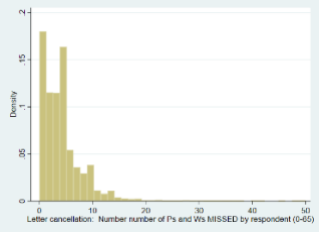
Domain	Verbal (memory)
Measures:	- Attention - Short-term episodic memory - Verbal memory
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Trained interviewer; CAPI
Procedure:	One of four lists of 10 common words were selected by the CAPI, and presented to participant via a recorded voice at a rate of one word every 2-seconds. In cases where the computer voice was not audible, the interviewer read the words, mimicking the pace and clarity of the recorded voice. After the list had been read out, the participants were given two minutes to recall as many of the words as possible (in no particular order). The total number recalled was entered into the CAPI. After additional tests were administered (animal naming and letter cancellation), the interviewer asked the participant to again recall as many words as possible from the original list (words not repeated by CAPI/interviewer). This delayed memory task was administered approximately five minutes after the initial recall task.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2018/10/BCS70_collated-CAPI-specs_FINAL.pdf
Scoring:	- Immediate recall: 10 items (scores range 0 - 10) - Delayed recall: 10 items (scores range 0 - 10)
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	B10CFLISN, B10CFLISD
Descriptives:	*Recall (immediate)* *Recall (delayed)*

	N = 8,501 Range = 0 - 10 Mean = 6.61 SD = 1.43 	N = 8,494 Range = 0 - 10 Mean = 5.47 SD = 1.81 
Age of participants (months):	Mean = 563.26, SD = 8.26, Range = 542 - 578	
Other sweep and/or cohort:	- NCDS (2018; Age 50, 61 - 63) - NSHD (1943; Age 43, 53, 60 - 64, 68 - 70)* * For each of three trials survey members were shown a list of 15 words at a rate of two seconds each, then were asked to write down as many words recalled as possible. A simple total score is available calculated as the sum of the words correctly recalled at each trial.	
Source:	Similar tasks have been used to measure verbal learning for decades, e.g. Bush and Mosteller (1955). Cognitive measures at this sweep were taken from the 2002 English Longitudinal Study of Ageing (ELSA; Taylor et al., 2007).	
Technical resources:	Banks, J., Breeze, E., Lessof, C., & Nazroo, J. (2006). Retirement, health and relationships of the older population in England: The 2004 English Longitudinal Study of Ageing (Wave 2).	
Reference examples:	Not available at time of writing.	

4.10.3 Timed Letter Search/ Letter cancellation test

Domain	Processing speed
Measures:	- Attention/concentration - Mental speed

	- Visual scanning
CHC:	- Gv (Visual Processing) - Gs (Processing Speed)
Administration method:	Pen and paper.
Procedure:	Cohort members were given a page of random letters arranged in rows (N = 26) and columns (N = 30) and were asked to cross out as many "Ps" and "Ws" as possible within a one-minute timeframe. They were instructed to work across each row from left-to right as if they were reading a page and they were asked to perform the task as quickly and accurately as possible. Once the allotted time was over, the respondent was asked to underline the last letter that reached their eye (any letter, target or otherwise). The total number of letters searched was summed to provide a measure of speed of processing, whereas the total number of target letters missed reflects level of accuracy.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2018/10/BCS70_collated-CAPI-specs_FINAL.pdf
Scoring:	Speed of processing: summed total of letters scanned. Accuracy: summed total of target letters missed.
Item-level variable(s):	Not currently available.
Total score/derived variable(s):	B10CFCOR, B10CFMIS, B10CFRC
Descriptives: (raw data)	*Processing speed (letter reached)* N = 8,242 Range = 28 - 780 Mean = 346.45 SD = 84.78 *Processing accuracy (number of "Ws" and "Ps" missed)* N = 8,242 Range = 0 - 50 Mean = 4.26 SD = 4.01

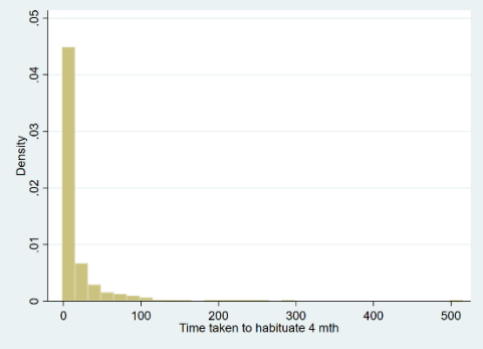
	 
Age of participants (months):	Mean = 563.26, SD = 8.26, Range = 542 - 578
Other sweep and/or cohort:	- NCDS (Age 50, 61 - 63) - NSHD (1989; Age 43*, 53, 60 - 64, 68 - 70) * 3 trials.
Source:	The letter cancellation test was initially developed for the NSHD 1946 birth cohort study (Richards et al., 1999) and has also been used in the MRC Cognitive Function and Ageing Study (MRC CFA Study, 1998). All cognitive measures at this sweep were taken from the 2002 English Longitudinal Study of Ageing (ELSA; Taylor et al., 2007).
Technical resources:	Banks, J., Breeze, E., Lessof, C., & Nazroo, J. (2006). Retirement, health and relationships of the older population in England: The 2004 English Longitudinal Study of Ageing (Wave 2).
Reference examples:	Not available at time of writing.

5. Avon Longitudinal Study of Parents and Children (ALSPAC)

5.1 Children in Focus Clinic (4 months)

5.1.1 Habituation Task

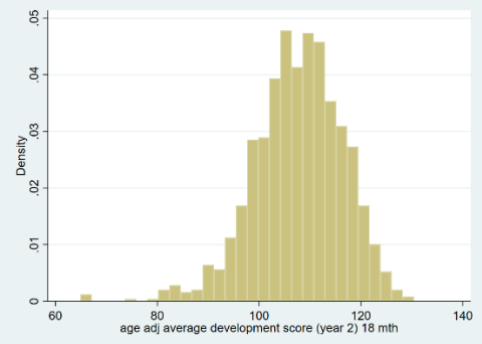
Domain:	Non-verbal; Habituation
Measures:	Correlates with later general ability.
CHC:	None
Administration method:	Trained interviewer; clinical setting; physical task (eye-tracking)
Procedure:	Habituation refers to the extent to which attention directed towards a stimulus lessens over time. Research in this area works on the assumption that the amount of time an infant spends looking at a non-threatening stimulus before losing attention reflects speed of information processing. In other words, a child that 'habituates' to (i.e. loses interest in) a stimulus quickly is thought to be more efficient at processing information, compared with a child that takes a long time to lose interest in a stimulus. Habituation has been shown to correlate with later general ability (McCall & Carriger, 1993). During the task, the infant sat on the lap of the researcher, 18" away from a computer screen that projected a picture of four diamonds. The eye movements of the infants were tracked, and 'habituation' was reached when two successive 'bouts' of looking at the stimulus were shorter than the two previous 'bouts'. The infant was then presented with the same image alongside a new image, until s/he spent a total of 40 seconds looking at both (novelty preference).
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Seconds taken to habituate (3.6 - 515.1)
Item-level variable(s):	cf700 - cf719

Total score/derived variable(s):	cf701
Descriptives:	*Time taken to habituate* N = 1,432 Range = 3.6 - 515.1 Mean = 12.62 SD = 34.91 
Age of participants:	Mean = 16.61 weeks, SD = 0.79, Range = 15-21
Other sweep and/or cohort:	None
Source:	Designed specifically for ALSPAC by Dr Alan Slater, Department of Psychology, University of Exeter, UK, and by Dr Marc Bornstein, NICHD, USA.
Technical resources:	None
Reference examples:	- Bornstein, M. H., Hahn, C. S., Bell, C., Haynes, O. M., Slater, A., Golding, J., ... & ALSPAC Study Team. (2006). Stability in cognition across early childhood: A developmental cascade. *Psychological Science*, *17*(2), 151-158. - Bornstein, M. H., Hahn, C. S., & Wolke, D. (2013). Systems and cascades in cognitive development and academic achievement. *Child development*, *84*(1), 154-162.

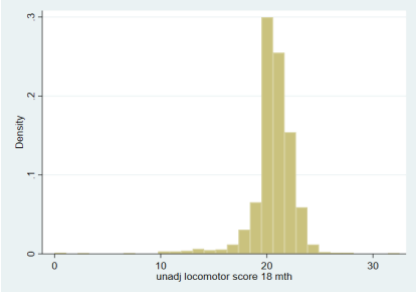
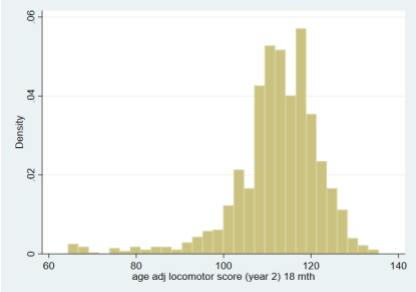
5.2 Children in Focus Clinic (18 months)

5.2.1 Griffiths Scales of Mental Development

Domain:	Verbal and non-verbal ability
Measures:	- Verbal ability - Non-verbal/performance ability - Psychomotor Abilities - Personal/social skills
CHC:	G (General ability)
Administration method:	Trained interviewer; clinical setting; guided play, physical task, oral questions, pen and paper.
Procedure:	The Griffiths Test consists of five subscales that assess the following areas of development: i) locomotion, ii) personal/social skills, iii) hearing and speech, iv) hand-eye coordination, and performance. The subscales consist of 86 items each. The first 48 items are designed for children aged 0 - 2 years, with the remaining 38 items belonging to the extension of the scale (6 additional items per year). Standardised developmental quotients (DQs) for each subscale are calculated using the formula: DQ = (Mental age x 100)/Chronological age. An overall DQ is calculated using the mean scores across all 5 scales. Due to time constraints, only the items pertaining to the 12-24 month period were administered when children were aged 18 months. Thus, study children who were considerably advanced/delayed may have received inflated/deflated scores respectively. The scales were administered by eight trained testers. Each of the five sub-tests is detailed in a separate section below. Duration: approximately 45 minutes for each full sub-test
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised DQ (0 - 100).
Item-level variable(s):	Not readily available.

Total score/derived variable(s):	cf772 - cf783
Descriptives:	*Age adjusted average development score* N = 1,390 Range = 64.91 - 130.37 Mean = 88.02 SD = 42.81 
Age of participants:	Mean = 79.90 weeks, SD = 1.47, Range = 76 - 87
Other sweep and/or cohort:	None
Source:	Griffiths, R. (1970). The abilities of young children. *London: Child Development Research Centre*.
Technical resources:	None
Reference examples:	- Hibbeln, J. R., Davis, J. M., Steer, C., Emmett, P., Rogers, I., Williams, C., & Golding, J. (2007). Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. *The Lancet*, *369*(9561), 578-585. - Pearson, R. M., Heron, J., Melotti, R., Joinson, C., Stein, A., Ramchandani, P. G., & Evans, J. (2011). The association between observed non-verbal maternal responses at 12 months and later infant development at 18 months and IQ at 4 years: A longitudinal study. *Infant Behavior and Development*, *34*(4), 525-533.

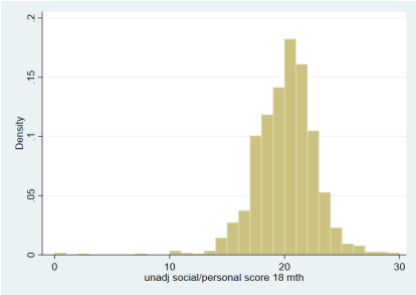
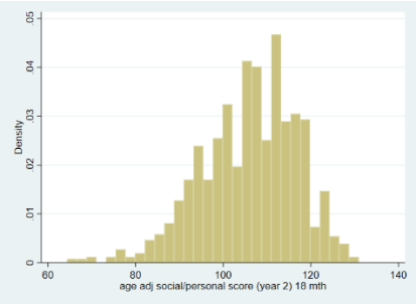
5.2.2 The Griffiths Locomotor Scale

Domain:	Motor skills
Measures:	- Psychomotor abilities - Control precision - Static strength
CHC:	Gp (Psychomotor Abilities)
Administration method:	Trained interviewer; clinical setting; physical tasks
Procedure:	The interviewer noted (yes/no) whether the child was capable of performing physical tasks ranging in difficulty from 'Can climb on to a low ledge or step' to 'Can bring a chair to the table, place it in position and seat her/himself without help'.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised DQ (0 - 100).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf772, cf778
Descriptives:	*Unadjusted score* N = 1,174 Range = 0 - 32.5 Mean = 20.60 SD = 2.22  *Age adjusted score* N = 1,168 Range = 64.38 - 135.45 Mean = 112.21 SD = 10.06 

Age of participants:	Mean = 79.90 weeks, SD = 1.47, Range = 76 - 87
Other sweep and/or cohort:	None
Source:	Griffiths, R. (1970). The abilities of young children. *London: Child Development Research Centre*.
Technical resources:	None
Reference examples:	- Little, R. E., Northstone, K., Golding, J., & ALSPAC Study Team. (2002). Alcohol, breastfeeding, and development at 18 months. *Pediatrics*, *109*(5), e72-e72. - Hibbeln, J. R., Davis, J. M., Steer, C., Emmett, P., Rogers, I., Williams, C., & Golding, J. (2007). Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. *The Lancet*, *369*(9561), 578-585.

5.2.3 The Griffiths Personal-Social Scale

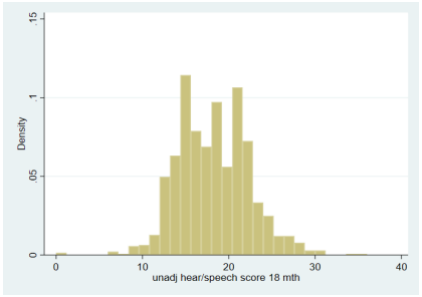
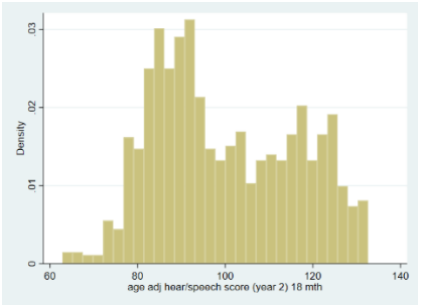
Domain:	Verbal and non-verbal social skills
Measures:	- Personal/social skills - Genera verbal information - Listening ability
CHC:	- Gkn (General domain-specific knowledge) - Gc (Crystallized Intelligence)
Administration method:	Trained interviewer; clinical setting; guided play session
Procedure:	During a guided play session, the interviewer noted (yes/no) whether the child was capable of performing tasks ranging in difficulty from 'Puts small objects in and out of cup in play' to 'Begins to co-operate in play with other children'. Also included a number of acquired knowledge items, e.g. "Where are the dolly's hands, etc."

Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised DQ (0 - 100).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf773, cf779
Descriptives:	*Unadjusted score* N = 1,174 Range = 0 - 30 Mean = 19.82 SD = 2.69  *Age adjusted score* N = 1,168 Range = 64.38 - 130.92 Mean = 106.00 SD = 10.87 
Age of participants:	Mean = 79.90 weeks, SD = 1.47, Range = 76-87
Other sweep and/or cohort:	None
Source:	Griffiths, R. (1970). The abilities of young children. *London: Child Development Research Centre*.
Technical resources:	None
Reference examples:	- Little, R. E., Northstone, K., Golding, J., & ALSPAC Study Team. (2002). Alcohol, breastfeeding, and development at 18 months. *Pediatrics*, *109*(5), e72-e72. - Pearson, R. M., Heron, J., Melotti, R., Joinson, C., Stein, A., Ramchandani, P. G., & Evans, J. (2011). The association between observed non-verbal maternal responses at 12

	months and later infant development at 18 months and IQ at 4 years: A longitudinal study. *Infant Behavior and Development*, *34*(4), 525-533.

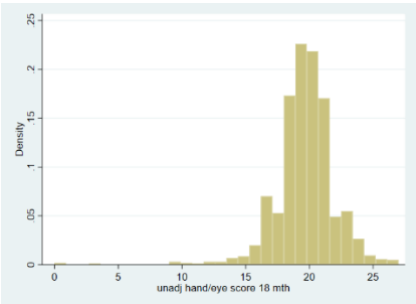
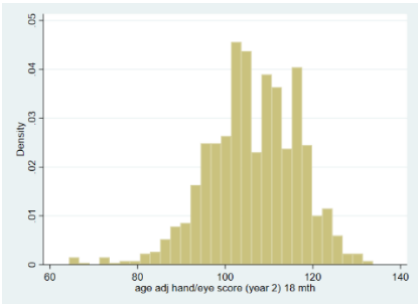
5.2.4 The Griffiths Hearing and Speech Scale

Domain:	Hearing and speech ability
Measures:	- General verbal information - Language development - Lexical knowledge - Listening ability - Communication ability - Oral production and fluency
CHC:	Gc (Crystallized Intelligence)
Administration method:	Trained interviewer; clinical setting; guided play session
Procedure:	During a guided play session, several tasks were administered by the interviewer, and the interviewer recorded whether the child could complete each task, e.g. whether the child could turn the pages of the picture book, whether they knew their own name, whether they used clear words, whether they could identify objects in a box of toys, whether they could name the contents of various pictures.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised DQ (0 - 100).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf774, cf780
Descriptives:	*Unadjusted score* N = 1,174 *Age adjusted score* N = 1,168

	Range = 0 - 36 Mean = 18.20 SD = 4.13  Range = 62.82 - 132.62 Mean = 99.84 SD = 16.11 
Age of participants:	Mean = 79.90 weeks, SD = 1.47, Range = 76 - 87
Other sweep and/or cohort:	None
Source:	Griffiths, R. (1970). The abilities of young children. *London: Child Development Research Centre*.
Technical resources:	Griffiths, R. (1970). The abilities of young children. *London: Child Development Research Centre*.
Reference examples:	- Hibbeln, J. R., Davis, J. M., Steer, C., Emmett, P., Rogers, I., Williams, C., & Golding, J. (2007). Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. *The Lancet*, *369*(9561), 578-585. - Pearson, R. M., Heron, J., Melotti, R., Joinson, C., Stein, A., Ramchandani, P. G., & Evans, J. (2011). The association between observed non-verbal maternal responses at 12 months and later infant development at 18 months and IQ at 4 years: A longitudinal study. *Infant Behavior and Development*, *34*(4), 525-533.

5.2.5 The Griffiths Hand and Eye Coordination Scale

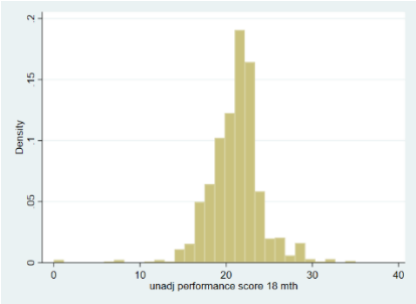
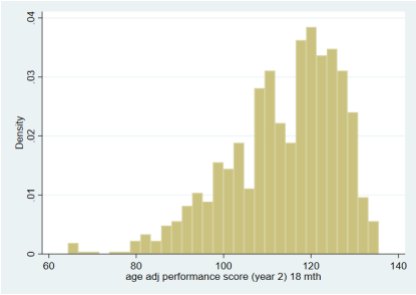
Domain:	Coordination
Measures:	- Hand and eye coordination - Finger dexterity

	- Manual dexterity - Arm-hand steadiness - Aiming
CHC:	Gp (Psychomotor Abilities)
Administration method:	Trained interviewer; clinical setting; guided play session; pen and paper
Procedure:	During a guided play session, the researcher noted whether the child could complete a series of tasks, e.g. whether the child could use a pencil on paper a little, build a tower of 3-7 blocks, throw a ball.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised DQ (0 - 100).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf775, cf781
Descriptives:	*Unadjusted score* N = 1,174 Range = 0 - 27 Mean = 19.611 SD = 2.35  *Age adjusted score* N = 1,167 Range = 64.38 - 133.71 Mean = 106.48 SD = 10.28 
Age of participants:	Mean = 79.90 weeks, SD = 1.47, Range = 76-87

Other sweep and/or cohort:	None
Source:	Griffiths, R. (1970). The abilities of young children. London*: Child Development Research Centre*.
Technical resources:	None
Reference examples:	- Little, R. E., Northstone, K., Golding, J., & ALSPAC Study Team. (2002). Alcohol, breastfeeding, and development at 18 months. *Pediatrics*, *109*(5), e72-e72. - Pearson, R. M., Heron, J., Melotti, R., Joinson, C., Stein, A., Ramchandani, P. G., & Evans, J. (2011). The association between observed non-verbal maternal responses at 12 months and later infant development at 18 months and IQ at 4 years: A longitudinal study. *Infant Behavior and Development*, *34*(4), 525-533.

5.2.6 The Griffiths Performance Scale

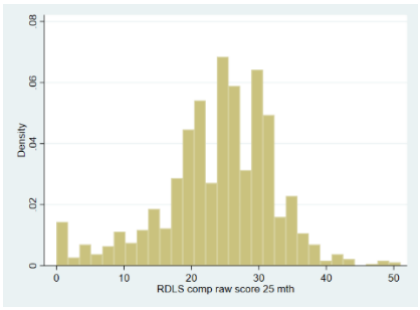
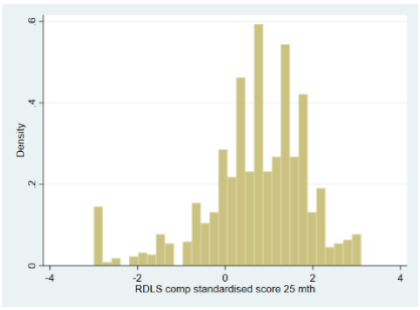
Domain:	Non-verbal ability
Measures:	Length estimation
CHC:	- Gv (Visual processing) - Gp (Psychomotor abilities)
Administration method:	Trained interviewer; clinical setting; guided play session
Procedure:	During a guided play session, the researcher presented the child with a series of boards and objects (insets) that could fit into shapes that were cut out of the boards. The researcher demonstrated how the insets fitted into the board, and the child was given the opportunity to copy. This was done with increased difficulty (increased number of holes and shapes in boards).
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/

Scoring:	Standardised DQ (0 - 100).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf776, cf782
Descriptives:	*Unadjusted score* N = 1,174 Range = 0 - 35 Mean = 21.14 SD = 3.10  *Age adjusted score* N = 1,142 Range = 64.38 - 135.45 Mean = 113.83 SD = 12.68 
Age of participants:	Mean = 79.90 weeks, SD = 1.47, Range = 76-87
Other sweep and/or cohort:	None
Source:	Griffiths, R. (1970). The abilities of young children. London*: Child Development Research Centre*.
Technical resources:	Griffiths, R. (1970). The abilities of young children. London*: Child Development Research Centre*.
Reference examples:	- Little, R. E., Northstone, K., Golding, J., & ALSPAC Study Team. (2002). Alcohol, breastfeeding, and development at 18 months. *Pediatrics*, *109*(5), e72-e72. - Hibbeln, J. R., Davis, J. M., Steer, C., Emmett, P., Rogers, I., Williams, C., & Golding, J. (2007). Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. *The Lancet*, *369*(9561), 578-585.

5.3 Children in Focus Clinic (Age 2)

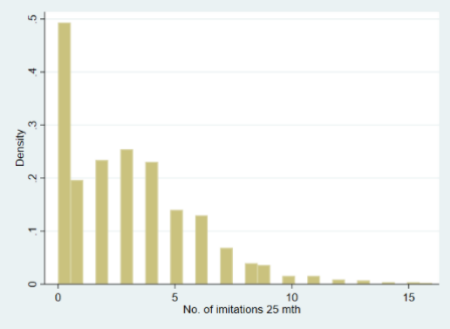
5.3.1 The Reynell Developmental Language Scale

Domain:	Language ability	
Measures:	- Language development - Verbal/lexical comprehension - Listening ability	
CHC:	Gc (Crystallized Intelligence)	
Administration method:	Trained interviewer; clinical setting; guided play session	
Procedure:	During a guided play session, the child was presented with a set of toys and asked to carry out a series of tasks of increasing complexity. First, the child was asked to select a specific toy (e.g. "Where is the horse?"). Next the child was asked to manipulate the toy in increasingly complex ways in order to demonstrate understanding, e.g. "Put the spoon in the cup", "Put the white button underneath the cup".	
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/	
Scoring:	Raw (0 - 55) and standardised (-11 - 3) scores are available, with the standardised score reflecting how well the children performed in comparison with other children at age 2 years (mean = 0, SD = +/- 1).	
Item-level variable(s):	Not readily available.	
Total score/derived variable(s):	cf421 - cf424	
Descriptives:	N = 1,109 Range = 0 - 51 Mean = 23.90	N = 1,085 Range = -3 - 3.1 Mean = 0.69

	SD = 8.44 SD = 1.17  
Age of participants:	Mean = 108.24 weeks, SD =0.98, Range = 106 - 115
Other sweep and/or cohort:	ALSPAC (Age 5 years/61 months)
Source:	Reynell, J., & Curwen, M. P. (1977). *Manual for the Reynell developmental language scales (revised)*. NFER.
Technical resources:	Reynell, J. K., & Gruber, C. P. (1997). *Reynell developmental language scales*. Western Psychological Services.
Reference examples:	- Roulstone, S., Loader, S., Northstone, K., & Beveridge, M. (2002). The speech and language of children aged 25 months: Descriptive data from the Avon Longitudinal Study of Parents and Children. *Early Child Development and Care*, *172*(3), 259-268. - Clegg, J., Law, J., Rush, R., Peters, T. J., & Roulstone, S. (2015). The contribution of early language development to children's emotional and behavioural functioning at 6 years: an analysis of data from the Children in Focus sample from the ALSPAC birth cohort. *Journal of Child Psychology and Psychiatry*, *56*(1), 67-75.

5.3.2 Object Naming Assessment

Domain:	Verbal knowledge (expressive and spoken)
Measures:	- Speech and sound production - Oral production and fluency

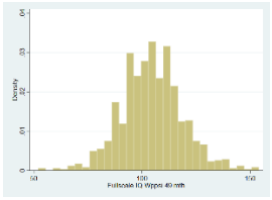
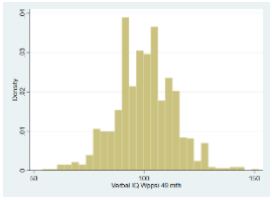
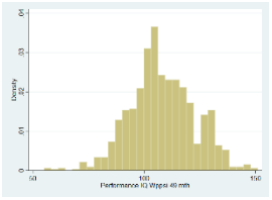
	- General verbal information
CHC:	Gc (Crystallised Intelligence)
Administration method:	Trained interviewer; clinical setting; guided play session
Procedure:	The tester chose an object from a box and asked the child to name it. If the child was reluctant, they were encouraged to choose an object themselves and name it. If a child failed to name an object after 3 requests, the tester named it clearly for the child, and encouraged imitation. The number of errors made by the child in each sound class was recorded and the percentage error calculated from those words attempted.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Number of imitations (0 - 16).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf428 - cf435
Descriptives:	*Number of imitations* N = 1,099 Range = 0 - 16 Mean = 2.97 SD = 2.83 
Age of participants:	Mean = 108.24 weeks, SD =0.98, Range = 106 - 115

Other sweep and/or cohort:	- MCS (age 3 and 5): similar object naming task involving pictures - BCS (children of cohort member, multi-age): similar object naming task involving pictures
Source:	Adapted from a similar procedure devised by Paden, Novak & Beiter (1987)
Technical resources:	None
Reference examples:	- Roulstone, S., Loader, S., Northstone, K., & Beveridge, M. (2002). The speech and language of children aged 25 months: Descriptive data from the Avon Longitudinal Study of Parents and Children. *Early Child Development and Care*, 172(3), 259-268.

5.4 Children in Focus Clinic (Age 4)

5.4.1 Wechsler Pre-school and Primary Scale of Intelligence - Revised (WPPSI -RUK)

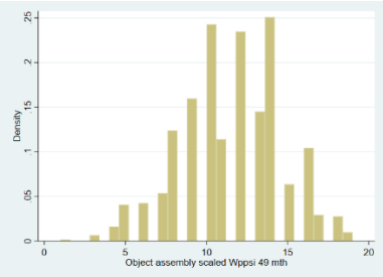
Domain:	- Verbal and non-verbal ability
Measures:	- Verbal ability - Non-verbal/performance ability
CHC:	G (general ability)
Administration method:	Trained interviewer; clinical setting
Procedure:	The WPPSI-R is a measure of cognitive functioning designed for children aged 3-7 years. It is comprised of two scales, verbal and performance (non-verbal), and each of these scales contains 5 subtests. The verbal subtests are: i) vocabulary, ii) similarities, iii) arithmetic, iv) information, v) comprehension. The performance subtests are: i) object assembly, ii) geometric design, iii) block design, iv) mazes, v) picture completion. Each subtest is described individually in the sections below. The WPPSI-R provides standard scores (M = 100, SD = 15), on verbal IQ, performance IQ and fullscale IQ. Scores on the individual subtests are standardised (M = 10, SD = 3). If fewer than 3 subtests were completed by the child,

	verbal, performance and fullscale IQ were not computed for that child. If 4 out of 5 subscales were completed on the verbal/performance scales, the mean of the 4 scales was substituted in for the missing 5th. This prorating strategy is a standard practice when using WPPSI-R. Raw scores are converted into scale scores using tables provided in the WPPSI-R manual.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M = 100, SD = 15).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf801 -cf813
Descriptives:	*Fullscale IQ* N = 1013 Range = 52 - 154 Mean = 104.36 SD = 14.17  *Verbal IQ* N = 1,013 Range = 54 - 152 Mean = 100.13 SD = 13.57  *Performance IQ* N = 1,016 Range = 55 - 151 Mean = 107.98 SD = 14.56 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207 - 221
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment*. John Wiley & Sons Inc.

Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

5.4.2 Object Assembly (WPPSI -RUK)

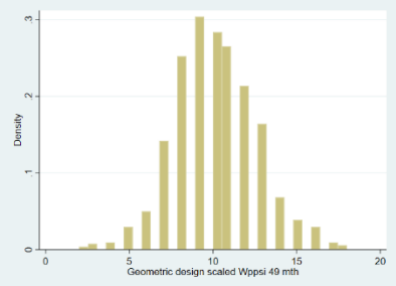
Domain:	Non-verbal reasoning
Measures:	- Spatial visualization - Non-verbal reasoning - Simultaneous processing - visual-motor coordination - Dexterity - Non-verbal concept formation
CHC:	- Gf (Fluid intelligence) - Gs (Processing speed)
Administration method:	Trained interviewer; clinical setting; physical task
Procedure:	The child was presented with the pieces of a puzzle in a standard arrangement and was asked to fit the pieces together to form a meaningful whole within 90 seconds. A total of six trials were administered. The child was assisted if they did not correctly complete the first puzzle (not scored). For the first two puzzles, the interviewer could prompt the child with phrase “now hurry”, as young children often struggle to grasp the concept of being timed. Points were awarded for the correct number of junctures (where two pieces join), with bonus points added for correctly completed trials. Raw scores were converted into scale scores using tables provided in the WPPSI-R manual.

Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M = 10, SD = 3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf801
Descriptives:	N = 1,023 Range = 1 - 19 Mean = 11.42 SD = 3.11 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207-221
Other sweep and/or cohort:	ALSPAC (age 8.5)
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R.* Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment*. John Wiley & Sons Inc.
Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8

	years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

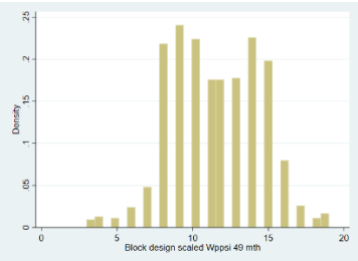
5.4.3 Geometric Design (WPPSI -RUK)

Domain:	Non-verbal ability
Measures:	- Visual recognition - Spatial visualisation - Visual organisation - Visual-motor coordination - Fine-motor ability/finger dexterity - Simultaneous processing
CHC:	Gv (Visual Processing)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was presented with a stimulus booklet, and pen and paper. The subtest contains two sections: i) first, they were asked to match a pictured design from an array of four designs (items 1-8 in picture booklet) and ii) they were required to copy a geometric figure from a printed model (items 9-16 in picture booklet). Encouragement (e.g. “do your best”), but no assistance, was provided. There was no fixed time limit for this subtest. The first 8 items were scored at one point each, the last eight items were worth 4 points for a total raw score of 57 points.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M = 10, SD = 3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf802

Descriptives:	N = 1,018 Range = 2 - 18 Mean = 10.11 SD = 2.48 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207-221
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment*. John Wiley & Sons Inc.
Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

5.4.4 Block Design (WPPSI -RUK)

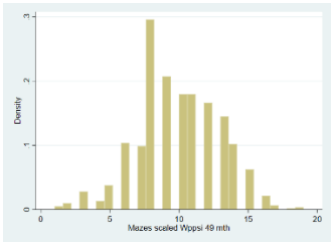
Domain:	Non-verbal ability
Measures:	- Planning - Spatial visualisation - Visual motor coordination

	- Simultaneous processing - Synthesis (part-whole relationships) - Non-verbal concept formation
CHC:	- Gf (Fluid intelligence) - Gs (Processing speed) - Gv (Visual processing)
Administration method:	Trained interviewer; clinical setting; physical task
Procedure:	The child was presented with an image or model that depicted a pattern, and was tasked with recreating the pattern with one- and two-colour blocks (white and red). The test contained 14 designs, and the child was allowed two attempts at each design. Points were awarded for completion, and bonus points were awarded based on time
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf803
Descriptives:	N = 1,013 Range = 3 - 19 Mean = 11.45 SD = 2.95 

Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207 - 221
Other sweep and/or cohort:	- ALSPAC (age 8.5) - MCS (age 5) BAS pattern construction - MCS (age 7) BAS pattern construction
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment*. John Wiley & Sons Inc.
Reference examples:	- Bornstein, M. H., Hahn, C. S., Bell, C., Haynes, O. M., Slater, A., Golding, J., ... & ALSPAC Study Team. (2006). Stability in cognition across early childhood: A developmental cascade. *Psychological Science*, *17*(2), 151-158. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

5.4.5 Mazes (WPPSI -RUK)

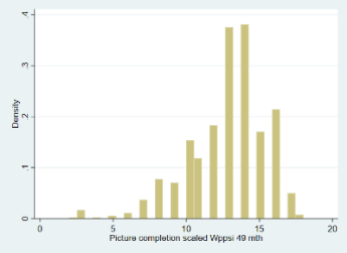
Domain:	Non-verbal ability
Measures:	- Planning - Simultaneous processing - Spatial visualisation - Visual-motor coordination - Spatial scanning
CHC:	Gv (Visual processing)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was presented with a series of mazes, and instructed to draw a pathway to the centre of each maze. For the first two mazes, the interviewer demonstrated by drawing half of the line.

	When necessary, the interviewer made use of several prompts to encourage the child to complete the mazes.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf804
Descriptives:	N = 1,013 Range = 1 - 19 Mean = 9.87 SD = 2.95 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207 - 221
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R.* Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment.* John Wiley & Sons Inc.
Reference examples:	- Bornstein, M. H., Hahn, C. S., Bell, C., Haynes, O. M., Slater, A., Golding, J., ... & ALSPAC Study Team. (2006). Stability in cognition across early childhood: A developmental cascade. *Psychological Science*, *17*(2), 151-158.

	- Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

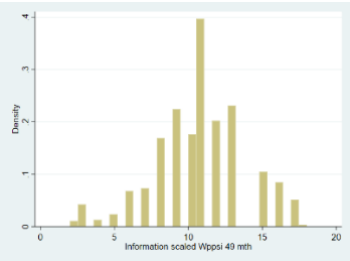
5.4.6 Picture Completion (WPPSI -RUK)

Domain:	Non-verbal visualisation
Measures:	- Simultaneous processing - Visual organisation - Visual recognition
CHC:	- Gv (Visual processing) - Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; child points to answer
Procedure:	The child was shown an image and then asked to point to or name the important missing part. For instance, a picture may have shown a person without an arm. Or, it might have shown a basketball game, complete with all the players, but with no ball. The child had 30 seconds to answer each item. Sample items (number differs with age) were provided to ensure the child understood the test. One point was awarded for each correct response within the time-limit.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf805
Descriptives:	N = 1,014 Range = 2 - 18

	Mean = 12.73 SD = 2.65 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207 - 221
Other sweep and/or cohort:	ALSPAC age 8.5
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R.* Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment.* John Wiley & Sons Inc.
Reference examples:	- Bornstein, M. H., Hahn, C. S., Bell, C., Haynes, O. M., Slater, A., Golding, J., ... & ALSPAC Study Team. (2006). Stability in cognition across early childhood: A developmental cascade. *Psychological Science*, *17*(2), 151-158. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

5.4.7 Information (WPPSI -RUK)

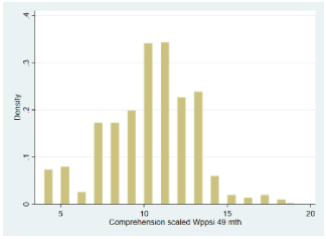
Domain:	Verbal ability
Measures:	- General verbal information - Verbal comprehension - Listening ability - Auditory/visual perception - Oral production and fluency

CHC:	Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; child points to answer, answers orally
Procedure:	This test consisted of two parts. For the first part of the test, the child was presented with 6 sets of four images. For each set of images, the child was asked to point to a particular image (e.g. "can you point to the duck"). If the child did not point to the correct picture for the first item, the interviewer demonstrated. The second part of the test consisted of verbal items, in which the child was asked general knowledge questions, e.g. "show me your foot."
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3)
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf806
Descriptives:	N = 1,021 Range = 2 - 18 Mean = 10.68 SD = 3.03 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207 - 221
Other sweep and/or cohort:	ALSPAC age 8.5

Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R.* Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment.* John Wiley & Sons Inc.
Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

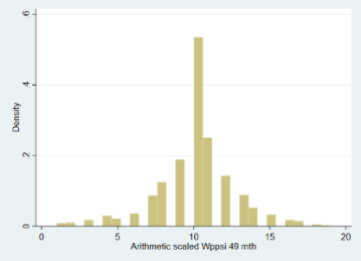
5.4.8 Comprehension (WPPSI -RUK)

Domain	Verbal comprehension
Measures:	- Verbal comprehension - Verbal reasoning - Verbal expression
CHC:	Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; responds orally
Procedure:	The child was asked a series of questions based on his or her understanding of general concepts, e.g. “Why do people brush their teeth?”, “Why can birds fly, but cats can’t?”. Interviewers could repeat questions if the child did not understand. Responses were scored on a 0 - 2 metric based on the content of their response. If the child spontaneously improved their answer, this was accepted.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3).

Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf807
Descriptives:	N = 1,006 Range = 4 - 19 Mean = 10.08 SD = 2.70 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207-221
Other sweep and/or cohort:	ALSPAC age 8.5
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R. Psychological Corporation*.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment*. John Wiley & Sons Inc.
Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

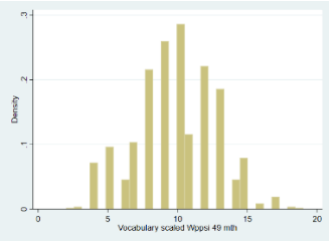
5.4.9 Arithmetic (WPPSI -RUK)

Domain:	Arithmetic ability
Measures:	- Numeric reasoning - Sequential processing
CHC:	Gq (Quantitative Knowledge)
Administration method:	Trained interviewer; clinical setting; pointing; questions and answers delivered orally
Procedure:	The test contained 23 items. For items 1-7, the child was asked to point to an object that illustrated a particular quantitative characteristic on a visually presented array of objects. For items 8-11 the child demonstrated numeric knowledge by counting and manipulating blocks. For items 12-23, the child solved arithmetic problems that were read aloud by the interviewer. There was a time-limit for each of questions 12-23. If the child held up the correct number of fingers to indicate a numeric response, this was accepted.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf808
Descriptives:	N = 1,015 Range = 1 - 19 Mean = 10.02 SD = 2.56

	
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207-221
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised. WPPSI-R*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment.* John Wiley & Sons Inc.
Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8 years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

5.4.10 Vocabulary (WPPSI -RUK)

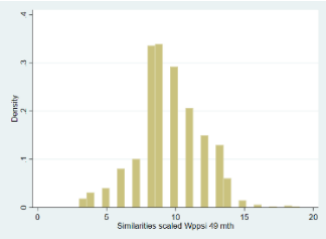
Domain:	Verbal ability
Measures:	- Verbal comprehension - Lexical knowledge - Long-term memory - Language development
CHC:	Gc (Crystallised intelligence)

Administration method:	Trained interviewer; clinical setting; pen and paper, oral response
Procedure:	The test contained both picture and verbal sections. The first three items consisted of arrays of pictures, and the child was asked to point to a particular image. If the child provided an incorrect answer on the first question, the interviewer pointed out the correct answer. The remaining items (4-25) consisted of words that the interviewer read aloud and asked the child to define. Items 1-3 were worth 1 point each, whereas items 4-25 are worth scored on a 0 - 2 point scale.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf809
Descriptives:	N = 1,006 Range = 2 - 19 Mean = 9.87 SD = 2.92 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207-221
Other sweep and/or cohort:	- ALSPAC Age 15

Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised.* WPPSI-R. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R Assessment*. John Wiley & Sons Inc.
Reference examples:	- Gathercole, S. E., Tiffany, C., Briscoe, J., Thorn, A., & ALSPAC team. (2005). Developmental consequences of poor phonological short-term memory function in childhood: A longitudinal study. *Journal of child Psychology and Psychiatry*, *46*(6), 598-611. - Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490.

5.4.11 Similarities (WPPSI -RUK)

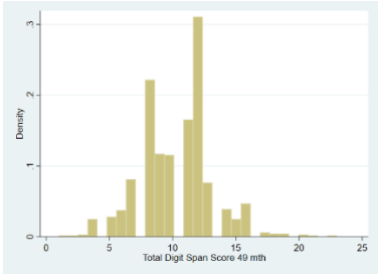
Domain:	Verbal ability
Measures:	- Verbal comprehension - Verbal reasoning - Language development
CHC:	- Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; oral response
Procedure:	This test consisted of two parts. First, the child was shown six pairs of images, and asked to state the similarity between the two. For the remaining items (7 - 20), the interviewer asked the child whether they knew how two different concepts were related, e.g. “In what way are red and blue alike?”. Items 1 - 12 were worth one point each, with the remaining items worth 0 - 2 points. If items 1, 7, or 13 were answered incorrectly, the interviewer demonstrated the correct answer.

Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf810
Descriptives:	N = 992 Range = 3 - 19 Mean = 9.53 SD = 2.40 
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207-221
Other sweep and/or cohort:	- BCS (age 10) word similarities - MCS (age 11) verbal similarities - ALSPAC (age 8.5) verbal similarities
Source:	Wechsler, D. (1989). *Wechsler Preschool and Primary Scale of Intelligence-Revised.* WPPSI-R. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Bornstein, M. H., Hahn, C. S., Bell, C., Haynes, O. M., Slater, A., Golding, J., ... & ALSPAC Study Team. (2006). Stability in cognition across early childhood: A developmental cascade. *Psychological Science*, *17*(2), 151-158. - Taylor, C. M., Kordas, K., Golding, J., & Emond, A. M. (2017). Data relating to prenatal lead exposure and child IQ at 4 and 8

	years old in the Avon Longitudinal Study of Parents and Children. *Neurotoxicology*, *62*, 224-230.

5.4.12 Short-term memory (Digit Span Test)

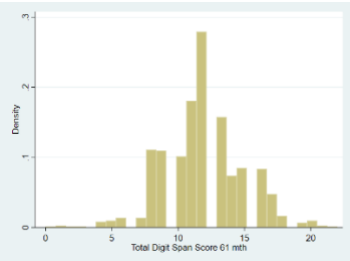
Domain:	Verbal memory
Measures:	- Short-term memory - Memory Span
CHC:	Gsm (Short-term memory)
Administration method:	Trained interviewer; clinical setting; questions answered orally
Procedure:	The child was presented with a spoken series of digits and asked to recall them immediately in sequence. A practice session was administered first. Sequence lists were then read aloud, beginning with a 2-number sequence. If the child correctly answered the first 3 lists of a particular sequence length, the length of the list was increased by one number. The outcome was the maximum digit span reached.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Max digit span reached (0 - 8).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf861
Descriptives:	N = 844 Range = 1 - 23 Mean = 10.36 SD = 2.88

	
Age of participants:	Mean = 212.39 weeks, SD = 1.63, Range = 207 - 221
Other sweep and/or cohort:	- ALSPAC (61 months) - NCDS (children of cohort member, multi-age) - BCS (age 10)
Source:	Gathercole, S. E., & Pickering, S. J. (2000). Assessment of working memory in six-and seven-year-old children. *Journal of Educational Psychology*, *92*(2), 377.
Technical resources:	None
Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490.

5.5 Children in Focus Clinic (Age 5)

5.5.1 Short-term memory (Digit Span Test)

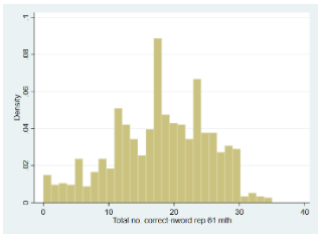
Domain:	Verbal memory
Measures:	- Short-term memory - Memory Span
CHC:	Gsm (Short-term memory)
Administration method:	Trained interviewer; clinical setting; questions answered orally

Procedure:	The child was presented with a spoken series of digits and asked to recall them immediately in sequence. A practice session was administered first. Sequence lists were then read aloud, beginning with a 2-number sequence. If the child correctly answered the first 3 lists of a particular sequence length, the length of the list was increased by one number. The outcome was the maximum digit span reached.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Max digit span reached (0 - 8).
Item-level variable(s):	cf870 - cf877
Total score/derived variable(s):	cf872
Descriptives:	N = 963 Range = 0 - 22 Mean = 11.91 SD = 2.96 
Age of participants (months):	Mean = 67.19, SD = 0.8, Range = 65-73
Other sweep and/or cohort:	- ALSPAC (49 months) - NCDS (children of cohort member, multi-age) - BCS (age 10)
Source:	Gathercole, S. E., & Pickering, S. J. (2000). Assessment of working memory in six-and seven-year-old children. *Journal of Educational Psychology*, *92*(2), 377.

Technical resources:	None
Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490.

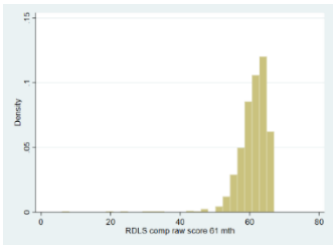
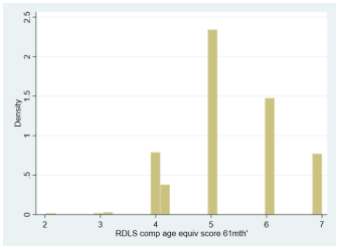
5.5.2 Short-term memory (Nonword Repetition)

Domain:	Verbal memory
Measures:	- Short-term memory - Memory Span
CHC:	Gsm (Short-term memory)
Administration method:	Trained interviewer; clinical setting; questions answered orally
Procedure:	The child was presented with 40 nonwords (10 each containing 2, 3, 4 and 5 syllables) played on an audio cassette recorder. The child was asked to repeat each item after it was played. The number of correctly repeated words at each syllable length was recorded.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Number of correct 2 - 5 syllable words (0 - 10) Total number of correct words (0 - 40)
Item-level variable(s):	cf470 - cf476
Total score/derived variable(s):	cf475
Descriptives:	N = 943 Range = 0 - 35

	Mean = 17.91 SD = 7.33 
Age of participants (months):	Mean = 67.19, SD = 0.8, Range = 65-73
Other sweep and/or cohort:	ALSPAC Age 8.5
Source:	Gathercole, S. E., & Baddeley, A. D. (1996). *The children's test of nonword repetition*. Pearson.
Technical resources:	None
Reference examples:	- Gathercole, S. E., Tiffany, C., Briscoe, J., Thorn, A., & ALSPAC team. (2005). Developmental consequences of poor phonological short-term memory function in childhood: A longitudinal study. *Journal of Child Psychology and Psychiatry*, *46*(6), 598-611. - Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490.

5.5.3 The Reynell Developmental Language Scale

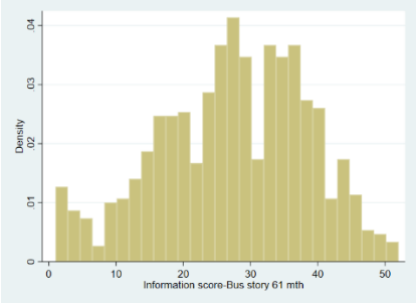
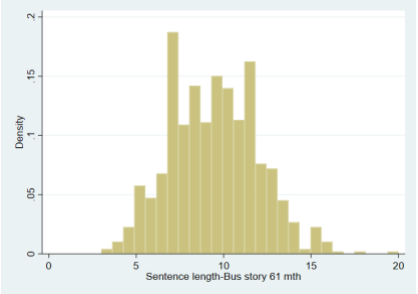
Domain:	Language ability
Measures:	- Language development - Verbal/lexical comprehension - Listening ability
CHC:	Gc (Crystallized Intelligence)

Administration method:	Trained interviewer; clinical setting; guided play session; questions answered orally
Procedure:	During a guided play session, the child was presented with a set of toys and asked to carry out a series of tasks of increasing complexity. First, the child was asked to select a specific toy (e.g. "Where is the horse?"). Next the child was asked to manipulate the toy in increasingly complex ways in order to demonstrate understanding, e.g. "Put the spoon in the cup", "Put the white button underneath the cup".
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Raw (0 - 55) and standardised (-11 - 3) scores are available, with the standardised score reflecting how well the children performed in comparison with other children at age 2 years (mean = 0, SD = +/- 1).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf463, cf464, cf465
Descriptives:	*Raw score* N = 985 Range = 6 - 67 Mean = 60.77 SD = 4.55  *Age equivalised score* N = 982 Range = 2.02 - 7 Mean = 5.33 SD = 0.95 
Age of participants (months):	Mean = 67.19, SD = 0.8, Range = 65-73

Other sweep and/or cohort:	ALSPAC (Age 2 years/25 months)
Source:	Reynell, J., & Curwen, M. P. (1977). *Manual for the Reynell developmental language scales (revised)*. NFER.
Technical resources:	Reynell, J. K., & Gruber, C. P. (1997). *Reynell developmental language scales*. Western Psychological Services.
Reference examples:	- Roulstone, S., Loader, S., Northstone, K., & Beveridge, M. (2002). The speech and language of children aged 25 months: Descriptive data from the Avon Longitudinal Study of Parents and Children. *Early Child Development and Care*, *172*(3), 259-268. - Clegg, J., Law, J., Rush, R., Peters, T. J., & Roulstone, S. (2015). The contribution of early language development to children's emotional and behavioural functioning at 6 years: an analysis of data from the Children in Focus sample from the ALSPAC birth cohort. *Journal of Child Psychology and Psychiatry*, *56*(1), 67-75.

5.5.4 Bus Story

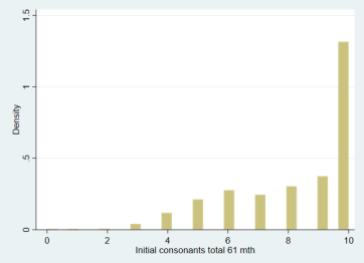
Domain:	Verbal expression
Measures:	- Language development - Verbal expression - Listening ability - Communication ability - Oral production and fluency
CHC:	- Gc (Crystallised Intelligence) - Glr (Long-Term Storage and Retrieval)
Administration method:	Trained interviewer; clinical setting; answered orally
Procedure:	The interviewer read aloud a story (accompanied with pictures) about a naughty bus. The child was then required to retell the story, using the pictures as support. The child's version was

	recorded, and scored for information content and sentence length.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Marks were awarded for information (0 - 55) and sentence length (0 - 20).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf466 - cf468
Descriptives:	*Information score* N = 823 Range = 1 - 52 Mean = 27.38 SD = 11.11  *Sentence length* N = 772 Range = 3 - 20 Mean = 9.45 SD = 2.53 
Age of participants (months):	Mean = 67.19, SD = 0.8, Range = 65 - 73
Other sweep and/or cohort:	None
Source:	Renfrew CE. Bus Story Test: A test of narrative speech. 4th edition. Winslow Press Ltd: UK 1997.
Technical resources:	None

Reference examples:	- Hughes, C., Dunn, J., & White, A. (1998). Trick or treat?: Uneven understanding of mind and emotion and executive dysfunction in “hard-to-manage” preschoolers. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *39*(7), 981-994. - Clegg, J., Law, J., Rush, R., Peters, T. J., & Roulstone, S. (2015). The contribution of early language development to children's emotional and behavioural functioning at 6 years: an analysis of data from the Children in Focus sample from the ALSPAC birth cohort. *Journal of Child Psychology and Psychiatry*, *56*(1), 67-75.

5.5.5 Initial Consonants Detection Test

Domain:	Reading ability
Measures:	- Reading decoding - Spelling ability
	Grw (Reading/Writing)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	Children were presented with 10 lists of three words, and were asked to identify which two of three words began with the same initial consonants. The number of correct responses was recorded.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Total number of correct word pairs selected (0 - 10)
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	cf445 -cf449
Descriptives:	N = 983 Range = 0 - 10 Mean = 8.27

	SD = 2.04 
Age of participants (months):	Mean = 67.19, SD = 0.8, Range = 65-73
Other sweep and/or cohort:	None
Source:	Byrne, Brian, and Ruth Fielding-Barnsley. "Recognition of phoneme invariance by beginning readers. "*Reading and Writing* 5, no. 3 (1993): 315-324.
Technical resources:	None
Reference examples:	- Gathercole, S. E., Tiffany, C., Briscoe, J., Thorn, A., & ALSPAC team. (2005). Developmental consequences of poor phonological short-term memory function in childhood: A longitudinal study. *Journal of child Psychology and Psychiatry*, *46*(6), 598-611. - Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490.

5.5.6 Multisyllabic Word Repetition

Domain:	Verbal repetition
Measures:	Verbal expression
CHC:	Unknown

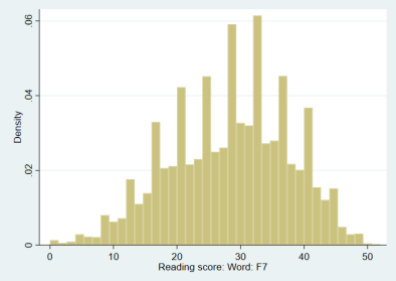
Administration method:	Trained interviewer; clinical setting; questions answered orally
Procedure:	Children were asked to repeat two multisyllabic words; “buttercup" and “dinosaur".
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Each word was scored as not correct/correct (0 - 1).
Item-level variable(s):	cf480 - cf485e
Total score/derived variable(s):	cf481, cf482, cf483
Descriptives:	NA.
Age of participants (months):	Mean = 67.19, SD = 0.8, Range = 65 - 73
Other sweep and/or cohort:	None
Source:	Devised specifically for ALSPAC.
Technical resources:	None
Reference examples:	None

5.6 Focus at 7 (Age 7.5 years)

5.6.1 Basic Reading

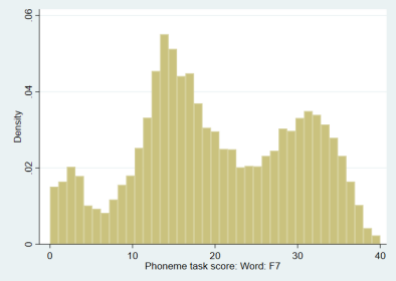
Domain:	Reading ability
Measures:	- General verbal information - Lexical knowledge

	- Reading decoding
CHC:	- Gc (Crystallised Intelligence) - Grw (Reading/Writing)
Administration method:	Trained interviewer; clinical setting; pointing/answers orally
Procedure:	Comprised of the basic reading subtest of the Wechsler objective reading dimensions (WORD; Wechsler, 1993). First, the child was shown a picture, with four words underneath. They were asked to point to the word that had the same beginning or ending sound as the picture. Second, they were shown a series of three pictures, each with four words beneath, and were asked to select the word that correctly matched the picture. Third, the child was asked to read aloud a list of 48 unconnected words that increased in difficulty. The reading task was stopped if the child made 6 consecutive errors. A total score was computed reflecting the number of items answered correctly.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Total number of correct items (0 - 50).
Item-level variable(s):	f7ws077 -f7ws083
Total score/derived variable(s):	f7ws076, f7ws076a
Descriptives:	N = 8,055 Range = 0 - 52 Mean = 28.22 SD = 9.34

	
Age of participants:	Mean = 90.5 months, SD =3.83, Range = 82-113
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1993). Wechsler objective reading dimensions. London*: The Psychological Corporation*.
Technical resources:	None
Reference examples:	- Gathercole, S. E., Tiffany, C., Briscoe, J., Thorn, A., & ALSPAC team. (2005). Developmental consequences of poor phonological short-term memory function in childhood: A longitudinal study. *Journal of Child Psychology and Psychiatry*, *46*(6), 598-611. - Meadows, S., Herrick, D., Feiler, A., & ALSPAC Study Team. (2007). Improvement in national test reading scores at Key Stage 1; grade inflation or better achievement?. *British Educational Research Journal*, *33*(1), 47-59.

5.6.2 Phoneme Deletion Task

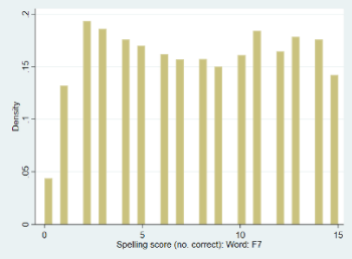
Domain:	Verbal ability (language repetition)
Measures:	- Spelling ability - Oral production and fluency - Communication ability
CHC:	- Gc (Crystallised Intelligence) - Grw (Reading/Writing)

Administration method:	Trained interviewer; clinical setting; answers orally
Procedure:	Children were presented with a word, and then asked to repeat the word, and then say it again with part of the word missing, e.g. 'sour' without the 's' = 'our'. The task began with 2 practice trials, followed by 40 test trials, each of which increased in difficulty. The number of correctly spoken items was recorded.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Correct items (0 - 40).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f7ws191 - f7ws220
Descriptives:	N = 8,074 Range = 0 - 40 Mean = 20.05 SD = 9.53 
Age of participants:	Mean = 90.5 months, SD =3.83, Range = 82 - 113
Other sweep and/or cohort:	None
Source:	Rosner, J., & Simon, D. P. (1971). The auditory analysis test: An initial report. *Journal of Learning disabilities*, *4*(7), 384-392.

Technical resources:	None
Reference examples:	- Powers, N. R., Eicher, J. D., Butter, F., Kong, Y., Miller, L. L., Ring, S. M., ... & Gruen, J. R. (2013). Alleles of a polymorphic ETV6 binding site in DCDC2 confer risk of reading and language impairment. *The American Journal of Human Genetics*, *93*(1), 19-28. - Eicher, J. D., Powers, N. R., Miller, L. L., Mueller, K. L., Mascheretti, S., Marino, C., ... & Pennington, B. F. (2014). Characterization of the DYX2 locus on chromosome 6p22 with reading disability, language impairment, and IQ. *Human genetics*, *133*(7), 869-881.

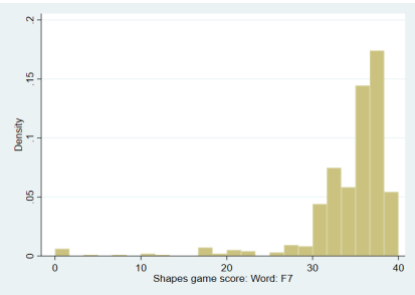
5.6.3 Spelling Task

Domain:	Verbal ability (spelling)
Measures:	Spelling ability
CHC:	Grw (Reading/Writing)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	Based on a pilot study of several hundred children (Peter Bryant and Terezinha Nunes, Personal Communication). The interviewer asked the child to spell 15 words, both regular and irregular, that increased in difficulty. For each word, the interviewer i) read it aloud, and ii) used it in a sentence. The child was asked to write down the correct spelling of the word.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	The main score was calculated by summing the correct number of items (0 - 15).
Item-level variable(s):	Not readily available.

Total score/derived variable(s):	f7ws116 -f7ws122.
Descriptives:	N = 7,912 Range = 0 - 15 Mean = 7.82 SD = 4.38 
Age of participants:	Mean = 90.5 months, SD =3.83, Range = 82-113
Other sweep and/or cohort:	ALSPAC age 9
Source:	(Peter Bryant and Terezinha Nunes, Personal Communication)
Technical resources:	None
Reference examples:	- Paracchini D Phil, S., Steer, C. D., Buckingham, L. L., Morris, A. P., Ring, S., Scerri D Phil, T., ... & Monaco, A. P. (2008). Association of the KIAA0319 dyslexia susceptibility gene with reading skills in the general population. *American Journal of Psychiatry*, 165(12), 1576-1584. - Schoemaker, M. M., Lingam, R., Jongmans, M. J., van Heuvelen, M. J., & Emond, A. (2013). Is severity of motor coordination difficulties related to co-morbidity in children at risk for developmental coordination disorder? *Research in Developmental Disabilities*, 34(10), 3084-3091.

5.6.4 Letter Decision Task

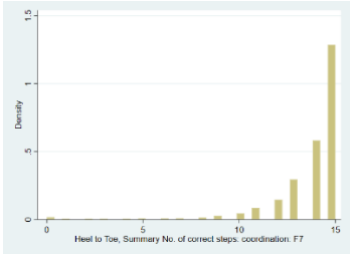
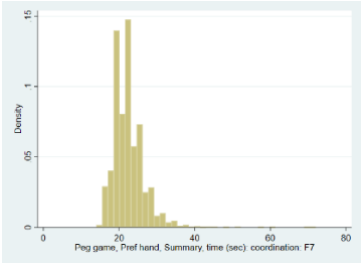
Domain:	Visual scanning

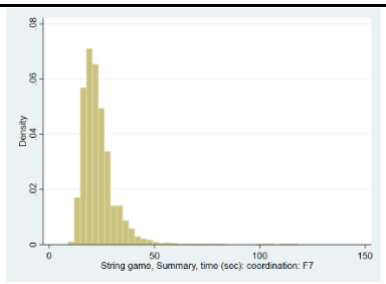
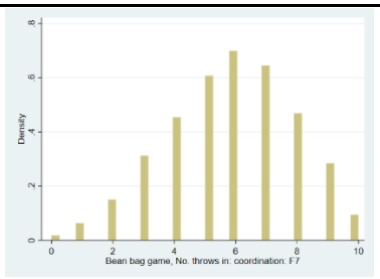
Measures:	- Visual scanning - Visual processing
CHC:	- Gs (Processing Speed) - Gv (Visual Processing)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was presented with a series of shapes, half of which were real letters, and half which were non-letters (including reversed letters). They were instructed to go through the list, placing a tick next to genuine letters and a cross next to non-letters. The speed of completion was recorded. This test was completed only by children who had struggled with other tasks, and thus the sample is considerably biased.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	The main score was the number of correct responses (0 - 40).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f7ws300 -f7ws348
Descriptives:	N = 586 Range = 0 - 40 Mean = 34.19 SD = 5.71 

Age of participants:	Mean = 90.5 months, SD =3.83, Range = 82-113
Other sweep and/or cohort:	None
Source:	(Gathercole & Baddeley, 1997, personal communication)
Technical resources:	None
Reference examples:	None

5.6.5 Motor Ability Task

Domain:	Motor skills
Measures:	- Motor skills - Manual dexterity - Balance
CHC:	Gp (Psychomotor abilities)
Administration method:	Trained interviewer; clinical setting; physical tasks
Procedure:	Motor ability was assessed using the Movement-assessment battery for children (Henderson & Sugden, 1992). The three following sub-tests were administered: i) manual dexterity (placing pegs and threading lace), ii) ball skills (bean bags), and iii) balance (heel toe walking). For the pegs task, the child had to insert 12 pegs, one at a time, into a peg board. This was done using the preferred and non-preferred hand, and the time taken for each was recorded. For the threading lace task, the child was asked to thread a lace through holes in a wooden board. The task was demonstrated by the interviewer, and a practice trial was performed. The time taken to complete the task was recorded. For the ball skills task, the child was tasked with throwing a bean bag (underarm) into a box, which was placed 6 feet away from the child. After demonstrations and five practice throws, the number

	of successful throws out of 10 were recorded. For the balance (heel-toe) task, the child was asked to walk along a taped straight line, without leaving any gaps between their heel and toe. The child was scored on the total number of "successful" steps taken.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	- 0 - 72 seconds (peg game) - 0 - 118 seconds (threading lace) - 0 - 10 (bean bag) - 0 - 15 (heel-toe)
Item-level variable(s):	f7cr015 - f7cr331
Total score/derived variable(s):	f7cr500 - f7cr502
Descriptives:	*Heel-toe* N = 7,305 Range = 0 - 15 Mean = 13.79 SD = 2.08  *Peg game* N = 7,256 Range = 14 - 72 Mean = 22.54 SD = 3.98  *Threading lace* N = 6,658 Range = 9 - 118 Mean = 23.32 SD = 8.20 *Bean bag* N = 7,314 Range = 0 - 10 Mean = 5.82 SD = 2.07

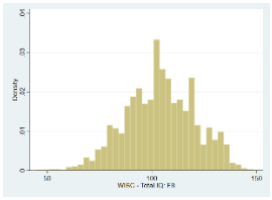
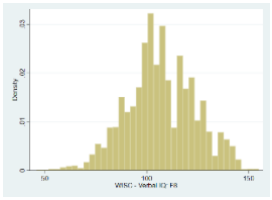
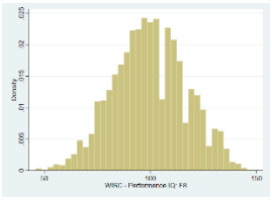
	 
Age of participants:	Mean = 90.5 months, SD =3.83, Range = 82-113
Other sweep and/or cohort:	None
Source:	Sheila, E. H., & David, A. S. (1992). Movement-assessment battery for children: manual. London*: The Psychological Corporation*.
Technical resources:	None
Reference examples:	- Lingam, R., Hunt, L., Golding, J., Jongmans, M., & Emond, A. (2009). Prevalence of developmental coordination disorder using the DSM-IV at 7 years of age: a UK population-based study. *Pediatrics*, *123*(4), e693-e700. - Green, D., Lingam, R., Mattocks, C., Riddoch, C., Ness, A., & Emond, A. (2011). The risk of reduced physical activity in children with probable Developmental Coordination Disorder: a prospective longitudinal study. *Research in Developmental Disabilities*, *32*(4), 1332-1342.

5.7 Focus at 8 (Age 8.5)

5.7.1 Wechsler Intelligence Scale for Children (WISC-III)

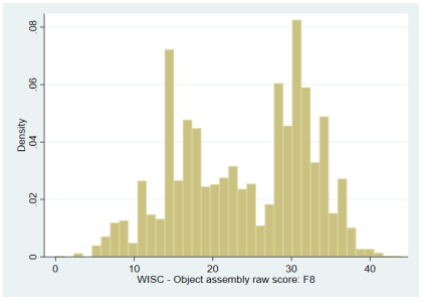
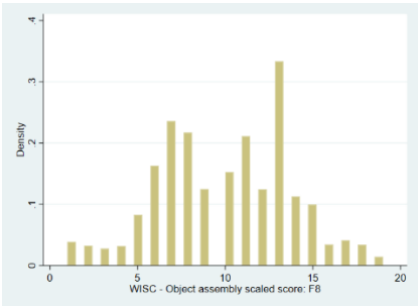
Domain:	Verbal and non-verbal ability
Measures:	- General cognitive ability - Verbal ability - Non-verbal/performance ability
CHC:	G (General ability)

Administration method:	Trained interviewer; clinical setting
Procedure:	The WISC-III is a measure of cognitive functioning designed for children aged 6-17 years. It is comprised of two scales, verbal and performance (non-verbal), and each of these scales contains 5 subtests. The verbal subtests are: i) vocabulary, ii) similarities, iii) arithmetic, iv) information, v) comprehension. The performance subtests are: i) object assembly, ii) coding, iii) block design, iv) picture arrangement, v) picture completion. Each subtest is described individually in the sections below. A short-form measure of the WISC was administered to reduce burden/fatigue on the children (with the exception of the coding test which was administered in full). Scores from this short-form version can be transformed to approximate scores on the full version as follows; multiplying by 2 scores for picture completion, information, arithmetic, vocabulary, comprehension and picture arrangement; multiplying by 5/3 for similarities; and multiplying by 3/2 for object assembly and block design. The WISC-III provides standard scores (M = 100, SD = 15), on verbal IQ, performance IQ and fullscale IQ. Scores on the individual subtests are standardised (M = 10, SD = 3). Raw scores are converted into scale scores using tables provided in the WISC-III manual. If fewer than 3 subtests were completed by the child, verbal, performance and fullscale IQ were not computed for that child. If 4 out of 5 subscales were completed on the verbal/performance scales, the mean of the 4 scales was substituted in for the missing 5th. This prorating strategy is a standard practice when using WISC-III.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M = 100, SD = 15).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws020 - f8ws155

Descriptives:	*Total IQ* N = 7,348 Range = 45 - 151 Mean = 103.97 SD = 16.53  *Verbal IQ* N = 7,379 Range = 46 - 155 Mean = 106.95 SD = 16.79  *Performance IQ* N = 7,371 Range = 46 - 151 Mean = 99.46 SD = 17.12 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89 - 127
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628. - Bornstein, M. H., Hahn, C. S., & Wolke, D. (2013). Systems and cascades in cognitive development and academic achievement. *Child Development*, 84(1), 154-162.

5.7.2 Object Assembly (WISC-III)

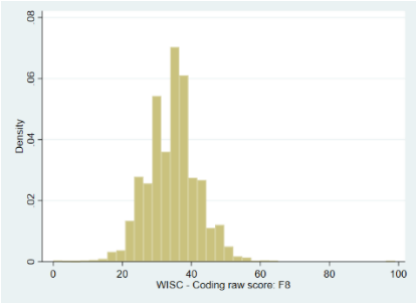
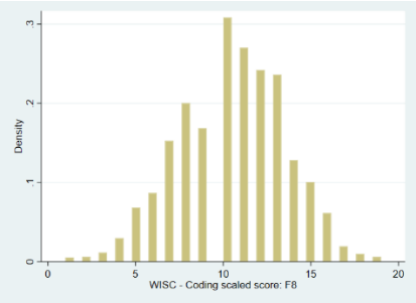
Domain:	Non-verbal reasoning
Measures:	- Spatial visualization - Non-verbal reasoning - Simultaneous processing - Visual-motor coordination - Dexterity - Non-verbal concept formation

Domain:	- Gf (Fluid intelligence) - Gs (Processing speed)
Administration method:	Trained interviewer; clinical setting; physical task
Procedure:	The child was presented with the pieces of a puzzle in a standard arrangement and was instructed to fit the pieces together to form a meaningful whole within 90 seconds. A total of six trials were administered. The examiner demonstrated using a sample puzzle before the test began. On the first puzzle, the examiner demonstrated the correct arrangement if the child failed to complete, however no second trial was given.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Scores consist of the correct number of junctures (where two pieces join), with bonus points added for correctly completed trials. Raw scores are converted into scale scores using tables provided in the WISC manual (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws030 -f8ws060
Descriptives:	*Raw score* N = 6,983 Range = 0 - 44 Mean = 23.96 SD = 8.40  *Scaled score* N = 6,984 Range = 1 - 19 Mean = 9.98 SD = 3.77 

Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	ALSPAC (Age 4)
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., ... & Zammit, S. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. *The British Journal of Psychiatry*, 193(3), 185-191. - Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628.

5.7.3 Coding (WISC-III)

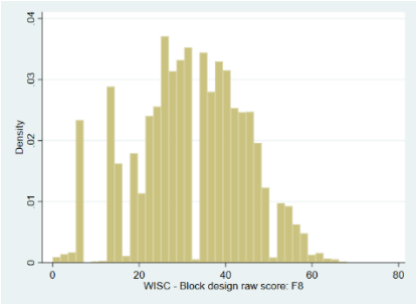
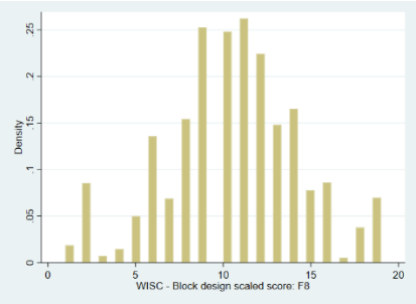
Domain:	Non-verbal sequencing
Measures:	- Visual-motor coordination/speed - Short-term visual memory - Cognitive flexibility - Visual sequencing - Concentration
CHC:	- Gv (Visual Processing) - Gs (Processing Speed)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was shown a key which contained geometric shapes, each of which was marked by a symbol. Next they were presented with rows and columns containing only the geometric shapes, and

	were tasked with marking each one with the appropriate symbol. Sample items were administered first. Duration: The actual trial lasted for 120 seconds.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correctly drawn symbol, and these were converted to standardised scores (M= 10, SD =3) using the WISC manual.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws027 -f8ws057
Descriptives:	*Raw score* N = 7,404 Range = 0 - 99 Mean = 34.52 SD = 7.45  *Scaled score* N = 7,403 Range = 1 - 19 Mean = 10.49 SD =3.04 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89 - 127
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.

Reference examples:	- Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., ... & Zammit, S. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. *The British Journal of Psychiatry*, 193(3), 185-191. - Bornstein, M. H., Hahn, C. S., & Wolke, D. (2013). Systems and cascades in cognitive development and academic achievement. *Child Development*, 84(1), 154-162.

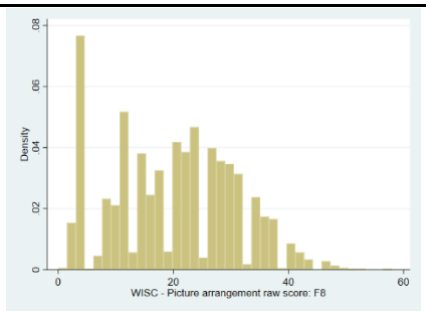
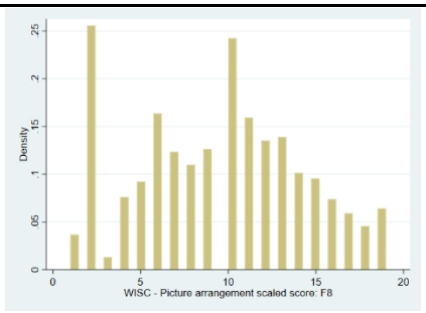
5.7.4 Block Design (WISC-III)

Domain:	Non-verbal ability
Measures:	- Planning - Spatial visualisation - Visual motor coordination - Simultaneous processing - Synthesis (part-whole relationships) - Non-verbal concept formation
CHC:	- Gs (Processing Speed) - Gv (Visual Processing)
Administration method:	Trained interviewer; clinical setting; physical task
Procedure:	The child was presented with an image or model that depicted a pattern, and was tasked with recreating the pattern with one- and two-colour blocks (white and red). The test contained 14 designs, and the child was allowed two attempts at each design. Points were awarded for completion, and bonus points were awarded based on time
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Raw scores were converted into scale scores using tables provided in the WISC manual (M= 10, SD =3).
Item-level variable(s):	Not readily available.

Total score/derived variable(s):	f8ws029 -f8ws059
Descriptives:	*Raw score* N = 7,324 Range = 0 - 68 Mean = 32.19 SD = 12.50  *Scaled score* N = 7,362 Range = 1 - 19 Mean = 10.53 SD = 3.81 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	- ALSPAC (Age 4) - MCS (age 5) BAS pattern construction - MCS (age 7) BAS pattern construction
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628. - Bornstein, M. H., Hahn, C. S., & Wolke, D. (2013). Systems and cascades in cognitive development and academic achievement. *Child Development*, 84(1), 154-162.

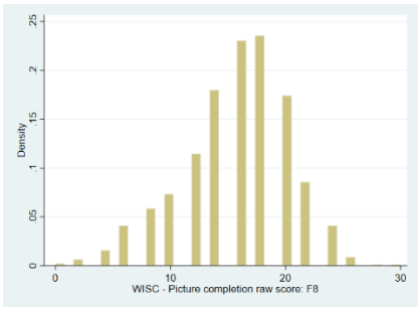
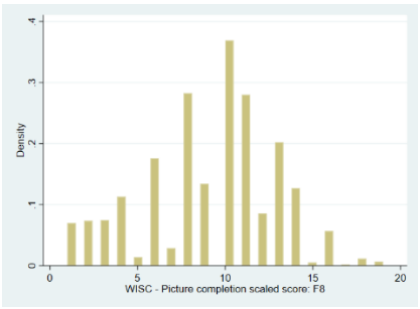
5.7.5 Picture Arrangement (WISC-III)

Domain:	Non-verbal reasoning
Measures:	- Sequential reasoning - Planning - Non-verbal reasoning - Social intelligence - Simultaneous processing
CHC:	- Crystallised intelligence (Gc) - Fluid intelligence (Gf) - Visual processing (Gv)
Administration method:	Trained interviewer; clinical setting; physical task
Procedure:	The child was presented with a set of cartoon images and was asked to arrange them in an order that made a sensible story. A sample item was administered prior to the full trial, which consisted of 14 sequences. Two trials were given for the first two items. For item 1 only, the examiner demonstrated the correct sequence if the child failed to do so.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Items 2-4 were worth 2 points each, with bonus points for completion time for items 3-14. Raw scores were converted into standardised scores (M= 10, SD =3) using the WISC manual.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws028 -f8ws058
Descriptives:	*Raw score* N = 7,308 Range = 0 - 58 Mean = 20.12 SD = 10.74 *Scaled score* N = 7,309 Range = 1 - 19 Mean = 9.41 SD = 4.77

	 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628. - Bornstein, M. H., Hahn, C. S., & Wolke, D. (2013). Systems and cascades in cognitive development and academic achievement. *Child Development*, 84(1), 154-162.

5.7.6 Picture Completion (WISC-III)

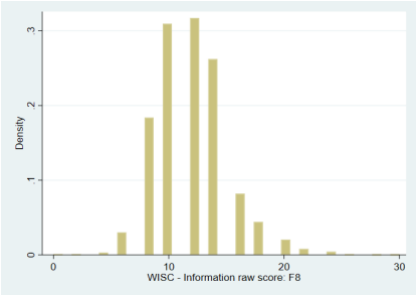
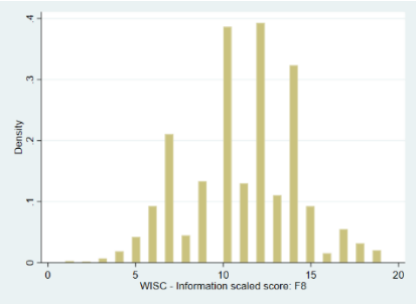
Domain:	Non-verbal visualisation
Measures:	- Simultaneous processing - Visual organisation - Visual recognition
CHC:	- Gv (Visual processing) - Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; child points to answer

Procedure:	The child was shown an image and then asked to point to or name the important missing part. For instance, a picture might have shown a car with a missing wheel. The child had 30 seconds to answer each item. Sample items (number differs with age) were provided to ensure the child understood the test.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correct response within the time-limit. Raw scores were converted into scale scores using tables provided in the WISC manual (M = 10, SD = 3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws026 -f8ws056
Descriptives:	*Raw score* N = 7,372 Range = 0 - 30 Mean = 15.73 SD = 4.64  *Scaled score* N = 7,384 Range = 1 - 19 Mean = 9.10 SD = 3.71 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	ALSPAC (Age 4)
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.

Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., ... & Zammit, S. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. *The British Journal of Psychiatry*, 193(3), 185-191. - Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628.

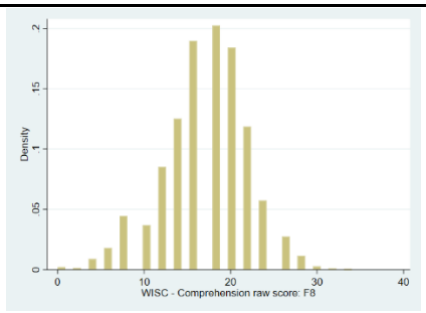
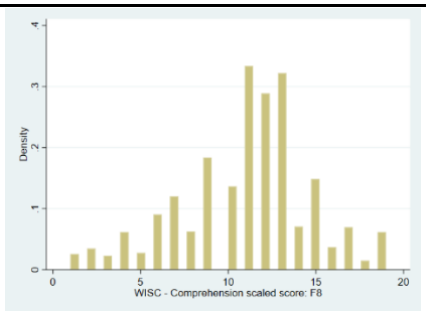
5.7.7 Information (WISC-III)

Domain:	Verbal ability
Measures:	- General verbal information - Verbal comprehension - Listening ability - Auditory/visual perception - Oral production and fluency
CHC:	Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; child points to answer
Procedure:	This test consisted of oral, 'general knowledge' questions. One point was awarded for each correct answer.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Raw scores were converted into scale scores using tables provided in the WISC manual (M= 10, SD =3)
Item-level variable(s):	Not readily available.

Total score/derived variable(s):	f8ws020 -f8ws050
Descriptives:	*Raw score* N = 7,389 Range = 0 - 30 Mean = 11.88 SD = 3.13  *Scaled score* N = 7,409 Range = 1 - 19 Mean = 11.08 SD = 3.12 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	ALSPAC (Age 4)
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., ... & Zammit, S. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. *The British Journal of Psychiatry*, 193(3), 185-191. - Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628.

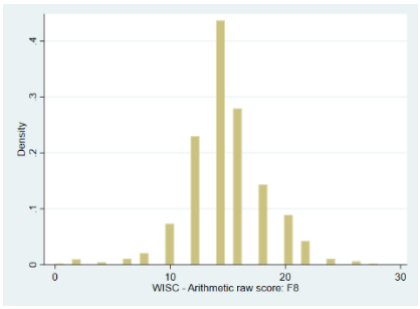
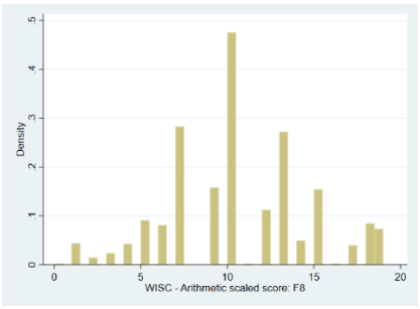
5.7.8 Comprehension (WISC-III)

Domain:	Verbal comprehension
Measures:	- Verbal comprehension - Verbal reasoning - Verbal expression
CHC:	Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; child answers orally
Procedure:	The child was asked a series of questions based on his or her understanding of general concepts, e.g. “Why do people brush their teeth?”, “Why can birds fly, but cats can’t?”. Interviewers were allowed to repeat questions if the child did not understand. Responses were scored on a 0 - 2 metric. If the child spontaneously improved their answer, this was accepted.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Responses were scored on a 0 - 2 metric. Raw scores were converted into scale scores using tables provided in the WISC manual (M = 10, SD = 3)
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws024 -f8ws054
Descriptives:	*Raw score* N = 7,328 Range = 0 - 34 Mean = 17.13 SD = 4.77 *Scaled score* N = 7,334 Range = 1 - 19 Mean = 10.98 SD = 3.71

	 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	ALSPAC (Age 4)
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., ... & Zammit, S. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. *The British Journal of Psychiatry*, 193(3), 185-191. - Bornstein, M. H., Hahn, C. S., & Wolke, D. (2013). Systems and cascades in cognitive development and academic achievement. *Child Development*, 84(1), 154-162.

5.7.9 Arithmetic (WISC-III)

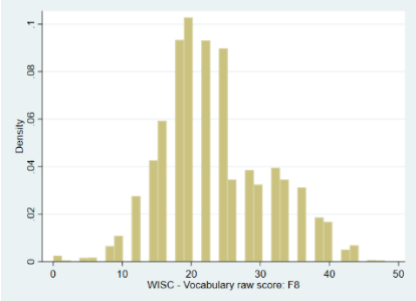
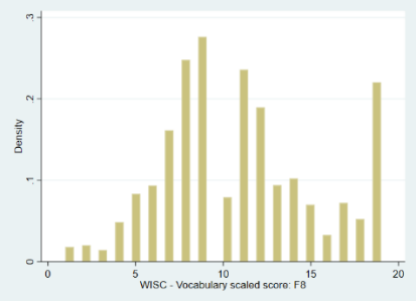
Domain:	Arithmetic
Measures:	- Numeric reasoning - Sequential processing
CHC:	Quantitative Knowledge (Gq)
Administration method:	Trained interviewer; clinical setting; pen and paper/oral answers
Procedure:	The test contains 24 items. For items 1-5, the child responds orally to questions posed by the examiner that are related to picture

	stimuli. For items 6-18 the child solves problems that are read aloud by the examiner. For items 19-24 the child reads aloud problems that are written in a stimulus book, then proceeds to solve them.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Raw scores were converted into scale scores using tables provided in the WISC manual (M= 10, SD =3).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws022 -f8ws052
Descriptives:	*Raw score* N = 7,332 Range = 0 - 28 Mean = 14.77 SD = 3.45  *Scaled score* N = 7,393 Range = 0 - 19 Mean = 10.45 SD = 4.11 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89 - 127
Other sweep and/or cohort:	ALSPAC Age 4
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.

Reference examples:	- Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628. - Bornstein, M. H., Hahn, C. S., & Wolke, D. (2013). Systems and cascades in cognitive development and academic achievement. *Child Development*, 84(1), 154-162.

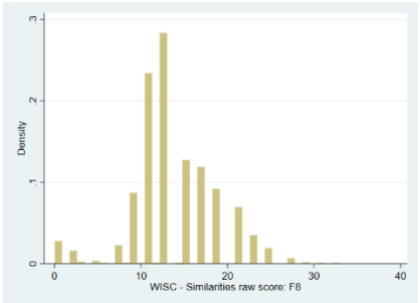
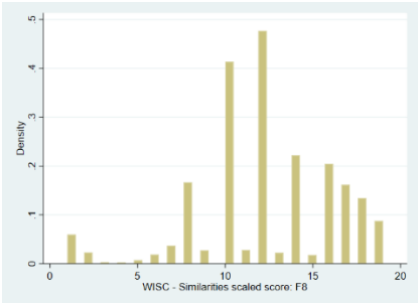
5.7.10 Vocabulary (WISC-III)

Domain	Verbal ability
Measures:	- Verbal comprehension - Lexical knowledge - Long-term memory - Language development
CHC:	Crystallised intelligence (Gc)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	The interviewer read aloud a list of words, asking the child to define each one in turn. Responses were scored on a 0 - 2 scale depending on the quality of response.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Responses were scored on a 0 - 2 scale depending on the quality of response. Raw scores were converted into scale scores using tables provided in the WISC manual (M = 10, SD = 3)
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws023 -f8ws053
Descriptives:	*Raw score* N = 7,371 *Scaled score* N = 7,376

	Range = 0 - 48 Mean = 23.30 SD = 7.87  Range = 1 - 19 Mean = 10.94 SD = 4.39 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89 - 127
Other sweep and/or cohort:	- NSHD Age 8 and 11 (similar tests) - BCS Age 10 (similar BAS task)
Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., ... & Zammit, S. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. *The British Journal of Psychiatry*, 193(3), 185-191. - Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628.

5.7.11 Similarities (WISC-III)

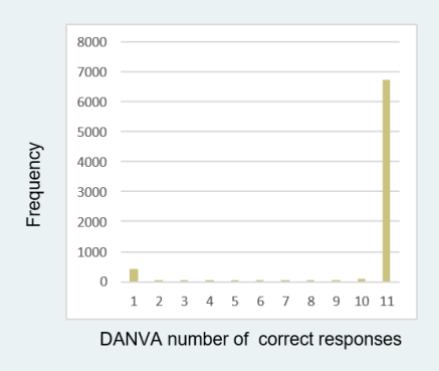
Domain:	Verbal ability
Measures:	- Verbal comprehension - Verbal reasoning - Language development

CHC:	- Gc (Crystallised intelligence)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	The interviewer asked the child whether they knew how two different things or concepts were related, e.g. “In what way are hope and fear alike?”.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Items 1-5 were worth one point each, with the remaining items worth 0 - 2 points. Raw scores were converted into scale scores using tables provided in the WISC manual (M = 10, SD = 3)
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f8ws021 -f8ws051
Descriptives:	*Raw score* N = 7,404 Range = 0 - 33 Mean = 13.86 SD = 4.91  *Scaled score* N = 7,409 Range = 1 - 19 Mean = 12.32 SD = 3.99 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89 - 127
Other sweep and/or cohort:	- ALSPAC (age 4; both verbal and picture similarities) - BCS (age 10) word similarities - MCS (age 11) verbal similarities

Source:	Wechsler, D. (1991). *WISC-III: Wechsler intelligence scale for children: Manual*. Psychological Corporation.
Technical resources:	Kaufman, A. S., & Lichtenberger, E. O. (2000). *Essentials of WISC-III and WPPSI-R assessment*. John Wiley & Sons Inc.
Reference examples:	- Horwood, J., Salvi, G., Thomas, K., Duffy, L., Gunnell, D., Hollis, C., ... & Zammit, S. (2008). IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. *The British Journal of Psychiatry*, 193(3), 185-191. - Northstone, K., Joinson, C., Emmett, P., Ness, A., & Paus, T. (2012). Are dietary patterns in childhood associated with IQ at 8 years of age? A population-based cohort study. *Journal of Epidemiology and Community Health*, 66(7), 624-628.

5.7.12 DANVA: Faces subtest

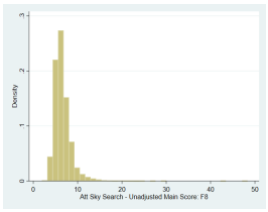
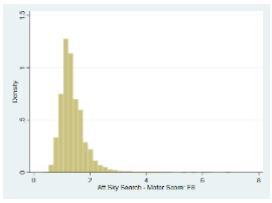
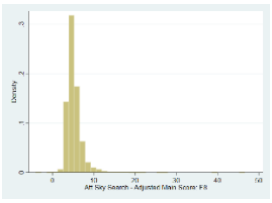
Domain:	Social cognition
Measures:	- Nonverbal social information processing - Nonverbal receiving ability - Nonverbal sending accuracy
CHC:	Gkn (General domain-specific knowledge)
Administration method:	Trained interviewer; clinical setting; CAPI
Procedure:	The child was sat in front of a computer screen, and the interviewer explained that they would be shown faces that depicted one of four emotions: happy, sad, angry, or fearful. The child was then shown 24 faces, each for approximately 2 seconds, and asked which of the four emotions corresponded to the faces. Faces were either high or low intensity (i.e. emotion was more or less obvious).
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/

Scoring:	The main outcome variable was the number of correct responses (0 - 24). In cases where there was only one missing value (N = 67), it was assumed the child scored correctly.
Item-level variable(s):	f8dv400 - f8dv446a
Total score/derived variable(s):	F8DV103
Descriptives:	N = 7303 Range = 0 - 24 Mean = 22.45 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89 - 127
Other sweep and/or cohort:	None
Source:	Nowicki, S., & Duke, M. P. (1994). Individual differences in the nonverbal communication of affect: The Diagnostic Analysis of Nonverbal Accuracy Scale. *Journal of Nonverbal Behavior*, *18*(1), 9-35.
Technical resources:	- Nowicki, S. (2000). Manual for the receptive tests of the Diagnostic Analysis of Nonverbal Accuracy 2. *Atlanta, GA: Department of Psychology, Emory University*. - http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Reference examples:	- Thompson, A., Sullivan, S., Heron, J., Thomas, K., Zammit, S., Horwood, J., ... & Harrison, G. (2011). Childhood facial emotion

	recognition and psychosis-like symptoms in a nonclinical population at 12 years of age: results from the ALSPAC birth cohort. *Cognitive Neuropsychiatry*, *16*(2), 136-157. - Barona, M., Kothari, R., Skuse, D., & Micali, N. (2015). Social communication and emotion difficulties and second to fourth digit ratio in a large community-based sample. *Molecular Autism*, *6*(1), 68.

5.7.13 TEA-Ch (the Test of Everyday Attention for Children): Sky Search

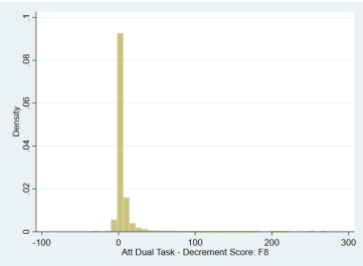
Domain:	Attention
Measures:	- Selective attention - Concentration - Mental speed - Visual scanning
CHC:	- Gs (Processing Speed) - Gps (Psychomotor Speed) - Gv (Visual Processing) - Gsm (Short-Term Memory)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was presented with an array of non-identical and identical spaceships, and was tasked with circling pairs of identical spaceships as quickly as possible, whilst trying to avoid any errors. The interviewer provided a demonstration, and the child worked through a practice sheet before commencing the test. After the practice sheet, the child was presented with a larger sheet and asked to do the same (20 identical pairs). The above task was then repeated, without the non-identical pairs of ships. The aim was to identify how quickly the child could complete the task, in order to control for motor performance.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Three summary scores are provided:

	i) unadjusted score: time taken (in seconds) for the search task divided by the number of spaceship pairs correctly circled ii) motor score: time in seconds for the motor task divided by number of correct pairs iii) The adjusted score is calculated by subtracting the motor score from the unadjusted score, thus controlling for motor speed iv) A normative score is also available, however the ALSPAC codebook recommends this is used with caution, as the original sample used to create the normative scores was small (N = ~100)
Item-level variable(s):	f8at003- f8at061
Total score/derived variable(s):	f8at061, f8at062, f8at065
Descriptives:	*Unadjusted score* N = 7,249 Range = 1.94 - 48.33 Mean = 6.58 SD = 2.07  *Motor score* N = 7,219 Range = 0.35 - 7 Mean = 1.37 SD =0.46  *Adjusted score* N = 7,184 Range = -4.05 - 46.58 Mean = 5.20 SD = 1.92 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89 - 127
Other sweep and/or cohort:	- ALSPAC Age 11
Source:	- Robertson, I. H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of normal human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society*, *2*(6), 525-534.

	- Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and ADHD performance. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(8), 1065-1081.
Technical resources:	- Heaton, S. C., Reader, S. K., Preston, A. S., Fennell, E. B., Puyana, O. E., Gill, N., & Johnson, J. H. (2001). The Test of Everyday Attention for Children (TEA-Ch): Patterns of performance in children with ADHD and clinical controls. *Child Neuropsychology*, *7*(4), 251-264.
Reference examples:	- Chandramouli, L., Steer, C. D., Ellis, M., & Emond, A. M. (2009). Effects of early childhood lead exposure on academic performance and behaviour of school age children. *Archives of Disease in Childhood*. - Odd, D. E., Emond, A., & Whitelaw, A. (2012). Long-term cognitive outcomes of infants born moderately and late preterm. *Developmental Medicine & Child Neurology*, *54*(8), 704-709.

5.7.14 TEA-Ch: Dividing Attention (Dual Task)

Domain:	Memory/Attention
Measures:	- Attention/concentration - Mental speed - Visual scanning - Selective attention - Working Memory - Auditory processing
CHC:	- Gsm (Short-Term Memory) - Gs (Processing Speed) - Gps (Psychomotor Speed) - Gv (Visual Processing) - Ga (Auditory Processing)

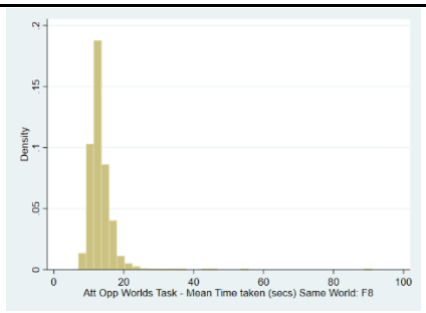
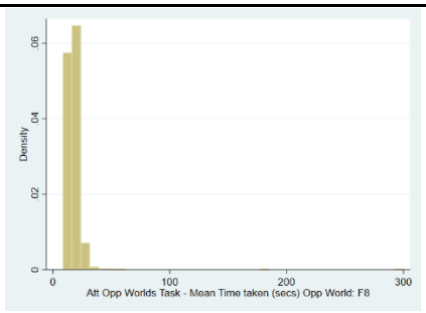
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The previous selective attention task was repeated, however this time, a number of computer spaceship noises (which varied in length) played throughout the task, and the child was asked to count these noises. This task was also preceded by a practice attempt. The following three aspects of the test were recorded: time taken to complete, ii) number of errors, iii) number of spaceship noises correctly counted.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	The overall score was calculated by dividing the time taken to complete the task by the number of correctly identified spaceships circled, and then dividing again by the number of spaceship noises correctly counted. A decrement score (f8at147) was also calculated by subtracting the selective attention task score prior to the adjustment for motor performance (f8at060) from the overall dual task score (f8at146), and this variable (f8at147) is recommended for use for researchers who are not overly familiar with the task.
Item-level variable(s):	f8at100 - f8at160
Total score/derived variable(s):	f8at148
Descriptives:	N = 7,224 Range = -34.09 - 270.88 Mean = 5.47 SD = 15.94 

Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	- ALSPAC Age 11
Source:	- Robertson, I. H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of normal human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society*, *2*(6), 525-534. - Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and ADHD performance. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(8), 1065-1081.
Technical resources:	- Heaton, S. C., Reader, S. K., Preston, A. S., Fennell, E. B., Puyana, O. E., Gill, N., & Johnson, J. H. (2001). The Test of Everyday Attention for Children (TEA-Ch): Patterns of performance in children with ADHD and clinical controls. *Child Neuropsychology*, *7*(4), 251-264.
Reference examples:	- Chandramouli, L., Steer, C. D., Ellis, M., & Emond, A. M. (2009). Effects of early childhood lead exposure on academic performance and behaviour of school age children. *Archives of Disease in Childhood*. - Odd, D. E., Emond, A., & Whitelaw, A. (2012). Long-term cognitive outcomes of infants born moderately and late preterm. *Developmental Medicine & Child Neurology*, *54*(8), 704-709.

5.7.15 TEA-Ch: Attentional Control (Opposite Worlds)

Domain:	Processing speed
Measures:	- Selective attention - Cognitive flexibility - Processing speed - Executive functions

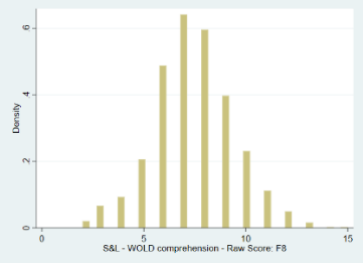
CHC:	- Gs (Processing Speed) - Gsm (Short-Term Memory)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	A form of Stroop task. The child was shown a trail made up of the numbers 1 and 2 (with 24 numbers in total). The tester pointed to each number, one after the other, and the child delivered responses based on two conditions. In the 'same world' (control) condition, they read the numbers out as they were, as quickly as possible. In the 'opposite world' condition, the child had to say the opposite number to the one that was pointed to. A demonstration of each condition and a practice attempt at were administered first. There were four test trials: a same world trial, followed by two opposite world trials and finishing with another same world trial.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Mean times for both same world and opposite world trials were calculated. A normative score is also available, however the ALSPAC codebook recommends this is used with caution, as the original sample used to create the normative scores was small (N = ~100).
Item-level variable(s):	f8at200 - f8at230
Total score/derived variable(s):	f8at228, f8at229
Descriptives:	*Same world* N = 7,208 Range = 7-91 Mean = 13.11 SD = 3.05 *Opposite world* N = 7,202 Range = 8.5-300 Mean = 17.46 SD = 5.65

	 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	ALSPAC Age 11
Source:	- Robertson, I. H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of normal human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society*, *2*(6), 525-534. - Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and ADHD performance. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(8), 1065-1081.
Technical resources:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Reference examples:	- Chandramouli, L., Steer, C. D., Ellis, M., & Emond, A. M. (2009). Effects of early childhood lead exposure on academic performance and behaviour of school age children. *Archives of Disease in Childhood*. - Odd, D. E., Emond, A., & Whitelaw, A. (2012). Long-term cognitive outcomes of infants born moderately and late preterm. *Developmental Medicine & Child Neurology*, *54*(8), 704-709.

5.7.16 Wechsler Objective Language Dimensions (WOLD): Listening Comprehension

Domain:	Verbal comprehension

Measures:	Listening comprehension
CHC:	- Crystallised intelligence (Gc) - Glr (Long-Term Storage and Retrieval)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	This task consisted of the second part of the listening comprehension subtest of the Wechsler Objective Language Dimensions (WOLD, Rust 1996). The tester read aloud a paragraph about a picture, and then the child was asked several questions about what they had heard. For example (taken from ALSPAC clinic documentation): "*Listen carefully.* *The kitten climbed up into the very highest branches of the tree. Amy called to the kitten to come down, but the kitten did not move. Amy started to climb the tree to get the kitten. "No, Amy," her grandfather said. "You don't need to climb up there. Your kitten will come down when it's ready."* *Why did Amy want to climb the tree?* *What reason did Amy's grandfather give her for not climbing the tree?*" The task was discontinued if the child got three consecutive answers wrong. Alternate items from the standard test were used, and items that were judged to be loaded towards American culture were not used.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	A raw score was calculated as the number of items the child got correct.
Item-level variable(s):	f8sl020 - f8sl036

Total score/derived variable(s):	f8sl040
Descriptives:	N = 7,377 Range = 2-15 Mean = 7.46 SD = 1.95 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	None
Source:	Rust, J. (1996). The manual of the Wechsler objective language dimensions (WOLD) UK Edition. London*: The Psychological Corporation*.
Technical resources:	None
Reference examples:	- Hameed, M. A., Lewis, A. J., Sullivan, S., & Zammit, S. (2013). Child literacy and psychotic experiences in early adolescence: findings from the ALSPAC study. *Schizophrenia research*, *145*(1-3), 88-94. - Paget, A., Parker, C., Heron, J., Logan, S., Henley, W., Emond, A., & Ford, T. (2018). Which children and young people are excluded from school? Findings from a large British birth cohort study, the Avon Longitudinal Study of Parents and Children (ALSPAC). *Child: Care, Health and Development*, *44*(2), 285-296.

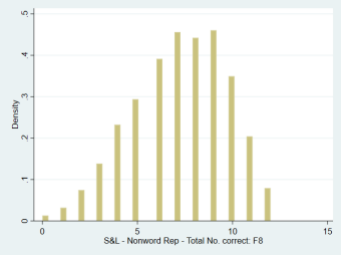
5.7.17 WOLD Oral Expression

Domain:	Verbal expression
Measures:	- Use of non-imitative expressive language - Descriptive skills - Narrative skills - Sequencing skills
CHC:	Crystallised intelligence (Gc)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	The WOLD has two subtests that measure expressive language, both of which were administered at age 8. In the first test, the child was shown a series of pictures and asked to describe them, with responses coded correct or incorrect The second part of the subtest consisted of three tasks: i) The child was presented with a picture of a scene, and asked to describe the scene to someone who has not and cannot see the picture. ii) The child was shown a map, and asked to give directions (shortest route possible) from one location to another iii) They were tasked with explaining the process of putting batteries into a torch using a series of picture-based instructions.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Responses were taped and coded for relevance, accuracy and logic (currently ongoing; only responses to the first sub-test are currently available).
Item-level variable(s):	f8sl050 - f8sl076

Total score/derived variable(s):	None
Descriptives:	Not available at time of writing.
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	None
Source:	Rust, J. (1996). The manual of the Wechsler objective language dimensions (WOLD) UK Edition. London*: The Psychological Corporation*.
Technical resources:	None
Reference examples:	- Taylor, A. E., Guthrie, P. A., Smith, G. D., Golding, J., Sattar, N., Hingorani, A. D., ... & Day, I. N. (2011). IQ, educational attainment, memory and plasma lipids: associations with apolipoprotein E genotype in 5995 children. *Biological psychiatry*, *70*(2), 152-158. - Hameed, M. A., Lewis, A. J., Sullivan, S., & Zammit, S. (2013). Child literacy and psychotic experiences in early adolescence: findings from the ALSPAC study. *Schizophrenia research*, *145*(1-3), 88-94.

5.7.18 Nonword Repetition (Short term memory)

Domain:	Verbal repetition
Measures:	Phonetic Coding
CHC:	- Gsm (Short term memory) - Ga (Auditory processing)
Administration method:	Trained interviewer; clinical setting; oral answers

Procedure:	The child was presented with 12 nonsense words, four each containing 3, 4 and 5 syllables. The words were played on a cassette recorder, and the child was asked to repeat each word after it was played.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	The number of correctly repeated items was scored for each child (0 - 12).
Item-level variable(s):	f8sl080 - f8sl105
Total score/derived variable(s):	f8sl105
Descriptives:	N = 7,361 Range = 0 - 12 Mean = 7.23 SD = 2.51 
Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	ALSPAC Age 5
Source:	Gathercole, S. E., & Baddeley, A. D. (1996). *The children's test of nonword repetition*. Pearson.
Technical resources:	None

Reference examples:	- Gathercole, S. E., Briscoe, J., Thorn, A., Tiffany, C., & ALSPAC Study Team. (2008). Deficits in verbal long-term memory and learning in children with poor phonological short-term memory skills. *The Quarterly Journal of Experimental Psychology*, *61*(3), 474-490. - Kormos, J., & Sáfár, A. (2008). Phonological short-term memory, working memory and foreign language performance in intensive language learning. *Bilingualism: Language and cognition*, *11*(2), 261-271.

5.7.19 Articulatory Skills

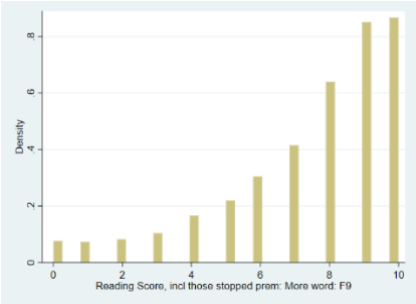
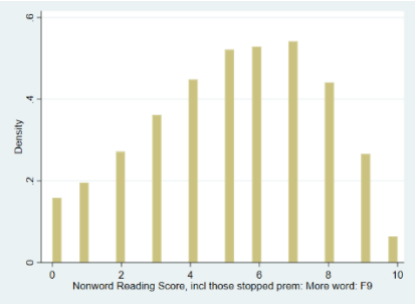
Domain:	Verbal (articulation)
Measures:	Diadochokinetic (DDK) rates
CHC:	Ga (Auditory Processing)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	This test involves the rapid repetition of sounds (syllables) within a given timeframe. The tester demonstrated; i.e. repeated a sound, syllable or series of syllables as quickly as possible for a short time. The child was then asked to repeat a series of sounds over a period of at least 10 seconds.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Number of correct repetitions within the time frame. Errors also recorded.
Item-level variable(s):	f8sl120 - f8sl170
Total score/derived variable(s):	None
Descriptives:	NA (for frequencies see ALSPAC documentation).

Age of participants:	Mean = 103.82 months, SD = 3.92, Range = 89-127
Other sweep and/or cohort:	None
Source:	Task designed specifically for study.
Technical resources:	None
Reference examples:	- Sullivan, S., Rai, D., Golding, J., Zammit, S., & Steer, C. (2013). The association between autism spectrum disorder and psychotic experiences in the Avon longitudinal study of parents and children (ALSPAC) birth cohort. *Journal of the American Academy of Child & Adolescent Psychiatry*, *52*(8), 806-814.

5.8 Focus at 9 (Age 9)

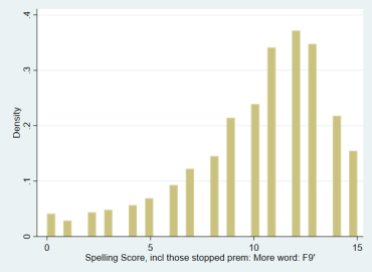
5.8.1 Word and Non-word Reading

Domain:	Reading ability
Measures:	- Verbal expression - Lexical knowledge - Pronunciation
CHC:	- Crystallised Intelligence (Gc) - Grw (Reading/Writing)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	This test consisted of 10 real words, and 10 nonwords. The words were presented to the child in a booklet and the child was asked to read aloud each word.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Number of correct words (0 - 10 real words; 0 - 10 nonwords).

Item-level variable(s):	f9mw020 - f9mw073
Total score/derived variable(s):	f9mw031, f9mw032, f9mw061, f9mw062
Descriptives:	*Verbal* N = 7,650 Range = 0 - 10 Mean = 7.49 SD = 2.49  *Non-verbal* N = 7,637 Range = 0 - 10 Mean = 5.20 SD = 2.50 
Age of participants:	Mean = 118.49 months, SD = 3.89, Range = 105-140
Other sweep and/or cohort:	None
Source:	Nunes, T., Bryant, P., & Olsson, J. (2003). Learning morphological and phonological spelling rules: An intervention study. *Scientific Studies of Reading*, *7*(3), 289-307.
Technical resources:	None
Reference examples:	- Bath, S. C., Steer, C. D., Golding, J., Emmett, P., & Rayman, M. P. (2013). Effect of inadequate iodine status in UK pregnant women on cognitive outcomes in their children: results from the Avon Longitudinal Study of Parents and Children (ALSPAC). *The Lancet*, *382*(9889), 331-337. - Hameed, M. A., Lewis, A. J., Sullivan, S., & Zammit, S. (2013). Child literacy and psychotic experiences in early adolescence: findings from the ALSPAC study. *Schizophrenia Research*, *145*(1-3), 88-94.

5.8.2 Spelling Task

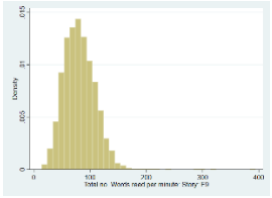
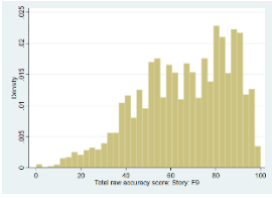
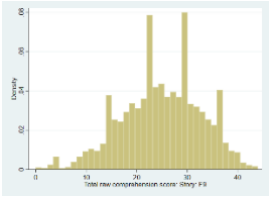
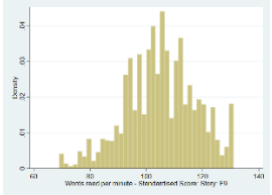
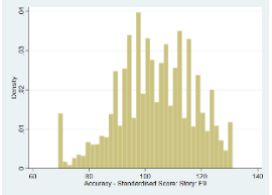
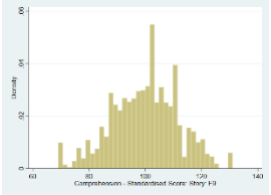
Domain:	Verbal (spelling)
Measures:	Spelling ability
CHC:	- Crystallised Intelligence (Gc) - Reading/Writing (Grw)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	Based on a pilot study of several hundred children (Peter Bryant and Terezinha Nunes, Personal Communication). The interviewer asked the child to spell 15 words, both regular and irregular, that increased in difficulty. For each word, the interviewer i) read it aloud, and ii) used it in a sentence. The child was asked to write down the correct spelling of the word. The main score was calculated by summing the correct number of items.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Number of correctly spelt words (0 - 15)
Item-level variable(s):	f9mw080 - f9mw103
Total score/derived variable(s):	f9mw097, f9mw098
Descriptives:	N = 7,633 Range = 0 - 15 Mean = 10.19 SD = 3.49

	
Age of participants:	Mean = 118.49 months, SD = 3.89, Range = 105 - 140
Other sweep and/or cohort:	ALSPAC age 7
Source:	(Peter Bryant and Terezinha Nunes, Personal Communication)
Technical resources:	None
Reference examples:	- Hibbeln, J., Gregory, S., Iles-Caven, Y., Taylor, C. M., Emond, A., & Golding, J. (2018). Total mercury exposure in early pregnancy has no adverse association with scholastic ability of the offspring particularly if the mother eats fish. *Environment International*, *116*, 108-115. - Khandaker, G. M., Stochl, J., Zammit, S., Lewis, G., & Jones, P. B. (2015). A population-based prospective birth cohort study of childhood neurocognitive and psychological functioning in healthy survivors of early life meningitis. *Annals of Epidemiology*, *25*(4), 236-242.

5.8.3 Neale Analysis of Reading Ability (NARA II)

Domain:	Verbal (reading ability)
Measures:	- Lexical Knowledge - Communication Ability - Verbal comprehension - Verbal expression - Reading speed - Reading decoding

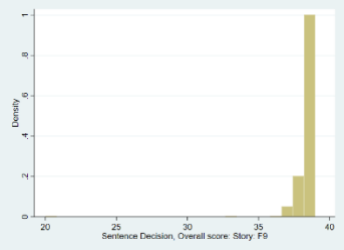
CHC:	- Gc (Crystallized Intelligence - Grw (Reading/Writing)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	The Neale Analysis of Reading Ability (NARA II) was used to assess reading comprehension. The child was presented with a booklet containing short passages of text (accompanied with illustrations). They were asked to read each passage and then asked a series of questions about the story they had just read. The test involved three stories of increasing difficulty (level 1-3). A practice trial was administered first, and if the child made more than 17 errors on the practice passage, they were not asked the comprehension questions and the tester moved straight on to the level one story. All other children moved on to the level two story unless the tester felt that they had particular difficulty with reading the practice passage. If the child made less than three errors on the level two story the tester proceeded to level three. If, however, the child made 3 or more errors on level two, the comprehension questions were administered but the tester moved down to the level one story. For the remaining test passages the child was not asked the comprehension questions if they made more than 16 errors (20 on level six) and the session was ended. The comprehension questions were asked as soon as the child had finished reading. For each question, the child was given 10 to 12 seconds to respond.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	The time taken, number of passages read, number of errors and comprehension scores were recorded. Standardised scores were calculated based on 1546 children (750 boys and 796 girls) in school years 1 to 7 in the UK (Neale, 1997).
Item-level variable(s):	f9sn700 - f9sn707a

Total score/derived variable(s):	f9sn800, f9sn801, f9sn802
Descriptives:	*Words per minute (raw)* N = 6,918 Range = 14-394 Mean = 80.69 SD = 27.71  *Accuracy (raw)* N = 6,937 Range = 0 - 100 Mean = 66.03 SD = 20.56  *Comprehension (raw)* N = 6,937 Range = 0 - 44 Mean = 24.95 SD = 7.84  *Words per minute (standardised)* N = 6,918 Range = 69 - 131 Mean = 105.10 SD = 12.55  *Accuracy (standardised)* N = 6,937 Range = 69 - 131 Mean = 103.64 SD = 13.68  *Comprehension (standardised)* N = 6,937 Range = 69 - 131 Mean = 99.86 SD = 11.90 
Age of participants:	Mean = 118.49 months, SD = 3.89, Range = 105 - 140
Other sweep and/or cohort:	None
Source:	Neale Analysis of Reading Ability-Revised: manual for schools, NFER-Nelson, Windsor, UK (1997)
Technical resources:	None
Reference examples:	- Paracchini D Phil, S., Steer, C. D., Buckingham, L. L., Morris, A. P., Ring, S., Scerri D Phil, T., ... & Monaco, A. P. (2008). Association of the KIAA0319 dyslexia susceptibility gene with reading skills in the general population. *American Journal of Psychiatry*, *165*(12), 1576-1584.

	- Bath, S. C., Steer, C. D., Golding, J., Emmett, P., & Rayman, M. P. (2013). Effect of inadequate iodine status in UK pregnant women on cognitive outcomes in their children: results from the Avon Longitudinal Study of Parents and Children (ALSPAC). *The Lancet*, *382*(9889), 331-337.

5.8.4 Sentence Decision Task

Domain:	Verbal (reading)
Measures:	- General (verbal) information comprehension - Reading comprehension - Reading decoding
CHC:	- Crystallized intelligence (Gc) - Reading/Writing (Grw)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	Administered primarily to children who greatly struggled with the NARA II. Children were presented with a series of 39 sentences, some of them describing something that is true (e.g. “Birds have wings”) and some of them describing things that are false (e.g. “Birds wear shoes”). The child was asked to read the sentence and indicate with a tick or a cross if they felt that the sentence was true or false. The child was shown two examples that had already been completed and was then given a further four as practice trials.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Total number of correct responses (0 - 39).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	f9sd060, f9sd072

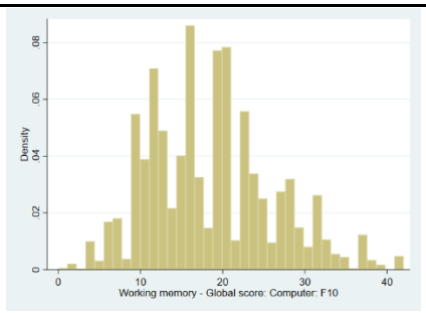
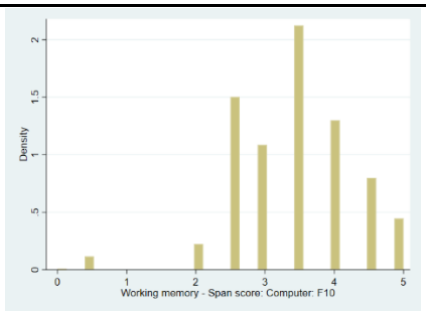
Descriptives:	N = 600 Range = 20 - 39 Mean = 38.71 SD = 0.95 
Age of participants:	Mean = 118.49 months, SD = 3.89, Range = 105-140
Other sweep and/or cohort:	None
Source:	Designed specifically for study.
Technical resources:	None
Reference examples:	Unknown

5.9 Focus 10+ (Age 10)

5.9.1 Working Memory (Counting Span Task)

Domain:	Short-term visual memory
Measures:	- Working memory - Simultaneous processing - Visual memory
CHC:	- Short-Term Memory (Gsm) - Visual Processing (Gv)
Administration method:	Trained interviewer; clinical setting; CAPI

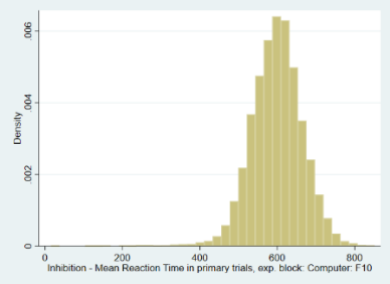
Procedure:	This test consisted of two components: the processing component, and the storage component. For the processing component, the child was presented with a number of red and blue dots on a white screen on the computer monitor. The child was asked to point to and count aloud the number of red dots. The child was shown: i) two practice sets of two screens, ii) three sets of two screens, iii) three sets of three screens, iv) three sets of four screens, and v) three sets of five screens. For the storage component, the child was asked to recall the number of red dots seen on each screen in the order they were presented within that set after each set. Every child worked through every set regardless of their overall performance.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	The child's working memory calculated (automatically by the computer programme) as the number of correctly recalled sets, weighted by the number of screens within each set, with a max score of 5 (i.e. all correct). Two scores are available: i) A Global score representing the number of trials the child got correct, ii) The Span score, the main outcome measure for this task as described above.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fdcm110, fdcm111
Descriptives:	*Global score* N = 7,007 Range = 0 - 42 Mean = 18.52 SD = 7.62 *Span score* N = 7,007 Range = 0 - 5 Mean = 3.41 SD = 0.84

	 
Age of participants:	Mean = 127.8 months, SD =3.18, Range = 118 - 147
Other sweep and/or cohort:	None
Source:	Case, R., Kurland, D. M., & Goldberg, J. (1982). Operational efficiency and the growth of short-term memory span. Journal of Experimental Child Psychology, 33(3), 386-404.
Technical resources:	None
Reference examples:	- Taylor, A. E., Guthrie, P. A., Smith, G. D., Golding, J., Sattar, N., Hingorani, A. D., ... & Day, I. N. (2011). IQ, educational attainment, memory and plasma lipids: associations with apolipoprotein E genotype in 5995 children. *Biological Psychiatry*, 70(2), 152-158. - Stautz, K., Pechey, R., Couturier, D. L., Deary, I. J., & Marteau, T. M. (2016). Do executive function and impulsivity predict adolescent health behaviour after accounting for intelligence? Findings from the ALSPAC cohort. *PloS One*, 11(8), e0160512.

5.9.2 Inhibition (Stop-Signal Task)

Domain:	Reaction time
Measures:	- Choice reaction time - Response inhibition
CHC:	Decision Speed/Reaction Time (Gt)

Administration method:	Trained interviewer; clinical setting; CAPI
Procedure:	Sitting in front of the computer monitor, the child was instructed to place their two index fingers in two stimulus boxes, labelled X and O respectively. Two types of trials were performed: primary task trials and stop signal trials. For the primary task, the child was asked to focus on a small smiley face presented in the centre of the computer screen. An X or O would then be presented on the screen and the child had to press the corresponding button as fast as possible. Thirty trials were administered (15 X's and 15 O's). A mean reaction time was calculated (this is used to calculate a tone delay used in subsequent trials; see below). The stop signal task was identical to the primary task except that a bleep (stop signal) was heard randomly after the X or O appeared (the go signal). If the bleep was not heard the child was asked to press the corresponding button according to what was presented on screen. When the bleep was sounded the child was told to refrain from pressing the response button, therefore inhibiting the stimulus response. The bleep sounded on random trials at 150 ms or 250 ms before the child's reaction time (as calculated in the Primary Task Trials). A total of 24 practice trials were administered, followed by 48 experimental trials (32 of which were without bleeps and 16 trails were with bleeps). For those children that were deaf or had severe hearing difficulties, a visual stop signal was used instead. For those children who could only use one hand, a one-handed stimulus box was used.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Mean reaction times across different conditions.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fdcm210 - fdcm222
Descriptives:	N = 6,970 Range = 15.36 - 851.23

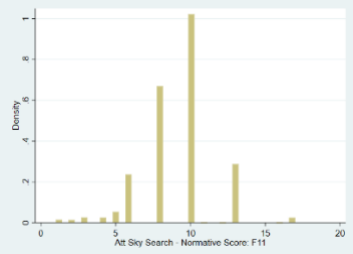
	Mean = 598.52 SD = 67.59 
Age of participants:	Mean = 127.8 months, SD =3.18, Range = 118-147
Other sweep and/or cohort:	ALSPAC Age 15
Source:	Logan, G. D., Cowan, W. B., & Davis, K. A. (1984). On the ability to inhibit simple and choice reaction time responses: a model and a method. *Journal of Experimental Psychology: Human Perception and Performance*, *10*(2), 276.
Technical resources:	None
Reference examples:	- Pindus, D. M., Davis, R. D. M., Hillman, C. H., Bandelow, S., Hogervorst, E., Biddle, S. J., & Sherar, L. B. (2015). The relationship of moderate-to-vigorous physical activity to cognitive processing in adolescents: findings from the ALSPAC birth cohort. *Psychological Research*, *79*(5), 715-728. - Wallace, S., & Linscott, R. J. (2018). Intra-individual variability and psychotic-like experiences in adolescents: Findings from the ALSPAC cohort. *Schizophrenia Research*, *195*, 154-159.

5.10 Focus 11+ (Age 11.5)

5.10.1 TEA-Ch: Sky Search

Domain:	Attention
Measures:	- Selective attention - Concentration

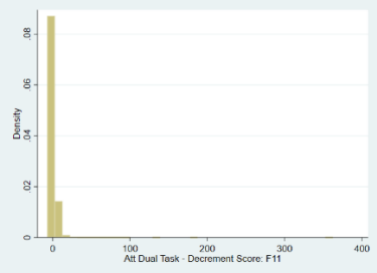
	- Mental speed - Visual scanning
CHC:	- Gs (Processing Speed) - Gps (Psychomotor Speed) - Gv (Visual Processing) - Gsm (Short-Term Memory)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was presented with an array of non-identical and identical spaceships, and was tasked with circling pairs of identical spaceships as quickly as possible, whilst trying to avoid any errors. The interviewer demonstrated, and the child worked through a practice sheet. After the practice sheet, the child was presented with larger sheet and asked to do the same (20 identical pairs). The amount of time taken was recorded in seconds. The above task was repeated, without the non-identical pairs of ships. The aim was to identify how quickly the child could complete the task, in order to control for motor performance.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Three summary scores are provided: i) unadjusted score: time taken (in seconds) for the search task divided by the number of spaceship pairs correctly circled ii) motor score: time in seconds for the motor task divided by number of correct pairs iii) The adjusted score is calculated by subtracting the motor score from the unadjusted score, thus controlling for motor speed
Item-level variable(s):	Not readily available.

Total score/derived variable(s):	feat025 - feat065
Descriptives:	N = 7,119 Range = 1-17 Mean = 9.11 SD = 2.42 
Age of participants:	Mean (months) = 140.97, SD = 2.86, Range = 125-163
Other sweep and/or cohort:	- ALSPAC Age 8
Source:	- Robertson, I. H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of normal human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society*, *2*(6), 525-534. - Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and ADHD performance. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(8), 1065-1081.
Technical resources:	- Heaton, S. C., Reader, S. K., Preston, A. S., Fennell, E. B., Puyana, O. E., Gill, N., & Johnson, J. H. (2001). The Test of Everyday Attention for Children (TEA-Ch): Patterns of performance in children with ADHD and clinical controls. *Child Neuropsychology*, *7*(4), 251-264.
Reference examples:	- Odd, D. E., Emond, A., & Whitelaw, A. (2012). Long-term cognitive outcomes of infants born moderately and late preterm. *Developmental Medicine & Child Neurology*, *54*(8), 704-709.

	- Booth, J. N., Tomporowski, P. D., Boyle, J. M., Ness, A. R., Joinson, C., Leary, S. D., & Reilly, J. J. (2013). Associations between executive attention and objectively measured physical activity in adolescence: findings from ALSPAC, a UK cohort. *Mental Health and Physical Activity*, *6*(3), 212-219.

5.10.2 TEA-Ch: Dividing Attention (Dual Task)

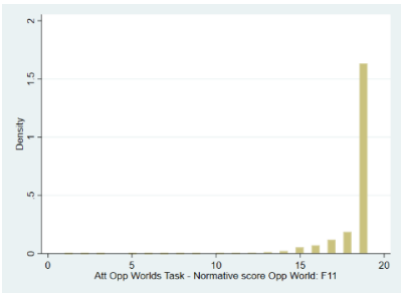
Domain:	Memory/Attention
Measures:	- Attention/concentration - Mental speed - Visual scanning - Selective attention - Working Memory - Auditory processing
CHC:	- Gsm (Short-Term Memory) - Gs (Processing Speed) - Gps (Psychomotor Speed) - Gv (Visual Processing) - Ga (Auditory Processing)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The previous selective attention task was repeated, however this time, a number of computer spaceship noises (which varied in length) played throughout the task, and the child was asked to count these noises. This task was also preceded by a practice attempt. The following three aspects of the test were recorded: time taken to complete, ii) number of errors, iii) number of spaceship noises correctly counted.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	The overall score was calculated by dividing the time taken to complete the task by the number of correctly identified spaceships circled, and then dividing again by the number of spaceship noises correctly counted. A decrement score (feat147) was also

	calculated by subtracting the selective attention task score prior to the adjustment for motor performance (feat060) from the overall dual task score (feat146), and this variable (feat147) is recommended for use for researchers who are not overly familiar with the task.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	feat136 - feat155
Descriptives:	N = 6,988 Range = -7.17 - 362.03 Mean = 1.35 SD = 6.68 
Age of participants:	Mean (months) = 140.97, SD = 2.86, Range = 125-163
Other sweep and/or cohort:	ALSPAC (Age 8).
Source:	- Robertson, I. H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of normal human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society*, *2*(6), 525-534. - Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and ADHD performance. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(8), 1065-1081.

Technical resources:	Heaton, S. C., Reader, S. K., Preston, A. S., Fennell, E. B., Puyana, O. E., Gill, N., & Johnson, J. H. (2001). The Test of Everyday Attention for Children (TEA-Ch): Patterns of performance in children with ADHD and clinical controls. *Child Neuropsychology*, *7*(4), 251-264.
Reference examples:	- Odd, D. E., Emond, A., & Whitelaw, A. (2012). Long-term cognitive outcomes of infants born moderately and late preterm. *Developmental Medicine & Child Neurology*, *54*(8), 704-709. - Booth, J. N., Tomporowski, P. D., Boyle, J. M., Ness, A. R., Joinson, C., Leary, S. D., & Reilly, J. J. (2013). Associations between executive attention and objectively measured physical activity in adolescence: findings from ALSPAC, a UK cohort. *Mental Health and Physical Activity*, *6*(3), 212-219.

5.10.3 TEA-Ch: Attentional Control (Opposite Worlds)

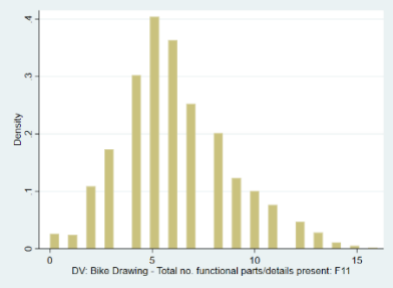
Domain:	Processing speed
Measures:	- Selective attention - Cognitive flexibility - Processing speed - Executive functions
Domain:	- Gs (Processing Speed) - Gsm (Short-Term Memory)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	A form of Stroop task. The child was shown a trail made up of the numbers 1 and 2 (with 24 numbers in total). The tester pointed to each number, one after the other, and the child delivered responses based on two conditions. In the 'same world' (control) condition, they read the numbers out as they are, as quickly as possible. In the 'opposite world' condition, the child was required to say the opposite number to the one that was pointed to. A demonstration of each condition and a practice attempt were administered first. There were four test trials: a same world trial,

	followed by two opposite world trials and finishing with another same world trial.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Mean time (seconds).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	feat200 -feat229
Descriptives:	*Same world normative score* N = 6,799 Range = 1-19 Mean = 18.81 SD = 0.97  *Opposite world normative* N = 6,797 Range = 1-19 Mean = 18.44 SD = 1.36 
Age of participants:	Mean (months) = 140.97, SD = 2.86, Range = 125-163
Other sweep and/or cohort:	- ALSPAC (Age 8)
Source:	- Robertson, I. H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of normal human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society*, *2*(6), 525-534. - Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and ADHD performance.

	The Journal of Child Psychology and Psychiatry and Allied Disciplines, *42*(8), 1065-1081.
Technical resources:	- Heaton, S. C., Reader, S. K., Preston, A. S., Fennell, E. B., Puyana, O. E., Gill, N., & Johnson, J. H. (2001). The Test of Everyday Attention for Children (TEA-Ch): Patterns of performance in children with ADHD and clinical controls. *Child Neuropsychology*, *7*(4), 251-264.
Reference examples:	- Booth, J. N., Tomporowski, P. D., Boyle, J. M., Ness, A. R., Joinson, C., Leary, S. D., & Reilly, J. J. (2013). Associations between executive attention and objectively measured physical activity in adolescence: findings from ALSPAC, a UK cohort. *Mental Health and Physical Activity*, *6*(3), 212-219.

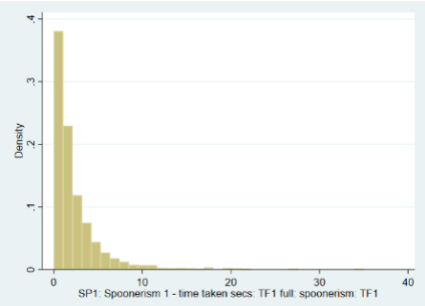
5.10.4 Higher Conceptual Reasoning (Bike drawing task)

Domain:	General ability (perceptual)
Measures:	- Higher conceptual reasoning - Mechanical reasoning - Visuographing functioning
CHC:	General ability (G)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was asked to draw a bicycle within a box on a piece of A4 paper. They were given a maximum of 3 minutes to complete the task, and were prompted with 30 seconds remaining. They were scored on whether any of 12 basic items necessary for a bike to function were present in the drawing (e.g. wheels, handlebars). A further 10 more detailed items were also scored (e.g. basket, bell), as were 3 possible background aspects of the picture (road, landscape, sky).
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/

Scoring:	In the early stages, each criterion was scored present/absent. However, additional coding was required to note whether an item was functional (e.g. pedals attached to frame), and scoring was later amended to Yes, functional; Yes, not functional and No. There is a summary variable that indicates which coding scheme was used. According to the latest ALSPAC documentation, early data is currently being recoded to the new format.
Item-level variable(s):	febd001 - febd101
Total score/derived variable(s):	febd020a - febd071
Descriptives:	N = 4,296 Range = 0 - 16 Mean = 6.08 SD = 2.70 
Age of participants:	Mean (months) = 140.97, SD = 2.86, Range = 125 - 163
Other sweep and/or cohort:	None
Source:	Designed for study by Professor Dieter Wolke. Based on similar tasks that have been used for decades, e.g. Piaget, J. (1930).
Technical resources:	None
Reference examples:	Unknown

5.11 TeenFocus 1 (Age 12.5)

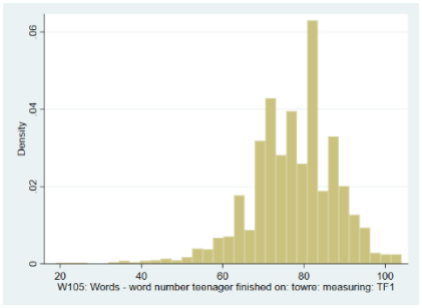
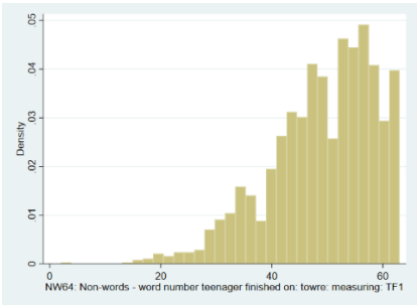
5.11.1 Phonological Awareness (Spoonerisms)

Domain:	Phonological processing
Measures:	Metaphonological skill (phonological awareness)
CHC:	Unknown
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	The child was played a series of two words (e.g. Paddington Bear) and was asked to repeat them, with the first sounds swapped around (e.g. Baddington Pear). Used as a screener for dyslexia.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Response time (seconds) and number of errors are recorded.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	ff4270 - ff8923
Descriptives:	*Time in seconds to complete first trial* N = 1,998 Range = 0 - 35 Mean = 2.71 SD = 2.92 

Age of participants:	Mean (months) = 153.73, SD = 2.77, Range = 136 - 171
Other sweep and/or cohort:	None
Source:	Similar to the spoonerism test from the Phonological Assessment Battery (PhAB; Gallagher, A., & Frederickson, N. (1995). The Phonological Assessment Battery (PhAB): An initial assessment of its theoretical and practical utility. *Educational and Child Psychology*, *12*(1), 53-67.
Technical resources:	None
Reference examples:	Unknown

5.11.2 Tests of Reading Efficiency/Fluency (TOWRE)

Domain:	Reading ability
Measures:	- Verbal expression - Lexical knowledge - Pronunciation - Sight word efficiency - Decoding efficiency - Reading speed
CHC:	- Crystallised Intelligence (Gc) - Grw (Reading/Writing)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	The child was presented with two lists, one consisting of real words (e.g. she, strong, crowd) and the other nonwords (e.g. ip, nup, poth). The child was asked to read the words aloud as quickly as possible (max time limit of 45 seconds per list).

Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Score based on number of correct words within timeframe.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	ff2430 - ff2525
Descriptives:	*Real words reached* N = 2,084 Range = 19-104 Mean = 77.38 SD = 10.60  *Non-words reached* N = 2,081 Range = 2-63 Mean = 49.07 SD = 9.63 
Age of participants:	Mean (months) = 153.73, SD = 2.77, Range = 136 - 171
Other sweep and/or cohort:	ALSPAC (Age 13.5 years).
Source:	Torgesen, J. K., Rashotte, C. A., & Wagner, R. K. (1999). *TOWRE: Test of word reading efficiency*. Austin, TX: Pro-ed.
Technical resources:	None
Reference examples:	- Bryant, P., Nunes, T., & Barros, R. (2014). The connection between children's knowledge and use of grapho-phonic and morphemic units in written text and their learning at school. *British Journal of Educational Psychology*, *84*(2), 211-225. - Davis, O. S., Band, G., Pirinen, M., Haworth, C. M., Meaburn, E. L., Kovas, Y., ... & Curtis, C. J. (2014). The correlation between

	reading and mathematics ability at age twelve has a substantial genetic component. *Nature Communications*, *5*, 4204.

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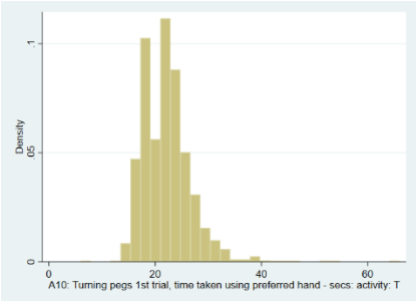
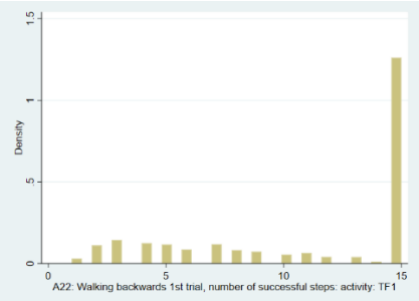
5.11.3 Motor Skill and Movement Test

Domain	Motor ability
Measures:	- Motor skill - Speed of limb movement - Limb power - Movement time - Dexterity
CHC:	Psychomotor Speed (Gps)
Administration method:	Trained interviewer; clinical setting; oral answers; physical task
Procedure:	Children undertook five separate physical tasks: 1. Turning Pegs (invert 12 pegs in a peg board) 2. Throwing at target (throws ball at target 3 meters away) 3. Walking backwards (child walks backwards along a 4.5 metre line on the floor) 4. One-hand catch (child bounces ball of wall 2m away and catches with one hand) 5. Two footed jump (child jumps forward as far as possible from a standing position)
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Scored on speed, accuracy and distance.
Item-level variable(s):	Not readily available.

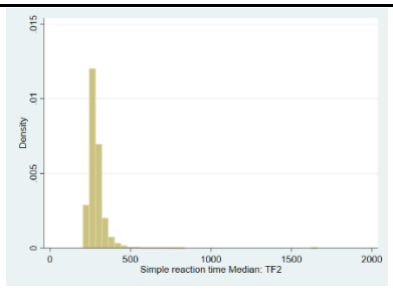
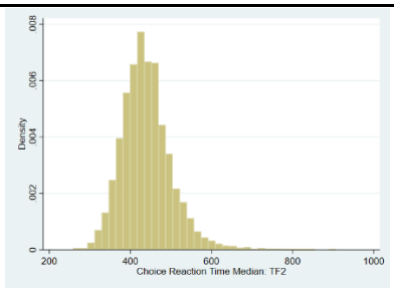
Total score/derived variable(s):	ff2640 - ff2893
Descriptives:	*Turning pegs first trial (preferred hand)* N = 1,956 Range = 6-66 Mean = 22.03 SD = 4.41  *Walking backwards (no. steps)* N = 2,081 Range = 1-15 Mean = 10.92 SD = 4.92 
Age of participants:	Mean (months) = 153.73, SD = 2.77, Range = 136 - 171
Other sweep and/or cohort:	None
Source:	Devised for study.
Technical resources:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Reference examples:	None

5.12 TeenFocus 2 (Age 13)

5.12.1 Reaction Time (Simple, Choice, Digit Vigilance)

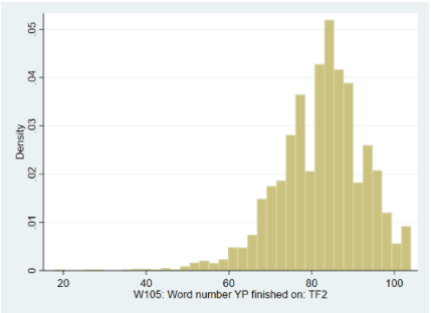
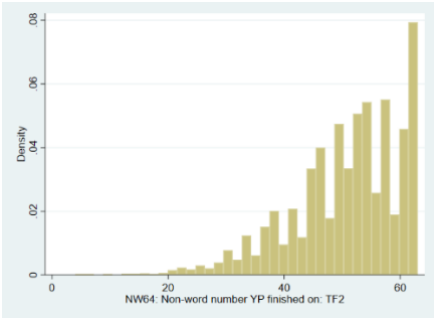
Domain:	Reaction time
Measures:	- Alertness - Concentration - Simple reaction time - Choice reaction time

	- Mental Comparison Speed
CHC:	Gt (Decision speed/reaction time)
Administration method:	Trained interviewer; clinical setting; CAPI
Procedure:	Reaction time was measured using three different tasks: i) Simple reaction time: Using the CAPI, the child was presented with the word "YES" in the middle of the screen, at irregular intervals. They were instructed to press the left arrow key as soon as they saw the word "YES" appear. ii) Choice Reaction time: Same as above but with the addition of the word "NO". Participant is instructed to press the left arrow key when "YES" appears, and the right arrow key when "NO" appears. iii) Digit Vigilance: A single number is presented on the right hand side of the screen, and a series of changing numbers appear in the centre. When the number in the centre matches the number on the right, the participant must press the left arrow key as quickly as possible.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Speed (median) and errors are recorded.
Item-level variable(s):	None
Total score/derived variable(s):	fg5600 - fg5681
Descriptives:	*Simple reaction time (median)* N = 5,477 Range = 204-1663 Mean = 285.26 SD = 51.49 *Choice reaction time (median)* N = 5,454 Range = 259-907 Mean = 440.30 SD = 63.02

	 
Age of participants:	Mean (months) = 166.02, SD = 2.49, Range = 150 - 182
Other sweep and/or cohort:	None
Source:	Standard reaction time tasks designed for study.
Technical resources:	None
Reference examples:	- Booth, J. N., Tomporowski, P. D., Boyle, J. M., Ness, A. R., Joinson, C., Leary, S. D., & Reilly, J. J. (2013). Associations between executive attention and objectively measured physical activity in adolescence: findings from ALSPAC, a UK cohort. *Mental Health and Physical Activity*, *6*(3), 212-219.

5.12.2 Tests of Reading Efficiency/Fluency (TOWRE)

Domain:	Reading ability
Measures:	- Verbal expression - Lexical knowledge - Pronunciation - Sight word efficiency - Decoding efficiency - Reading speed
CHC:	- Crystallised Intelligence (Gc) - Grw (Reading/Writing)
Administration method:	Trained interviewer; clinical setting; oral answers

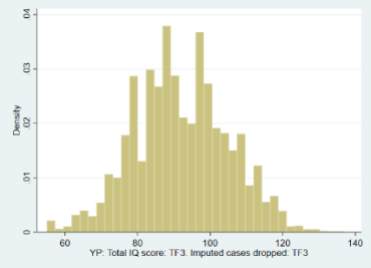
Procedure:	The child was presented with two lists, one consisting of real words (e.g. she, strong, crowd) and the other nonwords (e.g. ip, nup, poth). The child was asked to read the words aloud as quickly as possible (max time limit of 45 seconds per list).
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Score based on number of correct words within timeframe.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fg5700 - fg5925
Descriptives:	*Real word finished on* N = 5,535 Range = 18-104 Mean = 82.54 SD = 10.35 *Non-word finished on* N = 5,522 Range = 4-63 Mean = 50.80 SD = 9.41  
Age of participants:	Mean (months) = 166.02, SD = 2.49, Range = 150 - 182
Other sweep and/or cohort:	ALSPAC (Age 12.5 years)
Source:	Torgesen, J. K., Rashotte, C. A., & Wagner, R. K. (1999). *TOWRE: Test of word reading efficiency*. Austin, TX: Pro-ed.
Technical resources:	None

Reference examples:	- Bryant, P., Nunes, T., & Barros, R. (2014). The connection between children's knowledge and use of grapho-phonic and morphemic units in written text and their learning at school. *British Journal of Educational Psychology*, *84*(2), 211-225. - Davis, O. S., Band, G., Pirinen, M., Haworth, C. M., Meaburn, E. L., Kovas, Y., ... & Curtis, C. J. (2014). The correlation between reading and mathematics ability at age twelve has a substantial genetic component. *Nature Communications*, *5*, 4204.

5.13 Teen Focus 3 (Age 15.5)

5.13.1 Wechsler Abbreviated Scale of Intelligence (WASI)

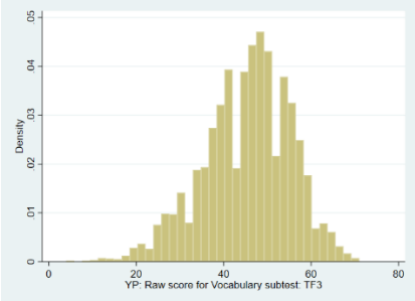
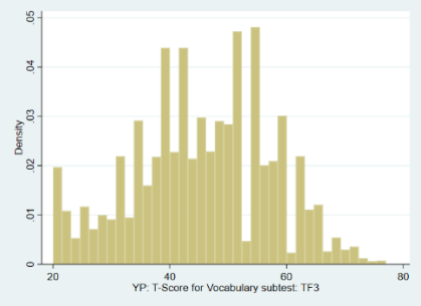
Domain:	Verbal and non-verbal ability
Measures:	- Verbal Ability - Non-verbal/performance ability
CHC:	G (general ability)
Administration method:	Trained interviewer; clinical setting; oral answers; pen and paper
Procedure:	The WASI is a measure of general cognitive ability designed for use in adults and older adolescents. It is a short-form measure that was developed in tangent with, and designed to provide an estimate of, the full Wechsler Adult Intelligence Scale. It is comprised of four subscales, two verbal and two performance (non-verbal. The two verbal subtests are: i) vocabulary, and ii) similarities. The performance subtests are: i) block design, and ii) matrix reasoning. Each subtest is described individually in the sections below. The WASI provides standard scores (M= 100, SD = 15), on verbal IQ, performance IQ and fullscale IQ. Raw scores are converted into age-adjusted standardized scores using tables provided in the WASI manual. ***Note that only the vocabulary and matrix reasoning tests were administered at this clinic, and these were used to approximate full IQ scores.***

Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Standardised score (M= 100, SD = 15)
Item-level variable(s):	fh6272 - fh6276
Total score/derived variable(s):	fh6277 - fh6281
Descriptives:	*Fullscale IQ* N = 4,955 Range = 55-137 Mean = 91.96 SD = 13.00 
Age of participants:	Mean = 185.69 months, SD = 4.24, Range = 171-212
Other sweep and/or cohort:	None
Source:	Wechsler, D. (1999). Manual for the Wechsler abbreviated intelligence scale (WASI). *San Antonio, TX: The Psychological Corporation*.
Technical resources:	None
Reference examples:	- Smithers, L. G., Golley, R. K., Mittinty, M. N., Brazionis, L., Northstone, K., Emmett, P., & Lynch, J. W. (2013). Do dietary trajectories between infancy and toddlerhood influence IQ in childhood and adolescence? Results from a prospective birth cohort study. *PLoS One*, *8*(3), e58904.

	- Ramsay, H., Barnett, J. H., Murray, G. K., Miettunen, J., Mäki, P., Järvelin, M. R., ... & Veijola, J. (2018). Cognition, psychosis risk and metabolic measures in two adolescent birth cohorts. *Psychological medicine*, *48*(15), 2609-2623.

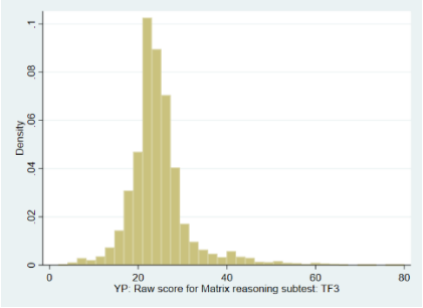
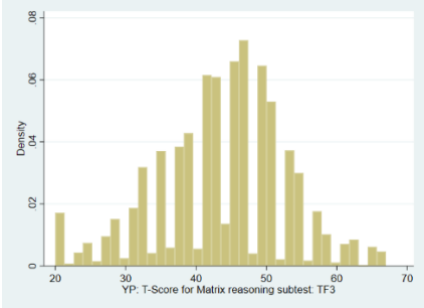
5.13.2 Vocabulary (WASI)

Domain:	Verbal ability
Measures:	- Verbal comprehension - Lexical knowledge - Long-term memory - Language development
CHC:	Crystallised intelligence (Gc)
Administration method:	Trained interviewer; clinical setting; oral answers
Procedure:	The test consists of 42 items. For items 7-10, the interviewer showed the child a picture and asked them to describe what they saw (e.g. a fish). For all other items, the interviewer read aloud a list of words, asking the child to define each one as they proceed, e.g. ("Tell me what TRANSFORM means").
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Items 7-10 were worth 1 point each. All other items are scored on a 0 - 2 scale depending on the quality of response. * note see documentation. WASI scores may underestimate IQ. Raw scores were converted to T-scores using the WASI manual (0 - 60).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fh6272, fh6277
Descriptives:	*Raw score* N = 5,281 *T-score* N = 5,281

	Range = 4 - 71 Mean = 45.42 SD = 10.02 	Range = 20 - 77 Mean = 45.56 SD = 11.82 
Age of participants:	Mean = 185.69 months, SD = 4.24, Range = 171 - 212
Other sweep and/or cohort:	- ALSPAC Age 4
Source:	Wechsler, D. (1999). Manual for the Wechsler abbreviated intelligence scale (WASI). *San Antonio, TX: The Psychological Corporation*.
Technical resources:	None
Reference examples:	- Mokrysz, C., Landy, R., Gage, S. H., Munafò, M. R., Roiser, J. P., & Curran, H. V. (2016). Are IQ and educational outcomes in teenagers related to their cannabis use? A prospective cohort study. *Journal of Psychopharmacology*, *30*(2), 159-168. - Ramsay, H., Barnett, J. H., Murray, G. K., Miettunen, J., Mäki, P., Järvelin, M. R., ... & Veijola, J. (2018). Cognition, psychosis risk and metabolic measures in two adolescent birth cohorts. *Psychological medicine*, *48*(15), 2609-2623.

5.13.3 Matrix Reasoning (WASI)

Domain:	Non-verbal ability
Measures:	- Classification and spatial ability - Knowledge of part-whole relationships - Simultaneous processing

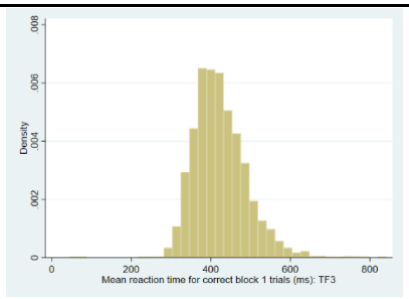
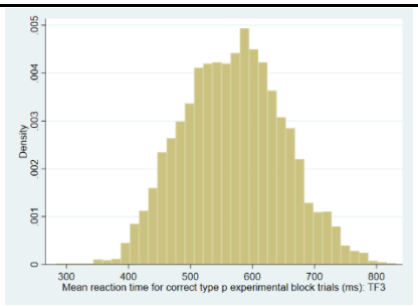
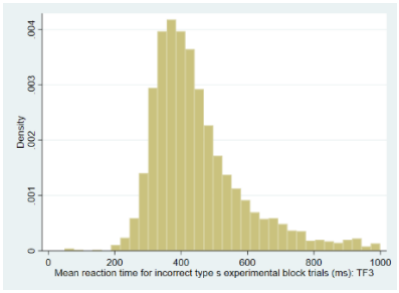
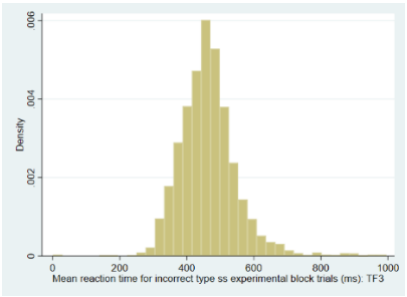
	- Perceptual organization
CHC:	- Fluid intelligence (Gf) - Visual processing (Gv)
Administration method:	Trained interviewer; clinical setting; pen and paper
Procedure:	The child was shown an incomplete matrix or visual series and selected the response option (from a possible 5) that completed the matrix or series. Two practice trials were administered followed by 28 real trials.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	A single point was awarded for each correct answer. * note see documentation. WASI scores may underestimate IQ. Raw scores were converted to T-scores using the WASI manual (0 - 60).
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fh6275, fh6278
Descriptives:	*Raw score* N = 5,277 Range = 2 - 80 Mean = 24.67 SD = 7.17  *T-score* N = 4,956 Range = 20 - 67 Mean = 43.68 SD = 9.15 
Age of participants:	Mean = 185.69 months, SD = 4.24, Range = 171-212

Other sweep and/or cohort:	BCS (age 10 and 16)
Source:	Wechsler, D. (1999). Manual for the Wechsler abbreviated intelligence scale (WASI). *San Antonio, TX: The Psychological Corporation*.
Technical resources:	None
Reference examples:	- Smithers, L. G., Golley, R. K., Mittinty, M. N., Brazionis, L., Northstone, K., Emmett, P., & Lynch, J. W. (2013). Do dietary trajectories between infancy and toddlerhood influence IQ in childhood and adolescence? Results from a prospective birth cohort study. *PLoS One*, *8*(3), e58904. - Mokrysz, C., Landy, R., Gage, S. H., Munafò, M. R., Roiser, J. P., & Curran, H. V. (2016). Are IQ and educational outcomes in teenagers related to their cannabis use? A prospective cohort study. *Journal of Psychopharmacology*, *30*(2), 159-168.

5.13.4 Inhibition (Stop-Signal Task)

Domain:	Reaction time
Measures:	- Choice reaction time - Response inhibition
CHC:	Decision Speed/Reaction Time (Gt)
Administration method:	Trained interviewer; clinical setting; CAPI
Procedure:	Sitting in front of the computer monitor, the child was instructed to place their two index fingers in two stimulus boxes, labelled X and O respectively. Two types of trials were performed: primary task trials and stop signal trials. For the primary task, the child was asked to focus on a small smiley face presented in the centre of the computer screen. An X or O would then be presented on the screen and the child had to press the corresponding button as fast as possible. A mean reaction time was calculated (this is used to calculate a tone delay used in subsequent trials; see below). The

	stop signal task was identical to the primary task except that a bleep (stop signal) was heard randomly after the X or O appears (the go signal). If the bleep was not heard the child was asked to press the corresponding button according to what was presented on screen. When the bleep was sounded the child was told to refrain from pressing the response button, therefore inhibiting the stimulus response. The bleep sounded on random trials at 150 ms or 250 ms before the child's reaction time (as calculated in the Primary Task Trials). For those children that were deaf or had severe hearing difficulties, a visual stop signal was used instead. For those children who could only use one hand, a one-handed stimulus box was used. The young person receives four blocks of trials. The first block consisted of Xs and Os with no beeps (30 trials in total) - the young person practiced the button presses here. The second block consisted of Xs, Os and beeps (24 trials in total 8 of which have a beep) - the young person practiced the button presses with beeps here. The third and fourth blocks were the actual experimental trials. Each experimental block consisted of 48 trials total in each. 32 of those trials were without beeps, and 16 trials were with beeps.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Mean reaction time across different conditions.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fh6910 - fh6953
Descriptives:	*Correct block 1 (mean RT)* N = 5,252 Range = 45-841 Mean = 423.78 SD = 66.95 *Correct type p (mean RT)* N = 5,252 Range = 284-831 Mean = 568.78 SD = 81.40

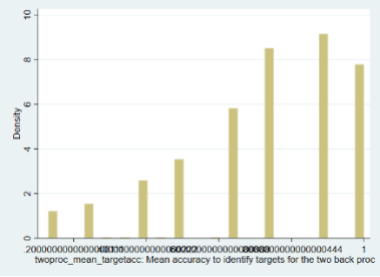
	  *Incorrect type s (mean RT)* N = 2,734 Range = 49 - 999 Mean = 448.55 SD = 139.25 *Incorrect type ss (mean RT)* N = 4,344 Range = 1-995 Mean = 464.52 SD = 87.95  
Age of participants:	Mean = 185.69 months, SD = 4.24, Range = 171-212
Other sweep and/or cohort:	ALSPAC Age 10
Source:	Logan, G. D., Cowan, W. B., & Davis, K. A. (1984). On the ability to inhibit simple and choice reaction time responses: a model and a method. *Journal of Experimental Psychology: Human Perception and Performance*, *10*(2), 276.
Technical resources:	None
Reference examples:	- Pindus, D. M., Davis, R. D. M., Hillman, C. H., Bandelow, S., Hogervorst, E., Biddle, S. J., & Sherar, L. B. (2015). The relationship of moderate-to-vigorous physical activity to cognitive processing in adolescents: findings from the ALSPAC birth cohort. *Psychological Research*, *79*(5), 715-728.

	- Wallace, S., & Linscott, R. J. (2018). Intra-individual variability and psychotic-like experiences in adolescents: Findings from the ALSPAC cohort. *Schizophrenia Research*, *195*, 154-159.

5.14 Teen Focus 4: Focus at 17 (Age 17.5)

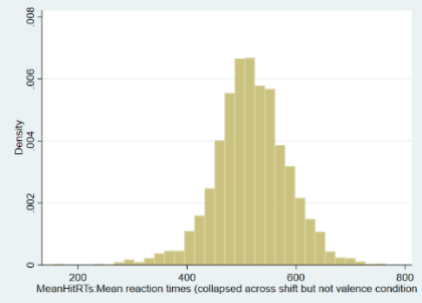
5.14.1 N-Back Task (Working Memory)

Domain:	Non-verbal memory
Measures:	- Working memory - Executive function
CHC:	Short-Term Memory (Gsm)
Administration method:	Trained interviewer; clinical setting; CAPI
Procedure:	In the N-Back task, participants were presented with a sequence of stimuli one-by-one. They had to decide whether the current stimulus was the same as the one presented N trials ago. In this case, N was either 1, 2, or 3 trials. The higher the number, the more difficult the task. Visuospatial stimuli (letters and numbers) were used in the trials.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Mean accuracy and median reaction time.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	FJNB001 - FJNB1000
Descriptives:	*Mean accuracy to identify non-targets (2-back condition)* N = 3,595 Range = 0.13-1 Mean = 0.72 SD = 0.23

	
Age of participants:	Mean = 213.59 months, SD = 5.46, Range = 195-240
Other sweep and/or cohort:	None
Source:	Kirchner, W. K. (1958). Age differences in short-term retention of rapidly changing information. *Journal of Experimental Psychology*, *55*(4), 352.
Technical resources:	None
Reference examples:	- Wardle, M. C., De Wit, H., Penton-Voak, I., Lewis, G., & Munafo, M. R. (2013). Lack of association between COMT and working memory in a population-based cohort of healthy young adults. *Neuropsychopharmacology*, *38*(7), 1253. - Sinclair, L. I., Button, K. S., Munafò, M. R., Day, I. N., & Lewis, G. (2015). Possible association of APOE genotype with working memory in young adults. *PloS one*, *10*(8), e0135894.

5.14.2 Information Processing Biases (Affective Go/No-Go Task)

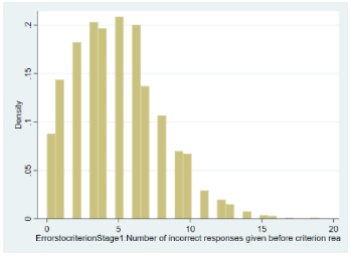
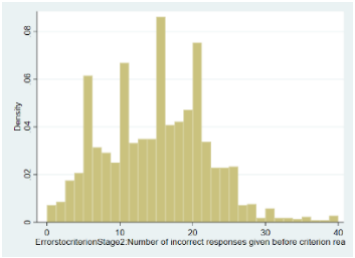
Domain:	Information processing biases for positive and negative stimuli
Measures:	Executive control of positive and negative information
CHC:	None
Administration method:	Trained interviewer; clinical setting; CAPI
Procedure:	This test required participants to differentiate between happy and sad words. Eight blocks of 18 words pertaining to emotions were presented. Single words appeared on the computer screen, and

	participants were instructed to hit the spacebar when a happy word appeared (e.g. hopeful, serene). After two word blocks requiring responses to happy words, the instructions changed so that the space bar was to be pressed for sad words. Instructions were alternated in this fashion until all eight blocks were administered. Words were presented for 300 msec, with a 900 msec interval between each word.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Mean RTs (reaction times) for hits (i.e., pressing the space bar in the presence of a target word), collapsed across valence and shift condition.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	FJGO001 - FJGO1850
Descriptives:	N = 2,485 Range = 155.38 - 764.07 Mean = 517.38 SD = 66.94 
Age of participants:	Mean = 213.59 months, SD = 5.46, Range = 195-240
Other sweep and/or cohort:	None
Source:	Murphy, F. C., Sahakian, B. J., Rubinsztein, J. S., Michael, A., Rogers, R. D., Robbins, T. W., & Paykel, E. S. (1999). Emotional bias

	and inhibitory control processes in mania and depression. *Psychological medicine*, *29*(6), 1307-1321.
Technical resources:	None
Reference examples:	Unknown

5.14.3 Behavioral inhibition (Probability Learning and Reversal Task)

Domain:	Memory
Measures:	Executive function
CHC:	Gsm (Short-term memory)
Administration method:	Trained interviewer; clinical setting; CAPI
Procedure:	The participant had to learn a 'rule' (i.e. a red and a green 'grating' pattern) that determined which of two abstract stimuli were selected. The rule changed in the middle of the block, and the goal was to see how quickly the participant could adapt to the rule change. All participants completed 40 trials of the initial rule, before the rule was reversed and a further 40 trials were administered.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Number of correct responses per condition.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	FJPR001 - FJCI002
Descriptives:	*Number of incorrect responses (Stage 1)* N = 1,782 *Number of incorrect responses (Stage 2)* N = 1,782

	Range = 0 - 19 Mean = 4.90 SD = 3.11 	Range = 0 - 40 Mean = 14.88 SD = 7.06 
Age of participants:	Mean = 213.59 months, SD = 5.46, Range = 195-240	
Other sweep and/or cohort:	None	
Source:	Lawrence, A. D., Sahakian, B. J., Rogers, R. D., Hodges, J. R., & Robbins, T. W. (1999). Discrimination, reversal, and shift learning in Huntington's disease: mechanisms of impaired response selection. *Neuropsychologia*, *37*(12), 1359-1374.	
Technical resources:	None	
Reference examples:	- Lancaster, T. M., Dimitriadis, S. L., Tansey, K. E., Perry, G., Ihssen, N., Jones, D. K., ... & Zammit, S. (2018). Structural and Functional Neuroimaging of Polygenic Risk for Schizophrenia: A Recall-by-Genotype-Based Approach. *Schizophrenia Bulletin*, *45*(2), 405-414. - Ramsay, H., Barnett, J. H., Murray, G. K., Miettunen, J., Mäki, P., Järvelin, M. R., ... & Veijola, J. (2018). Cognition, psychosis risk and metabolic measures in two adolescent birth cohorts. *Psychological Medicine*, *48*(15), 2609-2623.	

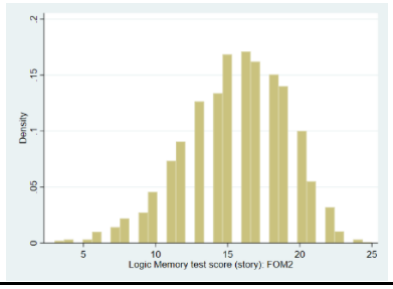
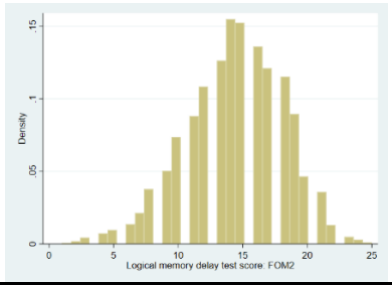
5.15 Focus on Mothers 2 (FOM2)

A study of ALSPAC study mothers began in 2008 with the aim of determining what factors are related to body size, bone density, blood pressure, glucose, insulin and abnormal blood lipids in women. This "Focus on Mothers" study consisted of four clinics held during the following periods: i) 2008 - 2011, ii) 2011 - 2013, iii) 2013 - 2014, and iv) 2014 - 2015. Each clinic lasted approximately 2.5 hours. For further details see Fraser et al. (2012).

Along with various physical measures, measures of cognitive ability/functioning were collected at clinics FOM2, FOM3, and FOM4.

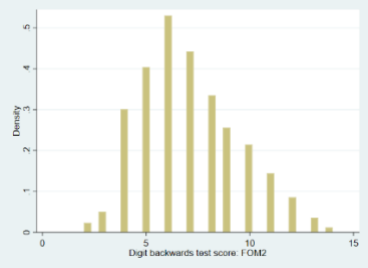
5.15.1 Logic memory (immediate and delayed)

Domain:	Verbal memory
Measures:	- Attention - Short-term episodic memory - Verbal memory
CHC:	Glr (long-term storage and retrieval)
Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	Participants were played an audio recording of a short story, and were asked to recount the story, using as close to the original wording as possible. They were given one minute to recount as much information as they could remember, with occasional prompts of encouragement (e.g. 'Anything else?') from the tester. After completing all other cognitive assessments, participants were again asked to recall the story from the beginning of the session.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point for each correct item at each line.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm2cg010, fm2cg015
Descriptives:	*Immediate recall* N = 2,946 Range = 3-25 Mean = 15.57 SD = 3.55 *Delayed recall* N = 2,926 Range = 1-25 Mean = 14.38 SD = 3.77

	 
Age of participants (years):	Mean = 50.81, SD = 4.41, Range = 36.83 - 65.66
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 3; Age 52) - ALSPAC (Focus on Mothers clinic 4; Age 53)
Source:	Wechsler, D. (1998).*Wechsler Memory Scale: Administration and scoring manual*. London, UK: The Psychological Corporation.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.15.2 Digits backwards

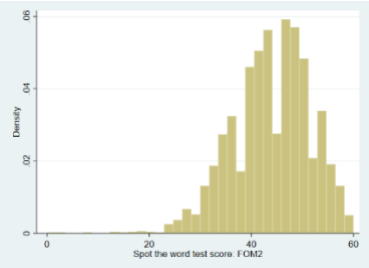
Domain:	Verbal memory
Measures:	Working memory
CHC:	Gsm (short-term memory)
Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	The interviewer read aloud a series of numbers and asked the participant to immediately repeat them backwards. For example; Interviewer: 1-5-9 Participant: 9-5-1

	The task was discontinued if the participant did not correctly recall any of the digits.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Each item was scored 0, 1 or 2 points as follows: - 2 points = if the participant passed both trials - 1 points = if the participant passed only 1 trial - 0 points = if the participant failed both trials Maximum score = 14 points.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm2cg011
Descriptives:	N = 2,945 Range = 2-14 Mean = 7.08 SD = 2.36 
Age of participants (years):	Mean = 50.81, SD = 4.41, Range = 36.83- 65.66
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 3; Age 52) - ALSPAC (Focus on Mothers clinic 4; Age 53)
Source:	Wechsler, D. (1998).*WAIS-III UK administration and scoring manual*. London, UK: The Psychological Corporation.

Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

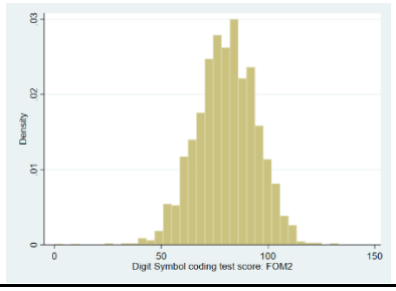
5.15.3 Spot-the word

Domain:	Reading ability
Measures:	- Reading comprehension - Reading decoding
CHC:	Grw (Reading/writing)
Administration method:	Trained interviewer; face to face; clinical setting; pen and paper task
Procedure:	The participant was presented with a list of word-pairs. Each pair consisted of a real word, and a non-word. Participants were instructed to work through the pairs, placing a tick beside the real word in each pair. The participant was given a practice list before the real trial. If the participant spent too long deliberating over a pair, they were prompted to guess.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point for each correct item.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm2cg012
Descriptives:	N = 2,939 Range = 0 - 60 Mean = 43.92

	SD = 7.60 
Age of participants (years):	Mean = 50.81, SD = 4.41, Range = 36.83 - 65.66
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 3; Age 52) - ALSPAC (Focus on Mothers clinic 4; Age 53)
Source:	Baddeley, A., Emslie, H., & Nimmo-Smith, I. (1993). The Spot-the-Word test: A robust estimate of verbal intelligence based on lexical decision. *British Journal of Clinical Psychology*, 32(1), 55-65.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.15.4 Digit symbol coding

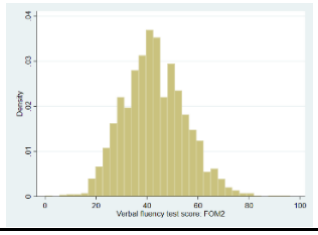
Domain:	Non-verbal memory and processing speed
Measures:	- Visual perception - Short-term memory - Motor coordination
CHC:	- Gs (processing speed) - Glr (long-term storage and retrieval) - Gv (Visual Processing)
Administration method:	Trained interviewer; face to face; clinical setting; pen and paper task

Procedure:	Participants were presented with a series of numbers that were each associated with unique symbols. They were then presented with a list of numbers and asked to copy the matching symbols as quickly as possible. A practice trial was administered, and the real test lasted for 120 seconds.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correctly copied symbol within the allotted time.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm2cg013
Descriptives:	N = 2,922 Range = 0 - 133 Mean = 80.56 SD = 13.99 
Age of participants (years):	Mean = 50.81, SD = 4.41, Range = 36.83 - 65.66
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 3; Age 52) - ALSPAC (Focus on Mothers clinic 4; Age 53)
Source:	Wechsler, D. (1998*).WAIS-III UK administration and scoring manual*. London, UK: The Psychological Corporation
Technical resources:	None

Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.15.5 Verbal Fluency Test

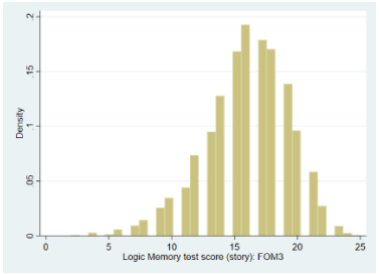
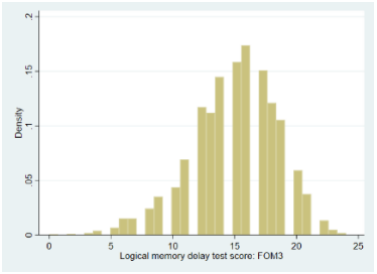
Domain:	Verbal fluency
Measures:	- Verbal/semantic fluency - Associational fluency - Executive function
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	Participants were given one minute in which to say as many words as possible beginning with a specific letter. They were instructed not to include proper nouns (e.g. people or place names), numbers, repetitions or variations of the same word (e.g. see - seeing). Three trials were administered (letters 'C', 'F' and 'L'), each lasting one minute.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correct word. The total scores from the three trials were summed to create a summary score.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm2cg014
Descriptives:	N = 2,924 Range = 0 - 96 Mean = 42.91 SD = 12.09

	
Age of participants (years):	Mean = 50.81, SD = 4.41, Range = 36.83- 65.66
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 3; Age 52) - ALSPAC (Focus on Mothers clinic 4; Age 53) - NSHD (Age 53)* - NCDS (Age 50)* - NCDS (Age 61-63 [proposed])* - BCS (Age 46)* *Participants asked to name as many animals as possible within one minute. One trial only.
Source:	Lezak, M. (2004). *Neuropsychological assessment*. New York, NY: Oxford University Press.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.16 Focus on Mothers 3 (FOM3)

5.16.1 Logic memory (immediate and delayed)

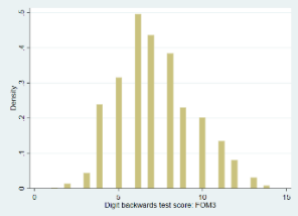
Domain:	Verbal memory
Measures:	- Attention - Short-term episodic memory - Verbal memory
CHC:	Glr (long-term storage and retrieval)

Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	Participants were played an audio recording of a short story, and were asked to recount the story, using as close to the original wording as possible. They were given one minute to recount as much information as they could remember, with occasional prompts of encouragement (e.g. 'Anything else?') from the tester. After completing all other cognitive assessments, participants were again asked to recall the story from the beginning of the session.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point for each correct item at each line.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm3cg010, fm3cg015
Descriptives:	*Immediate recall* N = 2,985 Range = 2 - 25 Mean = 15.95 SD = 3.29  *Delayed recall* N = 2,985 Range = 0 - 24 Mean = 14.94 SD = 3.53 
Age of participants (years):	Mean = 52.00, SD = 4.45, Range = 38 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 4; Age 53)

Source:	Wechsler, D. (1998).*Wechsler Memory Scale: Administration and scoring manual*. London, UK: The Psychological Corporation.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

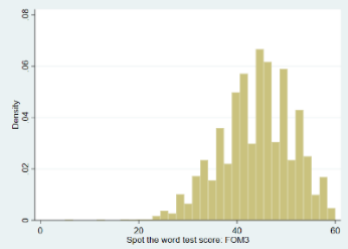
5.16.2 Digits backwards

Domain:	Verbal memory
Measures:	Working memory
CHC:	Gsm (short-term memory)
Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	The interviewer read aloud a series of numbers and asked the participant to immediately repeat them backwards. For example; Interviewer: 1 - 5 - 9 Participant: 9 - 5 - 1 The task was discontinued if the participant did not correctly recall any of the digits.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Each item was scored 0, 1 or 2 points as follows: - 2 points = if the participant passed both trials - 1 points = if the participant passed only 1 trial - 0 points = if the participant failed both trials Maximum score = 14 points.

Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm3cg011
Descriptives:	N = 2,987 Range = 1 - 14 Mean = 7.20 SD = 2.28 
Age of participants (years):	Mean = 52.00, SD = 4.45, Range = 38 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 4; Age 53)
Source:	Wechsler, D. (1998). *WAIS-III UK administration and scoring manual*. London, UK: The Psychological Corporation.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.16.3 Spot-the word

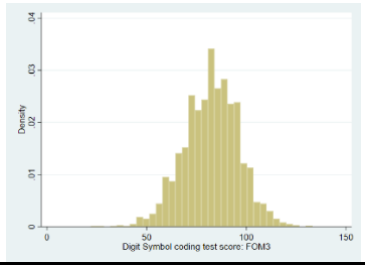
Domain:	Reading ability
Measures:	- Reading comprehension - Reading decoding

CHC:	Grw (Reading/writing)
Administration method:	Trained interviewer; face to face; clinical setting; pen and paper task
Procedure:	The participant was presented with a list of word-pairs. Each pair consisted of a real word, and a non-word. Participants were instructed to work through the pairs, placing a tick beside the real word in each pair. The participant was given a practice list before the real trial. If the participant spent too long deliberating over a pair, they were prompted to guess.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point for each correct item.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm3cg012
Descriptives:	N = 2,978 Range = 5-60 Mean = 43.99 SD = 7.40 
Age of participants (years):	Mean = 52.00, SD = 4.45, Range = 38 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 4; Age 53)
Source:	Baddeley, A., Emslie, H., & Nimmo-Smith, I. (1993). The Spot-the-Word test: A robust estimate of verbal intelligence based on lexical decision. *British Journal of Clinical Psychology*, 32(1), 55-65.

Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

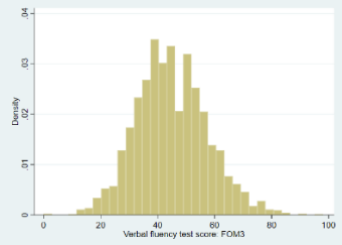
5.16.4 Digit symbol coding

Domain:	Non-verbal memory and processing speed
Measures:	- Visual perception - Short-term memory - Motor coordination
CHC:	- Gs (processing speed) - Glr (long-term storage and retrieval) - Gv (Visual Processing)
Administration method:	Trained interviewer; face to face; clinical setting; pen and paper task
Procedure:	Participants were presented with a series of numbers that were each associated with unique symbols. They were then presented with a list of numbers and asked to copy the matching symbols as quickly as possible. A practice trial was administered, and the real test lasted for 120 seconds.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correctly copied symbol within the allotted time.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm3cg013

Descriptives:	N = 2,979 Range = 22-133 Mean = 82.50 SD = 13.77 
Age of participants (years):	Mean = 52.00, SD = 4.45, Range = 38 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 4; Age 53)
Source:	Wechsler, D. (1998*).WAIS-III UK administration and scoring manual*. London, UK: The Psychological Corporation
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.16.5 Verbal Fluency Test

Domain:	Verbal fluency
Measures:	- Verbal/semantic fluency - Associational fluency - Executive function
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	Participants were given one minute in which to say as many words as possible beginning with a specific letter. They were instructed

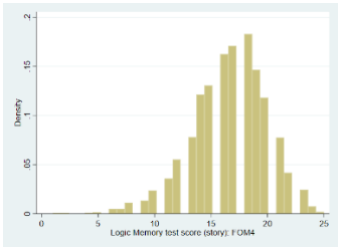
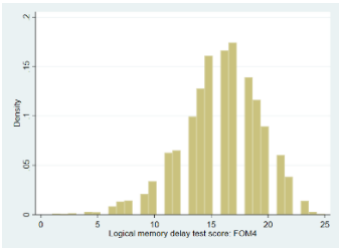
	not to include proper nouns (e.g. people or place names), numbers, repetitions or variations of the same word (e.g. see - seeing). Three trials were administered (letters 'C', 'F' and 'L'), each lasting one minute.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correct word. The total scores from the three trials were summed to create a summary score.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm3cg014
Descriptives:	N = 2,976 Range = 0 - 98 Mean = 44.93 SD = 12.46 
Age of participants (years):	Mean = 52.00, SD = 4.45, Range = 38 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 4; Age 53) - NSHD (Age 53)* - NCDS (Age 50)* - NCDS (Age 61-63 [proposed])* - BCS (Age 46)* *Participants asked to name as many animals as possible within one minute. One trial only.
Source:	Lezak, M. (2004).*Neuropsychological assessment*. New York, NY: Oxford University Press.

Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.17 Focus on Mothers 4 (FOM4)

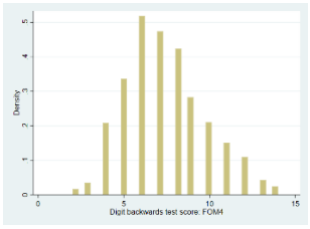
5.17.1 Logic memory (immediate and delayed)

Domain:	Verbal memory
Measures:	- Attention - Short-term episodic memory - Verbal memory
CHC:	Glr (long-term storage and retrieval)
Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	Participants were played an audio recording of a short story, and were asked to recount the story, using as close to the original wording as possible. They were given one minute to recount as much information as they could remember, with occasional prompts of encouragement (e.g. 'Anything else?') from the tester. After completing all other cognitive assessments, participants were again asked to recall the story from the beginning of the session.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point for each correct item at each line.
Item-level variable(s):	Not readily available.

Total score/derived variable(s):	fm4cg010, fm4cg015
Descriptives:	*Immediate recall* N = 2,852 Range = 1-25 Mean = 16.60 SD = 3.32  *Delayed recall* N = 2,851 Range = 1-25 Mean = 15.82 SD = 3.51 
Age of participants (years):	Mean = 53.13, SD = 4.43, Range = 40 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 3; Age 52)
Source:	Wechsler, D. (1998).*Wechsler Memory Scale: Administration and scoring manual*. London, UK: The Psychological Corporation.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.17.2 Digits backwards

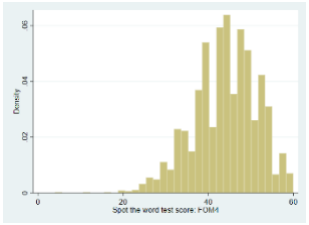
Domain:	Verbal memory
Measures:	Working memory
CHC:	Gsm (short-term memory)

Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	The interviewer read aloud a series of numbers and asked the participant to immediately repeat them backwards. For example; Interviewer: 1-5-9 Participant: 9-5-1 The task was discontinued if the participant did not correctly recall any of the digits.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	Each item was scored 0, 1 or 2 points as follows: - 2 points = if the participant passed both trials - 1 points = if the participant passed only 1 trial - 0 points = if the participant failed both trials Maximum score = 14 points.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm4cg011
Descriptives:	N = 2,846 Range = 2-14 Mean = 7.40 SD = 2.34 
Age of participants (years):	Mean = 53.13, SD = 4.43, Range = 40 - 67

Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 3; Age 52)
Source:	Wechsler, D. (1998).*WAIS-III UK administration and scoring manual*. London, UK: The Psychological Corporation.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

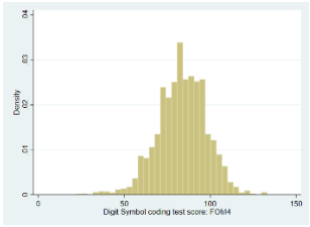
5.17.3 Spot the word

Domain:	Reading ability
Measures:	- Reading comprehension - Reading decoding
CHC:	Grw (Reading/Writing)
Administration method:	Trained interviewer; face to face; clinical setting; pen and paper task
Procedure:	The participant was presented with a list of word-pairs. Each pair consisted of a real word, and a non-word. Participants were instructed to work through the pairs, placing a tick beside the real word in each pair. The participant was given a practice list before the real trial. If the participant spent too long deliberating over a pair, they were prompted to guess.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point for each correct item.
Item-level variable(s):	Not readily available.

Total score/derived variable(s):	fm4cg012
Descriptives:	N = 2,842 Range = 4 - 60 Mean = 44.03 SD = 7.51 
Age of participants (years):	Mean = 53.13, SD = 4.43, Range = 40 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 3; Age 52)
Source:	Baddeley, A., Emslie, H., & Nimmo-Smith, I. (1993). The Spot-the-Word test: A robust estimate of verbal intelligence based on lexical decision. *British Journal of Clinical Psychology*, 32(1), 55-65.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.17.4 Digit symbol coding

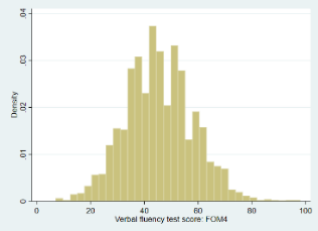
Domain:	Non-verbal memory and processing speed
Measures:	- Visual perception - Short-term memory - Motor coordination
CHC:	- Gs (processing speed) - Glr (long-term storage and retrieval)

	- Gv (Visual Processing)
Administration method:	Trained interviewer; face to face; clinical setting; pen and paper task
Procedure:	Participants were presented with a series of numbers that were each associated with unique symbols. They were then presented with a list of numbers and asked to copy the matching symbols as quickly as possible. A practice trial was administered, and the real test lasted for 120 seconds.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correctly copied symbol within the allotted time.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm4cg013
Descriptives:	N = 2,847 Range = 22-133 Mean = 83.63 SD = 14.14 
Age of participants (years):	Mean = 53.13, SD = 4.43, Range = 40 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 3; Age 52)
Source:	Wechsler, D. (1998*).WAIS-III UK administration and scoring manual*. London, UK: The Psychological Corporation

Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

5.17.5 Verbal Fluency Test

Domain:	Verbal fluency
Measures:	- Verbal/semantic fluency - Associational fluency - Executive function
CHC:	Glr (Long-Term Storage and Retrieval)
Administration method:	Trained interviewer; face to face; clinical setting
Procedure:	Participants were given one minute in which to say as many words as possible beginning with a specific letter. They were instructed not to include proper nouns (e.g. people or place names), numbers, repetitions or variations of the same word (e.g. see - seeing). Three trials were administered (letters 'C', 'F' and 'L'), each lasting one minute.
Link to questionnaire:	http://www.bristol.ac.uk/alspac/researchers/our-data/clinical-measures/
Scoring:	One point was awarded for each correct word. The total scores from the three trials were summed to create a summary score.
Item-level variable(s):	Not readily available.
Total score/derived variable(s):	fm4cg014

Descriptives:	N = 2,838 Range = 7-98 Mean = 45.63 SD = 12.69 
Age of participants (years):	Mean = 53.13, SD = 4.43, Range = 40 - 67
Other sweep and/or cohort:	- ALSPAC (Focus on Mothers clinic 2; Age 50) - ALSPAC (Focus on Mothers clinic 3; Age 52) - NSHD (Age 53)* - NCDS (Age 50)* - NCDS (Age 61-63 [proposed])* - BCS (Age 46)* *Participants asked to name as many animals as possible within one minute. One trial only.
Source:	Lezak, M. (2004).*Neuropsychological assessment*. New York, NY: Oxford University Press.
Technical resources:	None
Reference examples:	Anderson, E. L., Heron, J., Ben-Shlomo, Y., Kuh, D., Cooper, R., Lawlor, D. A., ... & Howe, L. D. (2017). Adversity in childhood and measures of aging in midlife: Findings from a cohort of British women. *Psychology and Aging*, 32(6), 521-530.

6. Millennium Cohort Study (MCS)

6.1 MCS1 (Age 9 months)

6.1.1 Developmental milestones

Domain:	- Fine and gross motor coordination - Receptive and productive vocabulary
Measures:	- Developmental milestones using questions from two developmental questionnaires: - 8 questions from Denver Developmental Screening Test (DDST) which screens for potential developmental problems - 5 items were chosen from a UK adaptation of MacArthur Communicative Development Inventories (CDI) identifies early communicative gestures
CHC:	N/A
Administrative method:	Parent report; face to face interview
Procedure:	Parents were asked to respond to selected statements from the tests, using a three point scale Often/once or twice/not yet for the Denver Developmental Screening Test, and Often/sometimes/not yet for the MacArthur CDI.
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/MCS1_CAPI_Questionnaire_Documentation_March_2006_v1.1.pdf
Scoring:	None available
Item-level variable(s):	achand00 acgrab00 acpick00 acptoy00 (DDST - fine) acsitu00 acstan00 acwalk00 (DDST - gross) acsmil00 acgive00 acwave00 acarms00 acnods00 (CDI)
Total score/derived variable(s):	None
Age of participant (days):	Mean = 295.5, SD = 15.25, Range = 243-382

Descriptives:	None available
Other sweep and/or cohort:	None
Source:	- Frankenburg, W. K., & Dodds, J. B. (1967). The Denver developmental screening test. *The Journal of Pediatrics*, *71*(2), 181-191. - Fenson L., Dale P., Resnick J., Thal D., Bates E., Hartung J. P. *et al. (*1993*). MacArthur Communicative Inventories. Singular Publishing Group,* San Diego.
Technical resources:	User guide to psychological, developmental and health inventories in the MCS (2015). Centre for Longitudinal Studies.
Reference examples:	- Sacker, A., Quigley, M. A., & Kelly, Y. J. (2006). Breastfeeding and developmental delay: findings from the millennium cohort study. *Pediatrics*, *118*(3), e682-e689.

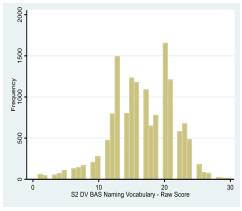
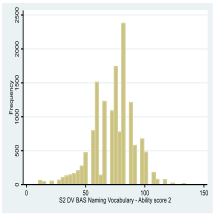
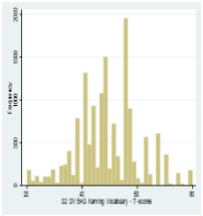
6.2 MCS2 (Age 3)

6.2.1 BAS II Naming Vocabulary

Domain:	Verbal knowledge (expressive and spoken)
Measures:	The Naming Vocabulary is a verbal scale which assesses the spoken vocabulary of young children. The full BASII version was employed. The test items consist of a booklet of coloured pictures of objects which the child is shown one at a time and asked to name. The scale measures expressive language ability, and successful performance depends on the child‘s previous development of a vocabulary of nouns. Picture recognition is also crucial; however, the pictures are large and brightly coloured and are unlikely to cause problems except for children with major visual impairments or with no experience of picture books. The items require the child to recall words from long-term memory rather than to recognise or understand the meaning of words or sentences.
CHC:	Gc (Crystallised ability)
Administrative method:	Interviewer, face to face, CAPI and verbal response

Procedure:	The cohort member was shown a picture, the cohort member responds verbally, recorded by the interviewer on Computer Assisted Personal Interviewing (CAPI) 36 items (pictures of objects) in total - as original BAS. The test continued, unless: - the cohort member failed on 5 successive items - after item 16 (Ear), the cohort member has failed on three or more items administered. - after item 30 (Hourglass), the cohort member has failed on three or more items administered. - the cohort member completes the Naming Vocabulary subscale (i.e.: reaches item 36 (Easel)).
Link to questionnaire:	No direct link to pdf. Information can be found in the file 'a3723udb.pdf' which accompanies data download from UK Data Service website.
Scoring:	36 items (pictures of objects) in total, starting at item 1 and first decision point at item 16.The raw scores were then adjusted using a set of standard adjustment tables to take account of the age of the cohort member and the difficulty of the item set administered.
Item-level variable(s):	bca01a00 - bca36a00 - items (raw) 1st attempt bcre1a00 - bcr36a00 - why stopped bca01b00 - bca36b00 - items (raw) 2nd attempt bcre1b00 - bcr36b00 - why stopped cognitive observations: bcapre00 – bcener00; bcenvi00 - bcslap00 duration: bcdurm00
Total score/derived variable(s):	- bdbasr00 (raw score - total number of correct responses) - bdbasa00 (ability adjusted - total number of correct responses, accounting for the sets of items the CM was presented with, which depended on age and successful completion of blocks of items) - bdbast00 (ability and age adjusted on BAS II age normed data)
Age of participant (months):	Mean = 37.71, SD = 2.53, Range = 32 – 55

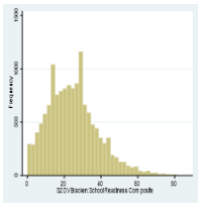
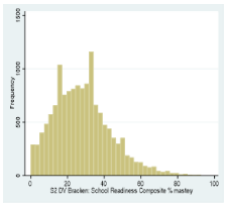
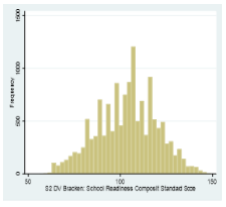
Descriptives:	bdbasr00 (raw score)	bdbasa00 (ability adjusted)	bdbast00 (ability and age adjusted)
N	14,776	14,776	14,776
Range	0 - 30	10 - 141	20 - 80
Mean	16.62	73.19	49.34

	SD	4.81	17.98	11.45
				
Other sweep and/or cohort:	- MCS (age 5): different starting point 12 - BCS (children of cohort member, multi-age) - ALSPAC (age 2): similar task involving objects			
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.			
Technical resources:	- Hansen, K. (ed, 5th edition) (2010) Millennium Cohort Study First, Second, Third and Fourth Surveys: A Guide to the Datasets, Centre for Longitudinal Studies, Institute of Education, London, March. (pp. 52-55) - Connelly, R., Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01. 2013, Centre for Longitudinal Studies: London. - Millennium Cohort Study Second Survey: - Hansen, K; Joshi, H; (2007) Millennium Cohort Study Second Survey: A User's Guide to Initial Findings. London: Centre for Longitudinal Studies.			
	- Jerrim, J., & Vignoles, A. (2013). Social mobility, regression to the mean and the cognitive development of high ability children from disadvantaged homes. *Journal of the Royal Statistical Society: Series A (Statistics in Society),* 176(4), 887-906. - Dockrell, J. E., & Hurry, J. (2018). The identification of speech and language problems in elementary school: Diagnosis and co-occurring needs. *Research in Developmental Disabilities. 81, 52-64.* - Midouhas, E., Kokosi, T., & Flouri, E. (2018). Outdoor and indoor air quality and cognitive ability in young children. *Environmental Research*, 161, 321-328.			

6.2.2 Bracken School Readiness Assessment-Revised (BSRA-R)

Domain:	Basic knowledge in preparation for school
Measures:	The BSRA-R is used to assess the 'readiness' of a child for formal education by testing their knowledge and understanding of basic concepts. The cohort members completed six sub-tests of the BSRA-R: 1. Colours: represents both primary colours and basic colour terms. 2. Letters: measures knowledge of both upper- and lower-case letters. 3. Numbers/Counting: measures recognition of single- and double-digit numbers, and samples the ability to assign a number value to a set of objects. 4. Sizes: includes concepts that describe one, two, and three dimensions. 5. Comparisons: measures ability to match and/or differentiate objects based on one or more of their salient characteristics. 6. Shapes: includes one, two, and three-dimensional shapes. The one-dimensional category includes linear shapes; two-dimensional shapes are represented by concepts such as the circle, square, and triangle; and three-dimensional shapes include concepts such as the cube and pyramid. All sub-sets are designed to measure "readiness" concepts which a child should have mastered before they commence formal education.
CHC:	- Gc (Crystallised ability) - Gv (Visual processing) - Gq (Quantitative Knowledge)
Administrative method:	Interviewer; face to face: non-verbal and interviewer records on CAPI
Procedure:	The exact tasks varied but, in essence, the cohort members were shown a page containing a number of visual stimuli, and were asked

	to point to the one that matched what the interviewer's read out. The CAPI script managed the scoring system for the assessments, which determined when one sub-test was terminated and the next one begun, based again on the patterns of correct and incorrect answers. (Unless the interviewer over-rode the script), each cohort member attempted at least some of each of each sub-test. Interviewers also had the option, based on how the cohort member was reacting, to terminate any sub-test, or the whole assessment, at any time. Duration: 10 - 15 minutes
Link to questionnaire:	For copyright reasons, the Bracken assessment is not freely available. BASR-3 available at: https://www.pearsonassessments.com/store/usassessments/en/Store/Professional-Assessments/Developmental-Early-Childhood/Bracken-School-Readiness-Assessment-%7C-Third-Edition/p/100000165.html
Scoring:	88 items in total, 6 sub-sets with varying number of items. 1 point for each correct response and 0 for incorrect response. Raw scores are provided for each sub-scale and are added together to provide a composite raw score, known as the School Readiness Composite (Bracken, 1998). To account for the differing number of items within each of the subscales, a percentage score (raw score relative to the number of items) score is also provided. In addition to the raw total score, there are also age-adjusted standardised scores (based on a US norming sample), percentiles and a normative classification which categories scores into a grouping based on the standardised composite score.
Item-level variable(s):	- bcco0100 - bcco1100 (11 colours) - bcle0100 - bcle1600 (16 letters) - bcno0100 - bcno1900 (19 numbers) - bcsz0100 - bcsz1200 (12 sizes) - bccm0100 - bccm1000 (10 comparisons) - bcsh0100 - bcsh2000 (20 shapes) - bcrknage (age in months)

<table>
<tr><td>Total score/derived variable(s):</td><td>- bdcosc00, bdcmas00 (colours: raw and percentage score)
- bdlesc00, bdlmas00 (letters: raw and percentage score)
- bdnosc00, bdnmas00 (numbers: raw and percentage score)
- bdszsc00, bdsmas00 (sizes: raw and percentage score)
- bdcmsc00, bdomas00 (comparisons: raw and percentage score)
- bdshsc00, bdhmas00 (shapes: raw and percentage score)
- bdbsrc00, bdsrcm00 (total: raw and percentage score)
- bdsrcs00 (standardised)
- bdsrcp00 (percentile)
- bdsrcn00 (normative classification)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 37.71, SD = 2.53, Range = 32 - 55</td></tr>
<tr><td>Descriptives:</td><td>
<table>
<tr><th></th><th>bdshsc00 (raw score)</th><th>bdsrcm00 (adjusted % subtest/items)</th><th>bdsrcs00 (age adjusted and standardised)</th></tr>
<tr><td>N</td><td>14,054</td><td>14,054</td><td>14,039</td></tr>
<tr><td>Range</td><td>0 - 88</td><td>0 - 100</td><td>56 - 149</td></tr>
<tr><td>Mean</td><td>24.86</td><td>28.25</td><td>103.43</td></tr>
<tr><td>SD</td><td>13.65</td><td>15.51</td><td>16.34</td></tr>
<tr><td></td><td>  </td><td>  </td><td>  </td></tr>
</table>
</td></tr>
<tr><td>Other sweep and/or cohort:</td><td>None</td></tr>
<tr><td>Source:</td><td>6 subsets of Bracken, B. (1998). Bracken Basic Concept Scale Revised: Examiner's Manual. London: The Psychological Corporation.</td></tr>
<tr><td>Technical resources:</td><td>- Bracken, B.A. (2002). Bracken School Readiness Assessment: Administration Manual. San Antonio, Texas: Psychological Corporation.
- Connelly, R., Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01. 2013, Centre for Longitudinal Studies: London.</td></tr>
</table>

Reference examples:	- Kiernan, K. E., & Huerta, M. C. (2008). Economic deprivation, maternal depression, parenting and children's cognitive and emotional development in early childhood. *The British Journal of Sociology*, *59*(4), 783-806. - Jokela, M. (2010). Characteristics of the first child predict the parents' probability of having another child. *Developmental Psychology, 46*(4), 915-926. - Schoon, I., Hope, S., Ross, A., & Duckworth, K. (2010). Family hardship and children's development: the early years. *Longitudinal and Life Course Studies*, *1*(3), 209-222.

6.3 MCS3 (Age 5)

6.3.1 BAS II Naming Vocabulary

Domain:	Verbal knowledge (expressive)
Measures:	Spoken vocabulary: - Expressive language skills - Vocabulary knowledge of nouns - Ability to attach verbal labels to pictures - General knowledge - General language development - Retrieval of names from long-term memory - Level of language stimulation
CHC:	Gc (Crystallised ability)
Administrative method:	Home interviewer; face to face, CM gives verbal response and interviewer records on CAPI
Procedure:	Test items consist of coloured pictures of objects shown one at a time and the cohort member was asked to name. The interviewer showed the cohort member a picture in the BAS easel and asked “What is this?” The cohort member responds verbally, recorded by the interviewer on Computer Assisted Personal Interviewing (CAPI). The assessment stopped automatically if the cohort member made five consecutive errors, apart from at the beginning of the assessment, where if the cohort member made five consecutive errors, and had fewer than three correct answers, the assessment was routed to

<table>
<tr><td></td><td>earlier items in the assessment, which were easier and contained additional teaching items.
Duration: 4-5 minutes (from data)</td></tr>
<tr><td>Link to questionnaire:</td><td>https://cls.ucl.ac.uk/wp-content/uploads/2017/07/mcs3_cogphys.pdf</td></tr>
<tr><td>Scoring:</td><td>36 items (pictures of objects) in total. Starts at item 12 and decision point at item 30, starting and decision points for children aged 5.</td></tr>
<tr><td>Item-level variable(s):</td><td>- ccnsta00 - start point for test
- ccndec00 - decision point for test
- ccn12v00 - ccn30v00; ccn31v00 – ccn36v00; ccn01v00 - ccn11v00 (items 12 - 30; 31 - 36; 1 - 11) - 1st attempt
- ccn12p00 - ccn30p00; ccn31p00 - ccn36p00; ccn01p00 - ccn11p00 (items 12 - 30, 31 - 36; 1-11) – probed</td></tr>
<tr><td>Total score/derived variable(s):</td><td>- ccnsco00 (raw score- total number of correct responses)
- ccnvabil (ability adjusted- total number of correct responses, accounting for the sets of items the CM was presented with, which depended on age and successful completion of blocks of items)
- ccnvtscore (ability and age adjusted on BAS II age normed data)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 62.68, SD = 3.00, Range = 53 – 74</td></tr>
<tr><td>Descriptives:</td><td>
<table>
<tr><th></th><th>ccnsco00 (raw score)</th><th>ccnvabil (ability adjusted)</th><th>ccnvtscore (ability and age adjusted)</th></tr>
<tr><td>N</td><td>15,168</td><td>15,168</td><td>15,168</td></tr>
<tr><td>Range</td><td>0 - 25</td><td>10 - 170</td><td>20 – 80</td></tr>
<tr><td>Mean</td><td>14.26</td><td>107.33</td><td>53.81</td></tr>
<tr><td>SD</td><td>3.45</td><td>16.44</td><td>11.25</td></tr>
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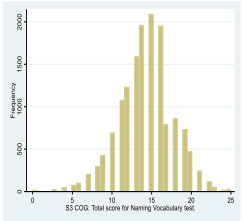
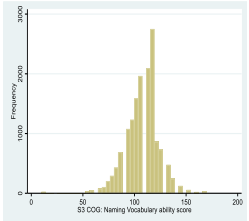
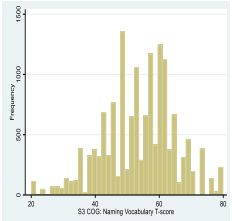
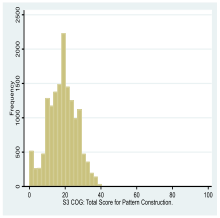
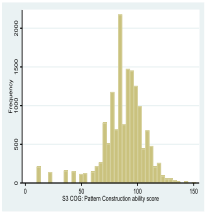
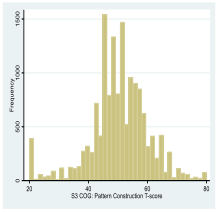



</td></tr>
</table>

Other sweep and/or cohort:	- MCS (age 3): different starting point 1 - BCS (children of cohort member, multi-age) - ALSPAC (age 2): similar task involving objects
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.
Technical resources:	Connelly, R., *Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01*. 2013, Centre for Longitudinal Studies: London.
Reference examples:	- Carson, C., Kelly, Y., Kurinczuk, J. J., Sacker, A., Redshaw, M., & Quigley, M. A. (2011). Effect of pregnancy planning and fertility treatment on cognitive outcomes in children at ages 3 and 5: longitudinal cohort study. *BMJ*, *343*, d4473. - Goodman, A., Gregg, P., & Washbrook, E. (2011). Children's educational attainment and the aspirations, attitudes and behaviours of parents and children through childhood. *Longitudinal and Life Course Studies*, *2*(1), 1-18. - Law, J., Rush, R., Anandan, C., Cox, M., & Wood, R. (2012). Predicting language change between 3 and 5 years and its implications for early identification. *Pediatrics*, *130*(1), e132-7.

6.3.2 BAS II Pattern Construction

Domain:	Non-verbal (spatial problem-solving)
Measures:	Non-verbal spatial ability: - Visuo-spatial analysis, decomposing a design into its component parts - Perception of relative orientation - Visuo-spatial matching, including size, angles and orientation - Spatial problem-solving, including use of strategies such as sequential assembly or trial and error, and ability to synthesize - Eye-hand coordination - Low scores: poor motor control
CHC:	Gv (Visual Processing)

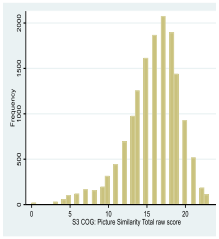
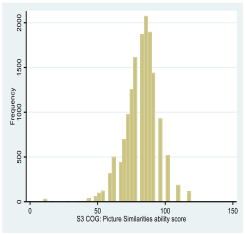
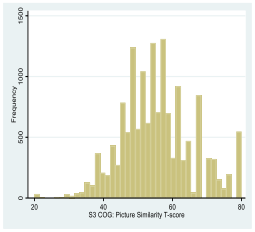
Administrative method:	Home interviewer; face to face; CM completes tasks and interviewer records outcome and timing on CAPI.
Procedure:	The assessment comprised 23 items and four example items. For each item, a pattern was presented to the cohort member, and the cohort member was asked to replicate the pattern using flat foam squares or solid plastic cubes with black and yellow patterns on each side. All of the cohort members started the assessment at the beginning with Example A, as this is the appropriate starting point for children of this age. On completion of each pattern, the interviewer coded whether or not the pattern was constructed correctly, and whether or not the pattern was constructed within the time limit. The patterns increased in complexity as the assessment progressed. The assessment stopped automatically if a cohort member made four errors in five consecutive items. Duration: 13-15 minutes (from data)
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/mcs3_cogphys.pdf
Scoring:	Score is based on accuracy and speed. Starts at item 1 and first decision point at item 13, for this age-group.
Item-level variable(s):	- ccccon0a - ccccon0v (number of failures in 5 items) - ccc01a00 - ccc07a00 (squares) outcome - ccc01b00 - ccc07b00 (squares) response - ccc08a00 - ccc13a00 (cubes1) outcome - ccc08b00 - ccc13b00 (cubes1) response - ccc14a00 - ccc23a00 (cubes2) outcome - ccc14b00 - ccc23b00 (cubes2) response
Total score/derived variable(s):	- cccsco00 (raw score- total number of correct responses) - ccpcabil (ability adjusted- total number of correct responses, accounting for the sets of items the CM was presented with, which depended on age and successful completion of blocks of items) - ccpctscore (ability and age adjusted on BAS II age normed data)
Age of participant (months):	Mean = 62.68, SD = 2.99, Range = 53 - 74

Descriptives:		cccsco00 (raw score)	ccpcabil (ability adjusted)	ccpctscore (ability and age adjusted)
	N	15,126	15,110	15,110
	Range	0 - 92	10 - 152	20 - 80
	Mean	18.41	87.26	50.27
	SD	7.92	19.57	10.07
				
Other sweep and/or cohort:	- MCS (age 7) - ALSPAC (age 4 and 8.5) Block Design			
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.			
Technical resources:	Connelly, R., *Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01*. 2013, Centre for Longitudinal Studies: London.			
Reference examples:	- Sullivan, A., Ketende, S., & Joshi, H. (2013). Social Class and Inequalities in Early Cognitive Scores. *Sociology*, *47*(6), 1187-1206. - Martin, A., Booth, J. N., Young, D., Revie, M., Boyter, A. C., Johnston, B., ... & Reilly, J. J. (2016). Associations between obesity and cognition in the pre-school years. *Obesity*, *24*(1), 207-214.			

6.3.3 BAS II Picture Similarities

Domain:	Non-verbal reasoning (pictorial)
Measures:	Reasoning ability of pre-school children: - Non-verbal problem solving (inductive reasoning) - Visual perception and analysis - Ability to attach meaning to pictures - Ability to develop and test hypotheses

	- Use of verbal mediation - General knowledge
CHC:	Gf (Fluid ability)
Administrative method:	Interviewer; face to face; CM completes tasks; interviewer uses CAPI programme for instructions and recording outcome
Procedure:	For each item, the cohort member was shown a row of four pictures or designs, and the cohort member placed a fifth card below the stimulus picture it best matched. Increasing difficulty in items required the cohort member to recognise a relationship based on a common concept or element. The assessment comprised of 33 items. The number of items administered during the assessment was dependent on the age of the cohort member and their performance during the assessment. All of the cohort members started at item 11, corresponding to the start point for cohort members of their age. If a cohort member gave six or more incorrect responses in any consecutive set of eight items, then the assessment stopped. The exception to this is the first eight items at the start of the assessment, where if a cohort member gave six or more incorrect responses the CAPI routes the assessment to earlier items, which are easier, and include additional teaching items. Duration: 7-8 minutes
Link to questionnaire:	https://cls.ucl.ac.uk/wp-content/uploads/2017/07/mcs3_cogphys.pdf
Scoring:	1 point for each correct item. Starts at item 11 and decision point at item 33.
Item-level variable(s):	ccp01s00 - ccp33s00 ccpsta00 (starting point) ccpdec00 (decision point)
Total score/derived variable(s):	ccpsco00 (raw score- total number of correct responses) ccpsabil (ability adjusted- total number of correct responses, accounting for the sets of items the CM was presented with, which depended on age and successful completion of blocks of items) ccpstscore (ability and age adjusted on BAS II age normed data)

Age of participant (months):	Mean = 62.68, SD = 3.00, Range = 53 - 74
Descriptives:	<table><tr><th></th><th>ccpsco00 (raw score)</th><th>ccpsabil (ability adjusted)</th><th>ccpstscore (ability and age adjusted)</th></tr><tr><td>N</td><td>15,188</td><td>15,188</td><td>15,110</td></tr><tr><td>Range</td><td>0 - 23</td><td>10 - 119</td><td>20 – 80</td></tr><tr><td>Mean</td><td>15.76</td><td>82.09</td><td>55.52</td></tr><tr><td>SD</td><td>3.53</td><td>11.93</td><td>10.28</td></tr></table>   
Other sweep and/or cohort:	None
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.
Technical resources:	Connelly, R. *Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01*. 2013, Centre for Longitudinal Studies: London.
Reference examples:	- Flouri, E., Midouhas, E., & Joshi, H. (2015). Family and neighbourhood risk and children's problem behaviour: The moderating role of intelligence. *Intelligence*, *53*, 33-42. - Bruckauf, Z., & Chzhen, Y. (2016). Poverty and Children's Cognitive Trajectories: Evidence from the United Kingdom Millennium Cohort Study, *Innocenti Working Paper* No.2016-14, UNICEF Office of Research, Florence.

6.4 MCS4 (Age 7)

6.4.1 BAS II Word Reading

Domain:	- Verbal (reading) - School knowledge - reading (achievement scale)
Measures:	Word decoding ability: Recognition and oral reading of single words (lack of contextual clues): - Recognition of printed words - Visual and auditory working memory - Skills in word analysis without additional contextual clues - Vocabulary knowledge Low scores: - Poor visual memory - Short term auditory memory for sequences - Poor skills in phonological segmentation of words into component sounds or syllables - Poor skills in sound blending - Poor auditory discrimination
CHC:	- Gc (Crystallised ability) - Grw (Reading/Writing)
Administrative method:	Home interview, face to face; verbal reading
Procedure:	The child reads aloud a series of words presented on a card. The assessment consisted of 90 words in total. The words were organised into 9 blocks of 10 words in ascending order of difficulty. The child was asked to read each word in a block out loud to the interviewer. The number of blocks of words the child was asked to attempt to read was dependent on the child's performance during the assessment. All of the children in MCS4 started at the first item, as this was the starting point for children of their age. As the child reads the words, the interviewer records whether or not the child pronounced each word correctly in the CAPI. A child's progression through the assessment was dependent on the number of words they read correctly. If a child made eight errors in a block of 10 words, then the assessment stops.

<table>
<tr><td></td><td>Duration: 5-6 minutes</td></tr>
<tr><td>Link to questionnaire:</td><td>https://cls.ucl.ac.uk/wp-content/uploads/2017/07/mcs4_cog_phys_documentation.pdf</td></tr>
<tr><td>Scoring:</td><td>1 point for each correct word</td></tr>
<tr><td>Item-level variable(s):</td><td>DCWR0100 - DCWR9000</td></tr>
<tr><td>Total score/derived variable(s):</td><td>- DCWRSC00 (raw score- total number of correct responses)
- DCWRAB00 (ability adjusted- total number of correct responses, accounting for the sets of items the CM was presented with, which depended on age and successful completion of blocks of items)
- DCWRSD00 (ability and age adjusted on BAS II age normed data)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 86.72, SD = 2.98, Range = 76 - 98</td></tr>
<tr><td>Descriptives:</td><td>
<table>
<tr><th></th><th>DCWRSC00 (raw score)</th><th>DCWRAB00 (ability adjusted)</th><th>DCWRSD00 (ability and age adjusted)</th></tr>
<tr><td>N</td><td>13,591</td><td>13,591</td><td>13,591</td></tr>
<tr><td>Range</td><td>0 - 90</td><td>10 - 222</td><td>55 - 145</td></tr>
<tr><td>Mean</td><td>44.05</td><td>106.43</td><td>111.27</td></tr>
<tr><td>SD</td><td>19.37</td><td>30.87</td><td>18.11</td></tr>
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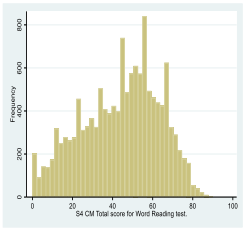
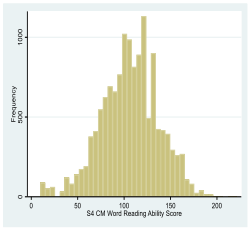
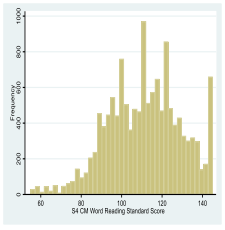
</td></tr>
<tr><td>Other sweep and/or cohort:</td><td>- NSHD (age 8 and 11 - NFER test)
- BCS (children of cohort member, multi-age)</td></tr>
<tr><td>Source:</td><td>- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson.
- Elliott, C. D., Smith, P. & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.</td></tr>
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Technical resources:	- Chaplin Gray, J., Gatenby, R., Simmonds, N., & Huang, Y. (2010). Millennium Cohort Study Sweep 4: Technical Report (Second Edition). London: NatCen. - Connelly, R., *Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01*. 2013, Centre for Longitudinal Studies: London.
Reference examples:	- Russell, G., Ryder, D., Norwich, B., & Ford, T. (2015). Behavioural Difficulties that co-occur with specific word reading difficulties: A UK population based cohort study. *Dyslexia*, *21*(2), 123-141. - Bono, E. D., Francesconi, M., Kelly, Y., & Sacker, A. (2016). Early maternal time investment and early child outcomes. *The Economic Journal*, *126*(596), F96-F135. - Dickerson, A., & Popli, G. K. (2016). Persistent poverty and children's cognitive development: evidence from the UK Millennium Cohort Study. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *179*(2), 535-558.

6.4.2 BAS II Pattern Construction

Domain:	Non-verbal (Spatial problem-solving)
Measures:	Non-verbal spatial ability: - Visuo-spatial analysis, decomposing a design into its component parts - Perception of relative orientation - Visuo-spatial matching, including size, angles and orientation - Spatial problem-solving, including use of strategies such as sequential assembly or trial and error, and ability to synthesize - Eye-hand coordination Low scores: poor motor control
CHC:	Gv (Visual Processing)
Administrative method:	Home interviewer; face to face; CM completes tasks and interviewer records outcome and timing on CAPI.

<table>
<tr><td>Procedure:</td><td>The number of items administered during the assessment was dependent on the age of the child, and their performance during the assessment. All of the children in MCS4 started the assessment at Example C (item 8), which was the starting point appropriate for children of their age. For each, a pattern was presented to the child, and the child was asked to replicate the pattern using solid plastic cubes with black and yellow patterns on each side. On completion of each pattern, the interviewer coded whether or not the pattern was constructed correctly, and whether or not the pattern was constructed within the time limit. The patterns increased in complexity as the assessment progressed.
Duration: 9-12 minutes (from data)</td></tr>
<tr><td>Link to questionnaire:</td><td>https://cls.ucl.ac.uk/wp-content/uploads/2017/07/mcs4_cog_phys_documentation.pdf</td></tr>
<tr><td>Scoring:</td><td>Score is based on accuracy and speed. Starts at item 8 and first decision point at item 16.</td></tr>
<tr><td>Item-level variable(s):</td><td>- DCSCOR0H-DCSCOR0K (Items 8-11)
- DCSCOR0L-DCSCOR0P (Items 12-16)
- DCSCOR0Q-DCSCOR0W (Items 17-23)
- DCSCOR0X-DCSCOR0Z (Items 24-26)
- DCSCOR0A-DCSCOR0G (Items 1-7)</td></tr>
<tr><td>Total score/derived variable(s):</td><td>- DCTOTS00 (raw score- total number of correct responses)
- DCPCAB00 (ability adjusted- total number of correct responses, accounting for the sets of items the CM was presented with, which depended on age and successful completion of blocks of items)
- DCPCTS00 (ability and age adjusted on BAS II age normed data)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 86.73, SD = 2.98, Range = 76 - 98</td></tr>
<tr><td>Descriptives:</td><td><table>
<tr><th></th><th>DCTOTS00 (raw score)</th><th>DCPCAB00 (ability adjusted)</th><th>DCPCTS00 (ability and age adjusted)</th></tr>
<tr><td>N</td><td>13,703</td><td>13,703</td><td>13,703</td></tr>
<tr><td>Range</td><td>0 - 72</td><td>10 - 211</td><td>20 - 80</td></tr>
<tr><td>Mean</td><td>18.89</td><td>116.13</td><td>52.99</td></tr>
<tr><td>SD</td><td>7.05</td><td>17.25</td><td>11.08</td></tr>
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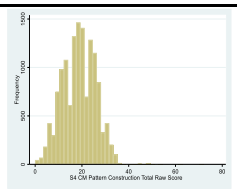
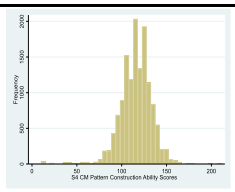
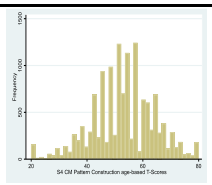
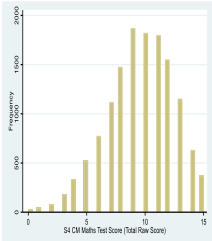
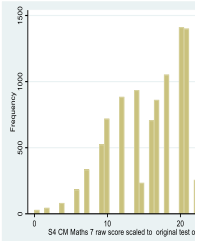
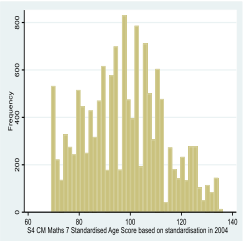
	  
Other sweep and/or cohort:	- MCS (age 5) - ALSPAC (age 4 and 8.5) Block Design
Source:	- Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson. - Elliott, C. D., Smith, P., & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson.
Technical resources:	- Chaplin Gray, J., Gatenby, R., Simmonds, N., & Huang, Y. (2010). Millennium Cohort Study Sweep 4: Technical Report (Second Edition). London: NatCen. - Connelly, R., *Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01*. 2013, Centre for Longitudinal Studies: London.
Reference examples:	- Jones, E., Gutman, L., & Platt, L. (2013). Family stressors and children's outcomes. DfE Research Report DFE-RR254. London: Dept for Education. - Gilligan, K. A., Flouri, E., & Farran, E. K. (2017). The contribution of spatial ability to mathematics achievement in middle childhood. *Journal of Experimental Child Psychology*, *163*, 107-125.

6.4.3 NFER Progress in Maths (adapted)

Domain:	Mathematical skills and knowledge
Measures:	Adaptation of the Progress in Maths 7 (PiM) test which was developed to assess mathematical ability. The child's mathematical skills and knowledge are tested by asking 20 questions covering topics such as numbers, shapes, measurement and data handling.
CHC:	Gq (Quantitative Knowledge)
Administrative method:	Home interviewer, face to face; verbal and child responds using pen and paper

<table>
<tr><td>Procedure:</td><td>The test is read aloud to the child and they are asked to complete a series of calculations in a paper and pencil exercise.

The test was adapted from the NFER Progress in Maths test (Cres Fernandes, NFER). All CM's had to complete an initial test and based on their score they were routed to an easier, medium or harder section. An item response scaling method (Rasch) was used to scale the results of the easy, medium and hard subtest scores to the equivalent original raw scores.</td></tr>
<tr><td>Link to questionnaire:</td><td>https://cls.ucl.ac.uk/wp-content/uploads/2017/07/mcs4_cog_phys_documentation.pdf</td></tr>
<tr><td>Scoring:</td><td>1 - 7 completed by all; routed into easier, medium and harder. Items 2 to 4, 13 and 17 score 2 points, all other items score 1 point</td></tr>
<tr><td>Item-level variable(s):</td><td>DMSCRE01- DMSCRE20 (items)

DCMT_1_7 - DCMSCR_HRD (totals by sections e.g. 1-7 items)</td></tr>
<tr><td>Total score/derived variable(s):</td><td>- DCMTOTSCOR (raw score)
- DCMATHS7SC (ability adjusted)
- DCMATHS7SA (ability and age adjusted - look up tables 2004)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 86.74, SD = 2.98, Range = 76 - 98</td></tr>
<tr><td>Descriptives:</td><td>
<table>
<tr><th></th><th>DCMTOTSCOR (raw score)</th><th>DCMATHS7SC (ability adjusted)</th><th>DCMATHS7SA (ability and age adjusted)</th></tr>
<tr><td>N</td><td>13,756</td><td>13,756</td><td>13,756</td></tr>
<tr><td>Range</td><td>0 - 15</td><td>0 - 28</td><td>69 - 136</td></tr>
<tr><td>Mean</td><td>9.58</td><td>18.38</td><td>97.65</td></tr>
<tr><td>SD</td><td>2.84</td><td>5.84</td><td>15.72</td></tr>
<tr><td></td><td>  </td><td>  </td><td>  </td></tr>
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Other sweep and/or cohort:	None
Source:	Adapted version specifically for MCS (by Cres Fernandes) of NFER Progress in Maths test which is aimed for 7-year-olds and was originally developed and nationally UK standardised in 2004.
Technical resources:	- MCS4 technical report second edition September 2010_v2.pdf - Connelly, R., *Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01*. 2013, Centre for Longitudinal Studies: London.
Reference examples:	- Jones, E & Schoon, I. (2010). Cognitive development. In Hansen, K, Jones, E, Joshi, H and Budge, D (ed), *Millennium Cohort Study Fourth Survey: A User's Guide to Initial Findings.* London: Centre for Longitudinal Studies. - Campbell, T. (2015). Stereotyped at seven? Biases in teacher judgement of pupils' ability and attainment. *Journal of Social Policy*, *44*(3), 517-547.

6.5 MCS5 (Age 11)

6.5.1 BAS II Verbal Similarities

Domain:	Verbal (reasoning using verbal concepts)
Measures:	(Acquired) verbal knowledge and verbal reasoning: - Verbal reasoning ability - Expressive language skills, including verbal fluency - Vocabulary knowledge - General knowledge - Abstract and logical thinking - Ability to distinguish between essential and superficial features - Level of language stimulation
CHC:	Gc (Crystallised ability)
Administrative method:	Home interviewer, face to face; read to child, verbal response
Procedure:	Verbal Similarities was modified to be administered with the help of the CAPI programme. The general rule in BAS assessments is that the

<table>
<tr><td></td><td>older the child the further into the assessment they start. As all of the cohort children were approximately the same age, they all started the assessment in the same place, at item 16, after completing Example A. The child was given three stimulus words and asked to name the class to which all the examples belong.</td></tr>
<tr><td>Link to questionnaire:</td><td>No direct link to pdf.</td></tr>
<tr><td>Scoring:</td><td>All items (except Example A) are scored 1 or 0 points:

Start at item 16 (age relevant start point) to item 28. The tests will terminate at this point (item 28) unless:

- There are less than 3 incorrect responses (the test continues from item 29 to 33) or if less than 3 correct answers (the test goes back to item 8 to item 15)
- There are 5 consecutive incorrect answers and less than 3 correct, the assessment will stop and go back to items 8 to 15. If items 8 to 16 are difficult the test is routed back to item 1</td></tr>
<tr><td>Item-level variable(s):</td><td>ECQ01I00 - ECQ37I00

LOW HIGH (base, ceiling)</td></tr>
<tr><td>Total score/derived variable(s):</td><td>- EVSRAW (raw score- total number of correct responses)
- EVSABIL (ability adjusted- total number of correct responses, accounting for the sets of items the CM was presented with, which depended on age and successful completion of blocks of items)
- EVSTSCO (ability and age adjusted)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 134.02, SD = 3.97, Range = 122 - 148</td></tr>
<tr><td>Descriptives:</td><td>
<table>
<tr><th></th><th>EVSRAW (raw score)</th><th>EVSABIL (ability adjusted)</th><th>EVSTSCO (ability and age adjusted)</th></tr>
<tr><td>N</td><td>13,168</td><td>13,168</td><td>13,168</td></tr>
<tr><td>Range</td><td>0 - 22</td><td>10 - 179</td><td>20 - 80</td></tr>
<tr><td>Mean</td><td>8.66</td><td>120.60</td><td>58.69</td></tr>
<tr><td>SD</td><td>3.64</td><td>17.11</td><td>10.07</td></tr>
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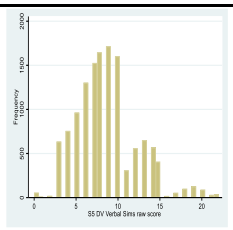
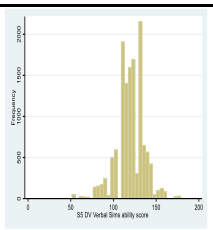
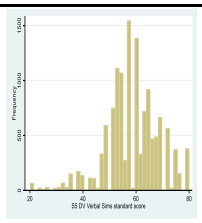
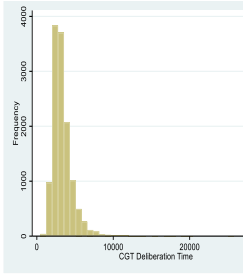
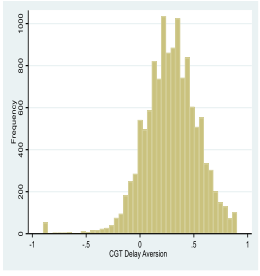
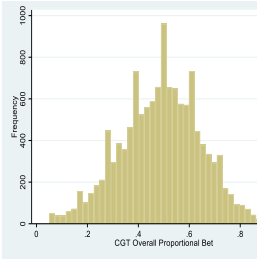
	  
Other sweep and/or cohort:	- BCS70 (age 10) BAS similarities (v1) - ALSPAC (age 8.5) verbal similarities asked slightly differently - ALSPAC (age 4; both verbal and picture similarities)
Source:	Elliott, C. D., Smith, P., & McCulloch, K. (1996). British Ability Scales Second Edition (BAS II). Administration and Scoring Manual. London: Nelson.
Technical resources:	- Elliott, C. D., Smith, P. & McCulloch, K. (1997). British Ability Scales Second Edition (BAS II). Technical Manual. London: Nelson. - Gallop, K., Rose, R., Wallace, E., Williams, R., Cleary, A., Thompson, A., Burston, K., Frere-Smith, T., Dangerfield, P., & Tietz , S. Millennium Cohort Study Fifth Sweep (MCS5): Technical Report. London: Ipsos MORI. (pp. 38-41). - Connelly, R., *Interpreting Test Scores. Millennium Cohort Study Data Note 2013/01*. 2013, Centre for Longitudinal Studies: London.
Reference examples:	- Brown, M., & Sullivan, A. (2014). Cognitive Development. In PLATT, L (ed), *Millennium Cohort Study: Initial findings from the Age 11 survey.* London: Centre for Longitudinal Studies. - Barbuscia, A., & Mills, M. C. (2017). Cognitive development in children up to age 11 years born after ART—a longitudinal cohort study. *Human Reproduction*, *32*(7), 1482-1488.

6.5.2 CANTAB Cambridge Gambling Task (CGT)

Domain:	Executive function (decision making)
Measures:	The Cambridge Gambling Task was developed to assess decision making and risk taking behaviour outside a learning context. It can be contrasted with widely used tests including the Balloon Analog Risk Taking Task (BART) and Iowa Gambling Task (IGT) in that the CGT asks participants to make bets under conditions of known risk, rather than ambiguity (e.g., Bechara, Damasio, Tranel & Damasio 2005; Lejuez et al., 2002). The test minimises learning, executive and working memory

	demands on participants, which can confound the interpretation of test scores. It also separates the decision-making - where participants choose what to bet on - from risk-taking, where participants decide how much then to bet on that choice. The test is recommended to assess cognitive function in: Attention deficit disorders, Depression and affective disorders, Obsessive compulsive disorder, Parkinson's disease, Schizophrenia and Traumatic brain injury.
CHC:	- Gs (Processing Speed) - Gt (Decision Speed/Reaction Time)
Administrative method:	Self-completion on CAPI tablet; using the CANTAB eclipse software which was integrated into the CAPI interview.
Procedure:	The participant was presented with a row of ten boxes across the top of the screen: some were red and some were blue. The ratio of red and blue boxes varied between stages but there was always one box that contained a yellow token hidden behind it. Participants used the 'Red' and 'Blue' buttons at the bottom of the screen to choose the box colour in which they thought the token was hidden. In the assessed stages, participants start with 100 points and select a proportion of these points to bet on their decision. A circle in the centre of the screen displays the current bet value, which will either incrementally increase or decrease (depending on the task variant selected). Participants pressed this button when it showed the proportion of their score they would like to bet. These points were either added or taken away to their total score, depending on their decision and where the token was actually hidden. Duration: max 18 minutes
Link to questionnaire:	Documentation not available. For some additional detail, see: https://www.cambridgecognition.com/cantab/cognitive-tests/executive-function/cambridge-gambling-task-cgt/
Scoring:	Raw data and procedures / algorithms for deriving the summary scores are unavailable. There are currently no normative scores.

<table>
<tr><td>Item-level variable(s):</td><td>Not readily available.

Additional variables available outlining any technical problems and test conditions</td></tr>
<tr><td>Total score/derived variable(s):</td><td>- CGTTTIME (Test duration)
- CGTDELAY (Delay aversion)
- CGTDTIME (Deliberation time - milliseconds)
- CGTOPBET (Overall proportional bet)
- CGTQOFDM (Quality of decision making)
- CGTRISKA (Risk adjustment)
- CGTRISKT (Risk taking)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 134, SD = 3.95, Range = 122 - 148</td></tr>
<tr><td>Descriptives:</td><td>
<table>
<tr><td></td><td>CGTDTIME (deliberation time)</td><td>CGTDELAY (Delay aversion</td><td>CGTOPBET (Overall proportional bet)</td></tr>
<tr><td>N</td><td>12,690</td><td>12,624</td><td>12,689</td></tr>
<tr><td>Range</td><td>468 - 31978</td><td>-.9 - .9</td><td>.05 - .95</td></tr>
<tr><td>Mean</td><td>3331.12</td><td>.29</td><td>.49</td></tr>
<tr><td>SD</td><td>1353.34</td><td>.25</td><td>.16</td></tr>
<tr><td></td><td> 
</td><td> 
</td><td> 
</td></tr>
<tr><td></td><td>CGTQOFDM (Quality of decision making)</td><td>CGTRISKA (Risk adjustment)</td><td>CGTRISKT (Risk taking)</td></tr>
<tr><td>N</td><td>12,690</td><td>12,689</td><td>12,689</td></tr>
<tr><td>Range</td><td>0 - 1</td><td>-6.43 - 6.43</td><td>.05 - .95</td></tr>
<tr><td>Mean</td><td>.80</td><td>.65</td><td>.53</td></tr>
<tr><td>SD</td><td>.17</td><td>1.04</td><td>.17</td></tr>
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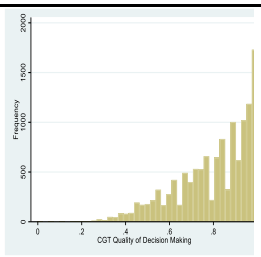
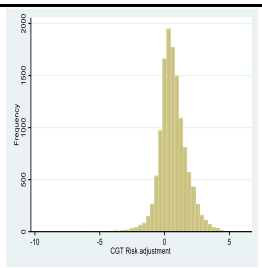
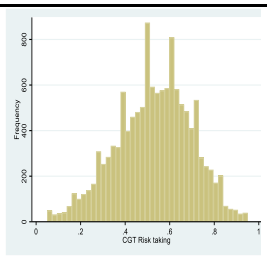
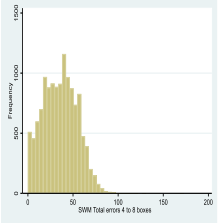
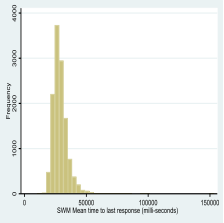
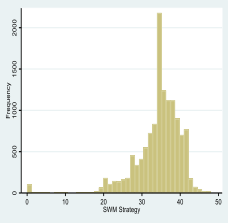
	  
Other sweep and/or cohort:	MCS (age 14)
Source:	Cambridge Cognition. CANTAB (Cambridge Neuropsychological Test Automated Battery) - Cognitive Assessment Software. Available at www.cambridgecognition.com/products/cognitive-research/
Technical resources:	- Atkinson, M. (2015). *Millennium Cohort Study Interpreting the CANTAB Cognitive Measures.* London, UK: Centre for Longitudinal Studies, Institute of Education, University of London. - Hansen K, ed. (2012). Millennium Cohort Study - First, Second, Third and Fourth Surveys: A Guide to the Datasets. 7th ed. London, UK: Centre for Longitudinal Studies, Institute of Education, University of London - Ipsos MORI. (2013). Millennium Cohort Study Fifth Sweep (MCS5) Age 11 Main Stage: Household and Main/Partner Questionnaire. London: Ipsos MORI.
Reference examples:	- Brown, M & Sullivan, A. (2014). Cognitive Development. In PLATT, L (ed), *Millennium Cohort Study: Initial findings from the Age 11 survey.* London: Centre for Longitudinal Studies. - Flouri, E., Ioakeimidi, S., Midouhas, E., & Ploubidis, G. B. (2017). Maternal psychological distress and child decision-making. *Journal of Affective Disorders*, *218*, 35-40. - Flouri, E., Moulton, V., & Ploubidis, G. B. (2018). The role of intelligence in decision-making in early adolescence. *British Journal of Developmental Psychology*.

6.5.3 CANTAB Spatial Working Memory task (SWM)

Domain:	Memory (holding and manipulating information)
Measures:	The test measures Spatial Working Memory, which requires retention and manipulation of visuospatial information. It has notable executive

	function demands and provides a measure of strategy as well as working memory errors. The test is recommended to assess cognitive function in: Alzheimer's disease, autism spectrum disorder, depression and affective disorders, Down's syndrome, epilepsy, multiple sclerosis, Parkinson's disease, schizophrenia, stroke and cerebrovascular disease, and traumatic brain injury.
CHC:	Gsm (Short-Term memory)
Administrative method:	Self-completion on CAPI tablet; using the CANTAB eclipse software which was integrated into the CAPI interview.
Procedure:	The test begins with a number of coloured squares (boxes) shown on the screen. The aim of this test is that by selecting the boxes and using a process of elimination, the participant should find one yellow 'token' in each of a number of boxes and use them to fill up an empty column on the right-hand side of the screen. Depending on the difficulty level used for this test, the number of boxes can be gradually increased until a maximum of 12 boxes are shown for the participants to search. The colour and position of the boxes used are changed from trial to trial to discourage the use of stereotyped search strategies. Duration: max 18 minutes
Link to questionnaire:	Documentation not available. https://www.cambridgecognition.com/cantab/cognitive-tests/memory/spatial-working-memory-swm/
Scoring:	Key outcomes of the test are the total errors, time taken until last response and strategy. Raw data and procedures / algorithms for deriving the summary scores are unavailable.
Item-level variable(s):	SWMTTIME - SWMWE8BX
Total score/derived variable(s):	Key Item-level variable(s): - SWMTE8BX (Total errors on 4,6 and 8 box trials) - SWMMTTLR (Mean time to last response)

<table>
<tr><td></td><td>- SWMSTRAT (Overall degree to which searches employ sequential heuristic)</td></tr>
<tr><td>Age of participant (months):</td><td>Mean = 134, SD = 3.95, Range = 122 - 148</td></tr>
<tr><td>Descriptives:</td><td>
<table>
<tr><th></th><th>SWMTE8BX (Total errors on 4,6 and 8 box trials)</th><th>SWMMTTLR (Mean time to last response)</th><th>SWMSTRAT (Strategy)</th></tr>
<tr><td>N</td><td>12,757</td><td>12,637</td><td>12,757</td></tr>
<tr><td>Range</td><td>0 - 173</td><td>10591 - 153037</td><td>0 - 48</td></tr>
<tr><td>Mean</td><td>35.71</td><td>28922.07</td><td>34.32</td></tr>
<tr><td>SD</td><td>18.76</td><td>6309.03</td><td>5.94</td></tr>
<tr><td></td><td>  </td><td>  </td><td>  </td></tr>
</table>
</td></tr>
<tr><td>Other sweep and/or cohort:</td><td>None</td></tr>
<tr><td>Source:</td><td>Cambridge Cognition. CANTAB (Cambridge Neuropsychological Test Automated Battery) - Cognitive Assessment Software. Available at

www.cambridgecognition.com/products/cognitive-research/</td></tr>
<tr><td>Technical resources:</td><td>- Atkinson, M. (2015). Millennium Cohort Study Interpreting the CANTAB Cognitive Measures. London, UK: Centre for Longitudinal Studies, Institute of Education, University of London.

- Hansen K, ed. (2012). Millennium Cohort Study - First, Second, Third and Fourth Surveys: A Guide to the Datasets. 7th ed. London, UK: Centre for Longitudinal Studies, Institute of Education, University of London

- Ipsos MORI. (2013). Millennium Cohort Study Fifth Sweep (MCS5) Age 11 Main Stage: Household and Main/Partner Questionnaire. London: Ipsos MORI.</td></tr>
</table>

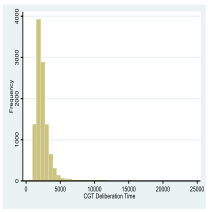
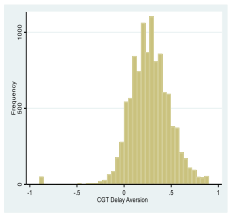
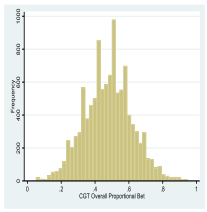
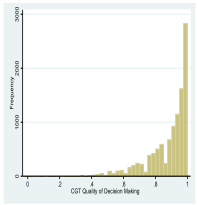
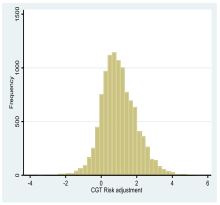
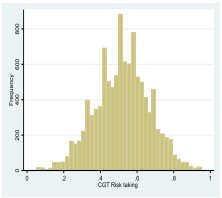
Reference examples:	- Brown, M & Sullivan, A. (2014). Cognitive Development. In Platt, L (ed), *Millennium Cohort Study: Initial findings from the Age 11 survey.* London: Centre for Longitudinal Studies. - Fitzpatrick, A., Carter, J., & Quigley, M. A. (2016). Association of gestational age with verbal ability and spatial working memory at age 11. *Pediatrics*, e20160578. - Flouri, E., Papachristou, E., & Midouhas, E. (2018). The role of neighbourhood greenspace in children's spatial working memory. *British Journal of Educational Psychology, 89, 359-373*.

6.6 MCS5 (Age 14)

6.6.1 CANTAB Cambridge Gambling Task (CGT)

Domain:	Executive function (decision making)
Measures:	The Cambridge Gambling Task was developed to assess decision making and risk taking behaviour outside a learning context. It can be contrasted with widely used tests including the Balloon Analog Risk Taking Task (BART) and Iowa Gambling Task (IGT) in that the CGT asks participants to make bets under conditions of known risk, rather than ambiguity (e.g., Bechara, Damasio, Tranel & Damasio 2005; Lejuez et al., 2002). The test minimises learning, executive and working memory demands on participants, which can confound the interpretation of test scores. It also separates the decision-making - where participants choose what to bet on - from risk-taking, where participants decide how much then to bet on that choice. The test is recommended to assess cognitive function in: Attention deficit disorders, Depression and affective disorders, Obsessive compulsive disorder, Parkinson's disease, Schizophrenia and Traumatic brain injury.
CHC:	- Gs (Processing Speed) - Gt (Decision Speed/Reaction Time)
Administrative method:	Self-completion on CAPI tablet; using the CANTAB eclipse software which was integrated into the CAPI interview.
Procedure:	The participant was presented with a row of ten boxes across the top of the screen: some were red and some are blue. The ratio of red and blue

	boxes varied between stages but there was always one box that contained a yellow token. Participants used the 'Red' and 'Blue' buttons at the bottom of the screen to choose the box colour in which they thought the token was hidden. In the assessed stages, participants start with 100 points and select a proportion of these points to bet on their decision. A circle in the centre of the screen displays the current bet value, which will either incrementally increase or decrease (depending on the task variant selected). Participants pressed this button when it showed the proportion of their score they would like to bet. These points were either added or taken away to their total score, depending on their decision and where the token was actually hidden. Duration: max 18 minutes
Link to questionnaire:	Documentation not available. https://www.cambridgecognition.com/cantab/cognitive-tests/executive-function/cambridge-gambling-task-cgt/
Scoring:	Raw data and procedures / algorithms for deriving the summary scores are unavailable. There are currently no normative scores.
Item-level variable(s):	Not readily available No additional variables available outlining any technical problems Test conditions in mcs6_cm_assessment.dta/ FCGTOUTCM (outcome of test)
Total score/derived variable(s):	- FCGTTTIME (Test duration) - FCGTDELAY (Delay aversion) - FCGTDTIME (Deliberation time - milliseconds) - FCGTOPBET (Overall proportional bet) - FCGTQOFDM (Quality of decision making) - FCGTRISKA (Risk adjustment) - FCGTRISKT (Risk taking)
Age of participant (months):	Mean = 171, SD = 4.05, Range = 158 - 184

<table>
<tr><td>Descriptives:</td><td>
<table>
<tr><td></td><td>FCGTDTIME (deliberation time)</td><td>FCGTDELAY (Delay aversion)</td><td>FCGTOPBET (Overall proportional bet)</td></tr>
<tr><td>N</td><td>10,854</td><td>10,848</td><td>10,848</td></tr>
<tr><td>Range</td><td>362 - 23691</td><td>-.9 - .9</td><td>.05 - .95</td></tr>
<tr><td>Mean</td><td>2336.53</td><td>.27</td><td>.48</td></tr>
<tr><td>SD</td><td>944.16</td><td>.22</td><td>.14</td></tr>
<tr><td></td><td>  </td><td>  </td><td>  </td></tr>
<tr><td></td><td>FCGTQOFDM (Quality of decision making)</td><td>FCGTRISKA (Risk adjustment)</td><td>FCGTRISKT (Risk taking)</td></tr>
<tr><td>N</td><td>10,854</td><td>10,853</td><td>10,853</td></tr>
<tr><td>Range</td><td>0 - 1</td><td>-4.06 - 5.28</td><td>.05 - .95</td></tr>
<tr><td>Mean</td><td>.88</td><td>.99</td><td>.52</td></tr>
<tr><td>SD</td><td>.13</td><td>.98</td><td>.15</td></tr>
<tr><td></td><td>  </td><td>  </td><td>  </td></tr>
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</td></tr>
<tr><td>Other sweep and/or cohort:</td><td>MCS (age 11)</td></tr>
<tr><td>Source:</td><td>Cambridge Cognition. CANTAB (Cambridge Neuropsychological Test Automated Battery) - Cognitive Assessment Software. Available at:

www.cambridgecognition.com/products/cognitive-research/</td></tr>
<tr><td>Technical resources:</td><td>- Atkinson, M. (2015). Millennium Cohort Study Interpreting the CANTAB Cognitive Measures. London, UK: Centre for Longitudinal Studies, Institute of Education, University of London.

- Hansen K, ed. (2012). Millennium Cohort Study - First, Second, Third and Fourth Surveys: A Guide to the Datasets. 7th ed. London,</td></tr>
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	UK: Centre for Longitudinal Studies, Institute of Education, University of London
Reference examples:	Creese, H., Viner, R., Hope, S., & Christie, D. (2018). Obesity and cognition during childhood: Findings from the Millennium Cohort Study: Hanna Creese. *European Journal of Public Health*, *28*(suppl_4), cky213-260.

6.6.2 APU Vocabulary Test (Applied Psychology Unit)

Domain:	Verbal (vocabulary)
Measures:	- Vocabulary - Understanding of the meaning of words - Word knowledge The test was a shortened version of 20 items from the full test (75 items) used in the BCS70 at age 16.
CHC:	Gc (Crystallised ability)
Administrative method:	CAPI: CM's selected their answer by touching the word on the screen with their index finger. If they changed their mind, they could deselect the word in the same way.
Procedure:	20 words in the test. Each word was followed by a multiple-choice list of 5 words from which the respondent picked the word with the same meaning as the original word. The test got progressively harder. In addition, the task was timed, 4 minutes was allowed and a warning was displayed on screen with one minute remaining and countdown from 60 seconds was shown. The task was completed by the CM, main parent and partner. Different sets of words were used for each, with the same level of difficulty. Duration: 4 minutes
Link to questionnaire:	Not available.

<table>
<tr><td>Scoring:</td><td>20 items; 1 point for each correct response, 0 for incorrect or not attempted</td></tr>
<tr><td>Item-level variable(s):</td><td>- FCCMCOGA-FCCMCOGT (CM item response)
- FPMCOG0A-FPMCOG0T (MAIN parent item response)
- FPPCOG0A-FPPCOG0T (PARTNER item response)</td></tr>
<tr><td>Total score/derived variable(s):</td><td>- FCWRDSC (Total raw score CM)
- FPWRDSCM (Total raw score MAIN)
- FPWRDSCP (Total raw score PARTNER)</td></tr>
<tr><td>Age of participant:</td><td>- Mean = 171, SD = 4.06, Range = 157 - 184 (CM months)
- Mean = 43.49, SD = 5.98, Range = 20 - 74 (MAIN years)
- Mean = 46.09, SD = 6.54, Range = 19 - 81 (PARTNER years)</td></tr>
<tr><td>Descriptives:

(Raw data)</td><td>
<table>
<tr><th></th><th>FCWRDSC
(CM raw score)</th><th>FPWRDSCM
(Total raw score MAIN)</th><th>FPWRDSCP
(Total raw score PARTNER)</th></tr>
<tr><td>N</td><td>10,921</td><td>11,057</td><td>6,869</td></tr>
<tr><td>Range</td><td>0 - 19</td><td>0 - 20</td><td>0 - 20</td></tr>
<tr><td>Mean</td><td>7.06</td><td>10.97</td><td>11.91</td></tr>
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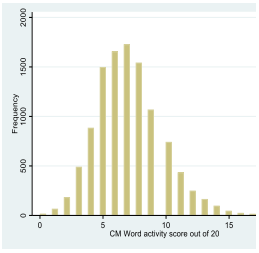

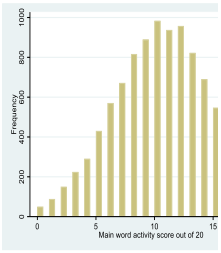

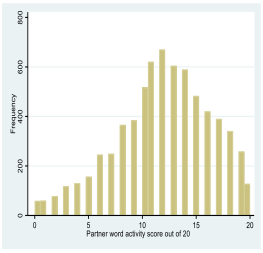

</td></tr>
<tr><td>Other sweep and/or cohort:</td><td>- BCS70 (age 16)
- BCS70 (age 42) shortened version (20 items)</td></tr>
<tr><td>Source:</td><td>Shortened version (20 of original 75 items) of Closs, S. J. (1976). APU vocabulary test (multiple choice format, 1986). Kent: Hodder and Stoughton Educational Ltd.</td></tr>
<tr><td>Technical resources:</td><td>Levy, P. & Goldstein, H. (1984). Tests in Education: a book of critical reviews. London: Academic Press.</td></tr>
</table>

Reference examples:	- Hoffmann, N. I. (2018). Cognitive achievement of children of immigrants: Evidence from the Millennium Cohort Study and the 1970 British Cohort Study. *British Educational Research Journal*, *44*(6), 1005-1028. - Sullivan, A., Moulton. V & Fitzsimons, E. (2018). The intergenerational transmission of vocabulary. CLS Working Paper, Institute of Education, London.

6.7 MCS6 (Age 17)*

6.7.1 Number Analogies

*Note. Fieldwork completed and data being processed. Number Analogies is a short version of the Quantitative Reasoning Battery which aims to assess reasoning ability with numbers. The test forms part of GL-assessments' Cognitive Ability Tests (CAT).

7. References

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