1958 National Child Development Study user guide

Measures of ability at ages 7 to 16

Peter Shepherd

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The Centre for Longitudinal Studies (CLS) is an Economic and Social Research Council (ESRC) resource centre based at the Institution of Education (IOE), University of London. It provides support and facilities for those using the three internationally-renowned birth cohort studies: the 1958 National Child Development Study, the 1970 British Cohort Study and the Millennium Cohort Study. CLS conducts research using the birth cohort study data, with a special interest in family life and parenting, family economics, youth life course transitions and basic skills.

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Introduction

1.	This document draws together information available on the key measures of ability that were gathered from members of the National Child Development Study (NCDS) during the three surveys carried out during the school years of the birth cohort. Below, a brief background on NCDS will be followed by an outline of the measurements made. Copies of each 'test' administered may be found by following the links given in the appendix.

1958 National Child Development Study (NCDS)

2.	NCDS is one of three cohort studies that are the responsibility of the Centre for Longitudinal Studies (CLS), an ESRC Resource Centre (www.cls.ioe.ac.uk). The cohort studies follow groups of individuals who were born at one particular time, throughout their lives, and have involved multiple surveys, collecting information on (eg) education and employment, family and parenting, physical and mental health, and social attitudes. The focus of NCDS is on those living in Great Britain who were born in one week in 1958. To date, NCDS surveys have been undertaken at: birth and 7 (1965), 11 (1969), 16 (1974), 23 (1981), 33 (1991), 42 (2000), 46 (2004) and 50 (2008) years. During the follow-ups at ages 7, 11 and 16 years, the original birth cohort was augmented by including in the target sample immigrants born in the relevant week as identified from school registers. A Biomedical Survey was undertaken at age 44-45 (2003) years and a number of other quantitative/qualitative sub-sample studies have been undertaken, selecting from the birth cohort those in particular circumstances/with specific health conditions. Further information is available on the CLS website (see above).

Measures of ability

3.	During the surveys at ages 7 (NCDS1), 11 (NCDS2) and 16 (NCDS3) years, information was gathered from: parents, teachers and by medical examination. It also came from the study subjects themselves – the cohort members. The information gathered from the latter included the completion of measures of reading, arithmetic, general ability and perceptual and motor ability as follows:

Surveys	NCDS1 7 years (1965)	NCDS2 11 years (1969)	NCDS3 16 years (1974)
Reading	Southgate Group Reading Test (Variables=N92)	Reading Comprehension Test (Variables=N923)	Reading Comprehension Test (Variables=N2928)
Arithmetic/mathematics	Problem Arithmetic Test (Variables=N90)	Arithmetic/ Mathematics Test (Variables=N926)	Mathematics Test (Variables=N2930)

Surveys	NCDS1 7 years (1965)	NCDS2 11 years (1969)	NCDS3 16 years (1974)
General Ability	-	General Ability Test (Variables=N914, N917, N920)	-
Perceptual and motor ability	Copying Designs Test Variables=N457 + Drawing-a-Man Test (Variables=N1840)	Copying Designs Test (Variables=N929)	-

4.   A summary of each ability measure is given below:

NCDS1, 1965, age 7 years

Southgate Group Reading Test	
Measures:	Word recognition and comprehension. Particularly suited to identifying backward readers.
Administration:	On 16 (of 30) occasions, the child was given a picture of an object and had to ring the word describing that object. On the other 14 occasions, the teacher read out a word and the child had to circle the correct one.
Scoring	One mark was awarded for each correct answer, giving a score between 0 and 30.
Reliability	Unkown
	A graded word reading test was considered, but it was felt that the Southgate Test was less likely to be known or used already by teachers in infant schools; that it would save time where there was more than one child in a school; and that it would, possibly, be less formal and therefore less stressful for 7-year olds. While this test was unable to extend the above average reader at this age, it did differentiate very clearly the backward readers. For the aims of the Study, this advantage outweighed the disadvantage of a rather low 'ceiling'.
Variables	N92
Source	Southgate, V (1962) *Southgate Group Reading Tests: Manual of Instructions.* University of London Press

Copying Designs Test	
Measures:	Perceptuo-motor ability.
Administration:	Six designs were presented: a circle, square, triangle, diamond, cross and star. The children were asked to copy each design twice.
Scoring	One mark was awarded for each correct attempt, giving an overall score between 0 and 12.
	The following principles were followed when scoring the drawings:
	1. The drawing must have the right general shape and look like what it is supposed to be
	2. It should be approximately symmetrical
	3. It should not be rounded
	4. The drawing should not be rotated, eg: the point of the triangle should be uppermost
	5. Angles must be approximately opposite each other (except for the triangle)
	6. Slight bowing or irregularity of lines is allowed
	7. As long as the other criteria are met, neatness is not important
	8. Lines should meet approximately but as long as other criteria are met small gaps at junctions are acceptable
	9. Slight crossing and overlapping of lines is permitted
Reliability	Unkown
Comments	Not all children completed two drawings of each design; therefore a score was given if at least one good copy was made of a given design. The total score was the sum of the scores obtained on each design, thus giving a range of 0-8. Zero score was obtained when a child attempted to copy at least one design but all attempts were judged to be poor copies.
	"...(A)ll the items in the test are used in intelligence tests and it measures one facet of general ability. Furthermore, it is an aspect of ability which is less likely than most to be affected by environmental factors such as different kinds of schooling, or by parental or community attitudes..." (Davie, *et al*)
Variables	N457
Source	Pringle, M K, Butler, N and Davie, R (1966) *11,000 Seven Year Olds*. Longman, in association with National Children's Bureau

Drawing-a-Man Test	
Measures:	General mental and perceptual ability, as well as other maturational aspects.
Administration:	The child was asked to draw a picture of a man
Scoring	Awarded a mark out of 100 according to the features that were included.
Reliability	Unkown
Comments	This was considered "...cheap as well as quick and easy for teachers to administer; moreover, it was felt that it would provide them with a useful 'sandwich' between the formal tests…".
Variables	N1840
Source	Goodenough, F (1926) Measurement of Intelligence by Drawings. World Book Company

Problem Arithmetic Test	
Measures:	Arithmetic
Administration:	Ten problems graded in level of difficulty. In order to avoid penalizing the poor readers, the teachers were asked to read the problems to the children if necessary.
Scoring	One mark was awarded for each correct answer, giving a score between 0 and 10.
Reliability	Unkown
Comments	The individual items were chosen in the main from a large number of 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.
Variables	N90
Source	Pringle, M K, Butler, N and Davie, R (1966) *11,000 Seven Year Olds*. Longman, in association with National Children's Bureau

NCDS2, 1969, age 11 years:

General Ability Test	
Measures:	Mental ability
Administration:	Consisting of 40 verbal and 40 non-verbal items. Children were tested individually by teachers, who recorded the answers for the tests. For the verbal items, children were presented with an example set of four words that were linked either logically, semantically, or phonologically. For the non-verbal tasks, shapes or symbols were used. The children were then given another set of three words or shapes or symbols with a blank. Participants were required to select the missing item from a list of five alternatives.
Scoring	Each correct answer was rewarded with a mark, giving intermediate verbal and non-verbal scores (between 0 and 40), and a total score (between 0 and 80).
Reliability	Reliability coefficient = 0.94
Comments	Scores from these two sets of tests correlate strongly with scores on an IQ-type test used for secondary school selection (r=0.93, Douglas, 1964) suggesting a high degree of validity.
Variables	N914, N917, N920
Source	Pigeon DA. Details of the fifteen years tests. Appendix 1. In: Douglas JWB (1964) *The Home and the School*. MacGibbon & Kee

Reading Comprehension Test	
Measures:	Reading comprehension
Administration:	The child was required to choose from a selection of 5 words that which appropriately completed sentences. There were 35 questions in total
Scoring	One mark was awarded for each correctly completed sentence, giving a total score between 0 and 35.
Reliability	Reliability coefficient = 0.82 It is conventional to reject items with facilities greater than 0.9 or less than 0.1. By these criteria items 1 and 2 are too easy and item 35 too hard. Discrimination values are generally good with the exception of items 2 and 30, which do not reach the 5% level of significance.

Comments	The NCDS test of reading comprehension was designed to parallel the Watts-Vernon test of reading ability, (originally developed by Watts and Vernon in 1947 to measure the changes of reading standards in UK).
Variables	N923
Source	Constructed by the National Foundation for Educational Research in England and Wales (NFER) specifically for use in the survey.

Arithmetic/Mathematics Test	
Measures:	Arithmetic
Administration:	Comprised 40 items involving numerical and geometric work. Most of the questions were answer-directly questions with only a few being involving multiple-choice answers.
Scoring	One mark was awarded for each correct answer, giving a total score between 0 and 40.
Reliability	Reliability coefficient = 0.94

All facility and discrimination values are within the acceptable range. |
Comments	-
Variables	N926
Source	Constructed by the National Foundation for Educational Research in England and Wales (NFER) specifically for use in the survey.

Copying Designs Test	
Measures:	Perceptuo-motor ability.
Administration:	Six designs were presented: a circle, square, triangle, diamond, cross and star. The children were asked to copy each design twice.
Scoring	One mark was awarded for each correct attempt, giving an overall score between 0 and 12.

The following principles were followed when scoring the drawings:

1. The drawing must have the right general shape and look like what it is supposed to be

2. It should be approximately symmetrical

3. It should not be rounded

4. The drawing should not be rotated, eg: the point of the triangle should be uppermost

5. Angles must be approximately opposite each other (except for the triangle)

6. Slight bowing or irregularity of lines is allowed

7. As long as the other criteria are met, neatness is not important

8. Lines should meet approximately but as long as other criteria are met small gaps at junctions are acceptable

9. Slight crossing and overlapping of lines is permitted |
Reliability	Unkown
Comments	Not all children completed two drawings of each design; therefore a score was given if at least one good copy was made of a given design. The total score was the sum of the scores obtained on each design, thus giving a range of 0-8. Zero score was obtained when a child attempted to copy at least one design but all attempts were judged to be poor copies.
Variables	N929
Source	Pringle, M K, Butler, N and Davie, R (1966) *11,000 Seven Year Olds.* Longman, in association with National Children's Bureau

NCDS3, 1974, age 16 years:

Reading Comprehension Test	
Measures:	Reading comprehension
Administration:	The child was required to choose from a selection of 5 words that which appropriately completed sentences. There were 35 questions in total
Scoring	One mark was awarded for each correctly completed sentence, giving a total score between 0 and 35.
Reliability	Reliability = 0.86 All of items 1 - 10 have facility values greater than 0.9. Both items 1 and 12 have discrimination values of zero, as nobody got them wrong. Otherwise discriminative values are OK.
Comments	The NCDS test of reading comprehension was designed to parallel the Watts-Vernon test of reading ability, (originally developed by Watts and Vernon in 1947 to measure the changes of reading standards in UK). This is the same test as used at 11-years (NCDS2).
Variables	N2928
Source	Constructed by the National Foundation for Educational Research in England and Wales (NFER) specifically for use in the survey.

Mathematics Test	
Measures:	Mathematics
Administration:	Contained both numerical and geometric questions with 27 multiple-choice questions and 4 true-or-false questions.
Scoring	One mark was awarded for each correct answer, giving a total score between 0 and 31.
Reliability	Reliability coefficient = 0.85 All facility and discrimination values are OK, although the latter is noticeably lower for item 27 than for others, and only just misses being in the 'use with caution' range.
Comments	-
Variables	N2930
Source	Constructed by the National Foundation for Educational Research in England and Wales (NFER) specifically for use in the survey.

5.   It should be noted that, in selecting these measures, and in considering more generally the data to be collected, those responsible for NCDS at the time of the surveys were particularly concerned about:

The extent to which comparable information could be obtained from many different field workers

The need to limit the burden placed on all those involved in providing/collecting data, including teachers and cohort members

The time that needed for processing and analysing the material

6.   Advice and guidance was sought from members of steering and advisory committees, as well as from experts – doctors, teachers, health visitors, school welfare officers and researchers – and, wherever time and resources permitted, piloting was undertaken.

Distributions

7.	The distribution of scores for each assessment is shown in the table below. A normal curve, based on all valid values, is superimposed on each distribution and descriptive statistics provided. In addition to mean and standard deviation, the latter include:

- ***Skewness -*** A measure of the asymmetry of a distribution. The normal distribution is symmetric and has a skewness value of 0. A distribution with a significant positive skewness has a long right tail. A distribution with a significant negative skewness has a long left tail.

- ***Standard Error of Skewness***

- ***Ratio of skewness to its standard error -*** Can be used as a test of normality (that is, you can reject normality if the ratio is less than -2 or greater than +2). A large positive value for skewness indicates a long right tail; an extreme negative value indicates a long left tail.

- ***Kurtosis -*** A measure of the extent to which observations cluster around a central point. For a normal distribution, the value of the kurtosis statistic is zero. Positive kurtosis indicates that, relative to a normal distribution, the observations are more clustered about the centre of the distribution and have thinner tails. Negative kurtosis indicates that, relative to a normal distribution, the observations cluster less and have thicker tails.

- **Standard Error of Kurtosis**

- ***Ratio of kurtosis to its standard error*** - this can be used as a test of normality (that is, you can reject normality if the ratio is less than -2 or greater than +2). A large positive value for kurtosis indicates that the tails of the distribution are longer than those of a normal distribution; a negative value for kurtosis indicates shorter tails (becoming like those of a box-shaped uniform distribution)

> **NB:**	NCDS data has been reviewed and revised over the years and the numbers reported below for which data is available may differ very slightly from those reported elsewhere, including references cited elsewhere in this document. The differences are rarely amount to more than 1 or 2 cases and are unlikely to have an impact on the distribution of scores or associated statistics.

NCDS1, 1965, age 7 years

8.	***Southgate Group Reading Test –*** Scores are available for 14,931 cohort members. The mean score achieved on this test was 23.34 and the distribution has a standard deviation of 7.14. As noted above, this test was selected because it was "...(p)articularly suited to identifying backward readers..." and was "...unable to extend the above average reader at this age...". In consequence, the distribution has a large proportion of cohort members achieving a high score with a long left tail (skewness=-

1.11; kurtosis=0.27). The departure of the distribution form normality is emphasised by the ratios of skewness (-55.65) and kurtosis (6.68) to their standard errors.

9. ***Problem Arithmetic Test –*** Scores are available for 14,898 cohort members. The mean score achieved was 5.11 with a standard deviation of 2.49. The distribution appears much more symmetric about the mean and has more modest skewness (0.05). However, it has thicker tails (kurtosis =-0.75) and the ratios of skewness (2.75) and kurtosis (18.83) to their standard errors emphasise the departure of the distribution from normality.

10. ***Copying Designs Test –*** Scores are available for 14,871 cases with a mean score of 7.01 and standard deviation of 2.00. Again, the distribution appears reasonably symmetric about the mean with a skewness of -0.450 and kurtosis of 0.125. However, the ratios of skewness (-22.50) and kurtosis (3.13) to their standard errors again show the departure of the distribution from normality.

11. ***Drawing-a-Man Test –*** Scores are available for 14,648 cases with a mean of 23.84 and standard deviation of 7.08. Once again, the distribution appears reasonably symmetric about the mean with a skewness of 0.12 and kurtosis of 0.11. However, the ratios of skewness (6.10) and kurtosis (-2.8) to their standard errors again show the departure of the distribution from normality.

NCDS2, 1969, age 11 years

12. ***Reading Comprehension Test –*** Scores are available for 14,133 cases with a mean of 15.98 and standard deviation of 6.29. As noted above, the test of reading comprehension was designed to parallel the Watts-Vernon test of reading ability and the distribution of scores appears much more symmetric than that for the Southgate Reading Test used at NCDS1 (skewness=0.01; and kurtosis=-0.29). The ratio of skewness to its standard error (0.62) suggest that the distribution does not depart significantly from normality, but the ratio of kurtosis to its standard error (7.07) emphasises that the distribution is not normal.

13. ***Arithmetic/Mathematics Test –*** Scores are available for 14,129 cases with a mean of 16.63 and standard deviation of 10.35. The value for skewness (-0.17) reflects the shifting of the distribution to the left and the kurtosis (-0.92) reflects the thicker tails. The ratios of skewness (-13.09) and kurtosis (-24.73) to their standard errors shows the distribution departs from normality.

14. ***General Ability Test – Verbal score –*** Scores are available for 14,134 cases and the distribution has a mean of 22.06 and standard deviation of 9.36. The values of skewness (0.17) and kurtosis (-0.92) and their respective ratio to their standard errors (8.43 and -22.36) are similar to those for the arithmetic test, although the distribution is shifted toward the higher scores.

15. ***General Ability Test – Non-verbal score –*** Scores are again available for 14,134 cases and have a mean of 20.88 and standard deviation of 7.61. The distribution
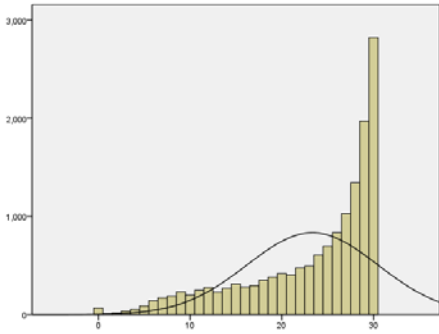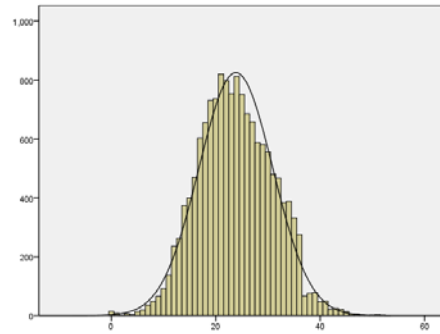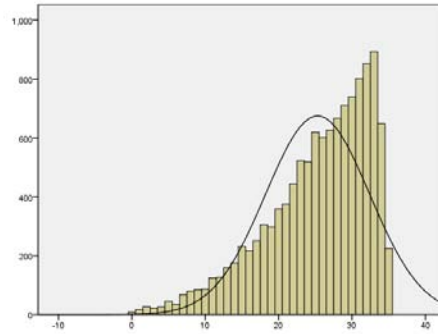
appears reasonably symmetric about the mean with skewness of -0.18 and kurtosis of -0.44. However, the ratios of skewness (-8.95) and kurtosis (-10.78) to their standard errors show the departure of the distribution from normality.
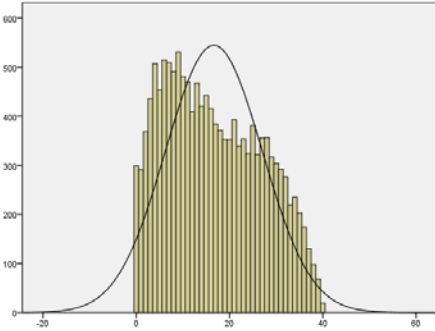
16. ***General Ability Test – Total score –*** Scores are available for 14,134 cases with a mean of 42.94 and standard deviation of 16.14. The combination of verbal and non-verbal scores has a distribution that looks more symmetric with skewness of -0.17 and kurtosis of 3.64 reflecting a long left tail and greater clustering around the mean. The ratios of skewness (-8.24) and kurtosis (-17.15) to their standard errors shows the distribution departs from normality.

17. ***Copying Designs Test –*** Scores are available for 14,104 cases with mean of 8.34 and standard deviation of 1.49. The scores appear to cluster predominantly around the mean with distribution (kurtosis=3.64) and shifted somewhat toward the high scores. (skewness=-0.60). The ratios of skewness (-28.71) and kurtosis 0.17) to their standard errors show the departure of the distribution from normality.

NCDS3, 1974, age 16 years

18. ***Reading Comprehension Test –*** Scores are available for 11,987 cases with a mean of 25.31 and standard deviation of 7.09. As noted above, this is the same test as used at 11-years (NCDS2). In consequence, the distribution has a large proportion of cohort members achieving a high score with a long left tail (skewness=-0.906; kurtosis=0.33). The departure of the distribution form normality is emphasised by the ratios of skewness (--41.18) and kurtosis (7.40) to their standard errors.

19. ***Mathematics Test -*** Scores are available for 11,921 cases with a mean of 12.75 and standard deviation of 6.99. The distribution has a long right tail (skewness=0.47) and is less clustered around the mean (kurtosis=-0.62). The departure of the distribution form normality is emphasised by the ratios of skewness (-13.93) and kurtosis (21.77).

Distributions of NCDS1-3 ability measures

Surveys:	NCDS1 7 years 1965	NCDS2 11 years 1969	NCDS3 16 years 1974
Reading	***Southgate Group Reading Test*** Variables=N92 Cases=14931 Mean=23.34 Standard deviation=7.143 Skewness=-1.113 Standard error of skewness=0.020 Ratio of skewness to its SE*=-55.65 Kurtosis=0.267 Standard error of kurtosis=0.040 Ratio of kurtosis to its SE*=6.675	***Reading Comprehension Test*** Variables=N923 Cases=14133 Mean=15.98 Standard deviation=6.295 Skewness=0.013 Standard error of skewness=0.021 Ratio of skewness to its SE*=0.62 Kurtosis=-0.290 Standard error of kurtosis=0.041 Ratio of kurtosis to its SE*=-7.07	***Reading Comprehension Test*** Variables=N2928 Cases=11987 Mean=25.31 Standard deviation=7.091 Skewness=-0.906 Standard error of skewness=0.022 Ratio of skewness to its SE*=-41.18 Kurtosis=0.333 Standard error of kurtosis=0.045 Ratio of kurtosis to its SE*=7.40

Surveys:	NCDS1 7 years 1965	NCDS2 11 years 1969	NCDS3 16 years 1974
Arithmetic/mathematics	*Problem Arithmetic Test* Variables=N90 Cases=14898 Mean=5.11 Standard deviation=2.491 Skewness=0.055 Standard error of skewness=0.020 Ratio of skewness to its SE*=2.75 Kurtosis=-0.753 Standard error of kurtosis=0.040 Ratio of kurtosis to its SE*=18.825	*Arithmetic/Mathematics Test* Variables=N926 Cases=14129 Mean=16.63 Standard deviation=10.353 Skewness=-0.177 Standard error of skewness=0.021 Ratio of skewness to its SE*=-13.09 Kurtosis=-0.921 Standard error of kurtosis=0.041 Ratio of kurtosis to its SE*=-24.73	*Mathematics Test* Variables=N2930 Cases=11921 Mean=12.75 Standard deviation=6.997 Skewness=0.479 Standard error of skewness=0.022 Ratio of skewness to its SE*=21.77 Kurtosis=-0.627 Standard error of kurtosis=0.045 Ratio of kurtosis to its SE*=-13.93

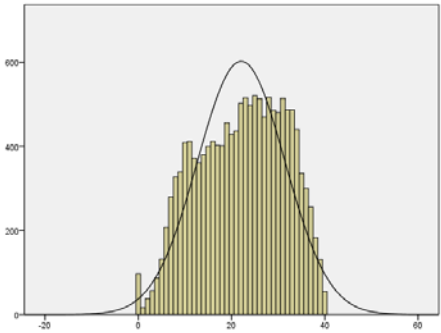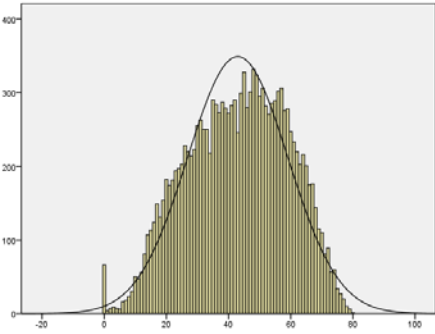| Surveys:	NCDS1 7 years 1965	NCDS2 11 years 1969	NCDS3 16 years 1974
General Ability	-	***General Ability Test*** **Verbal score** Variables=N914 Cases=14134 Mean=22.06 Standard deviation=9.362 Skewness=-0.177 Standard error of skewness=0.021 Ratio of skewness to its SE*=-8.43 Kurtosis=-0.921 Standard error of kurtosis=0.041 Ratio of kurtosis to its SE*=-22.46	-
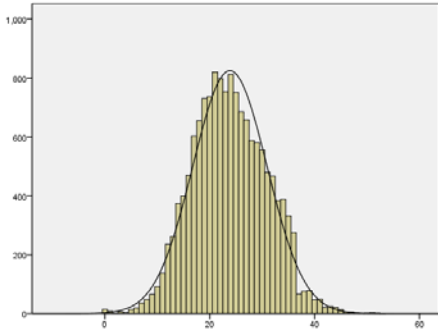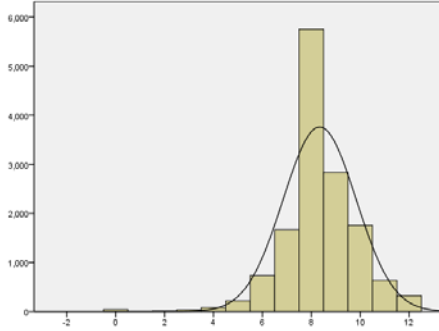
Surveys:	NCDS1 7 years 1965	NCDS2 11 years 1969	NCDS3 16 years 1974
		General Ability Test **Non-verbal score** Variables=N917 Cases=14134 Mean=20.88 Standard deviation=7.612 Skewness=-0.188 Standard error of skewness=0.021 Ratio of skewness to its SE*=-8.95 Kurtosis=-0.442 Standard error of kurtosis=0.041 Ratio of kurtosis to its SE*=-10.78	

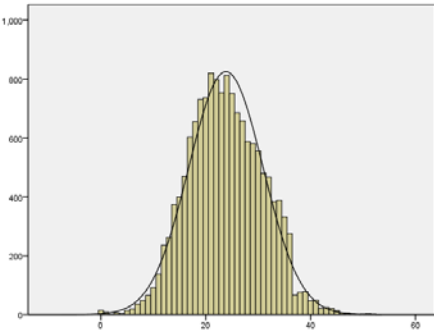| Surveys:	NCDS1 7 years 1965	NCDS2 11 years 1969	NCDS3 16 years 1974
		General Ability Test **Total score** Variables=N920 Cases=14134 Mean=42.94 Standard deviation=16.145 Skewness=-0.173 Standard error of skewness=0.021 Ratio of skewness to its SE*=8.24 Kurtosis=3.642 Standard error of kurtosis=0.041 Ratio of kurtosis to its SE*=17.15	

Surveys:	NCDS1 7 years 1965	NCDS2 11 years 1969	NCDS3 16 years 1974
Perceptual and motor ability	***Copying Designs Test*** Variables=N457 Cases=14871 Mean=7.01 Standard deviation=2.004 Skewness=-0.450 Standard error of skewness=0.020 Ratio of skewness to its SE*=-22.5 Kurtosis=0.125 Standard error of kurtosis=0.040 Ratio of kurtosis to its SE*=3.125	***Copying Designs Test*** Variables=N929 Cases=14104 Mean=8.34 Standard deviation=1.496 Skewness=-0.603 Standard error of skewness=0.021 Ratio of skewness to its SE*=-28.71 Kurtosis=3.642 Standard error of kurtosis=0.041 Ratio of kurtosis to its SE*=0.17	-

Surveys:	NCDS1 7 years 1965	NCDS2 11 years 1969	NCDS3 16 years 1974
	Drawing-a-Man Test Variables=N1840 Cases=14648 Mean=23.84 Standard deviation=7.081 Skewness=0.122 Standard error of skewness=0.020 Ratio of skewness to its SE*=6.1 Kurtosis=-0.112 Standard error of kurtosis=0.040 Ratio of kurtosis to its SE*=-2.8		

* The ratio of the skewness or kurtosis to the respective standard error may be used as a test of normality - if either ratio is less than -2 or greater than +2, normality can be rejected

Correlations

20. Correlations between the different ability scores are shown below for each survey. As noted in the tables, all correlations are highly significant, but this is to be expected given the size of the samples.

NCDS1

21. There is a modest positive correlation between the Southgate Group Reading Test and the Problem Arithmetic Test. All other correlations are also positive, but small.

NCDS2

22. As might be expected, the correlation between the total score on the General Ability test and the constituent verbal and non-verbal scores is positive and high, as is that between the verbal and non-verbal scores. Correlations between the Reading Comprehension Test, the Arithmetic/ Mathematics Test, and General Ability Test scores are also positive, but more modest. Correlations between the Copying Design Test and the other NCDS2 tests are positive, but low.

NCDS3

23. The correlation between the Reading Comprehension Test and the Mathematics Test is positive but modest. As noted above, the former was originally developed by NFER for use in the NCDS2 survey, whilst the latter was developed (again by NFER) for in the NCDS3 survey.

Correlations between NCDS1 tests

	Southgate Group Reading Test	Problem Arithmetic Test	Copying Designs Test	Drawing-a-Man Test
Southgate Group Reading Test	1.000	0.534 n=14838	0.331 n=14807	0.358 n=14584
Problem Arithmetic Test		1.000	0.312 n=14746	0.333 n=14522
Copying Designs Test			1.000	0.371 n=14545
Drawing-a-Man Test				1.000

NB: All correlations are significant at 0.000

Correlations between NCDS2 tests

	Reading Comprehension Test	Arithmetic/ Mathematics Test	General Ability Test – Verbal score	General Ability Test – Non-verbal score	General Ability Test – Total score	Copying Designs Test
Reading Comprehension Test	1.000	0.747 n=14128	0.754 n=14132	0.651 n=14132	0.744 n=14132	0.313 n=14101
Arithmetic/ Mathematics Test		1.000	0.792 n=14127	0.740 n=14127	0.808 n=14127	0.339 n=14099
General Ability Test – Verbal score			1.000	0.807 n=14134	0.961 n=14134	0.313 n=14101
General Ability Test – Non-verbal score				1.000	0.940 n=14134	0.358 n=14101
General Ability Test – Total score					1.000	0.350 n=14101
Copying Designs Test						1.000

NB: All correlations are significant at 0.000

Correlation between NCDS3 tests

	Reading Comprehension Test	Mathematics Test
Reading Comprehension Test	1.000	0.654 n=11920
Mathematics Test		1.000

NB: All correlations are significant at 0.000

NCDS1-3 Measures of ability in research

24. A major strength of the NCDS is that it includes repeated measures of ability, collected prospectively during childhood, on a very large and representative national sample. This data is particularly useful when combined with data collected during adult life. The measures of ability described above therefore provide very important information concerning the development of members of the birth cohort and have been used extensively in research.

25. There are perhaps 3 main areas of research that have been reliant on the use of the ability measures in NCDS. They are:

   - Understanding factors and circumstances that influence cognitive ability *and trajectories* of cognitive development
   - Work on returns to educational qualifications (and particularly higher education)
   - Understanding the contribution of ability to later outcomes, for example cognitive capability at age 50, and mental health and well being.

In addition there is a large body of research where it is important to use ability measured in childhood as a covariate when seeking to understand the relationship between early life circumstances and later outcomes

26. Each of these areas is briefly outlined below and a few examples of published research using the NCDS1-3 ability measures are given. There is a very large body of work that uses the NCDS ability measures and further examples can be found using the CLS searchable bibliography (www.cls.ioe.ac.uk/bibliography)

   a) **Understanding factors and circumstances that influence cognitive ability *and trajectories* of cognitive development.** The aim of this approach is to understand the factors that are associated with the cognitive development of children. In some cases there is a specific focus on educational progress, Researchers can investigate cognitive ability trajectories by examining how children's measured ability changes between ages seven, eleven and sixteen. For example, Essen, Fogelman and Head show that the housing conditions of children in the NCDS are related both to 16-year school attainment *but also to progress through secondary school from 11 to 16.* The rich information collected about cohort members' health and behaviour, their family circumstances, living conditions, and socio-economic resources throughout childhood, makes it possible to conduct analyses that focus on which factors have the strongest association with cognitive development.

   Examples:

   Carroll, H.C.M. (2010) The Effect of Pupil Absenteeism on Literacy and Numeracy in the Primary School. *School Psychology International*, 31(2), 115-130.

   Elliott, J and Richards, M. (1991) Children and divorce: educational performance and behaviour before and after parental separation. *International Journal of Law and the Family*, 5, 258-276.

Essen, J, Fogelman, K and Ghodsian, M. (1978) Long term changes in the school attainment of a national sample of children. *Educational Research*, 20(2), 143-151.

Essen, J, Fogelman, K and Head, J. (1978) Childhood housing experiences and school attainment. *Child Care Health and Development*, 3(1), 41-58.

Jefferis, B.J, Power, C and Hertzman, C. (2002) Birthweight, childhood socio-economic environment and cognitive development in the 1958 British birth cohort. *British Medical Journal*, 325(7359), 305-8.

b) **Work on returns to educational qualifications and particularly higher education**
The National Child Development Study has been a particularly useful resource for understanding more about the financial returns to higher education. It helps to answer the question - what is the impact on wages for an individual of going to university and getting a degree? When looking at the relationship between individual earnings and the qualifications that they have achieved, there are potential sources of bias. This is due to individual education choices; individuals of higher unobserved ability or with higher unobserved payoffs from schooling may for instance invest more in education. An advantage of the NCDS is that, as discussed in this document, there are good measures of ability collected through childhood. Research using the NCDS data by Blundell, Dearden et al suggests that the overall returns to educational qualifications at each stage of the educational process remain sizeable and significant, even after allowing for these potential selection effects. Their analyses suggest an average return of about 27% for those completing some form of higher education versus anything less. Compared with leaving school at 16 without qualifications, they find that in the population the average return to O levels is around 18%, to A levels 24% and to higher education 48%.

Examples:

Blundell, R, Dearden, L, Goodman, A and Reed, H. (2000) The returns to higher education in Britain: evidence from a British cohort. *The Economic Journal*, 110(461), 82-99.

Blundell, R, Dearden, L and Sianesi, B. (2005) Evaluating the effect of education on earnings: models, methods and results from the National Child Development Survey. *Journal of the Royal Statistical Society: Series A*, 168(3), 473-512.

Blundell, R, Dearden, L and Sianesi, B. (2004) *Evaluating the Impact of Education on Earnings in the UK: Models, Methods and Results from the NCDS.* Discussion Paper No 47. London: Centre for the Economics of Education, LSE.

Dearden, L, McIntosh, S, Myck, M and Vignoles, A. (2002) The returns to academic and vocational qualifications in Britain. *Bulletin of Economic Research*, 54(2), 249-274.

c) **Understanding the contribution of ability to later outcomes.** There is a huge body of research which examines the relationship between ability (measured in childhood) and outcomes in adult life. As can be seen from the examples provided below, the outcomes examined are very varied and include employment and earnings, cognitive capability at

age 50, mental health and well being, political interest, generalised trust and health behaviour.

Examples:

Case, A and Paxson, C. (2008) Stature and status: Height, ability, and labor market outcomes. *Journal of Political Economy*, 116(3), 499-532.

Collishaw, S, Maughan, B and Pickles, A. (2004) Affective problems in adults with mild learning disability: the roles of social disadvantage and ill-health. *British Journal of Psychiatry*, 185(4), 350-351.

Dearden, L. (1999) The effects of families and ability on men's education and earnings in Britain. *Labour Economics*, 6(4), 551-567.

Denny, K and Doyle, O. (2008) Political interest, cognitive ability and personality: determinants of voter turnout in Britain. *British Journal of Political Science*, 38, 291-310.

Flouri, E and Buchanan, A. (2002) Childhood predictors of labor force participation in adult life. *Journal of Family and Economic Issues*, 23, 101-120.

Gale, C.R, Cooper, R, Craig, L, Elliott, J, Kuh, D, Richards, M, Starr, J.M, Whalley, L.J, Deary, I.J and the HALCyon Study Team. (2012) Cognitive Function in Childhood and Lifetime Cognitive Change in Relation to Mental Wellbeing in Four Cohorts of Older People. *PLoS One*, 7(9), e44860.

Sturgis, P, Read, S and Allum, N. (2010) Does intelligence foster generalized trust? An empirical test using the UK birth cohort studies. *Intelligence*, 38(1), 45-54.

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Douglas, J W B (1964) *The Home and the School.* MacGibbon & Kee

Fogelman, K. (1985) Exploiting longitudinal data: examples from the National Child Development Study. In Nicol, A.R (ed), *Longitudinal Studies in Child Psychology and Psychiatry.* Chichester: John Wiley.

Goodenough, F (1926) *Measurement of Intelligence by Drawings.* World Book Company

Pringle, M K, Butler, N and Davie, R (1966) *11,000 Seven Year Olds.* Longman, in association with National Children's Bureau

Southgate, V (1962) *Southgate Group Reading Tests: Manual of Instructions.* University of London Press

NB: An up-to-date and searchable list of known NCDS publications is available at: www.cls.ioe.ac.uk/bibliography

Appendix: Copies of the NCDS1-3 Measures of Ability

Copies of the measures of ability may be found by following the links given below.

NCDS1, 1965, age 7 years:

- Southgate Group Reading Test
- Copying Designs Test
- Drawing-a-Man Test
- Problem Arithmetic Test

Link: www.cls.ioe.ac.uk/ncds1_questionnaires

NCDS2, 1969, age 11 years:

- General Ability Test
- Reading Comprehension Test
- Arithmetic/Mathematics Test
- Copying Designs Test

Link: www.cls.ioe.ac.uk/ncds2_questionnaires

NCDS3, 1974, age 16 years:

- Reading Comprehension Test
- Mathematics Test

Link: www.cls.ioe.ac.uk/ncds3_questionnaires

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