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Childhood cognition in the 1970 British Cohort Study

Samantha Parsons

Data Note

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Introduction

The 1970 British Cohort Study (BCS70) study members completed a wide range of age appropriate cognitive tests during their childhood: at 22 and 42 months[1], age five, ten and sixteen. The purpose of this data note is to provide an overview of each of the five tests that the BCS70 children took at age 5, eight tests at age 10 and nine tests at age 16.

BCS70 follows the lives of more than 17,000 people born in England, Scotland and Wales in a single week of 1970 (Elliott and Shepherd 2006). Over the course of cohort members' (CMs) lives, the BCS70 has collected information on health, physical, educational and social development, and economic circumstances among other factors. Since the birth survey in 1970, there have so far been eight further surveys (or 'waves') at ages 5, 10, 16, 26, 30, 34, 38 and 42.

An understanding of the educational progress of this cohort during their childhood is vital to understanding their later life course trajectories. The early test scores (up to age ten) have been analysed extensively, including influential work by Feinstein (2003; 2004). The cognitive scores at age ten have also been used as predictors of adult outcomes, including in employment (Breen and Goldthorpe 2001) and health (Batty, et al. 2007). There has, however, been relatively little research carried out using the age 16 test scores (though see Duncan, et al. 2012, Sullivan and Brown 2013). This is partly because although a total of nine cognitive tests were originally administered to students at school, due to fieldwork difficulties in 1986, including a teachers' strike, it became necessary to send a proportion of cohort members a 'home-pack', which included just two of the original nine tests[2]. Only tests completed both at school and home were originally deposited – these were the Spelling and Vocabulary tests. An arithmetic test was deposited more recently (Dodgeon, 2008). The remaining six test scores – reading (including sub-scales) and matrices – will be deposited in 2015 as part of an ESRC[3] funded project on 'Schooling and Unequal Outcomes in Youth and Adulthood'. This paper has been produced to accompany the deposit of these additional cognitive scales, and to provide information for users of the data on the cognitive tests administered at age five, ten and 16.

Cognitive tests in childhood and adolescence

The purpose and content of each test at each age, including administrative guidelines and any stopping rules is described below. Where possible, illustrative examples are included to highlight how the test was presented to and completed by the child. Descriptive statistics – mean, median and standard deviation – are included to give some indication of skewness and spread of the individual test scores.

[1] For further details see http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=804&sitesectiontitle=Sub-Studies

[2] See Brown and Sullivan (2013) for further details on performance in test scores dependent on whether the test was completed at home or school.

[3] http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=1233&sitesectiontitle=Schooling+and+unequal+outcomes+in+youth+and+adulthood+

Age five tests

Five tests were included in the age 5 survey. These were:

- **Copying Designs Test**: An assessment of visual-motor co-ordination (Rutter, et al. 1970).
- **English Picture Vocabulary Test:** A test of verbal vocabulary (Brimer and Dunn 1962).
- **Human Figure Drawing** (Draw-a-Man) **Test**: Intended to reflect conceptual maturity (Goodenough 1926; Harris 1963).
- **Complete a Profile Test**: Similar to the draw-a-man test, the child completes an outline picture of a human face in profile by filling in features (eyes, ears, etc.).
- **Schonell Reading Test**: a reading test originally designed to assess a child's 'reading age' (Schonell, 1971).

For further details of the assessments see the data guide available on the Centre for Longitudinal Studies website (Golding 1975)[4]. In total, 13,059 (99.4%) of all children participating in the age 5 survey completed at least one assessment, 11,254 (85.7%) children completed all five assessments. Further details of the response pattern across assessments are included in appendix 1. What follows are further details of each of the five assessments.

Copying Designs Test

The child was asked to make two copies of eight shapes. No time limit was given. For each drawing a score of 0 or 1 was allocated. As not all children completed two copies, a score of 1 was allocated if at least one good copy was made of a given design. The total score is the sum of the scores for the individual drawings. The test is used to assess the child's ability to reproduce shapes, and the neatness of the drawing is therefore irrelevant. For all of the drawings the following principles apply:

- the drawings must have the right general shape and look like what it is supposed to be
- they should be approximately symmetrical
- angles should not be rotated
- the drawing should not be rotated, i.e. the point of the triangle should be uppermost
- angles must be approximately opposite each other (except for the triangle)
- slight bowing or irregularity of lines is allowed
- as long as the other criteria are met, neatness is not important
- lines should meet approximately, but as long as other criteria are met small gaps in junctions are acceptable
- slight crossing and overlapping of lines is permitted.

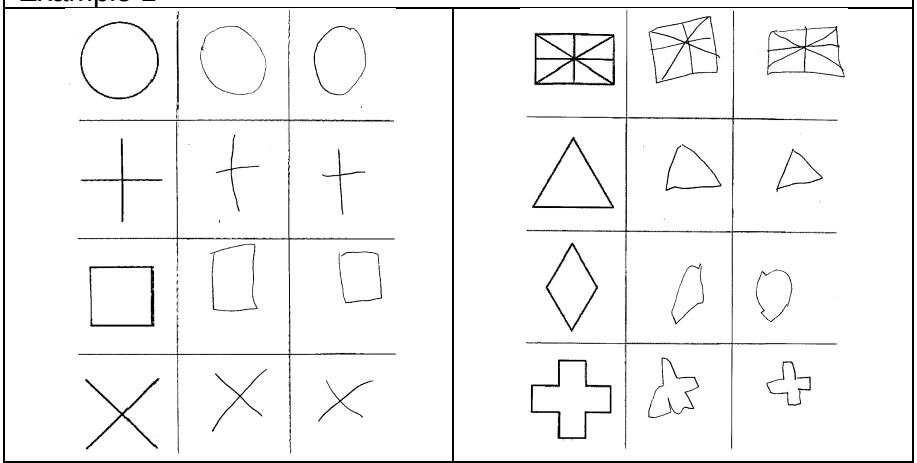
Figure 1 shows two examples of a completed booklet. The designs that the child had to copy are in the left hand column of each page. As there were no discontinuation

[4] http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=824&sitesectiontitle=Guide+to+Dataset

rules, interviewers were asked to encourage the child to attempt all eight designs, but should stop if the child was distressed or if s/he stopped attempting to copy. In total, 13,028 children completed the test. Scores ranged between 0-8 with a mean of 4.7 (standard deviation [sd] = 2.0) and a median of 5. Figure 2 provides the distribution of the scores.

Figure 1: Examples of completed Copying Designs task

Example 1



Example 2

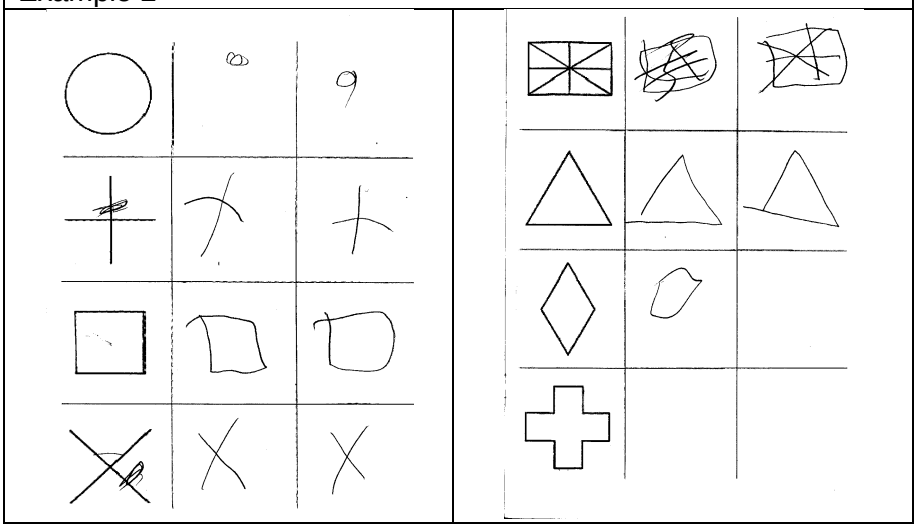
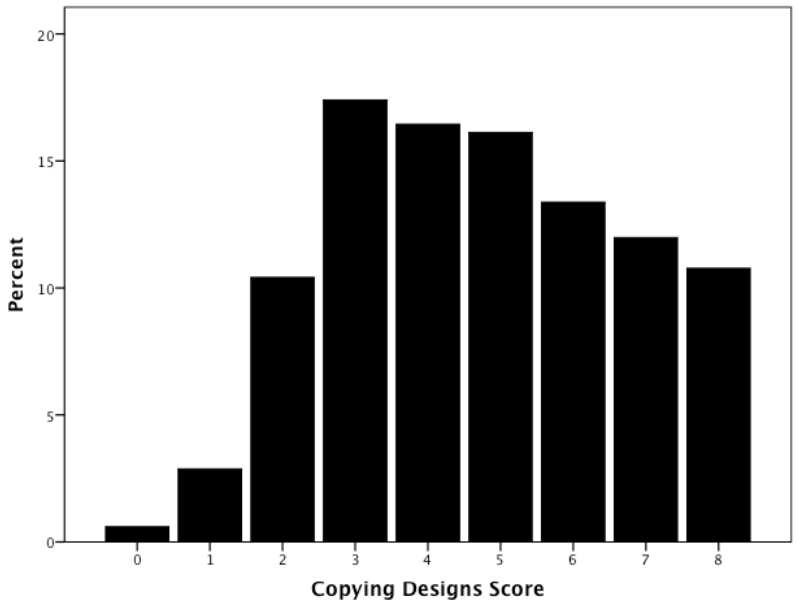


Figure 2: Distribution of Copying Designs scores

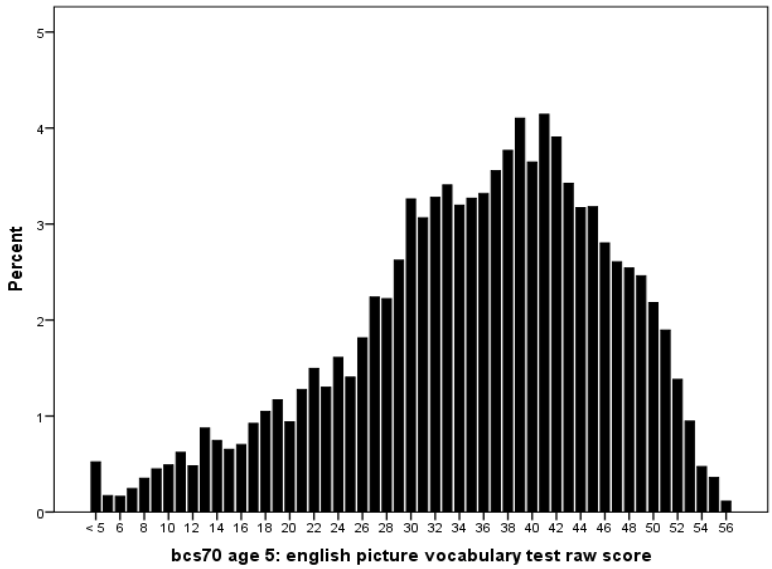


The English Picture Vocabulary Test (EPVT)

The need to assess language is generally recognised. Language comprehension is a crucial factor in the child's ability to understand school lessons, while expressive ability is concerned in a more subtle way with child's relations not only with peers and parents but also with the teachers themselves. The English Picture Vocabulary Test (Brimer and Dunn 1962), is an Anglicised form of the well-known Peabody Picture Vocabulary Test (Dunn 1959). It consists of 56 sets of four different pictures with a particular word associated with each set of four pictures. The child is asked to indicate the one picture that corresponds to the given word, and the test proceeds with words of increasing difficulty, until the child makes five mistakes in a run of eight consecutive items. The first two words are **drum** and **time**, the last two are **reel** and **coast**. The child received 1 point for each correct answer[5]. 12,235 children completed the test. Scores ranged between 0-56, with a mean score of 35.3 (sd = 10.8) and a median of 37. The distribution of the scores is given in figure 3. No images are available for this test due to copyright.

[5] 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.

Figure 3: Distribution of EPVT scores



Human Figure Drawing Test

The Human Figure drawing test used was a modified version of the 'Draw-a-Man' test originally devised by Goodenough (1926), and later developed by Harris (1963). The Harris-Goodenough test has been subjected to extensive evaluation as a measure of IQ, though Harris himself suggested that the test is more indicative of 'conceptual maturity' than IQ. This shift in emphasis gets away from the notion of unitary intelligence, and permits consideration of children's concepts of the human figure as an index or sample of their concepts generally. 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. Figure 4 gives some examples of study members' drawings.

As the drawings produced by the children were relatively simple, they did not warrant the implementation of the full Harris-Goodenough scoring scale of 73 items. The scoring scheme adopted was based on 30 developmental items suggested by Koppltz (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. Figure 5 details the scoring scheme. 12,784 children completed the test, and figure 6 shows that scores actually ranged between 1-23. The mean score was 10.4 (sd = 3.1) and the median 10.

Figure 4: Examples of completed 'Human Figure Drawing' pictures

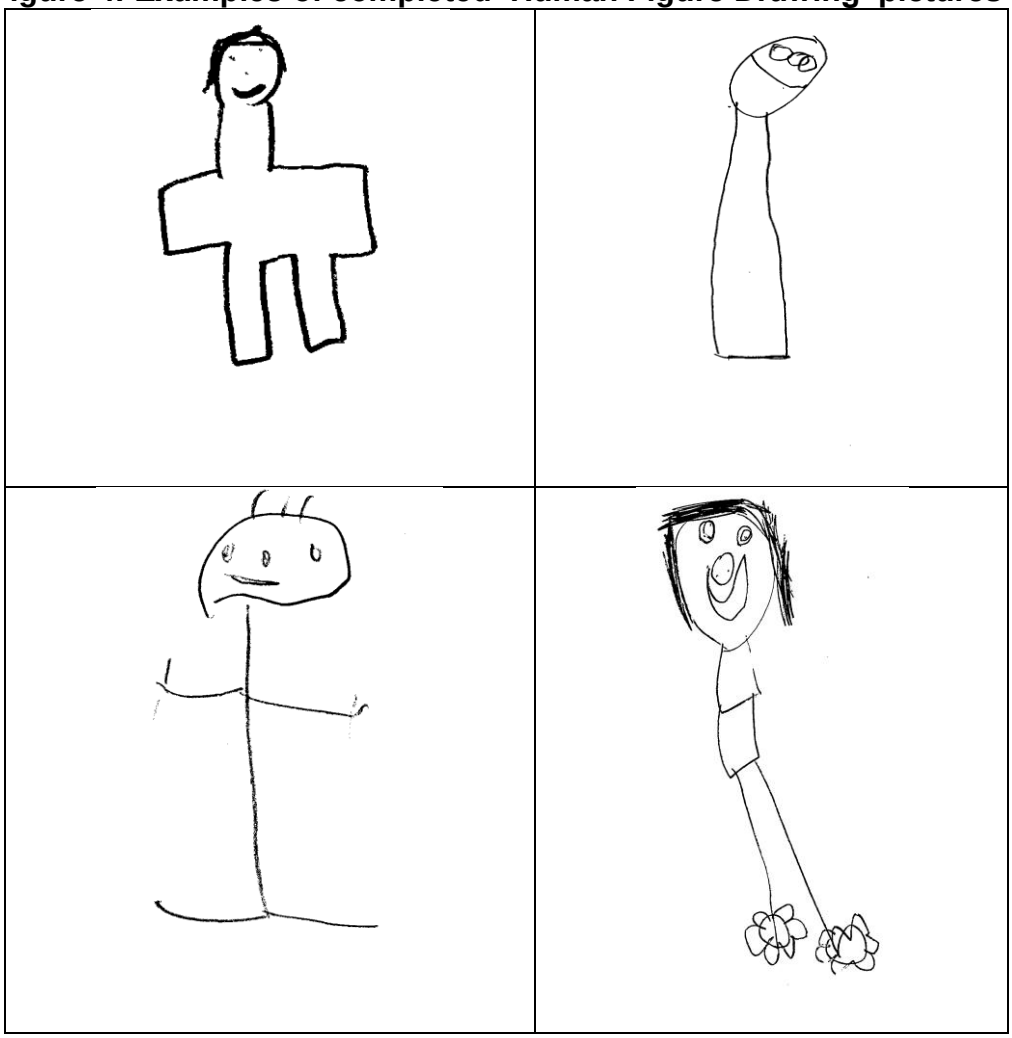
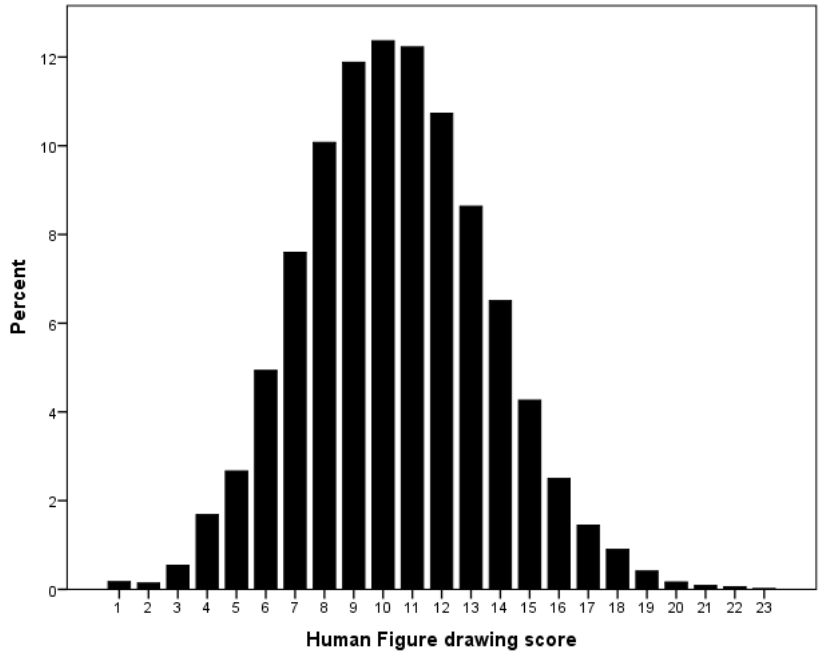


Figure 5: Human Figure Drawing scoring scheme

The presence of any of the following features adds one point to the score.

1) Head: Any representation
2) Eyes: Any representation
3) Pupils: Distinct circles or dots within the outlines of the eyes
4) Eyebrows or eyelashes: Either brows or lashes or both
5) Nose: Any representation
6) Nostrils: Dots or nostrils shown in addition to nose
7) Mouth: Any representation
8) Two lips: Two lips outlined and separated from each other: two rows of teeth only are not scored
9) Ear: Any representation
10) Hair: Any representation, or hat or cap covering head and hiding hair
11) Neck: Definite 'stalk' separating head and body
12) Body: Any representation, clear outline necessary
13) Arms: Any representation
14) Arms in two dimensions: Both arms represented by more than a single line
15) Arms at an angle: One or both arms pointing downwards at an angle of 30^{o} or more from horizontal position or arms raised appropriately for activity in which figure is engaged
16) Arms correctly attached at the shoulder: Arms firmly connected at the shoulder with shoulder clearly evident
17) Elbow: Distinct angle in arm; rounded curve in arm not scored
18) Hands: Differentiation from hands and figures necessary such as widening of arm or demarcation from arm by sleeve or bracelet
19) Fingers: Any representation distinct from hands or arms; any number of fingers acceptable
20) Correct number of fingers: Five fingers on each hand or arm
21) Legs: Any representation; in case of female figures in long skirts this item is scored if distance between waist and feet is long enough to allow legs to be present under the skirt
22) Legs in two dimensions: Both legs represented by more than a single line
23) Knee: Distinct angle in one or both legs (side view), or kneecap (front view); round curve in leg not scored
24) Feet: Any representation
25) Feet in two dimensions: Feet extending in one direction from heel (side view) and showing greater length than height, or feet drawn in perspective (front view)
26) Profile: Head drawn in profile even if rest of figure not entirely in profile
27) Clothing, one item or more: Items counted as clothing: trousers, shirt, skirt, blouse, dress, (Upper part of dress separated by belt scored as blouse), necklace, watch, ring, bracelet, pipe, cigarette, umbrella, cane, gun, rake, shoes, wallet, briefcase, hat, gloves
28) Clothing, two or more items: Two or more items of clothing represented
29) Clothing, four or more items: Four or more items of clothing represented
30) Good proportions: Figure looks right, even if not entirely anatomically correct

Figure 6: Distribution of Human Figure Drawing scores



Complete a Profile Test

This test is similar to the Draw-a-Man test, in that the child was asked to complete an outline picture of a human face in profile by filling in features (eyes, ears, nostrils etc.). The specific scoring is detailed in Figure 7. The test was included as an indicator of a child's spatial-constructive development, Kalverboer (1972)[6].

In total, 12,451 children completed the test. Figure 8 shows examples of children's profile drawings and figure 9 the (bi-modal) distribution of scores. The maximum score available was 16. Scores ranged between 0-16 with a mean score of 6.2 (sd = 3.2) and a median of 6.

[6] Professor Kalverboer is a psychologist in the Faculty of Behavioural and Social Sciences, University of Groningen, Netherlands. See http://www.rug.nl/staff/a.f.kalverboer/

Figure 7: Scoring of Complete a Profile test

	Points awarded
Two eyes One eye	1 2
Two ears One ear	1 2
Nose in centre Nostril added No nose added but one ear or eye drawn indicating child aware face was in profile	1 2 2
Mouth in centre Teeth added No mouth added but one ear or eye drawn indicating child aware face was in profile	1 2 2
Hair or hat	1
One eye (in position 1) One eye (in position 2)	1 2
One ear inside profile	1
Position of hair a. Hair drawn outside profile b. Hair drawn crossing profile or inside c. Hair only indicated by scribbling or drawing dashes d. Hair style and direction can be recognised in the drawing	 1 (a, b, c, d, apply) 2 (b + d only)
Shape of eye a. Front view, pupil in corner b. Side view of eye	 1 2

Figure 8: Examples of Profile pictures

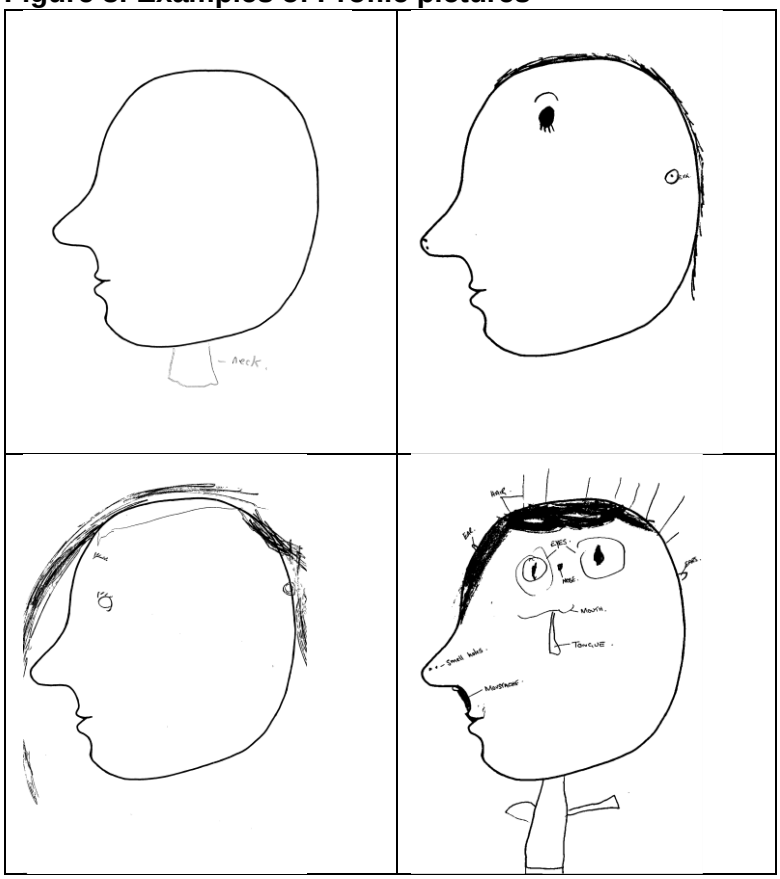
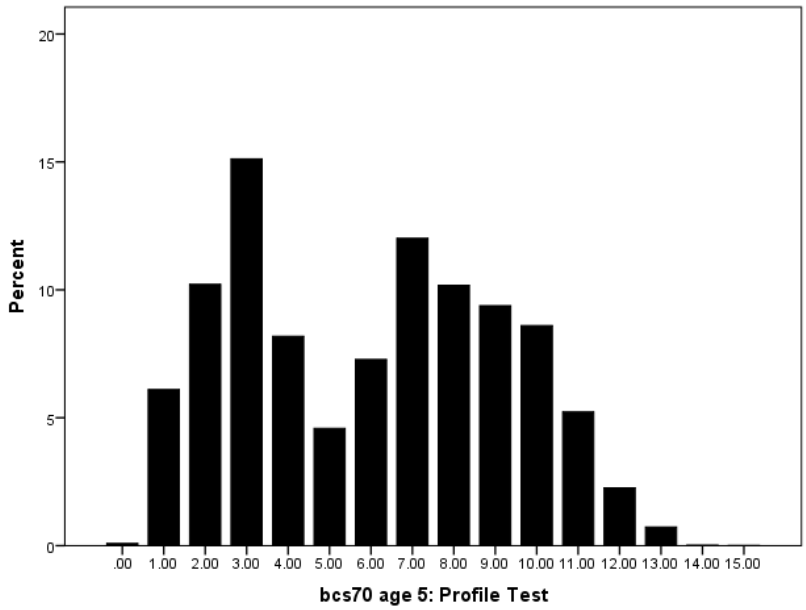


Figure 9: Distribution of Complete a Profile scores



Schonell Reading Test

The original Schonell Reading Test[7] comprised of 100 words and was originally designed to assess the reading age of children between age five and 14+ years of age. Reading age is calculated from the number of words read correctly and then compared to the child's chronological age to see if they are reading at, below or above the level for their age. As the BCS70 children were at the younger end of the age range when they sat the test, the length of the test was reduced to the first 50 words and reading age was not calculated from performance. In addition, before the test was administered, the child's mother was asked if she thought the child had begun to read at all. From the response options detailed in figure 10, 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 and a score of one was awarded for each word that was read correctly.

Figure 11 shows the words increased in difficulty as the test proceeded, starting with **tree** and **little** and ending with **audience** and **situated**. Where mothers indicated that their child was unable to read, the test was not administered and the child was allocated a score of 0. Of the 12,646 study members with valid information provided by their mother in the pre-test question, 8,603 (68%) could not read or could only read some letters. Scores ranged between 0-50, with a mean of 1.43 (sd = 3.9) and a median of 0. Figure 12 shows the very skewed distribution of the scores.

[7] The complete test is readily available on the web. For example, see http://www.crackingtheabccode.com/files/Schonell%20Reading%20Test(1).pdf for the complete test and scoring guidelines.

Figure 10: Schonell pre-test administration question

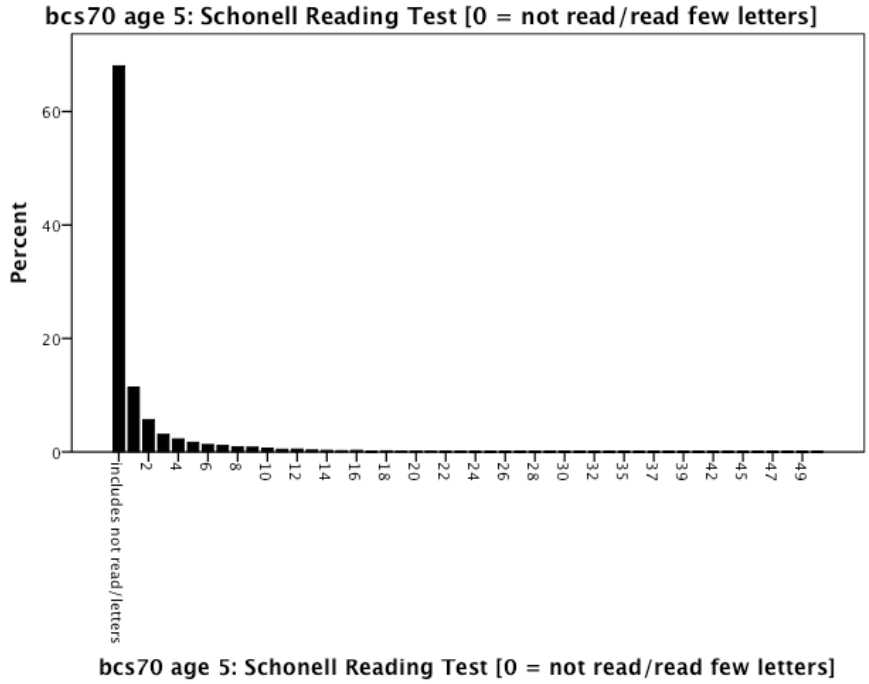
- No, child can read nothing or has not tried
- Yes, child can read - some letters
- **Yes, child can read - some words**
- **Yes, child can read - some sentences**
- Cannot say if child can read
- Other reply give details

Figure 11: Schonell Reading test

Reading Test Score Sheet

☐ tree	☐ little	☐ milk	☐ egg	☐ book
☐ school	☐ sit	☐ frog	☐ playing	☐ bun
☐ flower	☐ road	☐ clock	☐ train	☐ fight
☐ picture	☐ think	☐ summer	☐ people	☐ something
☐ dream	☐ downstairs	☐ biscuit	☐ shepherd	☐ thirsty
☐ crowd	☐ sandwich	☐ beginning	☐ postage	☐ island
☐ saucer	☐ angel	☐ ceiling	☐ appeared	☐ gnome
☐ canary	☐ attractive	☐ imagine	☐ nephew	☐ gradually
☐ smoulder	☐ applaud	☐ disposal	☐ nourished	☐ diseased
☐ university	☐ orchestra	☐ knowledge	☐ audience	☐ situated

Figure 12: Distribution of Schonell Reading test scores



Overall measure of cognitive ability at age 5

Looking at correlations between each pair of the five tests in Table 1, performance in the Copying Designs test was most strongly related to performance in the other four tests. The strongest correlation between two tests was found for the Copying Designs and Draw-a-Man test scores (0.4); the weakest correlation was for Profile and Schonell reading scores (0.05). Syntax for each assessment is included in Appendix 3.

Table 1: Correlations between age 5 test scores

	Copying designs	EPVT	Draw-a-Man	Profile	Schonell
Copying designs	1				
EPVT	.35** (12,215)	1			
Draw-a-Man	.40** (12,780)	.25** (12,024)	1		
Profile	.18** (12,446)	.20** (11,714)	.23** (12,296)	1	
Schonell	.25** (12,615)	.17** (11,899)	.14** (12,393)	.06** (12,074)	1

**all pairwise correlations are statistically significant (p<0.01)

A principal axis principal components analysis (PCA) (Field, 2011) of the five age 5 assessments was carried out to establish the presence of a general cognitive ability factor (traditionally dubbed *g*) (Jenson, 1998; Spearman, 1904). Examination of the scree plot confirmed the presence of a single component. The first unrotated principal component accounted for 38 per cent of the total variance among the five tests. The factor loading of each of the tests on this principal component was 0.75 for Copying Designs, 0.69 for Draw-a-Man, 0.64 for EPVT, 0.50 for Profile and 0.45 for Schonell Reading Test. Standardised [g] scores were saved for each study member under the regression method for scoring (DiStefano et al, 2009; Tabachnick & Fidell, 2001; Thurstone, 1935).

Following the assessment of dimensionality, we compared Cronbach's Alpha (Cronbach, 1951) for the resulting scale. Cronbach's alpha is an internal consistency estimate of the reliability of test scores that varies from zero to one. The alpha will generally increase as the intercorrelations among test items increase. Because intercorrelations among test items are maximized when all items measure the same underlying construct, Cronbach's alpha is widely believed to indirectly indicate the degree to which a set of items measures a single unidimensional latent construct. Obtaining an alpha (α) of greater than 0.70 is generally held as indicating good internal consistency (Nunnally, 1978). The α = 0.58 obtained for the standardised scores of the five assessments at age 5 whilst lower than ideal, was judged to be broadly acceptable. Omitting any individual assessment did not substantially improve the alpha, so a decision was taken to include a summary measure based on all of the

assessments to ensure the greatest breadth of coverage. The Principal Component Analysis (PCA) output is included in Appendix 2.

Age ten tests

Eight tests were included in the age 10 survey. These were:

- **Shortened Edinburgh Reading Test** (Godfrey Thompson Unit 1978): A test of word recognition, which examined vocabulary, syntax, sequencing, comprehension and retention.
- **Friendly Maths Test**: A multiple choice test including arithmetic, number skills, fractions, algebra, geometry and statistics.
- **Pictorial Language Comprehension Test**: Based on the English picture vocabulary test.
- **Spelling Dictation task:** Dictation task, including both real and made-up words.
- **British Ability Scales** (BAS) (Elliott, et al. 1979; Hill 2005): Two verbal subscales (**Word Definitions** and **Word Similarities**) and two non-verbal subscales (**Recall of Digits** and **Matrices**).

For further details of the assessments, including the complete tests, see the questionnaires and data guide available on the Centre for Longitudinal Studies website[8]. In total, 12,876 (86.5%) of all children participating in the age 10 survey completed at least one assessment, 11,123 (74.8%) children completed all eight assessments. Further details of the response patterns across assessments are included in appendix 1.

Shortened Edinburgh Reading Test

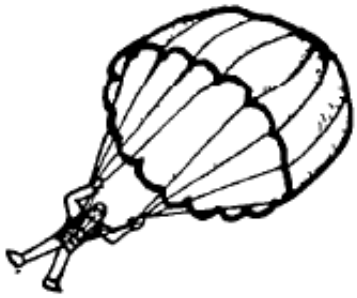
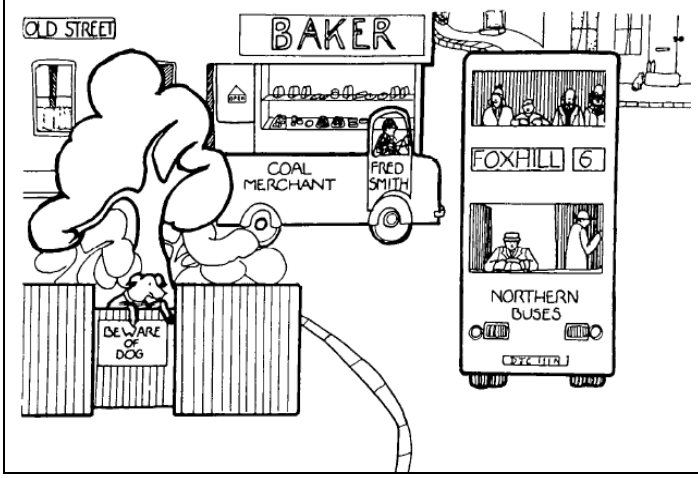
This is a test of word recognition, which examined vocabulary, syntax, sequencing, comprehension and retention. It was developed by the survey team and the Godfrey Thompson Unit for Academic Assessment in Edinburgh for the 1980 (age 10) sweep of the BCS70 (Godfrey Thompson Unit, 1978). It was drawn from all four of the Edinburgh Reading Tests[9], each of which was designed to accommodate a different age range, but the shortened version remained appropriate for 10-year-olds. There were a number of different sections in this test. For the first four sections with five questions in each, the interviewer went through an example at the beginning to show the child what they had to do. In the first section, the child had to select one from four words to correctly describe a picture; in the next section, they had to cross out a word that does not belong in a sentence; and in the third section they had to match five answers to five questions. The last instructed section was a picture quiz, and the child had to answer questions based on the picture. Figure 13 shows an example from section 1, section 2 and section 4, the picture quiz. For all remaining parts the child read the questions and completed the answers without further assistance. Altogether there were 67 questions to attempt, with a score of one awarded for each

[8] http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=818&sitesectiontitle=User+guide+to+the+dataset

[9] See http://www.hoddertests.co.uk/tfsearch/reading/ert2.htm for details of the four ERT assessments in their current form.

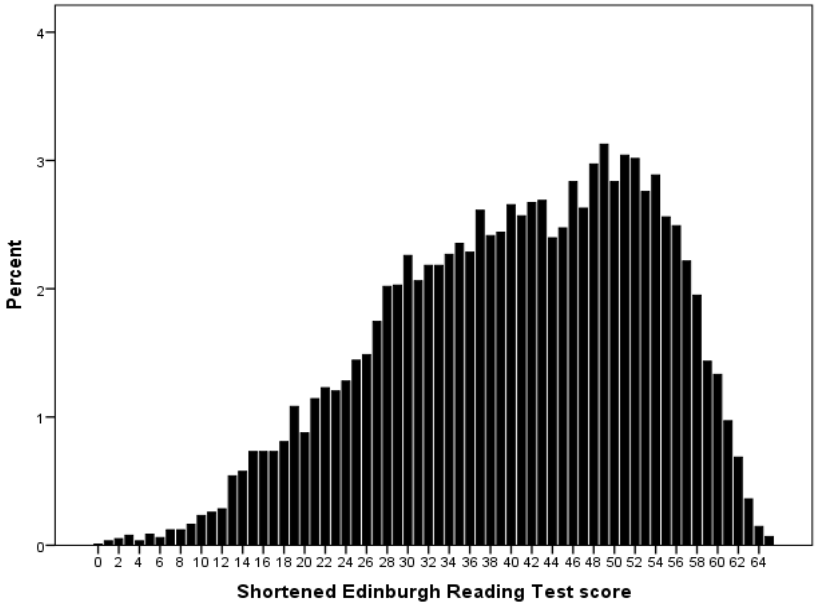
correct answer giving a maximum of 67. In total, 11,641 children sat the test and figure 14 shows actual scores ranged between 0-65, with a mean of 40.5 (sd = 12.7) and a median of 42.

Figure 13: Example questions from the Shortened Edinburgh Reading Test (age 10)

<table>
<tr><th>Section 1</th><th>Section 2</th></tr>
<tr><td>paragraph parachute
 
persecute bargain</td><td>Why are you been late?
Philip borrowed off my bicycle
In the summer, we play in out the park
I have just been on away holiday
Why are your nose feet dirty?
Give your ball needs blowing up</td></tr>
<tr><th colspan="2">Section 4 (picture quiz)</th></tr>
<tr><td colspan="2"> 

Where is the bus going?
What does the shop sell?
What is the name of the street you can see?
What is the name of the bus company?
What kind of shop can you see?</td></tr>
</table>

Figure 14: Distribution of Shortened Edinburgh Reading Test scores



Friendly Maths Test

The test was developed specifically for use in the survey. After consultation with many specialists in mathematics there was no definite consensus of opinion about a suitable mathematics test for 10-year-olds. Many current tests were considered not only out-of-date but also uni-dimensional. Although departments within the National Foundation of Educational Research (NFER) were engaged on the development of modern mathematics tests based on the latest concepts of mathematical competence, the work was at an early stage of development and could therefore not be used in the age 10 survey. Two specialists in mathematics – Colin Appleton and John Kerley – were therefore appointed to create a suitably wide-ranging test, which would meet the demands for a modern instrument. More than 220 highly pictorial items with an emphasis on cartoon presentation were created. Piloting took place on 400 children and item analysis was then undertaken. Responses to the new style test from both teachers and children were mixed: some teachers were extremely critical of the levity of the items and said that their pupils felt the same as they did; other teachers were enthusiastic about what they felt was a refreshingly new approach to mathematics assessment, and reported that children enjoyed the test.

The final test consisted of 72 items and provided a score over the full range of mathematical competence, from the earliest awareness of number operations in the first year of school up to the levels expected at around 13 years of age, including arithmetic, number skills, fractions, algebra, geometry and statistics. As far as possible, the individual items assess single rather than multiple skills. Within each of the areas covered, the questions increased in difficulty as the test proceeded. A child may therefore struggle with a few questions at the end of a particular section but with the next topic they will start with some simple questions; they are continually reinforced by the experience of success at frequent intervals. The test is stopped if the child fails six consecutive items. Figure 15 gives some examples of how the test is presented. In total 11,633 children sat the test. Figure 16 shows that scores ranged between 1-72, with a mean of 43.95 (sd = 12.3) and a median of 44.

Figure 15: example questions from the 'Friendly Maths Test'

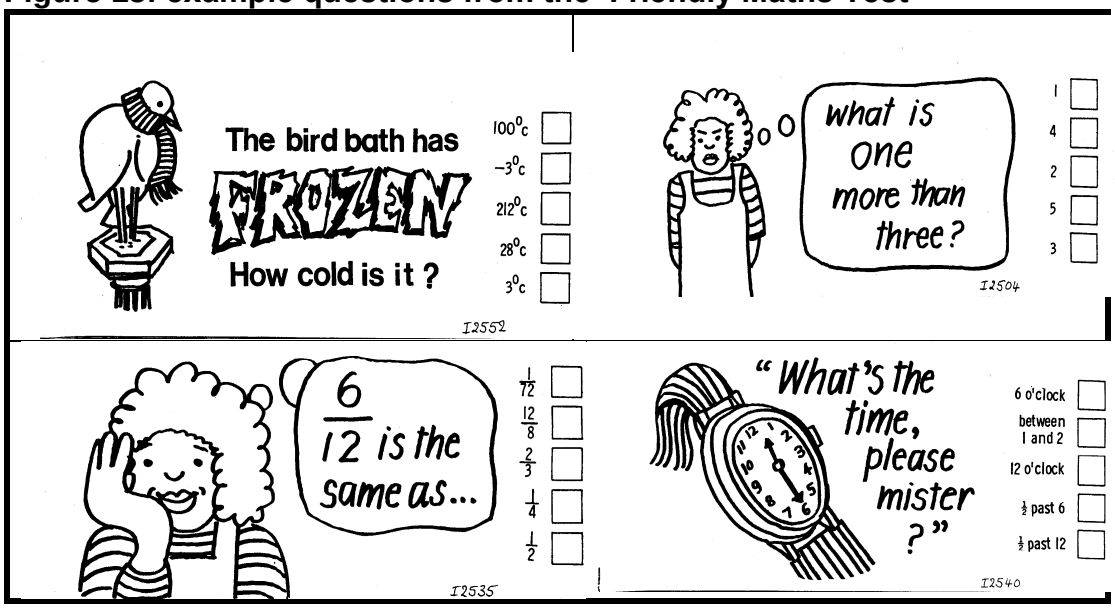
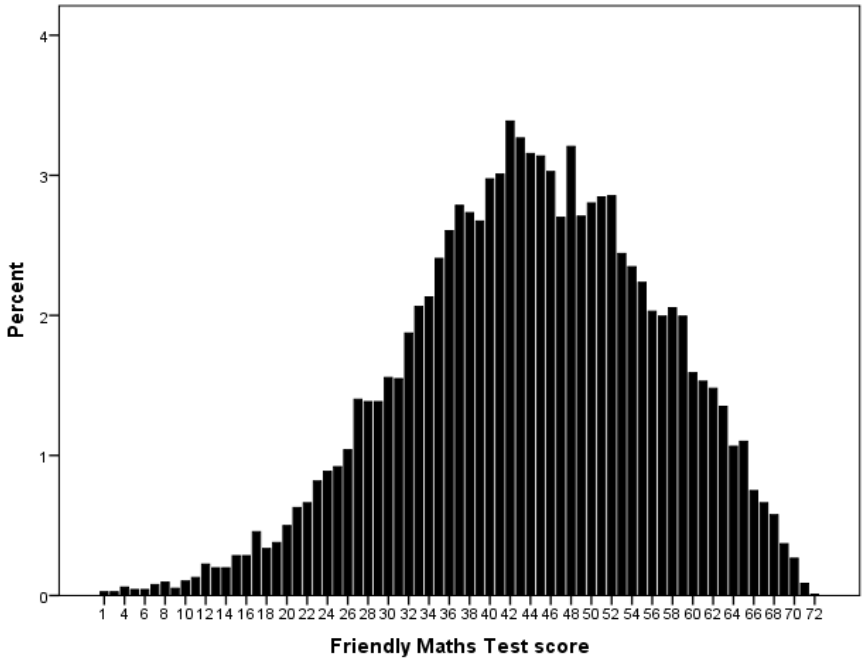


Figure 16: Distribution of Friendly Maths Test scores



Spelling Dictation task

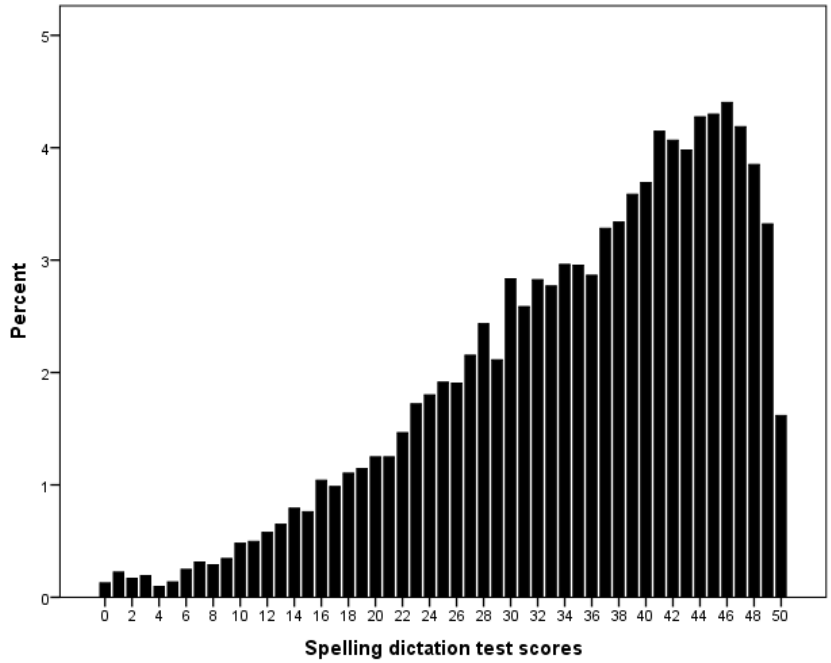
The dictation task included both real and made-up words, and therefore is a test of both spelling and phonetic decoding. If a child asked how a word is spelt, they were told to just try their best and the interviewer repeated the sentence containing the problem word. This could be done once. Figure 17 gives the full text that was read out by the interviewer. The made-up words, e.g. '**grondel**' and '**blomp**', could be repeated twice. A score of 1 was awarded for each correct spelling of a real word and a score of 1 was awarded for each syllable of the made-up words. For example, '**gron**' and '**del**' for **grondel**. Repeated words e.g. **my**, **but**, **her** and **was** were only scored once and other simple words were not scored e.g., **I**, **a**, **in**, **it**, **to**, **and**, **the**. In

total, 12,493 children sat this test. Figure 18 shows that scores ranged between 0-50 (with 50 the maximum score), with a mean of 34.96 (sd = 10.7) and a median of 37.

Figure 17: Spelling Dictation task

I often visited my aunt. She lived in a magnificent house opposite the gallery. I remember her splendid purple curtains. She wrote poetry. The problem was nobody could understand it. Her latest poems had words like prunty, slimber, grondel, blomp. I wanted to laugh but I had to pretend to like them. However, I really like the special refreshment. There was blue juice, cake and biscuits. When I left, my stomach was full and I was happy and contented.

Figure 18: Distribution of Spelling Dictation task scores



Pictorial Language Comprehension Test

This test was based on the English Picture Vocabulary Test (EPVT) study members completed when age 5, but was now not felt to be entirely suitable for the children now aged 10, given its somewhat dated appearance. Three linguists each located at different educational institutions were appointed, and the chief linguist worked closely with a Bristol artist, Edward Phelpz, who was commissioned to design the drawings. Careful consideration was given to choosing both suitable words and in the preparation of drawings that were clear and easily identified. The test was administered to a Bristol sample of 400 children and item analysis was again employed. The final test consisted of 100 sets of four different pictures with a particular word or sentence associated with each set of four pictures, and covered vocabulary, sentence comprehension and sequence comprehension. There are 71

vocabulary items, 16 sentence items and a further 13 sequence-sentence items. For the vocabulary and sentence items the child is asked to indicate the one picture that corresponds to the given word or sentence; for the sequence-sentence items the child is asked to point to the pictures in the order that everything happens. For the 71 vocabulary items, the test proceeds with words of increasing difficulty, until the child made five consecutive mistakes. The sentence and sequence items were thought relatively easy for most 10-year-olds and thus the interviewer was instructed to administer all 29 items. The child received 1 point for each correct answer.

The vocabulary items started with **elephant** and **playground** and ended with **vertebrate** and **formula**. The first sentence item was '**no house has a chimney**' and the final sequence-sentence item was ' **before he turned to the orchestra and lifted his baton, the conductor bowed to the audience and acknowledged their applause**'. Figure 19 gives examples of the pictures that go with some of these vocabulary and sentence items. In total, 12,493 children sat this test. Figure 20 shows scores ranged between 2-100, with a mean of 61.1 (sd = 10.7) and a median of 61.

Figure 19: Examples of vocabulary and sentence items in the Pictorial language comprehension test

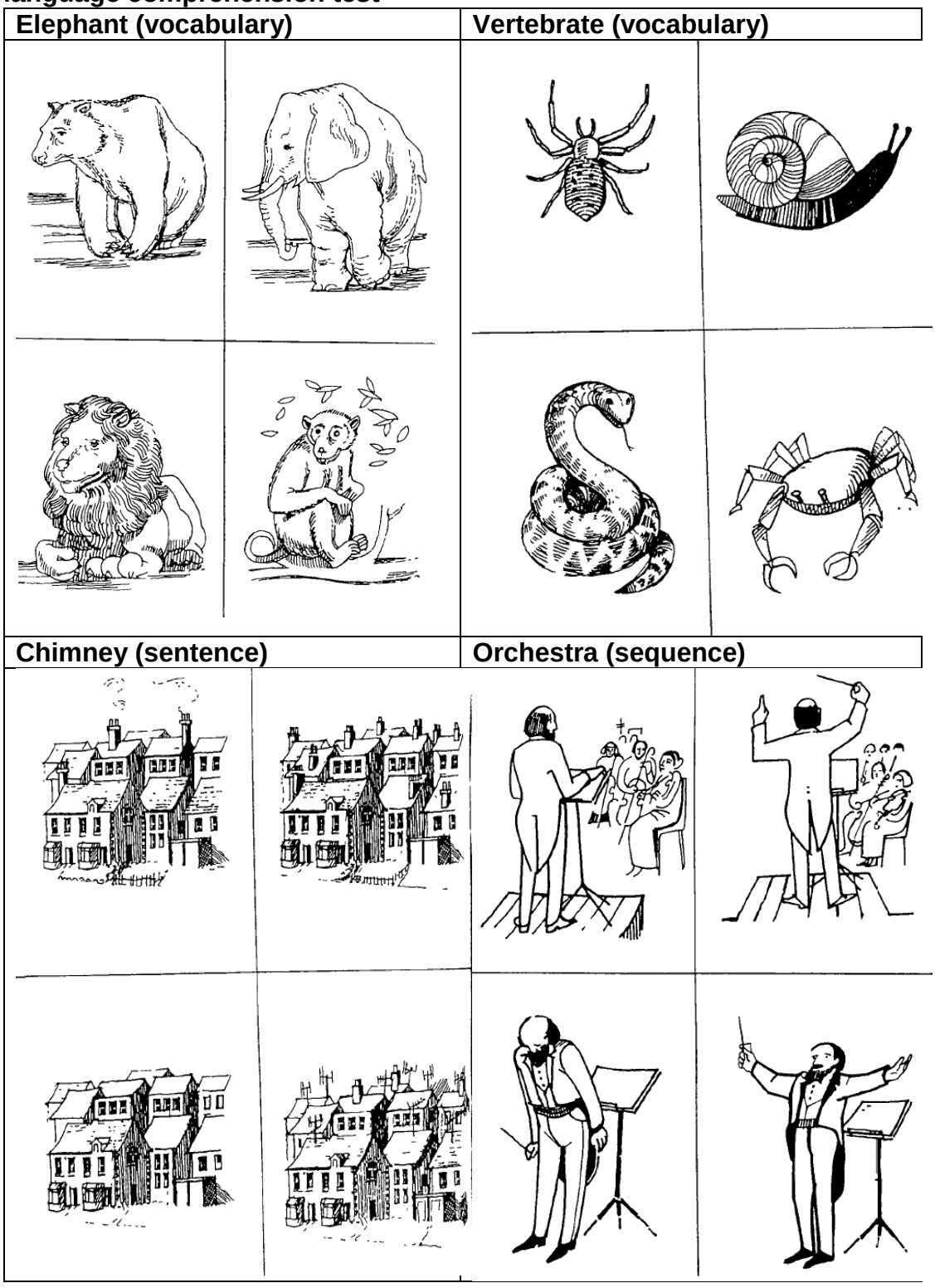
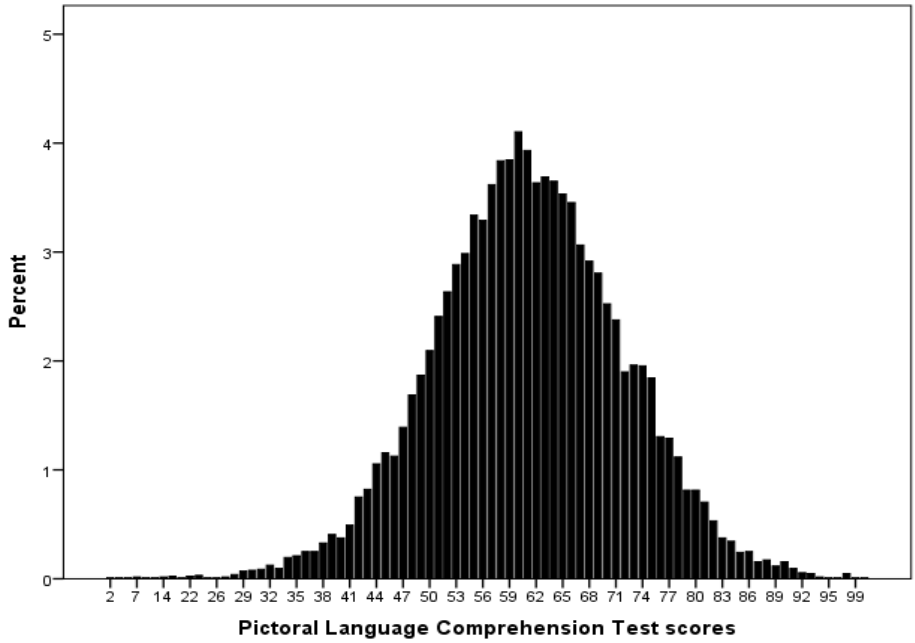


Figure 20: Distribution of Pictorial language comprehension test scores



British Ability Scales (BAS)

Four sub-scales from the British Ability Scales (BAS) (Elliott, et al. 1979; Hill 2005) were also included at age 10, the administration of which was adapted so that it could be carried out by teachers (Elliott, Murray and Pearson 1978). Verbal ability was assessed using two sub-scales: **Word Definitions** and **Word Similarities**. Non-verbal ability was assessed using two sub-scales: **Recall of Digits** and **Matrices**.

Verbal Ability

a) Word Definitions

The Word Definitions sub-scale consisted of a list of 37 words. The teacher articulated each word in turn and asked the child about its meaning. For example, **'SPORT'…… 'What does SPORT mean?'** or **'NOVICE'…… 'What does NOVICE mean?'.** The words increased in difficulty as the test proceeded, with the final two words being **'HIRSUTE'** and **'OSTRACIZE'**. When the child was unable to give a correct or partly correct definition for four successive words, the assessment was stopped. The child received 1 point for each correct answer, giving a maximum score of 37. 11,525 children completed the test, and figure 21 shows scores ranged between 0-32. The mean was 10.1 (sd = 5.0) and the median 10.

b) Word Similarities

The Word Similarities sub-scale consisted of 21 items each made up of three words (for example, **orange, banana, strawberry** or **sad, worried, happy**). For each item, the teacher enunciated the three words and asked the child to name another word consistent with the theme – a group example – with the words 'What will go with these?' Using the examples above, this child could include **'cherry'** or **'apple'**, **'content'** or **'miserable'**. The child was then asked to say what the group of items

had in common – give a group name – with the words 'Why do they all go together?' When the child was unable to describe *both* a group example and a group name to four successive items, the assessment was stopped. The items again increased in difficulty as the test proceeded, with '**democracy, justice, equality**' being the final group of words. A child received 1 point if they gave a correct group example *and* group name, but no points if they got just one right. This gave a maximum score of 21. 11,483 children completed the test and figure 22 shows scores ranged between 0-20. The mean was 12.1 (sd = 2.6) and the median 12.

Figure 21: Distribution of BAS Word Definitions Test scores

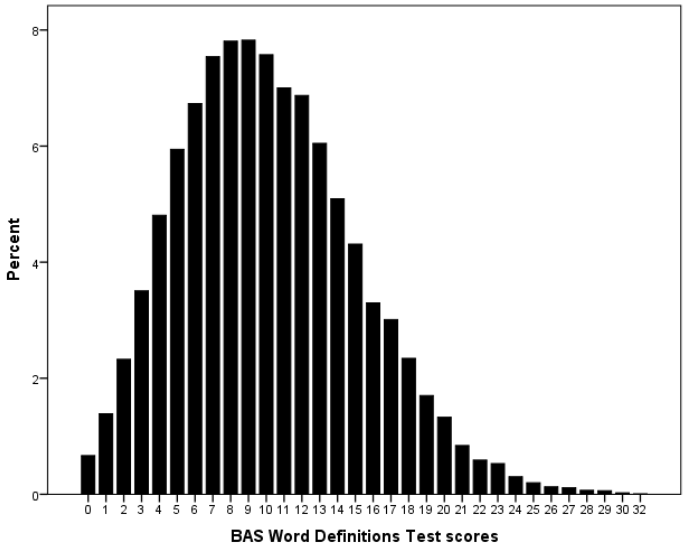
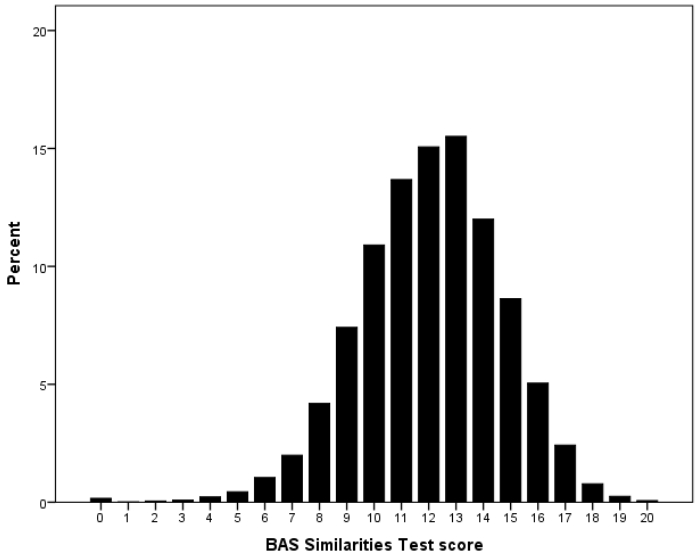


Figure 22: Distribution of BAS Word Similarities Test scores

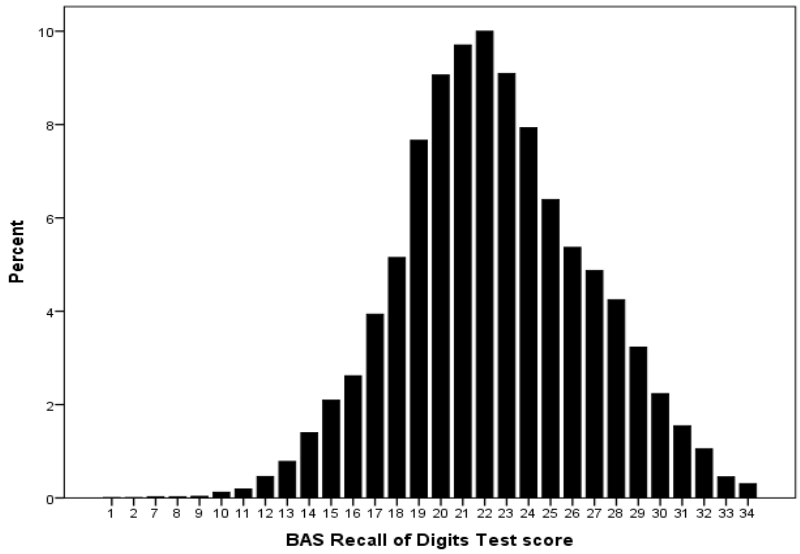


Non-Verbal Ability

a) Recall of Digits

The Recall of Digits sub-scale consisted of 34 items. The exercise began with the instruction 'Let's see how well you can remember: get ready to listen'. When the child was attentive, the teacher said 'say this after me'. For each item, the teacher read out digits in an even monotone at half-second intervals and asked the child to repeat them. The exercise increased in difficulty, with the child first being asked to remember and repeat two digits such as **'5..4'**, then three digits such as **'5..6..4'**, up to eight digits **3..8..8..7..8..4..4..6'**. If a child asked for a number to be repeated, the teacher repeated the number, but the child's subsequent answer was not credited as correct. The teacher also urged the child 'next time, you try to say it on your own, without asking me'. The assessment was stopped when the child answered four consecutive items incorrectly. The teacher said something like 'those numbers are much too long, aren't they!' to reassure the child about their performance. The child received 1 point for each correct recall. 11,512 children completed the test. Figure 23 shows the scores ranged between 0-32. The mean was 22.4 (sd = 4.3) and the median 22.

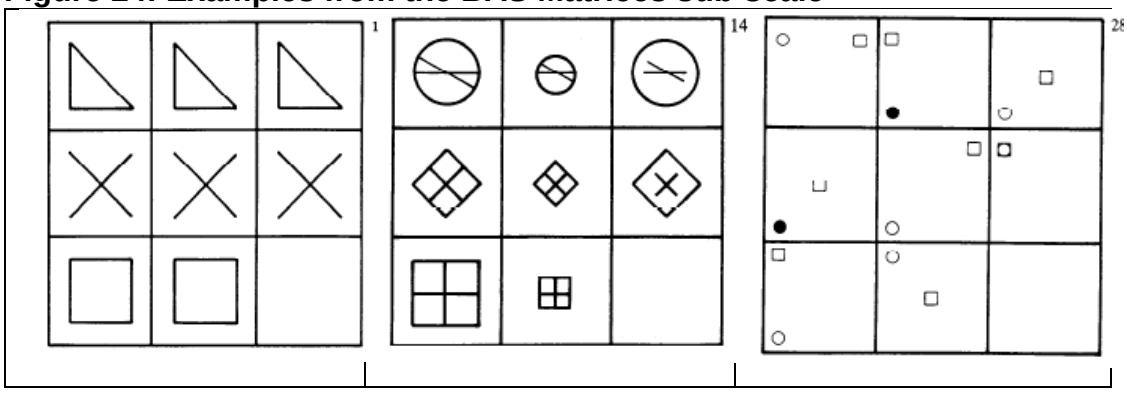
Figure 23: Distribution of BAS Recall of Digits score



b) Matrices

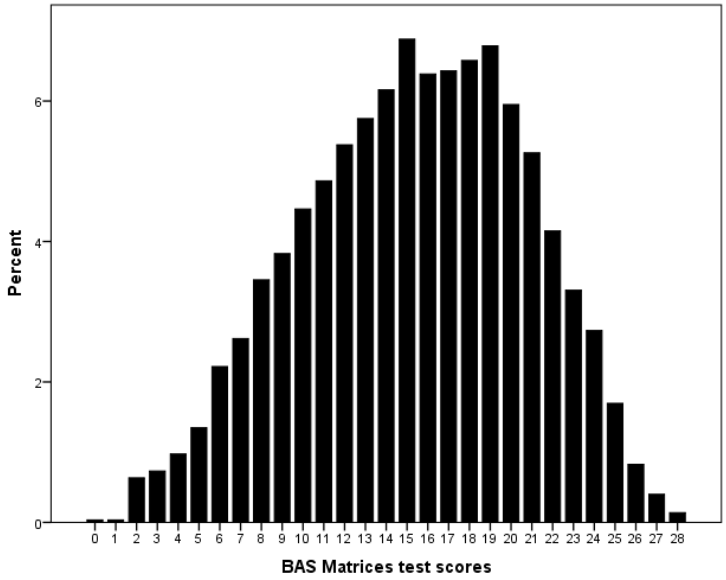
The Matrices sub-scale consisted of 28 incomplete patterns arrayed as a grid. The child had to complete each pattern by drawing the appropriate shape in the empty square. There were seven example items, three at the start of the exercise, then four further examples occurring later, when the level of difficulty increased. For each example item the teacher said 'Look at these patterns. You can see there is a part missing. You draw it in'. The missing part was always in the bottom right square, as indicated in the examples included in figure 24.

Figure 24: Examples from the BAS Matrices sub-scale



The assessment was stopped when the child had drawn four successive items incorrectly, or when it was apparent from several periods of lengthy indecision that the level of difficulty was too great. The teacher reassured the child that he or she had done well on this difficult game. The child received 1 point for each correct recall. Actual scores ranged over the complete score range of 0-28, with a mean of 15.3 (sd = 5.4) and a median of 16. 11,496 children completed the test and figure 25 shows the distribution of scores.

Figure 25: Distribution of BAS Matrices score



Overall measure of cognitive ability at age 10

Table 2 provides all pairwise correlations for the age 10 test scores. The strongest correlation was between the reading and maths test scores (0.75). Correlations were weakest with the BAS Recall of Digits, lowest of all between Recall of Digits and PLCT or BAS Matrices (0.31).

Table 2: correlations between age 10 test scores

	Reading	Maths	Spelling	PLCT	BAS WD	BAS Sim	BAS RD	BAS Mat
Reading	1							
Maths	0.75** (11,607)	1						
Spelling	0.67** (11,346)	0.58** (11,348)	1					
PLCT	0.62** (11,573)	0.60** (11,596)	0.40** (12,468)	1				
BAS WD	0.64** (11,510)	0.61** (11,500)	0.45** (11,279)	0.64** (11,480)	1			
BAS Sim	0.60** (11,467)	0.59** (11,461)	0.43** (11,240)	0.58** (11,442)	0.65** (11,462)	1		
BAS RD	0.41** (11,496)	0.41** (11,488)	0.40** (11,265)	0.31** (11,469)	0.32** (11,490)	0.33** (11,463)	1	
BAS Mat	0.59** (11,481)	0.64** (11,474)	0.40** (11,260)	0.51** (11,455)	0.48** (11,461)	0.48** (11,433)	0.31** (11,454)	1

**All pairwise correlations are statistically significant (p<0.010)

A principal components analysis (PCA) of these eight age 10 test scores was carried out to establish the presence of a general cognitive ability factor. Following the same process as for the age 5 tests (page 12), the scree plot suggested the presence of a single component, where the first unrotated principal component accounted for 58% of the total variance. The factor loading of each of the tests on the first component was 0.86 for reading, 0.86 maths, 0.80 BAS Word Definitions, 0.78 PLCT, 0.77 BAS Similarites, 0.73 BAS Matrices, 0.71 spelling and 0.53 BAS Recall of Digits. Standardised scores were saved for each study member under the regression method for scoring. Cronbach's alpha for the eight age 10 tests was very strong, α = 0.86 (unstandardised scores), α = 0.89 (standardised scores), indicating a high level of internal consistency between the tests. The PCA output is included in Appendix 2.

Age sixteen tests

Nine tests were included in the age 16 survey (including the five sub-scales that made up the Edinburgh Reading Test). These were

- **Spelling Test:** spelling was assessed by two tests, which consisted of 100 words each. The cohort member had to code whether each word was correctly or incorrectly spelled.
- **Vocabulary Test**: vocabulary was assessed using a 75-item test where each item was a word followed by a multiple-choice list from which the respondent must pick the one with the same meaning as the first word.
- **Shortened Edinburgh Reading Test** (Godfrey Thompson Unit 1978): A version of the test used at age 10 but more appropriate for 16 year olds. It included five sub-scales that examined vocabulary, syntax, sequencing, comprehension and retention.
- **Arithmetic Test:** this was assessed using the Applied Psychology Unit (UPU) Arithmetic test (Closs and Hutchings 1976) which comprised of 60 multiple choice items covering arithmetic, probabilities and area**.**
- **BAS Matrices**: a repeat of 11 of the 28 questions that comprised the Matrices section of the British Ability Scales completed by cohort members when age 10, although this time the questions were in multiple-choice format.

Further details of the tests, including the complete tests, are included in the guide to the age 16 data[10], found on the Centre for Longitudinal Studies website. In total, 6,003 (51.7%) of all children participating in the age 16 survey completed at least one assessment, 2,838 (24.4%) children completed all five assessments. Further details of the response patterns across assessments are included in Appendix 1.

Spelling Test

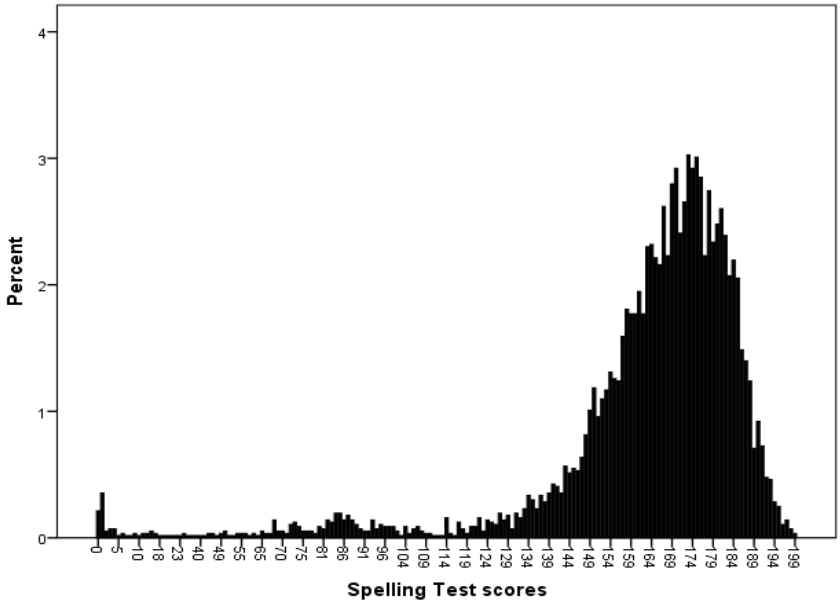
Spelling was assessed by two tests (A and B). Each consisted of 100 words that the cohort member had to code as correctly or incorrectly spelled. They were given 10 minutes to complete each test. The words got harder as the test progressed, as highlighted in figure 26 which gives the first and last five words in each of the two tests, A and B. The scores from the two tests were totalled to give an overall score out of 200. 5,649 teenagers completed the test. Scores ranged between 0-199 with a mean of 162.7 (sd = 28.3) and a median of 169. Figure 27 shows the distribution of the scores.

Figure 26: Examples of words included in Spelling test A and B

Spelling A			Spelling B		
First 5 words					
	Correct	Incorrect		Correct	Incorrect
Label	☐	☐	**Able**	☐	☐
Mother	☐	☐	**Tungue**	☐	☐
Heather	☐	☐	**Neither**	☐	☐
Mirror	☐	☐	**There**	☐	☐
Person	☐	☐	**Clear**	☐	☐
Last 5 words					
Depreciate	☐	☐	**Privilege**	☐	☐
Usuery	☐	☐	**Ingenuous**	☐	☐
Dependent	☐	☐	**Article**	☐	☐
Peritonites	☐	☐	**Committee**	☐	☐
Deprecate	☐	☐	**Groatesque**	☐	☐

10 http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=837&sitesectiontitle=User+guides+to+the+datasets

Figure 27: Distribution of Spelling Test scores



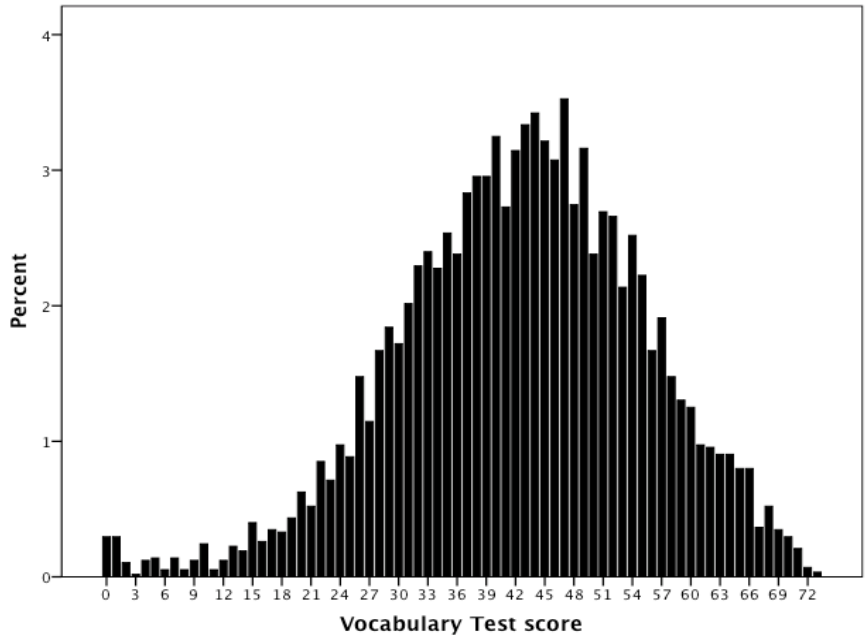
Vocabulary Test

Vocabulary was assessed using a 75-item test where each item was a word followed by a multiple-choice list from which the respondent must pick the one with the same meaning as the first word. The test got progressively harder. Figure 28 provides some examples from the vocabulary test. The complete test is included in the guide to the age 16 data. 5,756 teenagers completed the test. Scores ranged between 0-74, with a mean of 42.5 (sd = 12.7) and a median of 43. The distribution of the scores is given in figure 29.

Figure 28: examples of words in the Vocabulary test

	(a)	(b)	(c)	(d)	(e)
First 5 words					
BEGIN	ask	start	plain	over	away
AID	help	contrive	assent	manage	hurry
FOREST	grass	wood	sleep	grind	judge
QUICK	always	best	neat	sick	fast
REWARD	notice	golden	prize	stable	Marine
Last 5 words					
UBIQUITOUS	omnipresent	perdition	adduce	muddy	viscous
PROSAIC	commonplace	flowery	laudable	poetical	spacious
ASCETIC	artistic	dissolute	austere	antipathetic	charlatan
APOSTATE	insufferable	monastic	exegesis	renegade	vicious
PUSILLANIMOUS	loud	living	timid	averse	correct

Figure 29: Distribution of Vocabulary Test scores



Arithmetic Test

Arithmetic was assessed using the Applied Psychology Unit (UPU) Arithmetic test – a 30-minute assessment comprising 60 multiple-choice items covering arithmetic, probabilities and area (Closs and Hutchings 1976). Each question had five possible answers, only one of which was correct. Figure 30 shows that 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. See Dodgeon (2008) for details of the complete assessment. One point was awarded for each correct response. 3,677 children completed the test. Scores ranged between 0-60 with a mean of 36.8 (sd = 11.8) and a median of 38. The distribution of the scores is given in figure 31.

Figure 30: Examples of questions in the arithmetic test

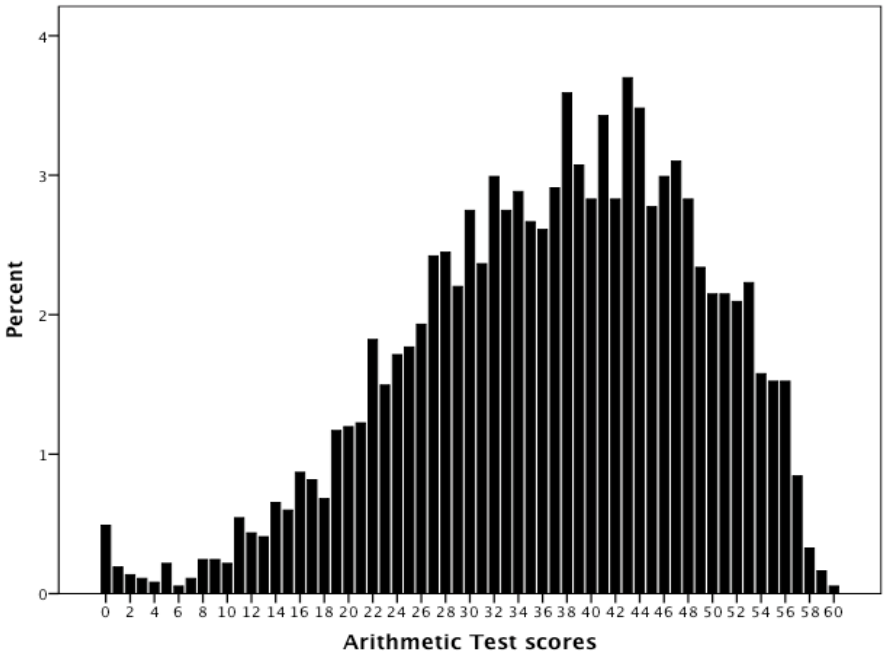
First 4 questions

	(a)	(b)	(c)	(d)	(e)
1. 2 + 3 = ...	⅕	3	4	5	7
2. 2 × 4 = ...	6	8	12	16	24
3. 12 ÷ 3 = ...	4	6	9	12	36
4. 359 − 126 = ...	103	113	133	213	233

Last 5 questions

	(a)	(b)	(c)	(d)	(e)
56. How many rectangular blocks 30 cms long, 20 cms wide and 6 cms deep will fit into a rectangular box 90 cms long, 80 cms wide and 72 cms deep?	144	154	156	164	166
57. The line round a football pitch is 350 metres long. The pitch is 35 metres longer than it is broad. How many metres long is it?	85	95	105	125	135
58. What is the radius in cms of a circle of 62·8 cms circumference? (Take π = 3·14)	5	6	8	9	10
59. What is the area in cm² of a circle of 3 cms radius? (Take π = 3·14)	(a) 31·46	(b) 31·4	(c) 30·28	(d) 30·26	(e) 28·26
60. If a two figure number is written backwards it makes a number that is 72 smaller. What is the number?	(a) 68	(b) 75	(c) 86	(d) 91	(e) 97

Figure 31: Distribution of Arithmetic test scores



Shortened Edinburgh Reading Test

The Shortened Edinburgh Reading Test (ERT) used here, as for age 10, is a shortened version that included questions from all four ERTs, which are designed to assess the reading skills of children from four different age ranges[11]. There are five sections and 75-questions to this shortened version of the ERT, and 1 point was awarded for each correct answer. An overall score and five sub-scale scores can be constructed for the different sections. Each section had a time limit. Questions were broken down as follows:

- Section A: *Skimming* (10 items). This involved answering questions based on a piece of text. There were five options to choose from (3 minutes).
- Section B: *Vocabulary* (20 items). Each question was a sentence with a word underlined. Respondents had to select a word that meant the same or nearly the same as the underlined word from five options (11 minutes).
- Section C: *Reading for facts* (15 items). Respondents had to read a passage and then look at a series of statements and answer whether the passage 'agreed', 'disagreed' or 'didn't say' with each statement (5 minutes).
- Section D: *Points of view* (17 items). Five individual views were numbered 'a' to 'e'. Respondents had to choose which individual was most likely to have said each of a number of the additional statements. There were two sub-sections (12 minutes).
- Section E: *Comprehension* (13 items). Respondents had to read a passage and answer questions based on the passage. Each question has five options to choose from. There were two separate passages (12 minutes).

Figure 32 gives some examples of questions from the test. The complete test is included in the Appendix of the guide to the age 16 data[12]. 3,227 teenagers completed the test. Scores ranged between 2-75 with a mean of 53.6 (sd = 14.5) and a median of 57. The distribution of the scores is given in figure 33.

[11] See http://www.hoddertests.co.uk/tfsearch/reading/ert4.htm for the current version for children age 11.7 year – 16+.

[12] http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=837&sitesectiontitle=User+guides+to+the+datasets

Figure 32: Examples from the Shortened Edinburgh Reading Test (age 16) (Section A, C and E)

CHICKEN SAUTÉ À L'INDIENNE:

Cut up a chicken into about 15 pieces; that is to say, divide each joint into two or three pieces. Put it into a saucepan, in which there has previously been heated some butter (with oil or with lard), a large chopped onion, one cup (100 grams) of ham cut into very small dice, and a large grated eating apple.

Add a sprig of thyme, a bay leaf, a pinch of cardamom, a pinch of cinnamon, a pinch of mace, and two crushed cloves of garlic. Sprinkle over four teaspoons of curry powder. Mix. Add two tomatoes, peeled and seeded; pour in two cups of coconut milk and cook for 40 minutes.

Set in a bowl, and serve with rice cooked in water coloured with saffron, and extra-thin flat cakes of fine wheaten flour, called Chapattis.

A1. **Into how many pieces should the chicken be cut?** (a) 2 (b) 3 (c) 4 (d) 15 (e) 100

INCIDENT AT RAMILLA

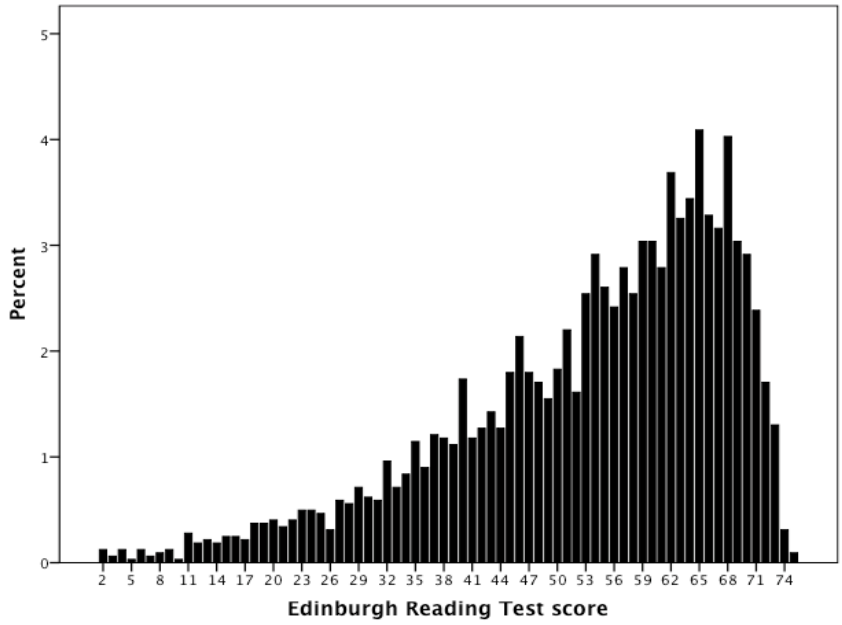
When the President drove into Ramilla the conspirators had laid their plans carefully and no fewer than nine of them had concealed themselves along the route. The first assassination attempt was made at the entrance to the town square. A bomb was thrown: it hit the carriage, but slid off. Two soldiers in attendance were badly wounded by the blast, but the President was not harmed.

For the return journey another route was planned but the cheering crowd, uncontrolled by either police or army, opened a lane for the carriage, and by a fatal mistake the carriage started back on the original route. The conspirators were still waiting in their chosen positions. The President's carriage slowed down and a young man pushed through to the front of the crowd. He was quickly disarmed by soldiers, but not before he had fired two gunshots at short range.

C1. **There were fewer than nine conspirators**

(a) Agrees (b) Disagrees (c) Doesn't say

Figure 33: Distribution of Edinburgh Reading Test scores

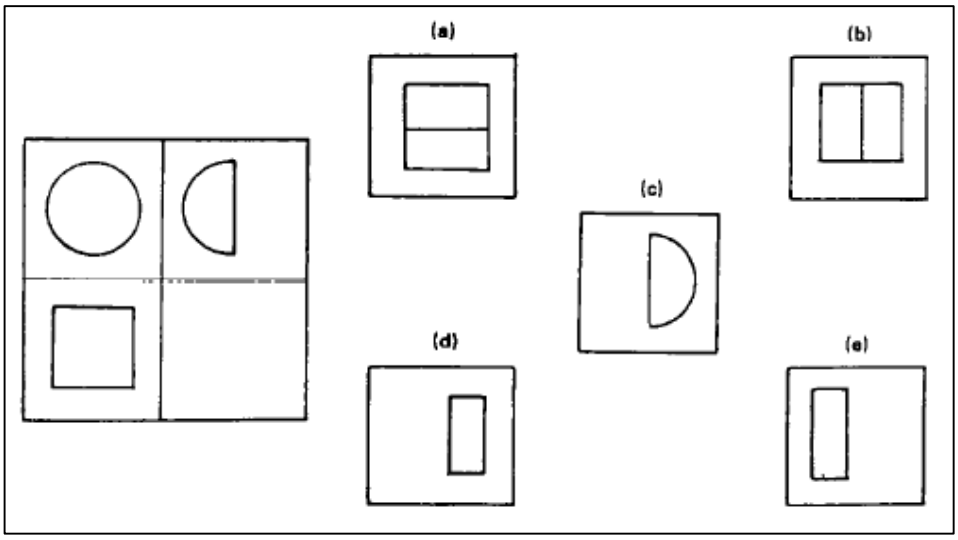


BAS Matrices

This test was a repeat of 11 of the 28 questions that comprised the Matrices section of the British Ability Scales completed by cohort members when age 10. There was, however, a change in format as the questions were now multiple-choice – as all tests at age 16. Figure 34 details two examples. The complete test is included in the Appendix of the guide to the age 16 data[13].
3,208 teenagers completed the test. Scores ranged between 1-11 with a mean of 8.9 (sd = 1.7) and a median of 9. The distribution of the scores is given in figure 35.

Figure 34: Two items from the Matrices multiple-choice test

Item 6



Item 11

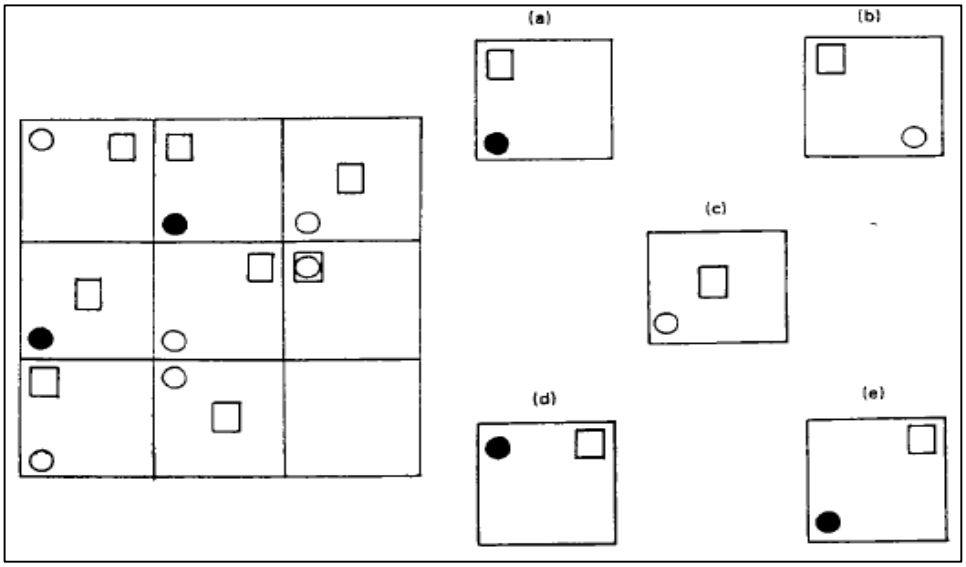


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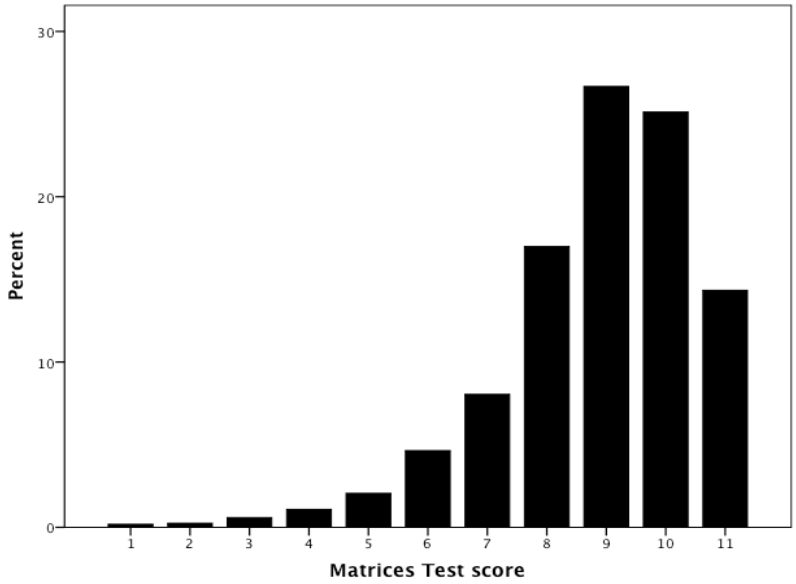
Figure 35: Distribution of Matrices test scores



Overall measure of cognitive ability at age 16

Table 3 provides all pairwise correlations for the age 16 test scores. At age 16, the strongest correlation between tests was between reading and vocabulary test scores (0.72). The weakest correlation was between spelling and matrices scores (0.33).

Table 3: correlations between age16 test scores

	Vocabulary	Spelling	Reading	Arithmetic	Matrices
Vocabulary	1				
Spelling	.49** (5,490)	1			
Reading	.72** (3,062)	.46** (2,976)	1		
Arithmetic	.65** (3,583)	.48** (3,453)	.66** (3,022)	1	
Matrices	.42** (3,077)	.33** (2,985)	.50** (3,160)	.50** (3,037)	1

**all pairwise correlations were statistically significant (p<0.01)

Again, following the same process as for earlier assessments, a Principal Components Analysis (PCA) of the five assessment scores when study members were age 16 was carried out to establish the presence of a general cognitive ability factor, as for previous evaluations at age 5 and 10 years. (The overall Edinburgh Reading Test score was used here, not the five sub-scale scores.) Examination of the scree plot confirmed the presence of a single component where the first unrotated principal component accounted for 64% of the total variance. The factor loading of each of the tests on this component was 0.75 for Vocabulary and Reading, 0.73 for Arithmetic, 0.53 for Spelling and 0.45 for Matrices. Standardised scores were saved for each study member based on the regression method of scoring.

Cronbach's alpha for these five age 16 tests was strong, α = 0.78 (unstandardised scores), α = 0.86 (standardised scores), indicating there was very good internal consistency between the tests. The PCA output is included in Appendix 2.

Summary

This paper provides a description of the cognitive assessments administered at ages 5, 10 and 16 years. There were five tests at age 5, eight at age 10 and five at age 16. Individual assessments covered drawing, copying, reading, maths, spelling, vocabulary and comprehension, and verbal and non-verbal ability across the ages. There was some reassuring evidence for the existence of a single dimension of cognitive ability at each age (Cronbach's alphas ranging between 0.6 and 0.9) as well as some interesting differences in the distribution of individual scores. For example, some exhibiting almost perfect symmetry and others being markedly skewed.

Table 4 shows that across the age ranges the PCA summary scores are significantly correlated.

Table 4: correlations between PCA summary scores

	Age 5	Age 10	Age 16
Age 5	1		
Age 10	.56 (8,324)	1	
Age 16	.49 (2,051)	.78 (2,048)	1

Note: all pairwise correlations were statistically significant (p<0.01)

Versions of the Edinburgh Reading Test and BAS Matrices assessments included at age 10 were also included at age 16, providing a rare opportunity to look at change in skill levels for those who participated at both time points[14].

[14] In addition to these, seven literacy and six numeracy open-response items from the assessments used to measure basic skills competence in the BCS70 age-21 10% sample survey (Ekinsmyth and Bynner, 1994) were repeated in the age 34 survey for investigating change in skill levels for those who participated at both time points. As St Clair (2010) has pointed out, repeated measure data of the kind available in the 1970 cohort constitutes an unequalled resource for the study of literacy (and numeracy) capability, enabling both the stability of skills proficiency to be established and the outcomes of any changes in them evaluated.

References

Batty G. D, Deary I. J, Schoon I. and 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 and Community Health*, 61, 997-1003.

Breen, R. and Goldthorpe, J. H. (2001) Class, Mobility and Merit; The Experience of Two British Birth Cohorts. *European Sociological Review*, 17(2), 81-101.

Brimer, M. A. and Dunn, L. M. (1962) *English Picture Vocabulary Test*: Educational Evaluation Enterprises.

Butler, B., Despotidou, S. and Shepherd, P. (1980) *1970 British Cohort Study (BCS70): Ten Year Follow-up*, London: Social Statistics Research Unit, City University.

Butler, N., Haslum, M., Barker, W., and Morris, A. (1982). *Child Health and Education Study. First Report to the Dept of Education and Science on the 10 year follow up* Bristol: University of Bristol.

Closs, S. J. and Hutchings, M. J. (1976) *APU arithmetic test*, London: Hodder and Stoughton.

Cronbach, L. (1951) Coefficent alpha and the internal structure of tests. *Psychometrika*, 16, 297-334.

DiStefano, C., Zhu,, M. and Mîndrilă, D. (2009) Understanding and Using Factor Scores: Considerations for the Applied Researcher, Practical Assessment, Research & Evaluation, 14(20) 1-11.

Dodgeon, B. (2008) *Guide to the Dataset: BCS70 16 year follow up: APU arithmetic test*, London: Centre for Longitudinal Studies.

Dunn, L. M. (1959) Peabody Picture Vocabulary. American Guidance Service. *Latest version*: Dunn, L. M. and Dunn, D. M. (1959-2007) Peabody Picture Vocabulary Test, Fourth Edition. Pearson, 5601 Green Valley Drive, Bloomington, MN 55437.

Elliott, C. D., Murray, D. J. and Pearson, L. S. (1979) *British Ability Scales*, Slough: NFER.

Ekinsmyth, C. and Bynner, J. (1994) *The Basic Skills of Young Adults.* London: The Basic Skills Agency.

Elliott, C., Murray, D., and Pearson, L. (1978). *British Ability Scales*. Windsor: National Foundation for Educational Research.

Elliott, J. and Shepherd, P. (2006) Cohort Profile: 1970 British birth cohort (BCS70), *International Journal of Epidemiology 35*(4): 836-843.

Feinstein, L. (2003) Inequality in the Early Cognitive Development of British Children in the 1970 Cohort. *Economica*, 70(1), 73-97.

Feinstein, L. (2004) Mobility in pupils' cognitive attainment during school life. *Oxford Review of Economic Policy*, *20*, 213-229.

Field, A. (2013) Discovering Statistics using IBM SPSS Statistics, Fourth Edition. London SAGE Publications Ltd.

Godfrey Thompson Unit (1978) *Edinburgh Reading Test.* Sevenoaks: Hodder and Stoughton.

Golding, J. (1975) *The 1970 Birth Cohort 5-Year Follow-up: Guide to the dataset*, University of Bristol: Institute of Child Health.

Goodenough, F. L. (1926) *The measurement of intelligence by drawings*, New York: World Book Company.

Goodman, A. and Butler, N. (1987) *BCS70 - The 1970 British Cohort Study: The sixteen year follow-up*, Social Statistics Research Unit, City University.

Harris, D. B. (1963) *Children's drawings as measures of intellectual maturity*, New York: Harcourt, Brace and World.

Hill, V. (2005) Through the Past Darkly: A Review of the British Ability Scales Second Edition. *Child and Adolescent Mental Health*, 10 (2), 87-98.

Jensen, A.R. (1998). *The g factor: The science of mental ability*. Westport, CT: Praeger.

Kalverboer, A.F. (1972) A Profile Test for the Spatial-Constructive Development. Lisse: Switz & Zeitlinger.

Koppitz, E M. (1968) Psychological Evaluation of Children's Human Figure Drawings. New York: Grune and Stratton.

Nunnally J. C. (1978). *Psychometric Theory, 2nd ed*. New York: McGraw-Hill.

Osborn, A. F., Butler, N. R., and Morris, A. C. (1984). *The social life of Britain's five-year-olds: a report of the Child Health and Education Study*. London: Routledge & Kegan Paul.

Spearman, C.E. (1904). General intelligence, Objectively Determined And Measured. *American Journal of Psychology, 15*, 201–293.

St. Clair, R. (2010). *Why Literacy Matters. Understanding the effects of literacy education for adults*. Leicester: National Institute for Adult and Continuing Education (NIACE).

Sullivan, A. and Brown, M. (2013) *Social inequalities in cognitive scores at age 16: The role of reading*. CLS Working Paper 2013/10. London: Centre for Longitudinal Studies.

Tabachnick, B. G., and Fidell, L. S. (2001). *Using Multivariate Statistics (4th Ed.)*. Needham Heights, MA: Allyn & Bacon.

Thurstone, L. L. (1935). *The vectors of mind.* Chicago: University of Chicago Press. (pp. 226-231).

Appendix 1: Response patterns

In the tables below, '2' indicates the assessment was completed, '1' that it was not.

Age 5

Working from left to right, the assessments are ordered 'draw-a-man', 'profile', 'Schonell reading', 'copying designs' and 'EPVT'. E.g., a response pattern of 11212 indicates a child completed the Schonell reading and the EPVT assessments; a response pattern of 21211 that the draw-a-man and Schonell reading test were completed. We can see that 11,254 (85.7%) children completed all five assessments (22222) and only 76 (0.6%) of children did not complete any of the assessments (11111).

b5tests b5 response pattern: draw - prof - schonell - copy - epvt

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11111	76	.6	.6	.6
	11121	16	.1	.1	.7
	11122	2	.0	.0	.7
	11211	9	.1	.1	.8
	11212	15	.1	.1	.9
	11221	23	.2	.2	1.1
	11222	55	.4	.4	1.5
	12122	4	.0	.0	1.5
	12212	3	.0	.0	1.5
	12221	16	.1	.1	1.7
	12222	132	1.0	1.0	2.7
	21121	7	.1	.1	2.7
	21122	11	.1	.1	2.8
	21211	2	.0	.0	2.8
	21221	30	.2	.2	3.1
	21222	438	3.3	3.3	6.4
	22121	54	.4	.4	6.8
	22122	319	2.4	2.4	9.2
	22212	2	.0	.0	9.2
	22221	667	5.1	5.1	14.3
	22222	11254	85.7	85.7	100.0
	Total	13135	100.0	100.0	

Age 10

From left-to-right, the assessments are ordered pictorial, spelling, maths, reading, BAS similarities, matrices, recall of digits and word definitions.

b10tests b10 response pattern: plct - spell math - read -- BAS sim - BAS mat - BAS digits - BAS word def

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11111111	2008	13.5	13.5	13.5
	11121111	8	.1	.1	13.6
	11121112	1	.0	.0	13.6
	11121122	1	.0	.0	13.6
	11121222	1	.0	.0	13.6
	11122122	1	.0	.0	13.6
	11122222	4	.0	.0	13.6
	11211111	3	.0	.0	13.6
	11212222	1	.0	.0	13.6
	11221111	14	.1	.1	13.7
	11222121	1	.0	.0	13.7
	11222222	13	.1	.1	13.8
	12211111	1	.0	.0	13.8
	12221112	2	.0	.0	13.8
	12221211	1	.0	.0	13.8
	12222222	21	.1	.1	14.0
	21111111	67	.5	.5	14.4
	21121111	1	.0	.0	14.4
	21122222	5	.0	.0	14.5
	21211111	5	.0	.0	14.5
	21212121	1	.0	.0	14.5
	21212222	2	.0	.0	14.5
	21221111	22	.1	.1	14.7
	21221112	1	.0	.0	14.7
	21221121	1	.0	.0	14.7
	21221122	1	.0	.0	14.7
	21221211	4	.0	.0	14.7
	21221212	1	.0	.0	14.7
	21222122	10	.1	.1	14.8
	21222221	1	.0	.0	14.8
	21222222	204	1.4	1.4	16.2
	22111111	1132	7.6	7.6	23.8
	22112222	1	.0	.0	23.8
	22121111	1	.0	.0	23.8
	22122222	11	.1	.1	23.9
	22211111	2	.0	.0	23.9
	22212222	11	.1	.1	24.0
	22221111	48	.3	.3	24.3
	22221112	5	.0	.0	24.3
	22221122	5	.0	.0	24.4
	22221211	9	.1	.1	24.4
	22221212	7	.0	.0	24.5
	22221221	2	.0	.0	24.5
	22221222	38	.3	.3	24.7
	22222122	37	.2	.2	25.0
	22222211	2	.0	.0	25.0
	22222212	18	.1	.1	25.1
	22222221	16	.1	.1	25.2
	22222222	11123	74.8	74.8	100.0
	Total	14875	100.0	100.0	

Age 16

Working from left-to-right, the table below indicates whether cohort members completed the reading, matrices, vocabulary, spelling and maths assessments.

b16tests response pattern age 16 tests: read mat vocab spell maths

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11111	5539	47.7	47.7	47.7
	11112	25	.2	.2	47.9
	11121	113	1.0	1.0	48.9
	11122	7	.1	.1	48.9
	11211	94	.8	.8	49.7
	11212	45	.4	.4	50.1
	11221	1976	17.0	17.0	67.1
	11222	542	4.7	4.7	71.8
	12111	6	.1	.1	71.9
	12112	4	.0	.0	71.9
	12122	1	.0	.0	71.9
	12211	2	.0	.0	71.9
	12212	1	.0	.0	71.9
	12221	4	.0	.0	72.0
	12222	30	.3	.3	72.2
	21111	34	.3	.3	72.5
	21112	3	.0	.0	72.5
	21121	7	.1	.1	72.6
	21122	1	.0	.0	72.6
	21211	1	.0	.0	72.6
	21212	3	.0	.0	72.6
	21221	4	.0	.0	72.7
	21222	14	.1	.1	72.8
	22111	57	.5	.5	73.3
	22112	33	.3	.3	73.6
	22121	10	.1	.1	73.7
	22122	20	.2	.2	73.8
	22211	10	.1	.1	73.9
	22212	110	.9	.9	74.9
	22221	82	.7	.7	75.6
	22222	2838	24.4	24.4	100.0
	Total	11616	100.0	100.0	

Appendix 2: PCA results

Age 5 assessments

```
FACTOR
  /VARIABLES b5epvt b5sread b5prof b5copy b5draw
  /MISSING LISTWISE
  /ANALYSIS b5epvt b5sread b5prof_sp b5copy b5draw
  /PRINT INITIAL EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /SAVE REG(ALL)
  /METHOD=CORRELATION.
```

Communalities

	Initial	Extraction
b5epvt bcs70 age 5: English Picture Vocabulary Test [raw score - max 56]	1.000	.406
b5sread bcs70 age 5: Schonell Reading Test [0 = not read/read few letters]	1.000	.207
b5copy bcs70 age 5: Copying Designs Test	1.000	.566
b5draw bcs70 age 5: Draw-a-Man Test (f113)	1.000	.471
b5prof bcs70 age 5: Profile Test	1.000	.247

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.896	37.923	37.923	1.896	37.923	37.923
2	.966	19.325	57.248			
3	.794	15.882	73.129			
4	.769	15.376	88.505			
5	.575	11.495	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
b5epvt bcs70 age 5: English Picture Vocabulary Test [raw score - max 56]	.637
b5sread bcs70 age 5: Schonell Reading Test [0 = not read/read few letters]	.454
b5copy bcs70 age 5: Copying Designs Test	.752
b5draw bcs70 age 5: Draw-a-Man Test (f113)	.687
b5prof bcs70 age 5: Profile Test	.497

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Reliability

Case Processing Summary

		N	%
Cases	Valid	11254	60.0
	Excluded[a]	7497	40.0
	Total	18751	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

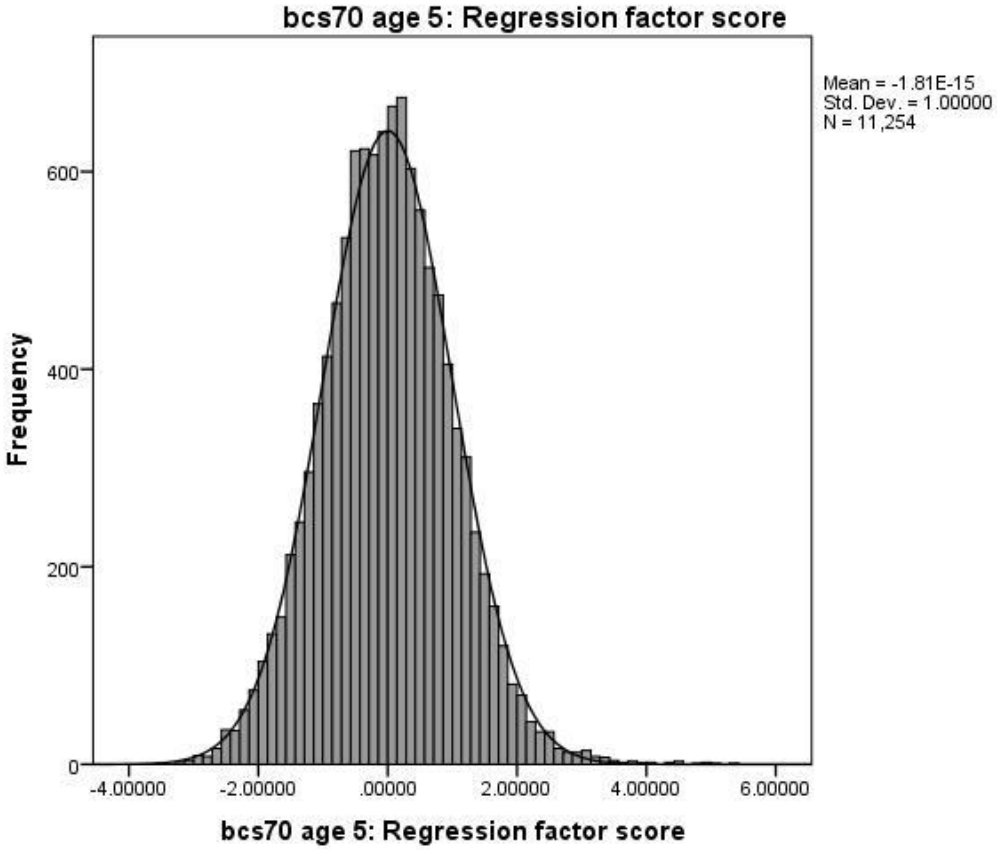
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.418	.577	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	11.732	1.505	35.796	34.291	23.785	191.377	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
b5epvt bcs70 age 5: English Picture Vocabulary Test [raw score - max 56]	22.8622	59.400	.339	.137	.449
b5sread bcs70 age 5: Schonell Reading Test [0 = not read/read few letters]	57.1530	185.453	.203	.071	.379
b5prof bcs70 age 5: Profile Test	52.6296	191.803	.239	.079	.372
b5copy bcs70 age 5: Copying Designs Test	53.8421	195.549	.437	.238	.347
b5draw bcs70 age 5: Draw-a-Man Test (f113)	48.1451	185.479	.327	.187	.336


bcs70 age 5: Regression factor score
Mean = -1.81E-15
Std. Dev. = 1.00000
N = 11,254
Frequency
600
400
200
0
-4.00000
-2.00000
.00000
2.00000
4.00000
6.00000
bcs70 age 5: Regression factor score

Age 10 assessments

Communalities

	Initial	Extraction
b10math bcs70 age 10: Maths Test	1.000	.737
b10read bcs70 age 10: Reasing Test	1.000	.768
b10spell bcs70 age 10: Spelling test	1.000	.503
b10plct bcs70 age 10: Pictoral Language Comprehension Test	1.000	.601
BASWDscore14 Total score BAS Word Definitions	1.000	.638
BASRDscore15 Total score BAS Recall of digits	1.000	.283
BASIMscore16 Total Score BAS Similarities	1.000	.596
BASMATscore17 Total Score BAS Matrices	1.000	.526

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.651	58.142	58.142	4.651	58.142	58.142
2	.847	10.585	68.727			
3	.642	8.025	76.752			
4	.584	7.295	84.047			
5	.418	5.230	89.276			
6	.325	4.060	93.337			
7	.304	3.795	97.132			
8	.229	2.868	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
b10math bcs70 age 10: Maths Test	.859
b10read bcs70 age 10: Reading Test	.876
b10spell bcs70 age 10: Spelling test	.709
b10plct bcs70 age 10: Pictoral Language Comprehension Test	.775
BASWDscore14 Total score BAS Word Definitions	.799
BASRDscore15 Total score BAS Recall of digits	.532
BASIMscore16 Total Score BAS Similarities	.772
BASMATscore17 Total Score BAS Matrices	.725

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Reliability

Case Processing Summary

		N	%
Cases	Valid	11123	59.3
	Excluded[a]	7628	40.7
	Total	18751	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

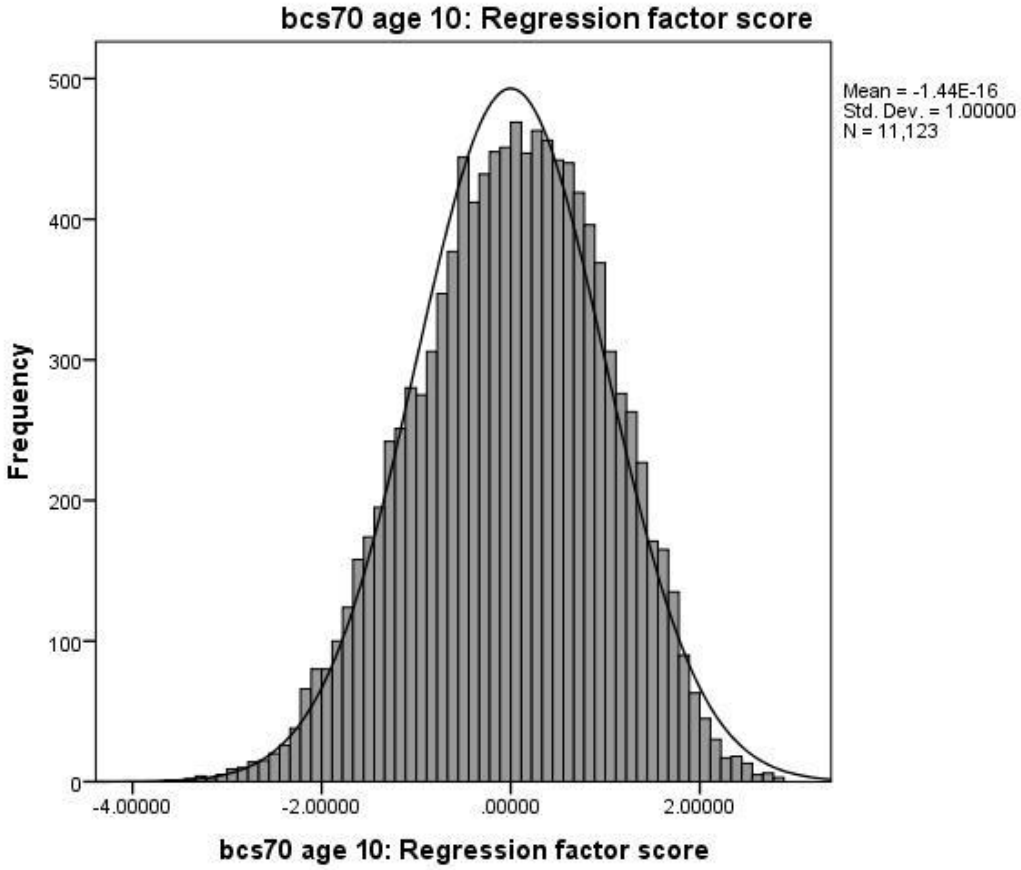
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.862	.893	8

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	30.176	10.189	61.339	51.151	6.020	329.697	8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
b10math1	197.1853	1555.537	.796	.655	.823
b10read1	200.6742	1499.685	.832	.702	.817
b10spell bcs70 age 10: Spelling test	206.4060	1775.521	.635	.483	.844
b10plct bcs70 age 10: Pictoral Language Comprehension Test	180.0655	1769.918	.665	.526	.839
BASWDscore14 Total score BAS Word Definitions	231.2162	2113.705	.706	.572	.846
BASRDscore15 Total score BAS Recall of digits	218.9622	2262.668	.451	.214	.864
BASIMscore16 Total Score BAS Similarities	229.3107	2288.792	.677	.513	.861
BASMATscore17 Total Score BAS Matrices	226.0137	2115.312	.642	.450	.849


bcs70 age 10: Regression factor score
Mean = -1.44E-16
Std. Dev. = 1.00000
N = 11,123
Frequency
500
400
300
200
100
0
-4.00000
-2.00000
.00000
2.00000
bcs70 age 10: Regression factor score

Age 16 assessments

Communalities

	Initial	Extraction
b16vocab bcs70 age 16: Vocabulary Test	1.000	.747
b16spell bcs70 ag e16: Spelling Test	1.000	.530
mathscore BCS70 16-year Arithmetic scores (out of 60)	1.000	.725
b16read BCS70 age 16: Reading Test	1.000	.745
b16mat BCS70 age 16: Matrices Test	1.000	.454

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.200	64.008	64.008	3.200	64.008	64.008
2	.678	13.563	77.570			
3	.522	10.444	88.015			
4	.352	7.046	95.061			
5	.247	4.939	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
b16vocab bcs70 age 16: Vocabulary Test	.864
b16spell bcs70 ag e16: Spelling Test	.728
mathscore BCS70 16-year Arithmetic scores (out of 60)	.852
b16read BCS70 age 16: Reading Test	.863
b16mat BCS70 age 16: Matrices Test	.673

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Reliability

Case Processing Summary

		N	%
Cases	Valid	2838	15.1
	Excluded[a]	15913	84.9
	Total	18751	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

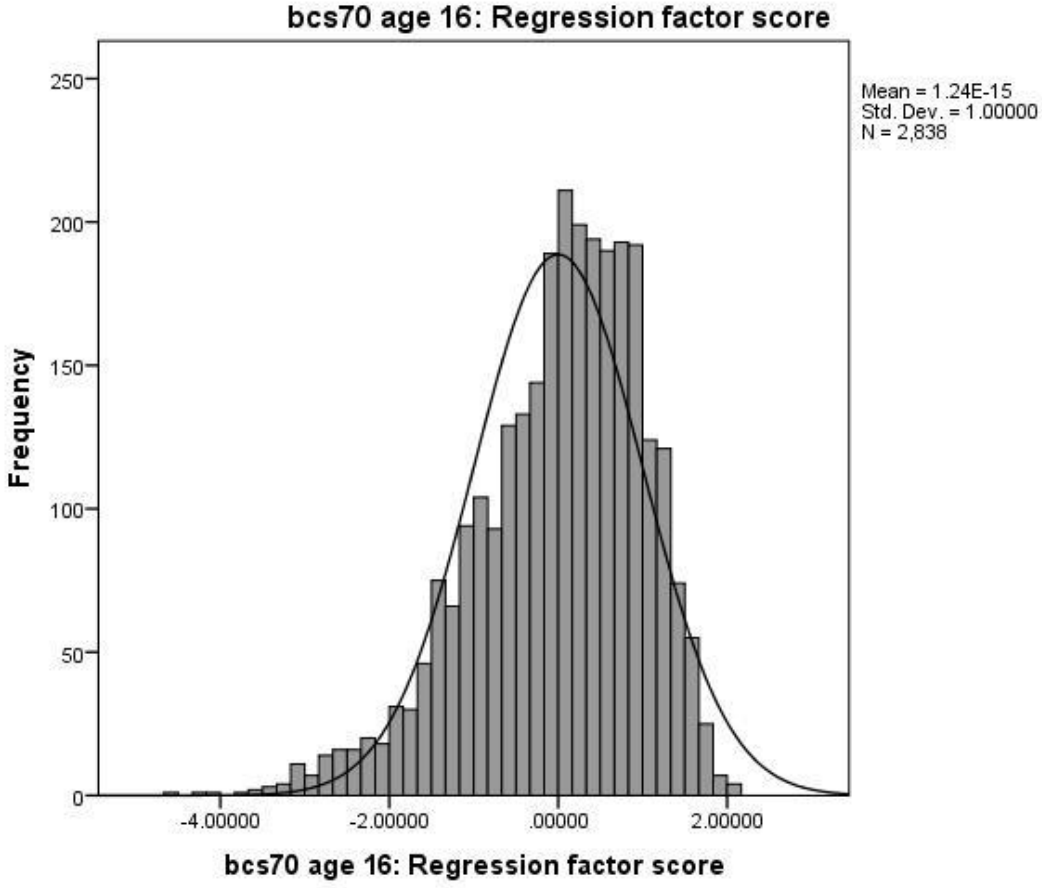
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.777	.856	5

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	60.947	8.905	163.596	154.691	18.371	3564.799	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
b16vocab bcs70 age 16: Vocabulary Test	264.3746	1640.019	.762	.630	.682
b16spell bcs70 ag e16: Spelling Test	141.1395	1100.554	.593	.365	.793
mathscore BCS70 16-year Arithmetic scores (out of 60)	267.1550	1658.780	.712	.558	.694
b16read BCS70 age 16: Reading Test	250.4422	1466.109	.705	.615	.679
b16mat BCS70 age 16: Matrices Test	295.8302	2346.873	.514	.310	.812



Appendix 3: BCS70 assessment syntax

Age 5

```
**********.
**EPVT score.
**********.

frequencies
   variables=f117.

**cohort members with no base item awarded 0 (meaning score less than 5) and 60 if no
ceiling item (meaning went through test without 5
consecutive errors) - however this does not mean that they have answered all questions
correctly thus their 'score' is not known though it must
be relatively high.

**to include these cohort members i have calculated their score as 56 (number of items) - the
number of incorrect items they have (f087).

temporary.
select if (f117 = 60).
freq f087.

**children with no base item are included with a score of 0 as the score would be between 0-4
- in variable f087 they have a value of -2 (not scorable).

temporary.
select if (f117 = 0).
freq f087.

missing values f117 ( ).
freq f117.
compute b5epvt = f117.
if (f117 = 60) b5epvt = 56 - f087.
missing values b5epvt (-3,-2).
variable labels b5epvt 'bcs70 age 5: english picture vocabulary test raw score - max 56'.
value labels b5epvt -3'not attempted' -2'not scorable' 0'less than 5 correct'.
frequencies
   variables=b5epvt f117
  /statistics=stddev mean median.


**********.
**Schonell Reading Test.
**********.

**f099 – many cohort members did not attempt test as mother says could not read or only a
few letters - but we want to give CMs who did not attempt the test a score of 0.

fre f099 f100.

compute b5sread = f100.
if (f099 = -3) b5sread = -3.
if (f100 = -2) b5sread = -2.
if (f099 >= 1 and f100 = -3) b5sread = 0.
missing values b5sread f100 (-3,-2).
variable labels b5sread 'bcs70 age 5: Schonell Reading Test [0 = not read/read few letters]'.
value labels b5sread -3'not attempted' -2'not scorable' 0'includes not read/letters'.
frequencies
```

```
    variables=b5sread f100
  /statistics=stddev mean median.

*****************
**Profile Test.
*****************

recode f090 f091 f092 f093 f094 f095 f096 f097 f098 ( -1 = 0) (else = copy) into  f090r f091r
f092r f093r f094r f095r f096r f097r f098r.
recode f090r f091r (1=2) (2=1) .
missing values  f090r f091r f092r f093r f094r f095r f096r f097r f098r (-3).
compute b5prof  = f090r + f091r + f092r + f093r + f094r + f095r + f096r + f097r + f098r.
if ((f090r = 2 or f091r = 2) and f092r = 0) b5prof = b5prof + 2.
if ((f090r = 2 or f091r = 2) and f093r = 0) b5prof = b5prof + 2.
variable labels b5prof ‘bcs70 age 5: Profile test score’.

freq b5prof.

************************
**Copying Designs Test.
************************.

frequencies
    variables=f119
  /statistics=stddev mean median.

compute b5copy = f119.
missing values b5copy (-3).
variable labels b5copy 'bcs70 age 5: Copying Designs Test Score'.
value labels b5copy -3'not attempted'.
frequencies
    variables=b5copy
  /statistics=stddev mean median.


*********************************
**Human Figure Drawing Test.
*********************************

**f113 is the score for the 1st drawing - this has fewer missing than for the 2nd drawing

frequencies
    variables=f113
  /statistics=stddev mean median.

compute b5draw = f113.
missing values b5draw (-3, -2).
variable labels b5draw 'bcs70 age 5: Draw a Man Test score (f113)'.
value labels b5draw -3'not attempted' -2'not scorable'.
frequencies
    variables=b5draw
  /statistics=stddev mean median.
```

Age 10

```
**************************
**Friendly Maths Test.
**************************
** RECODE ALL QUESTIONS WHEN FIRST ANSWER WAS THE CORRECT ONE .

RECODE
   i2505  i2520  i2526  i2532  i2534  i2538  i2548  i2561  (1=1) (2 THRU 5=0) (ELSE=COPY) .

** RECODE ALL QUESTIONS WHEN SECOND ANSWER WAS THE CORRECT ONE .

RECODE
   i2504  i2511  i2513  i2518  i2523  i2524  i2527  i2541  i2546  i2551  i2552  i2553  i2556
i2558  i2562  i2564  i2572  i2575
(1=0) (2=1) (3 THRU 5=0) (ELSE=COPY) .

** RECODE ALL QUESTIONS WHEN THIRD ANSWER WAS THE CORRECT ONE .

RECODE
    i2506  i2507  i2510  i2512  i2514  i2525  i2530  i2537 i2539  i2547  i2550  i2555  i2557
i2563  i2566  i2568
(1=0) (2=0) (3=1) (4 THRU 5=0) (ELSE=COPY) .

** RECODE ALL QUESTIONS WHEN FOURTH ANSWER WAS THE CORRECT ONE .

RECODE
   i2508  i2516  i2517  i2519  i2521  i2522  i2529  i2531 i2536  i2542  i2543  i2545  i2549
i2559  i2567  i2569  i2574
 (1 THRU 3=0)  (4=1) (5=0) (ELSE=COPY) .

** RECODE ALL QUESTIONS WHEN FIFTH ANSWER WAS THE CORRECT ONE .

RECODE
   i2509  i2515  i2528  i2533  i2535  i2540  i2544  i2554 i2560  i2565  i2570  i2571  i2573
 (1 THRU 4=0)  (5=1)  (ELSE=COPY) .

*END IF.
EXECUTE .

count b10math1 = i2504 i2505 i2506 i2507 i2508 i2509 i2510 i2511 i2512 i2513 i2514 i2515
i2516
  i2517 i2518 i2519 i2520 i2521 i2522 i2523 i2524 i2525 i2526 i2527 i2528
  i2529 i2530 i2531 i2532 i2533 i2534 i2535 i2536 i2537 i2538 i2539 i2540
  i2541 i2542 i2543 i2544 i2545 i2546 i2547 i2548 i2549 i2550 i2551 i2552
  i2553 i2554 i2555 i2556 i2557 i2558 i2559 i2560 i2561 i2562 i2563 i2564
  i2565 i2566 i2567 i2568 i2569 i2570 i2571 i2572 i2573 i2574 i2575 (1) /
b10mmiss = i2504 i2505 i2506 i2507 i2508 i2509 i2510 i2511 i2512 i2513 i2514 i2515 i2516
  i2517 i2518 i2519 i2520 i2521 i2522 i2523 i2524 i2525 i2526 i2527 i2528
  i2529 i2530 i2531 i2532 i2533 i2534 i2535 i2536 i2537 i2538 i2539 i2540
  i2541 i2542 i2543 i2544 i2545 i2546 i2547 i2548 i2549 i2550 i2551 i2552
  i2553 i2554 i2555 i2556 i2557 i2558 i2559 i2560 i2561 i2562 i2563 i2564
  i2565 i2566 i2567 i2568 i2569 i2570 i2571 i2572 i2573 i2574 i2575 (missing).

freq b10math1 b10mmiss.

compute b10math = b10math1.
if (b10mmiss = 72) b10math = -1.
Variable labels b10math ‘bcs70 age 10: Friendly Maths test’.
value labels b10math -1'missing all 72 questions'.
missing values b10math (-1).
```

```
freq b10math.


*********************************
**Edinburgh Reading Test.
*********************************

** RECODE ALL QUESTIONS WHEN FIRST ANSWER WAS THE CORRECT ONE .

RECODE
   i3004  i3005  i3012  i3015  i3017  i3018  i3019 i3020 i3021 i3024 i3031 i3036 i3037 i3038
i3039  i3040  i3031  i3041  i3042  i3043  i3047 i3056 i3065 i3066
  (1=1) (2 THRU HIGHEST=0) (MISSING=COPY)  .

** RECODE ALL QUESTIONS WHEN SECOND ANSWER WAS THE CORRECT ONE .

RECODE
   i3006  i3013  i3029  i3033  i3034  i3045 i3049 i3052 i3058 i3063 i3067
(1=0) (2=1) (3 THRU HIGHEST=0) (MISSING=COPY) .

** RECODE ALL QUESTIONS WHEN THIRD ANSWER WAS THE CORRECT ONE .

RECODE
   i3003  i3007 i3008  i3016  i3025 i3030 i3046 i3048 i3050 i3057 i3061 i3069
(1=0) (2=0) (3=1) (4 THRU HIGHEST=0) (MISSING=COPY)  .

** RECODE ALL QUESTIONS WHEN FOURTH ANSWER WAS THE CORRECT ONE .

RECODE
   i3011  i3014 i3022  i3044 i3051 i3055 i3060 i3062 i3064 i3068
 (1 THRU 3=0)  (4=1) (5 THRU HIGHEST=0) (MISSING=COPY)  .

** RECODE ALL QUESTIONS WHEN FIFTH ANSWER WAS THE CORRECT ONE .

RECODE
   i3027  i3032 i3059
 (1 THRU 4=0)  (5=1) (6 THRU HIGHEST=0) (MISSING=COPY) .

** RECODE ALL QUESTIONS WHEN SIXTH ANSWER WAS THE CORRECT ONE .

RECODE
   i3010   i3023  i3028
 (1 THRU 5=0)  (6=1)  (7=0) (MISSING=COPY) .

** RECODE ALL QUESTIONS WHEN SEVENTH ANSWER WAS THE CORRECT ONE .

RECODE
  i3009 i3026
 (1 THRU 6=0)  (7=1) (8 THRU HIGHEST=0)  (MISSING=COPY) .

** TWO QUESTIONS CODED DIFFERENTLY: HAD TO PUT 5 SENTENCES IN THE
CORRECT ORDER.

RECODE
  i3053
 (35214=1) (MISSING=COPY) (ELSE=0)  .

RECODE
  i3054
 (41532=1) (MISSING=COPY)  (ELSE=0)  .
```

```
EXECUTE .

freq i3003 i3004 i3005 i3006 i3007 i3008 i3009 i3010 i3011 i3012 i3013
i3014 i3015 i3016 i3017 i3018 i3019 i3020 i3021 i3022 i3023 i3024 i3025
i3026 i3027 i3028 i3029 i3030 i3031 i3032 i3033 i3034 i3035 i3036 i3037          i3038 i3039
i3040 i3041 i3042 i3043 i3044 i3045 i3046 i3047 i3048 i3049 i3050  i3051 i3052 i3053 i3054
i3055 i3056 i3057 i3058 i3059 i3060 i3061 i3062 i3063 i3064 i3065 i3066 i3067 i3068 i3069.

count b10read1 = i3003 i3004 i3005 i3006 i3007 i3008 i3009 i3010 i3011 i3012 i3013 i3014
i3015 i3016 i3017 i3018 i3019 i3020 i3021 i3022 i3023 i3024 i3025 i3026 i3027 i3028 i3029
i3030 i3031 i3032 i3033 i3034 i3035 i3036 i3037 i3038 i3039 i3040 i3041 i3042 i3043 i3044
i3045 i3046 i3047 i3048 i3049 i3050  i3051 i3052 i3053 i3054 i3055 i3056 i3057 i3058 i3059
i3060 i3061 i3062  i3063 i3064 i3065 i3066 i3067 i3068 i3069 (1) /
b10rmiss =
  i3003 i3004 i3005 i3006 i3007 i3008 i3009 i3010 i3011 i3012
  i3013 i3014 i3015 i3016 i3017 i3018 i3019 i3020 i3021 i3022
  i3023 i3024 i3025 i3026 i3027 i3028 i3029 i3030 i3031 i3032
  i3033 i3034 i3035 i3036 i3037 i3038 i3039 i3040 i3041 i3042
  i3043 i3044 i3045 i3046 i3047 i3048 i3049 i3050 i3051 i3052
  i3053 i3054 i3055 i3056 i3057 i3058 i3059 i3060 i3061 i3062
  i3063 i3064 i3065 i3066 i3067 i3068 i3069 (missing).

freq b10read1 b10rmiss.

compute b10read = b10read1.
if (b10rmiss = 67) b10read = -1.
Variable labels b10read ‘bcs70 age 10: Edinburgh Reading Test’.
value labels b10read -1'missing all 67 questions'.
missing values b10read (-1).
freq b10read.


**************************.
**British Ability Scales.
**************************.

*This syntax was previously available on the CLS website but used different variable names.
These are included in the variable labels.

*********************************
**BAS WORD DEFINITIONS.
*********************************

* Set up vector to loop through all 37 item reponses.
vector baswd=i3504 to i3540.

* Add up correct and incorrect answers over all 37 items.
compute b10baswd=0.
compute b10wdin=0.
variable label b10baswd 'bcs70 age 10: BAS Word Definitions [BASWDscore14]'.
missing values b10baswd (-9).
loop #i=1 to 37.
if (baswd(#i)=1)b10baswd=b10baswd+1.
if (baswd(#i)=2) b10wdin = b10wdin +1.
end loop.

* If no correct nor incorrect scores, set total to missing (i.e. they didn't do test at all).
if (b10baswd=0 and b10wdin=0)b10baswd=-9.
value labels b10baswd
-9 'No correct nor incorrect scores'.
```

```
**********************************
* BAS RECALL OF DIGITS
**********************************

* Set up vector to loop through all 34 item responses.
vector basrd=i3541 to i3574.

* Add up correct and incorrect answers over all 34 items.
compute b10basrd=0.
compute b10rdin =0.
format b10basrd b10rdin (f8.0).
variable label b10basrd 'bcs70 age 10: BAS Recall of digits [BASRDscore15]'.
missing values b10basrd (-9).
loop #i=1 to 34.
if (basrd (#i)=1)B10basrd=B10basrd+1.
if (basrd (#i)=2) b10rdin = b10rdin +1.
end loop.

* If no correct nor incorrect scores, set total to missing (i.e. didn't do test at all).
if (b10basrd=0 and b10rdin =0) b10basrd=-9.

value labels b10basrd
-9 'No correct nor incorrect scores'.


**********************
* BAS Similarities.
**********************

* This test is trickier to total up, as each question has two answers. Given a set of three
objects (e.g. apple, pear, plum) the respondent is asked first to give an EXAMPLE of any
other object which natural goes with those (e.g. banana).
* Then for that same set of objects the respondent is asked the NAME of the group of objects
(e.g. fruit)
* The method of scoring used here is to score 1 point if the respondent gets the EXAMPLE
and the NAME right, but no points if just one is right. So the maximumn score is 21 even
though there are 42 variables.

* Set up 2 vectors to loop through all 21 item responses on EXAMPLES and 21 item
responses on NAMES.

vector #b10bassx(21).
vector #b10bassn(21).
compute #b10bassx(1)=i3575.
compute #b10bassn(1)=i3576.
compute #b10bassx(2)=i3577.
compute #b10bassn(2)=i3578.
compute #b10bassx(3)=i3579.
compute #b10bassn(3)=i3580.
compute #b10bassx(4)=i3581.
compute #b10bassn(4)=i3582.
compute #b10bassx(5)=i3583.
compute #b10bassn(5)=i3584.
compute #b10bassx(6)=i3585.
compute #b10bassn(6)=i3586.
compute #b10bassx(7)=i3587.
compute #b10bassn(7)=i3588.
compute #b10bassx(8)=i3589.
compute #b10bassn(8)=i3590.
compute #b10bassx(9)=i3591.
compute #b10bassn(9)=i3592.
```

```
compute #b10bassx(10)=i3593.
compute #b10bassn(10)=i3594.
compute #b10bassx(11)=i3595.
compute #b10bassn(11)=i3596.
compute #b10bassx(12)=i3597.
compute #b10bassn(12)=i3598.
compute #b10bassx(13)=i3599.
compute #b10bassn(13)=i3600.
compute #b10bassx(14)=i3601.
compute #b10bassn(14)=i3602.
compute #b10bassx(15)=i3603.
compute #b10bassn(15)=i3604.
compute #b10bassx(16)=i3605.
compute #b10bassn(16)=i3606.
compute #b10bassx(17)=i3607.
compute #b10bassn(17)=i3608.
compute #b10bassx(18)=i3609.
compute #b10bassn(18)=i3610.
compute #b10bassx(19)=i3611.
compute #b10bassn(19)=i3612.
compute #b10bassx(20)=i3613.
compute #b10bassn(20)=i3614.
compute #b10bassx(21)=i3615.
compute #b10bassn(21)=i3616.

* Add up correct and incorrect answers over all 21 questions (bearing in mind both the
EXAMPLE of another object in the group, and NAME of the group need to be correct to score
1 point).

compute b10bass=0.
compute b10sin=0.
variable labels b10bass 'bcs70 age 10: BAS Similarities [BASIMscore16]'.
missing values b10bass (-9).
loop #i=1 to 21.
if (#b10bassx(#i) and #b10bassn(#i)=1)B10bass=B10bass+1.
if (#b10bassx(#i)=2 or #b10bassn(#i)=2 or (#b10bassx(#i)=1 and #b10bassn(#i)=9) or
(#b10bassx(#i)=9 and #b10bassn(#i)=1)) b10sin = b10sin +1.
end loop.

* If no correct nor incorrect scores, set total to missing (i.e. didn't do test at all).
if (b10bass=0 and b10sin =0) b10bass=-9.
value labels b10bass
-9 'No correct nor incorrect scores'.


**********
* BAS Matrices.
**********

* Set up vector to loop through all 28 item reponses.
vector basm=i3617 to i3644.
* Add up correct and incorrect answers over all 28 items.

compute b10basm=0.
compute b10min=0.
variable labels b10basm 'bcs70 age 10: BAS Matrices [BASMATscore17]'.
missing values b10basm (-9).
loop #i=1 to 28.
if (basm(#i)=1)b10basm=b10basm+1.
if (basm(#i)=2) b10min = b10min +1.
end loop.
```

```
* If no correct nor incorrect scores, set total to missing (i.e. didn't do test at all).
if (B10basm=0 and b10min =0) B10basm=-9.

value labels B10basm
-9 'No correct nor incorrect scores'.

 fre b10baswd b10basrd b10bass b10basm /statistics=mean stdev.

******************
**Spelling test.
******************

 fre i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826 i3827 i3828
i3829 i3830  i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841 i3842 i3843
i3844 i3845 i3846  i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856 i3857 i3858
i3859 i3860 i3861 i3862     i3863 i3864.
missing values i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826
i3827 i3828 i3829 i3830 i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841
i3842 i3843 i3844 i3845 i3846 i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856
i3857 i3858 i3859 i3860 i3861 i3862 i3863 i3864 ( ).
count b10lc = i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826 i3827
i3828 i3829 i3830 i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841 i3842
i3843 i3844 i3845 i3846 i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856 i3857
i3858 i3859 i3860 i3861 i3862 i3863 i3864 (1) /
b10li = i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826 i3827 i3828
i3829 i3830 i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841 i3842 i3843
i3844 i3845 i3846 i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856 i3857 i3858
i3859 i3860 i3861 i3862 i3863 i3864 (2) /
b10lb = i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826 i3827 i3828
i3829 i3830  i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841 i3842 i3843
i3844 i3845 i3846  i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856 i3857 i3858
i3859 i3860 i3861 i3862 i3863 i3864 (-7) /
b10lns = i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826 i3827
i3828 i3829 i3830 i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841 i3842
i3843 i3844 i3845 i3846 i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856 i3857
i3858 i3859 i3860 i3861 i3862 i3863 i3864 (-3) /
b10lna = i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826 i3827
i3828 i3829 i3830 i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841 i3842
i3843 i3844 i3845 i3846 i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856 i3857
i3858 i3859 i3860 i3861 i3862 i3863 i3864 (-1) /
b10sys = i3815 i3816 i3817 i3818 i3819 i3820 i3821 i3822 i3823 i3824 i3825 i3826 i3827
i3828 i3829 i3830 i3831 i3832 i3833 i3834 i3835 i3836 i3837 i3838 i3839 i3840 i3841 i3842
i3843 i3844 i3845 i3846  i3847 i3848 i3849 i3850 i3851 i3852 i3853 i3854 i3855 i3856 i3857
i3858 i3859 i3860 i3861 i3862 i3863 i3864 (sysmis).


fre b10lc b10li b10lb b10lns b10lna b10sys/statistics=mean stdev.

compute b10spell = b10lc.
if ( b10lb = 50 or b10lns = 50 or b10lna = 50 or b10sys = 50) b10spell = -1.

missing values b10spell (-1).
variable labels b10spell 'bcs70 age 10: Spelling test'.
value labels b10spell -1'not attempted all'.
frequencies
    variables=b10spell
  /statistics=stddev mean median.

*********************************
**Pictorial Language score.
```

```
*********************************
fre i8 i9 i10 i11 i12 i13 i14 i15 i16 i17 i18 i19 i20 i21 i22 i23 i24 i25 i26 i27 i28 i29 i30 i31 i32
i33 i34 i35 i36 i37 i38 i39 i40 i41 i42 i43 i44 i45 i46 i47 i48 i49 i50 i51 i52 i53 i54 i55 i56 i57
i58 i59 i60 i61 i62 i66 i67 i68 i69 i70 i71 i72 i73 i74 i75 i76 i77 i78 i79 i80 i81 i82 i83 i84 i85
i86 i87 i88 i89 i90 i91 i92 i93 i94 i95 i96 i97 i98 i99 i100 i101 i102 i103 i104  i105 i106 i107
i108 i109 i110.

recode i98 i99 i100 i101 i102 i103 i104  i105 i106 i107 i108 i109 i110 (1=0).
missing values  i8 i9 i10 i11 i12 i13 i14 i15 i16 i17 i18 i19 i20 i21 i22 i23 i24 i25 i26 i27 i28 i29
i30 i31 i32 i33 i34 i35 i36 i37 i38 i39 i40 i41 i42 i43 i44 i45 i46 i47 i48 i49 i50 i51 i52 i53 i54
i55 i56 i57 i58 i59 i60 i61 i62 i66 i67 i68 i69 i70 i71 i72 i73 i74 i75 i76 i77 i78 i79 i80 i81 i82
i83 i84 i85 i86 i87 i88 i89 i90 i91 i92 i93 i94 i95 i96 i97 i98 i99 i100 i101 i102 i103 i104  i105
i106 i107 i108 i109 i110 ( ).

count b10pclt0 = i8 i9 i10 i11 i12 i13 i14 i15 i16 i17 i18 i19 i20 i21 i22 i23 i24 i25 i26 i27 i28
i29 i30 i31 i32 i33 i34 i35 i36 i37 i38 i39 i40 i41 i42 i43 i44 i45 i46 i47 i48 i49 i50 i51 i52 i53
i54 i55 i56 i57 i58 i59 i60 i61 i62 i66 i67 i68 i69 i70 i71 i72 i73 i74 i75 i76 i77 i78 i79 i80 i81
i82 i83 i84 i85 i86 i87 i88 i89 i90 i91 i92 i93 i94 i95 i96 i97 i98 i99 i100 i101 i102 i103 i104
i105 i106 i107 i108 i109 i110 (0) /
b10pclt1 = i8 i9 i10 i11 i12 i13 i14 i15 i16 i17 i18 i19 i20 i21 i22 i23 i24 i25 i26 i27 i28 i29 i30
i31 i32 i33 i34 i35 i36 i37 i38 i39 i40 i41 i42 i43 i44 i45 i46 i47 i48 i49 i50 i51 i52 i53 i54 i55
i56 i57 i58 i59 i60 i61 i62 i66 i67 i68 i69 i70 i71 i72 i73 i74 i75 i76 i77 i78 i79 i80 i81 i82 i83
i84 i85 i86 i87 i88 i89 i90 i91 i92 i93 i94 i95 i96 i97 i98 i99 i100 i101 i102 i103 i104 i105 i106
i107 i108 i109 i110 (1,2,3,4,5,6) /
b10pcltM = i8 i9 i10 i11 i12 i13 i14 i15 i16 i17 i18 i19 i20 i21 i22 i23 i24 i25 i26 i27 i28 i29 i30
i31 i32 i33 i34 i35 i36 i37 i38 i39 i40 i41 i42 i43 i44 i45 i46 i47 i48 i49 i50 i51 i52 i53 i54 i55
i56 i57 i58 i59 i60 i61 i62 i66 i67 i68 i69 i70 i71 i72 i73 i74 i75 i76 i77 i78 i79 i80 i81 i82 i83
i84 i85 i86 i87 i88 i89 i90 i91 i92 i93 i94 i95 i96 i97 i98 i99 i100 i101 i102 i103 i104  i105 i106
i107 i108 i109 i110 (-3, -2, -1) /
b10pclts = i8 i9 i10 i11 i12 i13 i14 i15 i16 i17 i18 i19 i20 i21 i22 i23 i24 i25 i26 i27 i28 i29 i30
i31 i32 i33 i34 i35 i36 i37 i38 i39 i40 i41 i42 i43 i44 i45 i46 i47 i48 i49 i50 i51 i52 i53 i54 i55
i56 i57 i58 i59 i60 i61 i62 i66 i67 i68 i69 i70 i71 i72 i73 i74 i75 i76 i77 i78 i79 i80 i81 i82 i83
i84 i85 i86 i87 i88 i89 i90 i91 i92 i93 i94 i95 i96 i97 i98 i99 i100 i101 i102 i103 i104 i105 i106
i107 i108 i109 i110 (sysmis) .

fre b10pclt0 b10pclt1 b10pcltM b10pcltS/statistics=mean stdev.

compute misss = b10pcltM + b10pcltS.
freq misss.

compute b10plct = b10pclt0.
if (misss = 100) b10plct = -1.

missing values b10plct (-1).
variable labels b10plct 'bcs70 age 10: Pictorial Language Comprehension Test'.
value labels b10plct -1'not attempted some/all'.
frequencies
   variables=b10plct
  /statistics=stddev mean median.
```

Age 16

```
***************
**Vocabulary.
***************

**Recoding to make 0-1 variables, 1=correct answer.
recode  cvo2 cvo7 cvo8 cvo9 cvo13 cvo25  cvo29  cvo37 cvo38 cvo42  cvo48  cvo59  cvo68
cvo71 cvo72 (1=1) (2 thru 5 = 0) into cvo2r cvo7r cvo8r cvo9r cvo13r cvo25r  cvo29r  cvo37r
cvo38r cvo42r  cvo48r  cvo59r  cvo68r  cvo71r cvo72r.

recode cvo1 cvo3  cvo17  cvo27 cvo32 cvo36  cvo45 cvo46  cvo51  cvo61  cvo63 cvo64
cvo67 cvo69 cvo70 (2=1) (1,3,4,5=0) into cvo1r cvo3r  cvo17r  cvo27r cvo32r cvo36r  cvo45r
cvo46r  cvo51r  cvo61r  cvo63r cvo64r  cvo67r cvo69r cvo70r.

recode cvo5  cvo10 cvo11  cvo20 cvo21 cvo23 cvo33  cvo40  cvo44  cvo53  cvo56 cvo57
cvo73  cvo75 (3=1) (1,2,4,5=0) into cvo5r  cvo10r cvo11r  cvo20r cvo21r cvo23r cvo33r
cvo40r  cvo44r  cvo53r  cvo56r cvo57r  cvo73r  cvo75r.

recode  cvo15 cvo16  cvo24 cvo31  cvo34  cvo35 cvo43  cvo49  cvo52 cvo54 cvo58  cvo60
cvo62 cvo65 cvo66  cvo74 (4=1) (1,2,3,5=0) into cvo15r cvo16r  cvo24r cvo31r  cvo34r
cvo35r cvo43r  cvo49r  cvo52r cvo54r cvo58r  cvo60r cvo62r cvo65r cvo66r  cvo74r.


recode cvo4 cvo6  cvo12  cvo14  cvo18  cvo19  cvo22  cvo26  cvo28  cvo30 cvo39  cvo41
cvo47  cvo50 cvo55 (5=1) (1,2,3,4=0) into cvo4r cvo6r  cvo12r  cvo14r  cvo18r  cvo19r
cvo22r  cvo26r  cvo28r  cvo30r cvo39r  cvo41r  cvo47r  cvo50r cvo55r.

freq cvo2r cvo7r cvo8r cvo9r cvo13r cvo25r  cvo29r  cvo37r cvo38r cvo42r  cvo48r  cvo59r
cvo68r  cvo71r cvo72r cvo1r cvo3r  cvo17r  cvo27r cvo32r cvo36r  cvo45r cvo46r  cvo51r
cvo61r  cvo63r cvo64r  cvo67r cvo69r cvo70r cvo5r  cvo10r cvo11r  cvo20r cvo21r cvo23r
cvo33r  cvo40r  cvo44r  cvo53r  cvo56r cvo57r  cvo73r  cvo75r cvo15r cvo16r  cvo24r cvo31r
cvo34r  cvo35r cvo43r  cvo49r  cvo52r cvo54r cvo58r  cvo60r cvo62r cvo65r cvo66r  cvo74r
cvo4r cvo6r  cvo12r  cvo14r  cvo18r  cvo19r  cvo22r  cvo26r  cvo28r  cvo30r cvo39r  cvo41r
cvo47r  cvo50r cvo55r .

count b16vocab1 = cvo2r cvo7r cvo8r cvo9r cvo13r cvo25r  cvo29r  cvo37r cvo38r cvo42r
cvo48r  cvo59r  cvo68r  cvo71r cvo72r cvo1r cvo3r  cvo17r  cvo27r cvo32r cvo36r  cvo45r
cvo46r  cvo51r  cvo61r  cvo63r cvo64r  cvo67r cvo69r cvo70r cvo5r  cvo10r cvo11r  cvo20r
cvo21r cvo23r cvo33r  cvo40r  cvo44r  cvo53r  cvo56r cvo57r  cvo73r  cvo75r cvo15r cvo16r
cvo24r cvo31r  cvo34r  cvo35r cvo43r  cvo49r  cvo52r cvo54r cvo58r  cvo60r cvo62r cvo65r
cvo66r  cvo74r  cvo4r cvo6r  cvo12r  cvo14r  cvo18r  cvo19r  cvo22r  cvo26r  cvo28r  cvo30r
cvo39r  cvo41r  cvo47r  cvo50r cvo55r (1) /
b16vmiss = cvo2r cvo7r cvo8r cvo9r cvo13r cvo25r  cvo29r  cvo37r cvo38r cvo42r  cvo48r
cvo59r  cvo68r  cvo71r cvo72r cvo1r cvo3r  cvo17r  cvo27r cvo32r cvo36r  cvo45r cvo46r
cvo51r  cvo61r  cvo63r cvo64r  cvo67r cvo69r cvo70r cvo5r cvo10r cvo11r  cvo20r cvo21r
cvo23r cvo33r  cvo40r  cvo44r  cvo53r  cvo56r cvo57r  cvo73r  cvo75r cvo15r cvo16r  cvo24r
cvo31r  cvo34r  cvo35r cvo43r  cvo49r  cvo52r cvo54r cvo58r  cvo60r cvo62r cvo65r cvo66r
cvo74r  cvo4r cvo6r  cvo12r  cvo14r  cvo18r  cvo19r  cvo22r  cvo26r  cvo28r  cvo30r cvo39r
cvo41r  cvo47r  cvo50r cvo55r (sysmis).
freq b16vocab b16vmiss.

compute b16vocab = b16vocab1.
if (b16vmiss = 75) b16vocab = -1.
Variable labels b16vocab ‘bcs70 age 16: Vocabulary Test’.
value labels b16vocab -1'missing all 75 questions'.
missing values b16vocab (-1).
freq b16vocab.


***************
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**Spelling.
***************
count b16spell1 = c7a1 c7a2 c7a3 c7a4 c7a5 c7a6 c7a7 c7a8 c7a9 c7a10 c7a11 c7a12
c7a13 c7a14 c7a15 c7a16 c7a17 c7a18 c7a19 c7a20 c7a21 c7a22 c7a23 c7a24 c7a25
c7a26 c7a27 c7a28 c7a29 c7a30 c7a31 c7a32 c7a33 c7a34 c7a35 c7a36 c7a37 c7a38
c7a39 c7a40 c7a41 c7a42 c7a43 c7a44 c7a45 c7a46 c7a47 c7a48 c7a49 c7a50 c7a51
c7a52 c7a53 c7a54 c7a55 c7a56 c7a57 c7a58 c7a59 c7a60 c7a61 c7a62 c7a63 c7a64
c7a65 c7a66  c7a67 c7a68 c7a69 c7a70 c7a71 c7a72 c7a73 c7a74 c7a75 c7a76 c7a77
c7a78 c7a79 c7a80 c7a81 c7a82  c7a83 c7a84 c7a85 c7a86 c7a87 c7a88 c7a89 c7a90
c7a91 c7a92 c7a93 c7a94 c7a95 c7a96 c7a97 c7a98
c7a99 c7a100 c7b1 c7b2 c7b3 c7b4 c7b5 c7b6 c7b7 c7b8 c7b9 c7b10 c7b11 c7b12 c7b13
c7b14 c7b15 c7b16 c7b17 c7b18 c7b19 c7b20 c7b21 c7b22 c7b23 c7b24 c7b25 c7b26
c7b27 c7b28 c7b29 c7b30 c7b31 c7b32 c7b33 c7b34 c7b35 c7b36 c7b37 c7b38 c7b39
c7b40 c7b41 c7b42 c7b43 c7b44 c7b45 c7b46 c7b47 c7b48 c7b49 c7b50 c7b51 c7b52
c7b53 c7b54 c7b55 c7b56 c7b57 c7b58 c7b59 c7b60 c7b61 c7b62 c7b63 c7b64 c7b65
c7b66 c7b67 c7b68 c7b69 c7b70 c7b71 c7b72 c7b73 c7b74 c7b75 c7b76 c7b77 c7b78
c7b79 c7b80 c7b81 c7b82 c7b83 c7b84 c7b85 c7b86 c7b87 c7b88 c7b89 c7b90 c7b91
c7b92 c7b93 c7b94 c7b95 c7b96 c7b97 c7b98 c7b99 c7b100 (1) /
b16smiss = c7a1 c7a2 c7a3 c7a4 c7a5 c7a6 c7a7 c7a8 c7a9 c7a10 c7a11 c7a12 c7a13
c7a14 c7a15 c7a16 c7a17 c7a18 c7a19 c7a20 c7a21 c7a22 c7a23 c7a24 c7a25 c7a26
c7a27 c7a28 c7a29 c7a30 c7a31 c7a32 c7a33 c7a34 c7a35 c7a36 c7a37 c7a38 c7a39
c7a40 c7a41 c7a42 c7a43 c7a44 c7a45 c7a46 c7a47 c7a48 c7a49 c7a50 c7a51 c7a52
c7a53 c7a54 c7a55 c7a56 c7a57 c7a58 c7a59 c7a60 c7a61 c7a62 c7a63 c7a64 c7a65
c7a66
c7a67 c7a68 c7a69 c7a70 c7a71 c7a72 c7a73 c7a74 c7a75 c7a76 c7a77 c7a78 c7a79
c7a80 c7a81 c7a82 c7a83 c7a84 c7a85 c7a86 c7a87 c7a88 c7a89 c7a90 c7a91 c7a92
c7a93 c7a94 c7a95 c7a96 c7a97 c7a98 c7a99 c7a100 c7b1 c7b2 c7b3 c7b4 c7b5 c7b6 c7b7
c7b8 c7b9 c7b10 c7b11 c7b12 c7b13 c7b14 c7b15 c7b16 c7b17 c7b18 c7b19 c7b20 c7b21
c7b22 c7b23 c7b24 c7b25 c7b26 c7b27 c7b28 c7b29 c7b30 c7b31 c7b32 c7b33 c7b34
c7b35 c7b36 c7b37 c7b38 c7b39 c7b40 c7b41 c7b42 c7b43 c7b44 c7b45 c7b46 c7b47
c7b48 c7b49 c7b50 c7b51 c7b52 c7b53 c7b54 c7b55 c7b56 c7b57 c7b58 c7b59 c7b60
c7b61 c7b62 c7b63 c7b64 c7b65 c7b66 c7b67 c7b68 c7b69 c7b70 c7b71 c7b72 c7b73
c7b74 c7b75 c7b76 c7b77 c7b78 c7b79 c7b80 c7b81 c7b82 c7b83 c7b84 c7b85 c7b86
c7b87 c7b88 c7b89 c7b90 c7b91 c7b92 c7b93 c7b94 c7b95 c7b96 c7b97 c7b98 c7b99
c7b100 (missing).
freq b16spell b16smiss.


compute b16spell = b16spell1.
if (b16smiss = 200) b16spell = -1.
Variable labels b16spell ‘bcs70 age 16: Spelling test score’.
value labels b16spell -1'missing all 200 questions'.
missing values b16spell (-1).
freq b16spell.


*****************
**BAS Matrices
*****************

count  b16basm = SCR_M1 SCR_M2 SCR_M3 SCR_M4 SCR_M5 SCR_M6 SCR_M7
SCR_M8 SCR_M9 SCR_M10 SCR_M11 (1) /
b16mmiss = SCR_M1 SCR_M2 SCR_M3 SCR_M4 SCR_M5 SCR_M6 SCR_M7 SCR_M8
SCR_M9 SCR_M10 SCR_M11 (missing).
if (b16mmiss = 11) b16basm = -1.
missing values b16basm (-1).
variable labels b16basm 'bcs70 age 16: BAS Matrices [11 items from age 10 test]'.

freq b16basm  .

*********************************
```

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**Edinburgh Reading Test
*******************************

*fre SCR_A1 SCR_A2 SCR_A3 SCR_A4 SCR_A5 SCR_A6 SCR_A7 SCR_A8 SCR_A9
SCR_A10 SCR_B1 SCR_B2 SCR_B3 SCR_B4 SCR_B5 SCR_B6 SCR_B7 SCR_B8
SCR_B9 SCR_B10 SCR_B11 SCR_B12 SCR_B13 SCR_B14 SCR_B15 SCR_B16
SCR_B17 SCR_B18 SCR_B19 SCR_B20 SCR_C1 SCR_C2 SCR_C3 SCR_C4 SCR_C5
SCR_C6 SCR_C7 SCR_C8 SCR_C9 SCR_C10 SCR_C11 SCR_C12 SCR_C13 SCR_C14
SCR_C15 SCR_D1 SCR_D2 SCR_D3 SCR_D4 SCR_D5 SCR_D6 SCR_D7 SCR_D8
SCR_D9 SCR_D10 SCR_D11 SCR_D12 SCR_D13 SCR_D14 SCR_D15 SCR_D16
SCR_D17 SCR_E1 SCR_E2 SCR_E3 SCR_E4 SCR_E5 SCR_E6 SCR_E7 SCR_E8
SCR_E9 SCR_E10 SCR_E11 SCR_E12 SCR_E1.

count b16read =  SCR_A1 SCR_A2 SCR_A3 SCR_A4 SCR_A5 SCR_A6 SCR_A7 SCR_A8
SCR_A9 SCR_A10 SCR_B1 SCR_B2 SCR_B3 SCR_B4 SCR_B5 SCR_B6 SCR_B7
SCR_B8 SCR_B9 SCR_B10 SCR_B11 SCR_B12 SCR_B13 SCR_B14 SCR_B15 SCR_B16
SCR_B17 SCR_B18 SCR_B19 SCR_B20  SCR_C1 SCR_C2 SCR_C3 SCR_C4 SCR_C5
SCR_C6 SCR_C7 SCR_C8 SCR_C9 SCR_C10 SCR_C11 SCR_C12 SCR_C13 SCR_C14
SCR_C15  SCR_D1 SCR_D2 SCR_D3 SCR_D4 SCR_D5 SCR_D6 SCR_D7 SCR_D8
SCR_D9 SCR_D10 SCR_D11 SCR_D12 SCR_D13 SCR_D14 SCR_D15 SCR_D16
SCR_D17
SCR_E1 SCR_E2 SCR_E3 SCR_E4 SCR_E5 SCR_E6 SCR_E7 SCR_E8 SCR_E9
SCR_E10 SCR_E11 SCR_E12 SCR_E1 (1) /
b16rmiss = SCR_A1 SCR_A2 SCR_A3 SCR_A4 SCR_A5 SCR_A6 SCR_A7 SCR_A8
SCR_A9 SCR_A10  SCR_B1 SCR_B2 SCR_B3 SCR_B4 SCR_B5 SCR_B6 SCR_B7
SCR_B8 SCR_B9 SCR_B10 SCR_B11 SCR_B12 SCR_B13 SCR_B14 SCR_B15 SCR_B16
SCR_B17 SCR_B18 SCR_B19 SCR_B20  SCR_C1 SCR_C2 SCR_C3 SCR_C4 SCR_C5
SCR_C6 SCR_C7 SCR_C8 SCR_C9 SCR_C10 SCR_C11 SCR_C12 SCR_C13 SCR_C14
SCR_C15  SCR_D1 SCR_D2 SCR_D3 SCR_D4 SCR_D5 SCR_D6 SCR_D7 SCR_D8
SCR_D9 SCR_D10 SCR_D11 SCR_D12 SCR_D13 SCR_D14 SCR_D15 SCR_D16
SCR_D17  SCR_E1 SCR_E2 SCR_E3 SCR_E4 SCR_E5 SCR_E6 SCR_E7 SCR_E8
SCR_E9 SCR_E10 SCR_E11 SCR_E12 SCR_E13 (missing).
if (b16rmiss = 75) b16read = -1.
missing values b16read (-1).
variable labels b16read 'bcs70 age 16: Edinburgh Reading Test [total]'.

Freq b16read

**************************
**Reading sub-scales.
**************************

count b16readA =  SCR_A1 SCR_A2 SCR_A3 SCR_A4 SCR_A5 SCR_A6 SCR_A7
SCR_A8 SCR_A9 SCR_A10 (1) /
b16readB =  SCR_B1 SCR_B2 SCR_B3 SCR_B4 SCR_B5 SCR_B6 SCR_B7 SCR_B8
SCR_B9 SCR_B10 SCR_B11 SCR_B12 SCR_B13 SCR_B14 SCR_B15 SCR_B16
SCR_B17 SCR_B18 SCR_B19 SCR_B20 (1)/
b16readC =  SCR_C1 SCR_C2 SCR_C3 SCR_C4 SCR_C5 SCR_C6 SCR_C7 SCR_C8
SCR_C9 SCR_C10 SCR_C11 SCR_C12 SCR_C13 SCR_C14 SCR_C15 (1) /
b16readD =  SCR_D1 SCR_D2 SCR_D3 SCR_D4 SCR_D5 SCR_D6 SCR_D7 SCR_D8
SCR_D9 SCR_D10 SCR_D11 SCR_D12 SCR_D13 SCR_D14 SCR_D15 SCR_D16
SCR_D17 (1) /
b16readE =   SCR_E1 SCR_E2 SCR_E3 SCR_E4 SCR_E5 SCR_E6 SCR_E7 SCR_E8
SCR_E9 SCR_E10 SCR_E11 SCR_E12 SCR_E13 (1) /
b16rAmiss = SCR_A1 SCR_A2 SCR_A3 SCR_A4 SCR_A5 SCR_A6 SCR_A7 SCR_A8
SCR_A9 SCR_A10 (missing) /
b16rBmiss = SCR_B1 SCR_B2 SCR_B3 SCR_B4 SCR_B5 SCR_B6 SCR_B7 SCR_B8
SCR_B9 SCR_B10 SCR_B11 SCR_B12 SCR_B13 SCR_B14 SCR_B15 SCR_B16
SCR_B17 SCR_B18 SCR_B19 SCR_B20 (missing) /
b16rCmiss = SCR_C1 SCR_C2 SCR_C3 SCR_C4 SCR_C5 SCR_C6 SCR_C7 SCR_C8
SCR_C9 SCR_C10 SCR_C11 SCR_C12 SCR_C13 SCR_C14 SCR_C15 (missing) /
```

```
b16rDmiss = SCR_D1 SCR_D2 SCR_D3 SCR_D4 SCR_D5 SCR_D6 SCR_D7 SCR_D8
SCR_D9 SCR_D10 SCR_D11 SCR_D12 SCR_D13 SCR_D14 SCR_D15 SCR_D16
SCR_D17 (missing) /
b16rEmiss = SCR_E1 SCR_E2 SCR_E3 SCR_E4 SCR_E5 SCR_E6 SCR_E7 SCR_E8
SCR_E9 SCR_E10 SCR_E11 SCR_E12 SCR_E13 (missing).

if (b16rAmiss = 10) b16readA = -1.
if (b16rBmiss = 20) b16readB = -1.
if (b16rCmiss = 15) b16readC = -1.
if (b16rDmiss = 17) b16readD = -1.
if (b16rEmiss = 13) b16readE = -1.

missing values b16readA b16readB b16readC b16readD b16readE (-1).
fre b16readA b16readB b16readC b16readD b16readE.

variable labels b16readA 'bcs70 age 16: Edinburgh Reading Test A [skimming]'.
variable labels b16readB 'bcs70 age 16: Edinburgh Reading Test B [vocabulary]'.
variable labels b16readC 'bcs70 age 16: Edinburgh Reading Test  C [reading for facts]'.
variable labels b16readD 'bcs70 age 16: Edinburgh Reading Test D [points of view]'.
variable labels b16readE 'bcs70 age 16: Edinburgh Reading Test E [comprehension]'.

fre b16readA b16readB b16readC b16readD b16readE.
```

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