



# Reading and Mathematics Attainments and Self-esteem in Years 2 and 6—an eight-year cross-sectional study

JULIE DAVIES & IVY BREMBER

*School of Education, University of Manchester, Oxford Road, Manchester M13 9PL, UK*

**SUMMARY** *This eight-year cross-sectional study measured the self-esteem, reading and mathematical attainments of eight cohorts of Year 2 and Year 6 children over the period of the introduction of the National Curriculum and assessment procedures into primary schools (the first cohort was pre-national curriculum: the others were post-national curriculum). All Year 2 (N = 1513) and Year 6 children (N = 1488) in five randomly selected primary schools within one Local Education Authority (LEA) comprised the sample to which the Lawseq questionnaire (Lawrence, 1982), Mathematics 7 or 11 (National Foundation for Educational Research, 1985, 1987a) and The Primary Reading Test Level 1 or 2 (France, 1981) was administered. Self-esteem means for Year 2 shows a downward trend in the first 4 years of the study followed by an upward trend in the second half of the study with the mean of Cohort 8 being slightly below that of Cohort 1. Self-esteem means for Year 6 fluctuated for the first 5 years followed by a steady rise until the mean for Cohort 8 is 2.17 above that of Cohort 1. An analysis of variance showed there were significant differences between both years groups with cohorts focused around the introduction of the national tests having significantly different scores than other cohorts (Year 2 significantly lower: Year 6 significantly higher). Overall, there were significant positive correlations between the children's self-esteem and all their attainment scores. When the correlation coefficients were computed separately for the pre- and post-national test groups differences emerged. There were no significant correlations for the Year 2 pre-national test cohorts but for the post-national test groups all the correlations were significant. For Year 6 all correlations were significant. Discussion centres on the possible link between national testing and self-esteem.*

## Introduction

The National Curriculum was introduced into English primary schools in 1989 to raise standards of attainment, especially in the basic skills of reading and mathematics (Department of Education and Science, 1989; p. 2). This study analysed the mathematics and reading standards of eight cohorts of Year 2 children (N = 1513) and Year 6 children (N = 1488) from five randomly

TABLE I. Composition of sample

| Cohort | Year 2 | Year 6 |
|--------|--------|--------|
| 1      | 193    | 160    |
| 2      | 192    | 187    |
| 3      | 195    | 182    |
| 4      | 185    | 200    |
| 5      | 188    | 177    |
| 6      | 178    | 185    |
| 7      | 184    | 207    |
| 8      | 198    | 190    |
| Total  | 1513   | 1488   |

selected primary schools within one Local Education Authority (LEA) (Table I). Some of this data has been reported elsewhere (Davies & Brember, 1997; Davies, 1998).

Educationalists recognise the importance of a child's self-esteem as a factor in attainment (Brookover *et al.*, 1964; Piers & Harris, 1964; Purkey, 1970; Williams, 1973; Burns, 1979a,b; Lawrence, 1971, 1972, 1973, 1982, 1987, 1996; Mortimore *et al.*, 1988; Cabell & Terrell, 1994).

The definition of self-esteem and the method of measuring it in this paper have been based on Lawrence's work (Lawrence, 1996). His definition: 'the child's affective evaluation of the sum total of his or her characteristics both mental and physical' (Lawrence, 1982) grew out of his clinical counselling work with 8- to 11-year-olds. This definition refers to a global self-esteem which is an individual's overall feeling of self-worth. In addition to this global, or unidimensional, construct of self-esteem, recent research has proposed a multidimensional construct of self-knowledge in which several context-related and domain-related self-concepts can be distinguished (Harter, 1982, 1984; Byrne, 1984, 1996; Marsh & Shavelson, 1985; Markus & Wurfe, 1987; Marsh, 1989; Oosterwegel & Oppenheimer, 1993). This view holds, for example, that feelings of worth or unworthiness in specific situations can develop with regard to reading and mathematics, for instance. Self-esteem and the effects of high stakes national testing is an area of enquiry for the National Curriculum research agenda (Gipps, 1992). Figure 1 reports Year 2 and Year 6 children's self-esteem levels over the first 8 years of the introduction of the National Curriculum.

## Method

A cross-sectional eight-year study (1988–1995: 2 years before national testing was introduced and 6 years after national testing was introduced) was devised to observe Year 2 and Year 6 children's:

- self-esteem as measured by the Lawseq questionnaire (Lawrence, 1982);
- mathematical attainments as measured by the Mathematics 7 (Year 2)

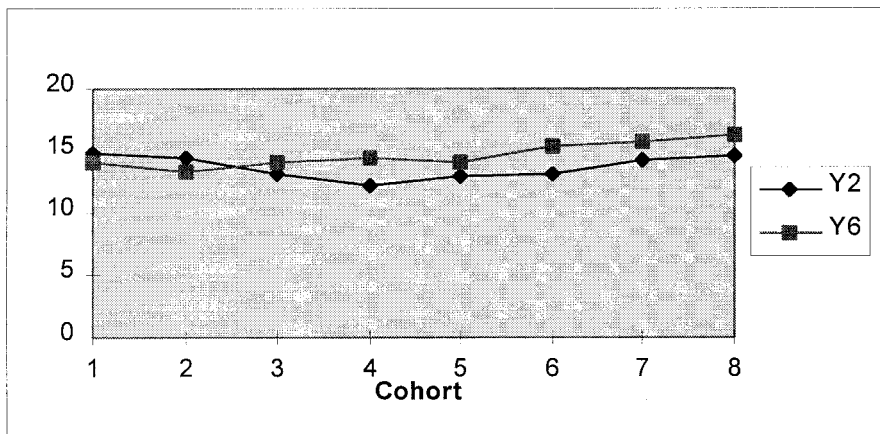


FIG. 1. Mean Lawseq scores for Years 2 and 6.

and Mathematics 11 test (Year 6) [National Foundation for Educational Research (NFER), 1985, 1987a];

- reading attainments as measured by The Primary Reading Test (PRT) Level 1 (Year 2) Level 2 (Year 6) (France, 1981).

**Sample**

All Year 2 and Year 6 children in five randomly selected primary schools within one Local Education Authority (LEA) comprised the sample. The schools varied in their catchment areas from suburban to poor urban and each had very few British Asian or British Afro-Caribbean children on roll.

**Procedure**

Each summer term from 1989 (pre-National Curriculum) to the present time the cohorts were tested using the following instruments:

**Year 2**

- Primary Reading Test Level 1 (France, 1981)
- Mathematics 7 (NFER, 1987a)
- Self-esteem (Lawrence, 1982)
- Attitudes towards school and school activities (Smiley Scale, ILEA, 1988)

**Year 6**

- Primary Reading Test Level 2 (France, 1981)
- Mathematics 11 (NFER, 1985)
- Self-esteem (Lawrence, 1982)
- Attitudes towards school and school activities (Smiley Scale, ILEA, 1988)

The national test results of the Year 2 cohorts (1991 onwards) and the Year 6 cohorts (1995 onwards) were collected. In addition, information about Year 2 children's pre-school experience, social class, length of infant experience and birth date was collected.

Class teachers administered both the PRT and the NFER Mathematics test to their children after the half-term holiday in the summer term of each of the 8 years. The instruction manuals were used as guides to administration (France, 1981; NFER, 1985, 1987b). The Lawseq questionnaire was administered to each of the eight cohorts by a researcher who had been working in the schools with those particular children as part of a larger research project (Lawrence, 1982). It was chosen for its appropriacy to the age group under study, its theoretically sound genesis, its brevity and ease of administration (Appendix 1).

The Lawseq was developed and extensively trialled for use with primary children from a series of 30 adjectives, through two sets of 40 questions in parallel form which were both administered to a random sample of 76 9-year-olds. The results from the two forms of the questionnaire were then compared. Questions showing less than 80% agreement were discarded. This left 16 items in both Forms A and B. Four other questions of an innocuous nature were then added to make the questionnaires less threatening, making 20 questions in all, and a parallel form of another 20 questions. The Forms A and B of this new version of the Lawseq were then administered to 431 9-year-olds and a correlation of 0.83 was found between both ( $P < 0.01$ ). In 1979, an item analysis of all the questions in the A and B Forms as carried out using the responses of 419 children aged 9 who filled in both questionnaires, a short form of the Edinburgh Reading Test and the Friendly Mathematics Test. As a result of this analysis 12 questions were considered to be particularly discriminating (four from Form A and eight from Form B). Another four innocuous questions were added to these, making a final questionnaire of 16 items. This final version was used in the National Child Health and Education Study and was given to a sample of 15,000 boys and girls in the United Kingdom who were born during the week 5–11 April 1970. The mean was 19 and the standard deviation was 4. No sex differences were observed. The test was administered on two occasions in 1981 to a sample of 745 Australian children between age 8 and 16 and for all groups except the Year 12 children the test re-test correlations were significant at 0.01%. The overall means on occasion one and two were 18.34 and 18.88, respectively.

Administration to the sample of Year 2 children was on an individual or small group only basis (four to six children) so that the questions could be read out to the child who might have difficulty. Administration to the Year 6 sample was at the class level.

## Results

The means of the Lawseq scores for the Year 2 children show a steady downward trend in the first 4 years with a similarly steady recovery in the last

TABLE II. Two-way analysis of variance

| Source             | SS       | D.F. | Variance | F Ratio |
|--------------------|----------|------|----------|---------|
| Year group         | 796.19   | 1    | 796.19   | 39.17*  |
| Cohort             | 1531.22  | 7    | 218.75   | 10.76*  |
| Cohort versus year | 1015.19  | 7    | 145.03   | 7.14*   |
| Residual           | 60669.04 | 2985 | 20.32    |         |

\*Significant at the 0.1% level.

4 years. The means for the Year 6 children fluctuate for the first 5 years followed by a steady rise in the means until the mean of Cohort 8 is 2.17 above that of Cohort 1.

In order to test the null hypotheses that:

- (i) there would be no difference on self-esteem means between cohorts;
- (ii) there would be no difference on self-esteem means between year groups;
- (iii) there would be no interaction on self-esteem between year groups and cohort;

a two-way analysis of variance was carried out on the self-esteem scores, the independent variables being cohort and year group.

Harmonic means were used to compensate for the different numbers in the cells. The results of this analysis are shown in Table II and indicate that there was a significant interaction at the 0.1% level between cohort and age group. This indicates that the self-esteem scores followed significantly different patterns over the age groups.

In order to investigate these differences, two one-way analyses of variance were carried out, one for each group, the independent variable being cohort. The results of these analyses, in Table III, show that the differences between the cohorts were significant for both the Year 2 and the Year 6 children. The analyses on Year 2 and Year 6 were therefore followed by a series of Scheffe's tests to determine exactly where the significant differences lay.

TABLE III. One-way analysis of variance of Lawseq score on Years 2 and 6

|        | Source          | SS       | D.F. | Variance | F Ratio |
|--------|-----------------|----------|------|----------|---------|
| Year 2 | Between cohorts | 1180.78  | 7    | 168.68   | 9.27*   |
|        | Within cohorts  | 27374.99 | 1505 | 18.11    |         |
|        | Total           | 28555.77 | 1512 |          |         |
| Year 6 | Between cohorts | 1367.94  | 7    | 195.42   | 8.69*   |
|        | Within cohorts  | 33294.05 | 1480 | 22.50    |         |
|        | Total           | 34661.99 | 1487 |          |         |

\*Significant at the 0.1% level.

TABLE IV. Scheffes test between cohorts on Lawseq scores

| Cohort | 1 | 2  | 3  | 4  | 5  | 6 | 7  | 8  |
|--------|---|----|----|----|----|---|----|----|
| 1      |   |    | *  | ** | *  |   |    |    |
| 2      |   |    |    | ** |    |   |    |    |
| 3      |   |    |    |    |    |   |    |    |
| 4      |   |    |    |    |    |   | ** | ** |
| 5      |   |    |    |    |    |   |    | *  |
| 6      |   | *  |    |    |    |   |    |    |
| 7      |   | ** |    |    |    |   |    |    |
| 8      | * | ** | ** | *  | ** |   |    |    |

Shaded section Year 2, unshaded section Year 6.

\*Significant at the 5% level. \*\*Significant at the 1% level.

Table IV shows that for Year 2, Cohorts 3, 4 and 5 had significantly lower means than Cohort 1, Cohort 4 was also significantly lower than Cohort 7 and 8 and Cohort 5 was significantly lower than Cohort 8. To see whether this drop in self-esteem was matched by a drop in performance on the standardised tests, the means and standard deviations of their mathematics and reading scores followed by a one-way analysis of variance were computed.

The Year 2 results in Fig. 2 display no overall pattern with the means fluctuating slightly in both directions over the 8 years. However, the *F* ratios were significant for reading age and comprehension scores. Follow-up Scheffe's tests found significant differences at the 5% level on reading age between Cohorts 1 and 8. On the comprehension score, there were significant differences at the 1% level between Cohorts 1 and 8 and at the 5% level between Cohorts 2 and 8. For these scores, Cohort 8 was the highest and Cohort 1 the lowest. This does not reflect their Lawseq scores since Cohort 1 had the highest mean.

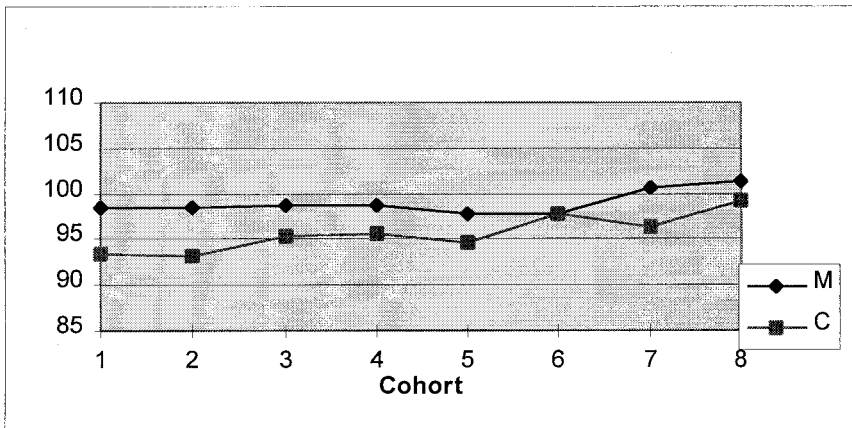


FIG. 2. Mean mathematics and comprehension scores Year 2.

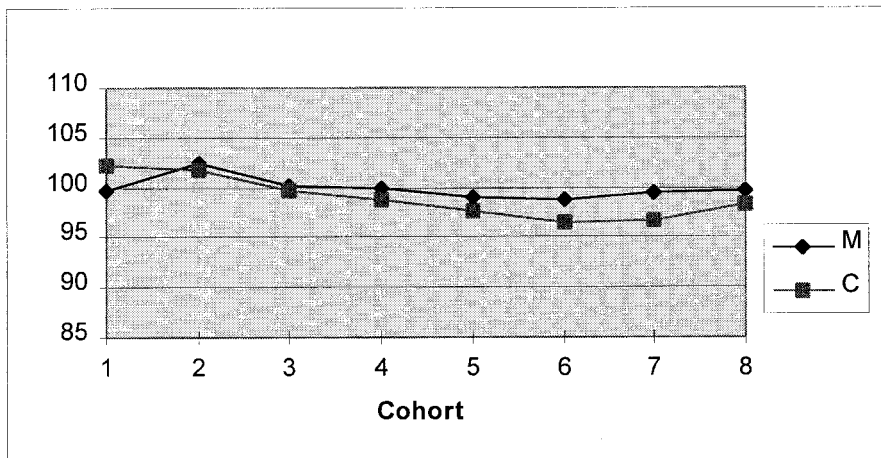


FIG. 3. Mean mathematics and comprehension scores Year 6.

The Scheffe tests on the Lawseq scores for Year 6 reveal that the means for Cohort 8 were significantly higher than Cohorts 1–5 and that Cohorts 6 and 7 were significantly higher than Cohort 2. Examination of the standardised test means (Fig. 3) shows that the means for Cohort 8 were not the highest. Indeed, the standardised mathematics score for Cohort 8 was almost three below (2.89) the highest (Cohort 1) and the standardised comprehension mean for Cohort 8 was 3.38 below the highest.

In order to test whether our sample supported the large body of evidence showing a positive significant correlation between attainment and self-esteem, we computed the correlation coefficients between Lawseq and the attainment scores (Table V) for the total sample and also for the pre- and post-national test groups separately.

The correlation coefficients for the total sample are all positive and significant thus confirming other research findings. However, somewhat surprisingly, none of the correlations for the pre-national test cohorts in Year 2 are significant whereas those for the post-national test cohorts are all significant at the 0.1% level. It should be noted that the cohorts with the significant correlations actually have lower self-esteem scores (mean = 13.39) than the other cohorts (mean = 14.58) although, as a group, they have higher means on all the attainment tests than the pre-national test cohorts (Table VI).

The national tests were administered to the last two cohorts of Year 6 children and a table of correlation coefficients was drawn up for them. In this case, all the correlation coefficients were significant at the 0.1% level.

For Year 6 children the post-national test children did better than the pre-national test children on all the test scores. Their mean self-esteem score was, however, 1.76 higher.

TABLE V. Correlation coefficients between Lawseq and attainment scores

|                            | Year 2                             |                                       |  | Year 6                             |   |   |
|----------------------------|------------------------------------|---------------------------------------|--|------------------------------------|---|---|
|                            | Total sample<br>( <i>N</i> = 1513) | Pre-nat.<br>test<br>( <i>N</i> = 385) | Post-nat.<br>tests<br>( <i>N</i> = 1128) | Total sample<br>( <i>N</i> = 1488) | Pre-nat.<br>tests<br>( <i>N</i> = 1091) | Post-nat.<br>tests<br>( <i>N</i> = 397) |
| Raw mathematics            | 0.122*                             | 0.029                                 | 0.162*                                   | 0.206*                             | 0.178*                                  | 0.306*                                  |
| Standardised mathematics   | 0.130*                             | 0.041                                 | 0.165*                                   | 0.185*                             | 0.159*                                  | 0.269*                                  |
| Raw reading score          | 0.110*                             | - 0.030                               | 0.178*                                   | 0.203*                             | 0.172*                                  | 0.314*                                  |
| Reading age                | 0.118*                             | - 0.029                               | 0.176*                                   | 0.199*                             | 0.165*                                  | 0.326*                                  |
| Standardised comprehension | 0.102*                             | - 0.030                               | 0.164*                                   | 0.196*                             | 0.165*                                  | 0.321*                                  |

\*Significant at 0.1% level.



TABLE VI. Means and standard deviations of attainment scores for pre- and post-national tests' cohorts

|                            | Year 2         |                 | Year 6         |                 |
|----------------------------|----------------|-----------------|----------------|-----------------|
|                            | Pre-nat. tests | Post-nat. tests | Pre-nat. tests | Post-nat. tests |
| Raw mathematics            | 18.88          | 19.33           | 27.45          | 26.51           |
|                            | 5.75           | 5.83            | 10.74          | 10.97           |
| Standardised mathematics   | 98.42          | 99.28           | 99.85          | 99.48           |
|                            | 11.82          | 12.97           | 13.81          | 13.71           |
| Reading score              | 23.45          | 24.76           | 36.62          | 36.03           |
|                            | 6.77           | 6.51            | 5.92           | 6.05            |
| Reading age                | 6.77           | 6.98            | 11.39          | 11.18           |
|                            | 1.22           | 1.41            | 1.97           | 1.95            |
| Standardised comprehension | 93.30          | 96.44           | 99.35          | 97.56           |
|                            | 13.15          | 13.81           | 14.64          | 14.416          |
| Lawseq                     | 14.58          | 13.39           | 14.28          | 16.04           |
|                            | 4.50           | 4.25            | 4.66           | 5.05            |

## Discussion

Whereas Year 2 children's self-esteem dropped significantly when national tests were first introduced and recovered to almost pre-national test levels in the eighth year of national testing, Year 6 children's means fluctuated for the first 6 years and increased significantly in the final 2 years when national tests were carried out on them. It is interesting to note that there was no significant correlation between self-esteem and attainments for the pre-national tests Year 2 cohorts who actually had lower attainments in reading than the post-national test cohorts but higher self-esteem scores. Within this group, the children's views of themselves was apparently less affected by their attainments than the post-national test group. The Year 6 children's scores are also interesting with the pre-national test cohorts doing better on all the standardised test items yet scoring lower than the post-national test children on the self-esteem measure.

What follows next is a speculative discussion of possible causes for the results. The fact that Year 2 children's self-esteem scores did not remain at a consistently lower level after the introduction of national testing but slowly climbed back up after the initial 3 year low may be owing to the fact that the initial shock of the new National Curriculum assessment procedures to both teachers and children had lost some of its initial impact. There is no doubt that it was a sea change in early years practice which neither teachers nor children were prepared for or welcomed (Shorrocks *et al.*, 1992; Carrington & Tymms, 1994; Campbell & Neill, 1994).

The actual process of administering the tests in the first 3 years may have contributed to the fall in Year 2 children's self-esteem during that time. The tests were administered individually or to small groups of children over a period of several weeks. This meant that for a considerable part of the time the teacher

was working intensively and under great time constraints with a few children at a time. The rest of the class would have been given tasks they could get on with without interrupting her. Over an extended period of time, however, this can have the effect of the children not directly involved in the testing feeling unimportant or overlooked by their teacher. As Lawrence (1996) notes, it is the day-to-day exchanges between child and teacher that most affects children's self-esteem. The gradual recovery in self-esteem scores over time could be accounted for by the change in the administrative procedures noted in later national test years. Each year, at Key Stage 1, national test content and administration formulae have been changed. The result has been a decline in the amount of time needed for their administration so children and teachers are not so disrupted from their normal working routines as in the early days (Davies & Brember, 1998). This is borne out by discussions with the two Year 2 teachers in this sample who had been doing the tests since their inception with their classes. One summed up the amount of time taken this year compared to the first tests: 'What we have to do now is a doddle compared to the first tests. The time they took was endless and that floating pineapple went on forever'. They both referred to the newness of the tests in the first few years of national testing, their feelings of inadequacy in terms of the time they had to do the tests in and their frustration at leaving large numbers of their children on 'holding activities' while they tested others.

One other aspect could have had a part to play in the fluctuating Year 2 self-esteem scores. The teacher's self-esteem is a vital factor in children's feelings of self-worth (Burns, 1973, 1975; Reynolds, 1995; Williams & Eden, 1995; Galton *et al.*, 1996). In the early days especially, teachers felt they were administering long-winded tests which they did not have a hand in devising, which were being used as an important measure of their effectiveness and which, at the same time, they felt there was not a lot of point in doing. Their hearts were not in it, basically, and their morale was low (Smithers & Robinson, 1991). This, perhaps, also communicated itself to their children and affected their self-esteem in the first 3 years of national testing. The annual national testing and the intermittent teacher assessments which became a standard feature of primary schools would have meant that, over time, children became used to these and, therefore, felt less threatened by them.

Speculation concerning the Year 6 self-esteem scores have to consider possible reasons for the statistically significant rise in the cohorts that were the first to do the national tests (Cohorts 7 and 8). These are the same cohorts (Cohorts 3 and 4) which, in Year 2, had scored significantly lower on self-esteem than any of the other cohorts. First of all, there is the children's level of maturity to consider which may have helped them to cope more adequately with any stress the tests put them under. In addition, a testing culture had been established within primary education over the previous years which the children would have grown up with and which they would have accepted more easily as part of school life compared to the first time testing was introduced to them in Year 2.

This small study indicates the continuing need to focus research on both the affective and the cognitive development of the primary child when innovations such as the National Curriculum are introduced to raise standards.

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## Appendix 1

### Lawseq pupil questionnaire (final version)

|  | Yes | No | Don't know |
|--|-----|----|------------|
| 1. Do you think that your parents usually like to hear about your ideas?                           |     |    |            |
| 2. Do you often feel lonely at school?   |     |    |            |
| 3. Do other children often break friends or fall out with you?                                     |     |    |            |
| 4. Do you like team games?   |     |    |            |
| 5. Do you think that other children often say nasty things about you?                              |     |    |            |
| 6. When you have to say things in front of teachers, do you usually feel shy?                      |     |    |            |
| 7. Do you like writing stories or doing other creative writing?                                    |     |    |            |
| 8. Do you often feel sad because you have nobody to play with at school?                           |     |    |            |
| 9. Are you good at mathematics?  |     |    |            |
| 10. Are there lots of things about yourself you would like to change?                              |     |    |            |
| 11. When you have to say things in front of other children do you usually feel foolish?            |     |    |            |
| 12. Do you find it difficult to do things like woodwork or knitting?                               |     |    |            |
| 13. When you want to tell a teacher something, do you usually feel foolish?                        |     |    |            |
| 14. Do you often have to find new friends because your old friends are playing with somebody else? |     |    |            |
| 15. Do you usually feel foolish when you talk to your parents?                                     |     |    |            |
| 16. Do other people often think that you tell lies?  |     |    |            |

Scoring key:

Questions 4, 7, 9, 12 are distracters.

Score + 2 for Yes answers to question 1.

Score + 2 for No answers to remaining scored questions.

Score + 1 for Don't know answers to scored questions.

Score 0 for all other possibilities.

Maximum possible score in the direction of high self-esteem + 24.

