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Childhood intelligence, locus of control and behaviour disturbance as determinants of intergenerational social mobility: British Cohort Study 1970

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ABSTRACT

Determinants of intergenerational social mobility were examined in 8287 men from the British Cohort Study 1970. Confirming previous research, parental social class, childhood intelligence, and educational qualifications were the strongest predictors of occupational social class at the age of 30. Locus of control and childhood behaviour disturbance had independent significant effects and accounted for additional amounts of variance. Self-esteem had only a trivial influence on social mobility. Structural equation modelling using full information maximum likelihood estimation demonstrated that: educational qualifications mediated other predictors' effects, accounting for the greatest amount of variance in people's own social status attainment; there was a substantial overlap of childhood behavioural disturbance, intelligence, and locus of control; there were effects of parental social class on own occupational social class attainment. Intergenerational social mobility is determined by a nexus of inter-correlated variables whose independent effects remain difficult to disentangle.

1. Introduction

Social mobility is understood as the transition of an individual or social object from one social position to another (Sorokin, 1959). Early theoretical frameworks, such as status attainment theory (Blau & Duncan, 1967), predicted that intergenerational social mobility would be limited by the predefining effects of parental social class. More recently it has become clear that, although parental social class remains an important influence, social mobility is also strongly linked with mental ability and educational attainment (Bowles & Gintis, 2002; Deary et al., 2005; Herrnstein & Murray, 1994; Strenze, 2007). For example, Deary et al. (2005) found, in a male Scottish population sample ($N = 243$), that intelligence in childhood accounted for 23.2% and parental social class for 17.6% of the total variance in social status attainment in mid life at the age of 50 years (Fig. 1). In this and other studies, parental social class and mental ability significantly affected the level of education which had a mediating function on attained social status, whether defined by occupation or other indicators (Breen & Goldthorpe, 2001; Deary et al., 2005; Nettle, 2003).

However, mental ability, education and parental social class only account for a part of the total variance in social status attainment. Deary et al.'s (2005) path model accounted for 44.1% of the variance in social status attainment; other models account for even less variance (e. g. Bond & Saunders, 1999). Other factors that might influence social status attainment in adult life are behaviours and attitudes in childhood (Bowles & Gintis, 2002; Colom, Escorial, Shih, & Privado, 2007; Jackson, 2006; Jencks, 1979; Osborne Groves, 2005; Sigle-Rushton, 2004; Silles, 2005).

Childhood behaviours predict not only personality structure in adulthood but also employment status and occupational social class attainment (e. g. Caspi, 2000; Caspi, Roberts, & Shiner, 2005; McCrae et al., 2000). In addition, childhood behaviours and personality are determinants of school and university achievements (e. g. Feinstein, 2000). For example, in a sample of Spanish school children,

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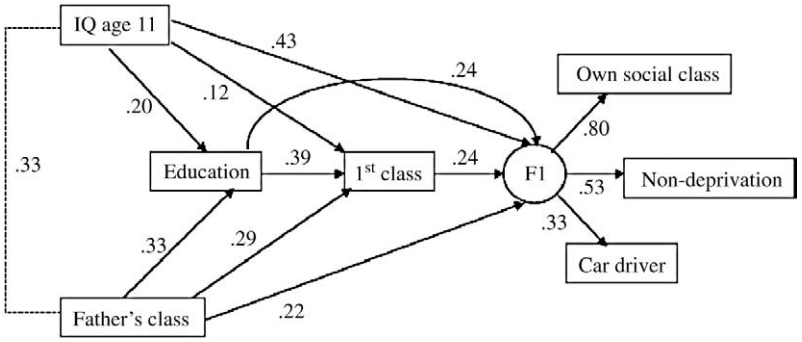

Fig. 1. Direct and indirect influences of parental social class and childhood mental ability on education, status of first employment and social attainment in midlife. Adapted from Deary et al. (2005) with permission from the authors. *Note*. Arrows represent significant path parameters; the dashed line represents a correlation without causal inference. Social status attainment is derived from measures of own social class, non-deprivation and car ownership. Key: IQ age 11 = Childhood mental ability; Father's class = Parental social class; 1st class = Status of first job; F1 = Latent trait of social status attainment at midlife.

temperament difficulties accounted for a greater amount of variance in academic performance than cognitive ability (32.5% versus 29.2%, respectively; Colom et al., 2007). Investigations of the National Child Development Study 1958 showed that behavioural characteristics like withdrawal, aggression and resentfulness, assessed at ages of 5, 11 and 16 years, significantly affected adult earnings (Silles, 2005), occupational attainment (Jackson, 2006), social exclusion (Sigle-Rushton, 2004), and labour market returns (Osborne Groves, 2005). Thus, childhood behaviours are likely to contribute, in addition to parental social class and mental ability, to educational achievement and social class attainment.

1.1. Locus of control and self-esteem

Locus of control (Rotter, 1966) and self-esteem (Rosenberg, 1979) are plausibly important antecedents of attainment, but have been under-examined in current research (Wang, Kick, Fraser, & Burns, 1999). Rotter (1966) suggested that people either believe in their own ability to control events (internal locus of control), or attribute their personal circumstances to external forces (external locus of control). In the context of education, an external locus of control predicts poor grades, whereas an internal locus of control precedes superior academic performance (Nelson & Mathia, 1995; Osborn & Milbank, 1987). Pearlin and Kohn (1966) identified differences in child-rearing patterns of middle class parents, who encouraged children's self-direction, and working class parents, who were more likely to emphasise conformity to externally imposed conditions. Working class parents tend to endorse obedience, neatness, and honesty in child-rearing, whereas middle class parents stress curiosity, self-control and happiness (Bowles & Gintis, 1972). Locus of control may therefore partially mediate effects of parental social class on educational and social status attainments.

Self-esteem is defined as the sum of evaluations across salient attributes of one's self and personality and reflects an evaluation of one's worth and importance (Rosenberg, 1979). Previously, high self-esteem was associated with superior academic performance, advanced educational qualifications, and higher income levels (Goldsmith, Veum, & Darity, 1997; Schoon, 2001). Moreover, individuals with increased self-esteem are more likely to assign success to internal attributes, whereas people low in self-esteem tend to explain accomplishments in terms of external circumstances (Abdallah, 1989). Indeed, locus of control and self-esteem are significantly related (Wang et al., 1999). It is plausible that both these characteristics are associated with social mobility.

1.2. The present study

The current study aims to evaluate predictors of occupational social class attainment at the age of 30 in a sample from the British Cohort Study 1970 (BCS 1970). The outcome variable, however, can be measured more accurately in men than in women, whose occupational social class is affected by childbearing (Dex, Ward, & Joshi, 2006). Thus, the present study will include an all-male sample.

Previous investigations often relied on few indicators of childhood behaviour and potentially biased observer ratings (e. g. Jackson, 2006; Osborn & Milbank, 1987). In the present study, multiple assessments of childhood behaviour will be analysed, including teacher's and mother's ratings, as well as children's self-reports of locus of control and self-esteem.[2] Overall, parental social class and the subject's intelligence are hypothesised to be substantially correlated and to affect occupational status directly and indirectly through mediated effects by educational attainment. Locus of control and self-esteem are predicted to be positively correlated and to mediate effects of parental social class on educational and occupational attainment. Finally, childhood behaviour disturbance as rated by mothers and teachers is assumed to affect educational attainment and occupation status.

[2] The BCS 1970 comprises 8 items adapted from the Eysenck Personality Inventory (Eysenck & Eysenck, 1975), which were completed by children at the age of 10 under teacher's supervision. Children indicated how much they could identify with personal characteristics like being 'nervous', 'lively' or 'easy-going'. However, the items were found to be psychometrically unsatisfactory and thus, were omitted from the analyses.

2. Method

2.1. Participants

BCS 1970 is an ongoing longitudinal study of 17,198 people born between April 5 and 11, 1970 in England, Scotland, Wales and Northern Ireland. The present study includes data from assessment sweeps at the ages of 10, 16 and 30 years. In total, 11,261 participants took part in the 30-year follow-up in 2000 (65.5% of the original cohort). Attrition was due to common causes such as refusal, moving and death (Collins et al., 2001), and the obtained sample in adult follow-ups does not differ significantly in any respect from other British survey samples (Shepherd, 1997).

2.2. Measures

2.2.1. The British Ability Scales

At age 10, mental ability was assessed using four tests from the British Ability Scales (BAS; Elliott, Murray, & Pearson, 1978). Testing took place at school. Following recommendations of one of the test designers, the scales were adapted for administration by teachers (Elliot et al., 1978). Verbal ability was assessed by two scales of word definitions and word similarities. For word definitions, teachers articulated 37 words, which were subsequently defined by the child. The words varied in their degree of difficulty. The word similarities scale comprised 42 items, each composed of three words based on a theme, for example fruit or emotions. Children were asked to name one other word consistent with the theme. Teachers recorded all answers verbatim. Non-verbal ability was measured by scales of recall digits and matrices. For the recall digits test, teachers read out 34 lines of digits at half-second intervals, which increased in length from 2 to 8 digits, and children had to repeat each line. Teachers circled correctly repeated numbers. The matrices subscale contained 28 incomplete patterns arrayed as a grid. For each item, the child was asked to draw the missing part of the pattern and teachers recorded the number of correctly completed patterns. The BAS are a good proxy for IQ scores and details of validity and reliability have been published elsewhere (see Elliot et al., 1978).

2.2.2. Child Development Scale

Teachers rated children's behaviour (aged 10) on a total of 51 items from the Connors Teachers Hyperactivity Rating Scale (Conners, 1969), the Rutter Teacher Behaviour Scale (Rutter, 1967), and questions from the Swansea Assessment Battery (with permission of Professor Maurice Chazan; Butler, Despotidou, & Shepherd, 1980). Items covered a wide range of behaviours, social maladjustment, and personal attitudes. Example items are 'Child shows perseverance', 'Child has frequent outbursts of temper' and 'Child fails to complete task'. Teachers indicated their level of agreement with each statement by bisecting a line, which was coded into a 47-point scale ranging from 'Not at all' to 'A great deal'.

2.2.3. Mother Self-Completion Form

Mothers completed the same set of 38 questions about behaviours and attitudes at children's ages of 10 and 16 years, consisting of items from the Rutter Parental 'A' Scale of Behaviour Disorder (Rutter, Tizard, & Whitmore, 1970), and the Conners Hyperactivity Scale (Conners, 1969). For example, statements included 'Worried or anxious', 'Takes other's belongings', and 'Inattentive and easily distracted'. Mothers indicated their level of agreement by bisecting a line, which was coded into a 100-point scale ranging from 'Does not apply' to 'Certainly applies', and from 'Not at all' to 'A great deal'.

2.2.4. Self-Completion Questionnaire

The self-esteem scale LAWSEQ (Lawrence, 1973, 1978) and the Locus of Control Scale CARALOC (Gammage, 1975) were completed by the children at age 10. The LAWSEQ assessed children's self-esteem with reference to teachers, peers and parents and consisted of 12 items, for example 'Do you feel lonely at school?' and 'Do your parents like to hear about your ideas?'. The CARALOC measured children's perceived achievement control; 7 out of 16 items refer specifically to school experiences. Example items are 'Do you feel that most of the times it is not worth trying hard because things never turn out anyway?' and 'Do you feel that wishing can make good things happen?'. On both questionnaires, answers were recorded on a 3-point scale ('Yes', 'Don't know' and 'No') whereby a higher score represents higher levels of self-esteem or a more internal locus of control.

LAWSEQ and CARALOC had some low corrected total inter-item correlations and items with a coefficient <.20 were excluded from the scales. Subsequently, coefficient alpha was .69 for the CARALOC with 11 items, and .67 for the LAWSEQ with 10 items ($N = 5544$, and $N = 5541$, respectively).

2.2.5. Social class and education

Social class of origin was assessed in terms of fathers' occupation in 1970 or 1980 (if data were missing, or mother's occupation if no data were available) and was coded into six categories (unskilled, partly skilled, skilled manual, skilled non-manual, managerial and professional) according to the OPCS Registrar General's Classification of Occupations (OPCS, 1970, 1980). To assess each subject's own social status attainment at age 30, the OPCS classification of six categories was applied to their current occupation. Academic and vocational qualifications were represented by academic leaving certificates and National Vocational Qualifications (NVQs). NVQs are based on national occupational standards and mirror increasing job complexity and personal responsibility. Academic and vocational qualifications were collapsed into six categories, reflecting increasing attainment from no qualifications, CSE/ NVQ level 1 and equivalent, O-levels/NVQ level 2 and equivalent, A-levels/ NVQ level 3 and equivalent, degree or diploma/ NVQ level 4 and equivalent, to higher degree/ NVQ level 5.

2.3. Statistical analyses

The analyses were conducted using *SPSS 14.0* and *AMOS 5.0* for Windows. Predictors of social mobility included parental social class, intelligence, childhood behaviours, self-esteem, locus of control and educational qualifications. The outcome measure was the subject's own occupational social class at the age of 30 years. The BAS scores and the items from childhood behaviour scales, rated by mothers and teachers at children's age of 10 and 16, were subjected to

principal axis factor analyses (PFA) and higher order factor analysis where appropriate. To evaluate the influence of the a priori predictor variables on occupational social class attainment, univariate and stepwise ordinal logistic regression models were conducted. Based on herein-identified predictors of social status attainment and previous research outcomes (e. g. Deary et al., 2005), a structural equation model (SEM) of occupational social class was tested.

In addition to common attrition rates, data of the BSC 1970 is partially incomplete due to some subjects' inconsistent attendance throughout assessment sweeps: for example, some men provided data at ages 10 and 30, others at ages 16 and 30, and again another group only at age 10. For SEM analysis with missing or incomplete data, full information maximum likelihood estimation (FIML) is most effective (e. g. Enders & Bandalos, 2001; Schafer & Graham, 2002). As a goodness-of-fit measure, the model χ^2 tests for differences between log-likelihood functions of the implied and the saturated model. However, a significant χ^2 result is insufficient for model rejection because it is affected by sample size (Jöreskog, 1969). Incremental fit indices, such as the Comparative Fit Index (CFI), Bentler–Bonett Normed Fit Index (NFI) and the Tucker–Lewis Index (TLI), assess the implied model's fit relative to the null or independence model with a recommended minimum of .90 but preferably higher (Hu & Bentler, 1999). In the present data, the assumption of multivariate normality was violated, which distorts both incremental fit indices and χ^2 results (West, Finch, & Curran, 1995). Moreover, incremental fit indices are affected by the amount of missing data in inconsistent directions of worse or better fit. Davey, Savla, and Luo (2005) concluded that new fit indices should be developed for SEM analysis on missing data. Gignac, Palmer, Bates, and Stough (2006) suggested placing interpretive confidence in absolute close-fit indices rather than in incremental fix indices. An absolute close-fit index is the parsimony measure of the Root-mean-square error of approximation (RMSEA), which is based on the non-centrality parameter and indicates an adequate model fit with a value below .05 (Hu & Bentler, 1999).

3. Results

3.1. Sample

Within the sample of the BCS 1970, 8287 male cohort members were identified (the remainders were either female or did not declare their sex). At the age of 10 years, 7713 boys were assessed, of whom 1158 never returned for later assessment sweeps. At age 16, 372 boys who had not taken part in the first wave, were recorded; 163 did not return for further assessment. At age 30, another 202 cases were recorded who had not been previously documented in the BCS 1970. Of 8287 men overall, 1523 were assessed once (at either assessment sweep), 2816 attended two assessment waves and 3948 took part in all sweeps.

A binary logistic regression model tested for the effect of social class origin on continuation of research participation within a sub-sample of 6840 boys with complete data on parental social class at age 10.[3] Participants in the two lowest social classes in childhood were significantly ($p<.001$) less likely to return for future assessment waves compared with those from the highest parental social class. However the differences in distribution of social class origin were slight. Thus, out of a total of 923 drop-outs, 5.7% of children were from the lowest and 18.4% from the second lowest social class. By comparison, out of overall 5917 continuously-assessed cases there were 4.2% and 13.0%, respectively, of children from these classes.

Complete data on parental and own social class (age 30) were available for 4388 men, whereby 38.6% ($N=1695$) experienced upward social mobility, 27.3% ($N=1196$) moved downwards with reference to their parental social class, and 34.1% ($N=1497$) retained their social status of origin. This is in line with earlier reports on common rates of social mobility (e.g. Deary et al., 2005; Nettle, 2003). In summary, lower social classes are slightly underrepresented in the current sample but such biases seem unrelated to experiencing social downward mobility.

3.2. Data preparation

3.2.1. The British Ability Scales

The four subscales of the BAS were subjected to PFA resulting in a one factor solution with an eigenvalue of 2.31, accounting for 57.8% of the total variance ($N=5303$, after listwise omission; Kaiser–Meyer–Olkin Measure of Sampling Adequacy = .74). Factor loadings were .63 for matrices, .79 for word definitions, .43 for recall of digits, and .80 for word similarities. The coefficient alpha was .72. Factor scores were derived using the regression method, and will be referred to herein as *g* (a general cognitive ability factor).

3.2.2. Child development scale

The child development scale, comprising 51 items and completed by teachers at children's age of 10 years, was subjected to PFA. The scree slope suggested a four factor solution after oblique rotation (Direct Oblimin rotation with Kaiser Normalisation). High loading items (>.50) were maintained and newly subjected to PFA (N items = 37) confirming the four factor structure and accounting for 58.8% of the total variance. The extracted factors were labelled Anger, Anxiety, Concentration difficulties, and Hand skills. Satisfactory coefficient alpha values were obtained and factor composite scores were computed (Table 1).

3.2.3. Mother Self-Completion Form

PFA was applied to 38 items completed by mothers on their children's behaviour at the age of 10 years. The scree slope suggested a four factor solution after oblique rotation. Sufficiently loading items (>.50) were newly subjected to factor analysis (N items = 21) confirming a four factor solution, which accounted for 56.2% of the total variance ($N=6{,}571$ after listwise deletion). One item did not sufficiently load above .35 on any of the extracted factors and was subsequently excluded. All factor scales had satisfactory coefficient alpha values and were labelled Restlessness, Clumsiness, Aggression, and Attention Deficit (Table 1).

To ensure the comparability of dimensions of childhood behavioural disturbance over time, the previously identified 20 items were selected from mother ratings at children's age

[3] Parental social class was only recorded at the first assessment wave at children's age of 10.

Table 1
Childhood behavioural components from teacher (at the age of 10) and mother ratings (at the ages of 10 and 16).

	Items	α	Example items	Composite score correlation coefficients		
Teacher ratings (age 10)						
Anger	14	.94	Bullies other children.	–		
Anxiety	4	.81	Afraid of new situations and tasks.	.32	–	
Concentration difficulties	10	.93	Fails to finish task.	.58	.44	–
Hand skills	9	.85	Drops things being carried.	.41	.42	.52
Mother ratings (age 10 / 16)						
Restlessness	6	.81 / .78	Shows restless behaviour.	–		
Clumsiness	5	.76 / .69	Trips, falls, bumps easily.	.31 / .38	–	
Aggression	5	.76 / .76	Fights with others.	.46 / .49	.36 / .21	–
Attention deficit	4	.83 / .81	Inattentive and easily distracted.	.56 / .58	.37 / .39	.42 / .43

Note. Columns 1 to 3 show extracted factors from teacher and mother ratings at ages 10 and 16 with their respective item numbers and coefficient alpha (α) values. Column 4 gives example items from the analysed scales. Columns 5 to 9 show the correlation matrices of the factor scores for each factor solution under oblique rotation. Results for analyses from mother ratings at ages 10 are presented together with the results at age 16 (separated by a punctuation mark).

10 and subjected to confirmatory factor analysis. The four factor structure was confirmed with all items loading sufficiently on their specified latent trait. Coefficient alpha values for factor scales were satisfactory and corresponding composite scores were computed (Table 1).

The composite score correlation matrices suggested conducting higher order factor analyses (Table 1, right-most three columns). For mother ratings at ages 10 and 16, a hierarchical factor structure was confirmed with a general factor accounting for 56.2% and 56.5% of the total variance, respectively. The two factors of childhood behaviour disturbance will be referred to herein as MR10 (mother ratings at age 10) and MR16 (mother ratings at age 16). For teacher ratings, one higher order factor was extracted after PFA accounting for 58.7% of the total variance. The latter will be throughout referred to as TR10 (teacher ratings at age 10).

Finally, a structural equation model using FIML was fitted to confirm an association between mother's ratings of childhood behaviour at age 10 and at the age of 16 (Fig. 2). One general factor and four lower order latent traits were extracted from each set of 20 items (mother ratings at ages 10 and 16) in hierarchical models. Furthermore, the higher order latent trait MR10 directly predicted the general factor of MR16. Model fit indices showed an adequate model fit (χ^2 (731) = 13,620.40, $p < .001$; TLI = .824; NFI = .836; CFI = .843; RMSEA = .046 with a Confidence Interval of 90% ranging from .045 to .047; p-Value for Test of Close Fit = 1). The path parameter from mother ratings of childhood behaviour at age 10 was .67 (Standard Error < .00) accounting for 46.3% of the variance in childhood behaviour at age 16.

3.3. Ordinal regression models

Univariate and stepwise multivariate ordinal logistic regression models tested the significance of predictor

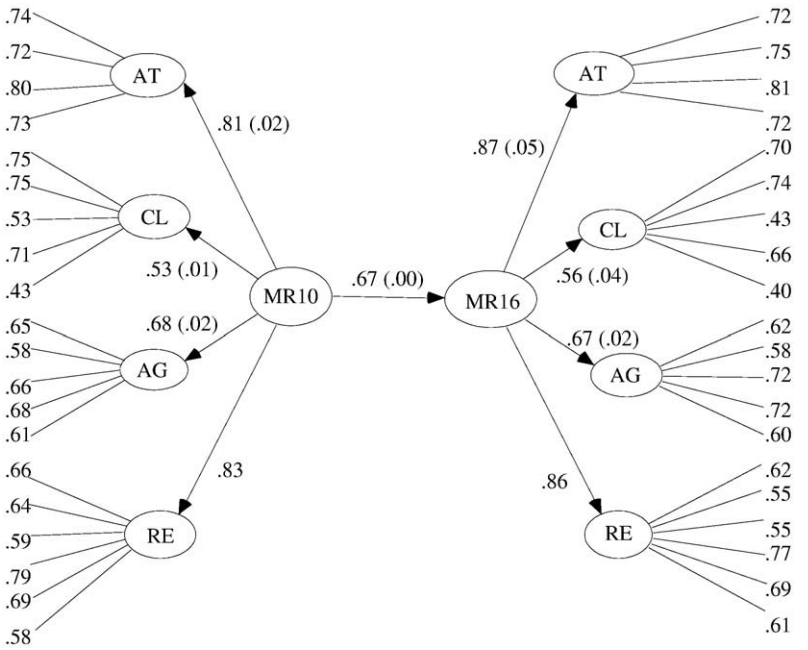

Fig. 2. Childhood behaviour disturbance from mother ratings at children's age of 10 and 16 years. *Note.* For graphical simplicity, all error terms have been omitted and factor loadings are displayed instead of observed variable labels. Numbers in parentheses are Standard Errors for path parameters of latent traits (where missing, the path was fixed at 1 for purposes of model identification). Key: AT = Attention deficit; CL = Clumsiness; RE = Restlessness; AG = Aggression; MR10 = Higher order factor extracted from mother ratings at children's age 10; MR16 = Higher order factor derived from mother ratings at children's age 16.

Table 2
Predictors of social mobility in univariate ordinal regression models.

Dependent: own social class	Estimate	Exp (*E*)	CI (95%)
TR10	−.57	.57	−.65 to −.50
MR10	−.44	.64	−.50 to −.37
MR16	−.36	.70	−.44 to .28
Self-esteem	.26	1.30	.21 to .32
Locus of control	.55	1.73	.49 to .61
Parental social class [a]	.47	1.60	.43 to .52
Education [a]	.78	2.18	.74 to .82
g	.89	2.44	.81 to .96

Note. Link function: Logit. Exp (*E*) is expressed per SD increase (Anxiety, Anger, Concentration difficulties, Hand skills, MR16, locus of control, self-esteem, IQ) and per category division (parental social class, education). Key: Estimate = Ordered log-odds regression coefficient; Exp (*E*) = Odds ratio; CI = Confidence Interval; TR10 = Behavioural disturbance ratings from teachers at age 10; MR 10 = Behavioural disturbance factor from mother ratings at age 10; MR16 = Behavioural disturbance factor from mother ratings at age 16; *g* = regression scores from BAS scales.
[a] Test of parallel lines is significant at $p<.001$.

variables for social status attainment at age 30 including intelligence (*g*), locus of control, self-esteem, TR10, MR10, MR16, and educational qualifications (Table 2). Predictors were evaluated regarding their contribution to improving the odds of moving to the highest social class (i.e. most professional), which was the chosen reference standard. In univariate regressions, all predictors were highly significant ($p<.001$) and, therefore, each contributed individually to the odds of entering a higher social class. For example, for each Standard Deviation increase in *g* the odds of being in a higher social class at the age of 30 increased by 2.44; another example was that behavioural disturbance as rated by teachers at children's age of 10 had a negative impact on social class attainment (odds ratio = .57).

Subsequently, predictor variables were subjected to a pre-planned sequence of multivariate ordinal regressions (Table 3).[4] To examine the potential independent predictive value of variables which had not yet been consistently associated with social class attainment, these 'novel' predictors (factors of childhood behaviour, locus of control, and self-esteem) were entered prior to well-established factors (parental social class, education and intelligence). The final model had a good fit to the data according to the Pearson and Deviance goodness-of-fit measures (χ^2 (11,473) = 11,706.11 and 6120.54, $p>.05$ for both tests). In the last step, TR10, MR10, locus of control, parental social class, education and *g* all remained significant predictors of social status attainment. Self-esteem was not shown to have a consistent, significant effect on own social class attainment.

3.4. Structural equation model

A model of social class at age 30 was drawn up as follows. Exogenous variables of parental social class, locus of control (observed variables), childhood behaviours rated by mothers and teachers at age 10, and *g* (latent traits) were hypothesised to affect own occupational social class at age 30 directly and indirectly, the latter on account of being partially mediated by educational qualifications. Without causal inference but in line with previous research (e. g. Deary et al., 2005; Strenze, 2007), parental social class and *g* were allowed to correlate. Gale, Batty, and Deary (2008) found *g* highly inter-correlated with locus of control which in turn is related to parental social class (see also Pearlin & Kohn, 1966). Accordingly, the present model included locus of control, parental social class and *g* as inter-correlated variables.

The fact that they were based on different raters and that these used different questionnaires did not recommend extracting one latent trait from mother's and teacher's behaviour ratings. However a positive relationship was very plausible and, therefore, mother and teacher ratings of behavioural disturbance at children's age of 10 were allowed to correlate. Latent traits of childhood behaviour were extracted from composite scales of teacher's and mother's ratings. Error terms of the same scales from mother's ratings were allowed to covary across the assessment times at ages 10 and 16. Overall, the model comprised 20 observed variables, 4 latent traits of childhood behaviours and *g*, and 87 parameter estimates (including path coefficients, variances, covariances, means and intercepts). The model fit indices for the FIML model were as follows: χ^2 (143) = 3669.56, $p<.001$; TLI = .835; NFI = .884; CFI = .888; RMSEA = .055 with a Confidence Interval of 90% ranging from .053 to .056, *p*-Value for Test of Close Fit = 0. The model accounted for 29% of the total variance in own social status attainment. All path parameters were significant at α-level of .01 except for the association between locus of control and own social status attainment ($p>.05$).

Even taking into account the missing data conditions and the violation of multivariate normality, the reported model fit index results are much lower than recommended cut-off points. Parental social class, TR10, MR10, locus of control and *g* are substantially correlated (Table 4) and the present model misspecification may be due to treating them as uncorrelated variables. Model modifications require theoretical justifications beyond statistical results derived from one population sample (Kline, 2005). However from a theoretical

Table 3
Odds ratios (Exp (*E*)) of predictor variables in ordinal regression with stepwise entry.

	Step 1	Step 2	Step 3	Step 4	Step 5†	Step 6†	Step 7†
TR10	.57**	.61**	.63**	.70**	.70**	.79**	.83**
MR10		.76**	.79**	.59**	.82**	.89*	.89*
Self-esteem			1.15**	1.00	.98	1.00	1.01
Locus of control				1.48**	1.39**	1.23**	1.12*
Parental class					1.46**	1.28**	1.25**
Education						1.95**	1.82**
g							1.54**

Note. Link function: Logit. Exp (*E*) is expressed per SD increase (TR10, MR16, locus of control, self-esteem, *g*) and per category augment (parental social class, education). Confidence intervals are at 95%. Key: see Table 2.
† Test of parallel lines is significant at $p<.001$.
** $p<.001$.
* $p<.05$.

[4] Ordinal logistic regression assumes independence of observations and treats mother ratings of childhood behaviour at ages 10 and 16 as separate entities, which they are not. Therefore, only mother ratings at children's age of 10 were included in the stepwise ordinal regression models.

Table 4
Pearson product correlation moments for predictor variables of social mobility.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. MA (*g*)	–																		
2. DIG (*g*)	.31*	–																	
3. DEF (*g*)	.48*	.33*	–																
4. SIM (*g*)	.49*	.32*	.65*	–															
5. Restlessness (MR10)	−.15*	−.08*	−.14*	−.14*	–														
6. Clumsiness (MR10)	−.06*	−.04*	−.06*	−.05*	.31*	–													
7. Aggression (MR10)	−.17*	−.11*	−.19*	−.18*	.46*	.36*	–												
8. Attention def (MR16)	−.26*	−.18*	−.24*	−.21*	.56*	.37*	.42*	–											
9. Anger (TR10)	−.22*	−.12*	−.17*	−.15*	.25*	.08*	.26*	.27*	–										
10. Hand skills (TR10)	−.23*	−.15*	−.17*	−.16*	.10*	.14*	.09*	.20*	.41*	–									
11. Con diff (TR10)	−.41*	−.28*	−.38*	−.34*	.18*	.09*	.22*	.38*	.58*	.52*	–								
12. Anxiety (TR10)	−.16*	−.15*	−.15*	−.15*	.07*	.05*	.02	.12*	.32*	.42*	.44*	–							
13. Restlessness (MR10)	−.11*	−.04	−.09*	−.08*	.45*	.12*	.26*	.29*	.22*	.10*	.16*	.06*	–						
14. Clumsiness (MR16)	−.05*	−.03	−.02	−.02	.19*	.33*	.09*	.20*	.12*	.15*	.11*	.09*	.38*	–					
15. Aggression (MR16)	−.13*	−.08*	−.12*	−.11*	.23*	.08*	.37*	.23*	.21*	.10*	.19*	.05*	.49*	.21*	–				
16. Attention def (MR16)	−.24*	−.12*	−.20*	−.19*	.35*	.17*	.26*	.49*	.26*	.18*	.35*	.13*	.58*	.39*	.43*	–			
17. Locus of control	.34*	.28*	.41*	.37*	−.15*	−.08*	−.20*	−.25*	−.22*	−.23*	−.41*	−.20*	−.10*	−.05*	−.15*	−.22*	–		
18. Education	.32*	.17*	.34*	.31*	−.13*	−.06*	−.17*	−.21*	−.17*	−.12*	−.29*	−.07*	−.12*	−.08*	−.12*	−.23*	.28*	–	
19. Parental class	.24*	.12*	.31*	.28*	−.13*	−.05*	−.15*	−.11*	−.07*	−.09*	−.16*	−.07*	−.09*	−.00	−.09*	−.09*	.21*	.28*	–
20. Own social class	.31*	.21*	.35*	.32*	−.13*	−.05*	−.16*	−.22*	−.16*	−.14*	−.31*	−.11*	−.11*	−.04	−.13*	−.19*	.29*	.48*	.31*

*$p < .01$.

Note. Sample sizes vary from 2417 to 6341 using pairwise deletion. Key: DEF = Word definition test score; SIM = Word similarities test score; MA = Matrices test score; DIG = Recall of digits test score; g = Latent trait of general intelligence; Con Diff = Concentration difficulties; Attention Def = Attention Deficit; Locus = Locus of control; TR10 = Latent trait of teacher ratings of childhood behaviour; MR10 = Latent trait of mother ratings at children's age 10; MR16 = Latent trait of mother ratings at children's age 16.

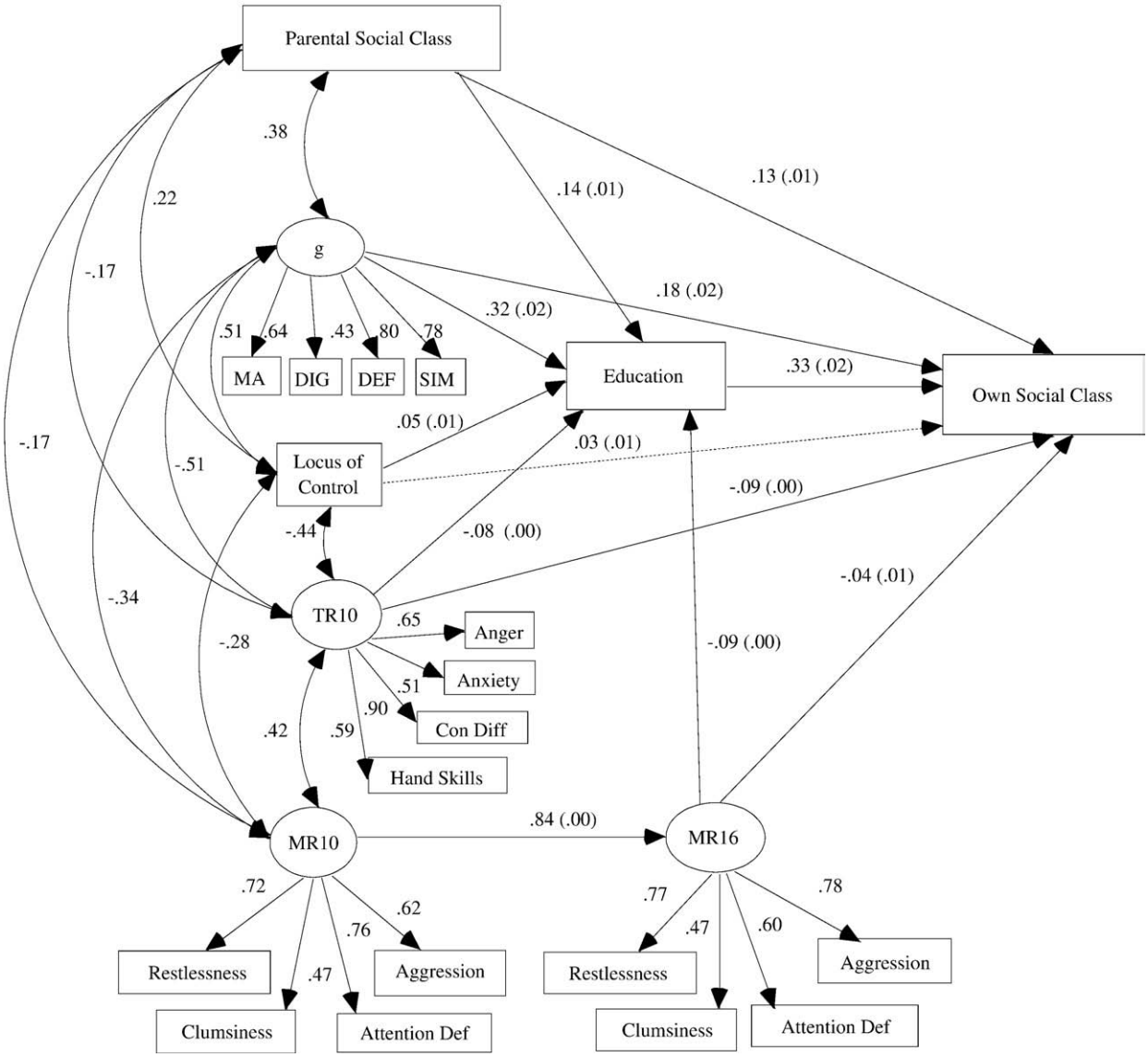

Fig. 3. Structural equation model with path coefficients, accounting for 33% of the total variance in own social class at the age of 30. *Note.* All variables have been coded in a fashion that higher scores refer to advanced social classes, higher levels of intelligence, and higher educational qualification. Dashed arrows indicate non-significant pathways ($p > .01$). Error terms are not shown to sustain graphical simplicity; note that error terms of composite scales from mother's ratings at ages 10 and 16 were allowed to correlate (not shown). In parentheses, Standard Errors of parameter coefficients are shown for pathways between predictor and outcome variables. Key: DEF = Word definition test score; SIM = Word similarities test score; MA = Matrices test score; DIG = Recall of digits test score; *g* = Latent trait of general intelligence; Con Diff = Concentration difficulties; Attention Def = Attention Deficit; TR10 = Latent trait of teacher ratings of childhood behaviour; MR10 = Latent trait of mother ratings at children's age 10; MR16 = Latent trait of mother ratings at children's age 16.

perspective, it is plausible that the exogenous variables are substantially related, whereby more intelligent children from more privileged backgrounds develop a greater sense of personal mastery and achievement control and less behavioural disturbances. Therefore, an alternative SEM was tested allowing for covariances of parental social class, TR10, MR10, locus of control and *g* to be freely estimated. This revised model had the following fit indices: χ^2 (137) = 2095.10; TLI = .904; NFI = .934; CFI = .938; RMSEA = .043 with a Confidence Interval of 90% ranging from .040 to .043, *p*-Value for Test of Close Fit = 1. This model accounted for 33% of the variance in own social status attainment and clearly showed a superior fit to the previous one. Thus, values of CFI, NFI and RMSEA indicated an adequate model fit, although TLI remained below recommended values. Additional model modifications were likely to enhance the model fit: both correlation (Table 4) and residual covariance matrix (see Appendix A) highlighted substantial associations amongst lower order factors of mother's ratings at ages 10 and 16 and lower order factors of teacher's ratings. However, these (and other) associations are not central to the proposed model of intergenerational social mobility. Therefore, no

further model re-specifications were undertaken. Fig. 3 shows that all paths were significant ($p<.01$; except for mother's ratings at age 16 to own social class attainment, $p<.05$) except the path coefficient of locus of control to own social status attainment ($p>.05$). Educational qualifications had a path weight of .33 on social status attainment, and general intelligence and parental social class had additional direct effects of .18 and .13, respectively. Finally, the behavioural measures of *g*, locus of control, TR10 and MR10 were intercorrelated with coefficients ranging in absolute size from .28 to .51. Parental social class was associated with other exogenous variables with absolute correlation values ranging from .17 for MR10 and TR10 to .38 for intelligence.

4. Discussion

The current study examined determinants of intergenerational social mobility in the BCS 1970. Confirming previous research (e. g. Breen & Goldthorpe, 2001; Deary et al., 2005; Nettle, 2003), parental social class, childhood intelligence, and educational qualifications were found to predict occupational social class attainment in adulthood. Locus of control and factors of childhood behaviour disturbance from mother and teacher ratings at the ages of 10 and 16 years affected own social status attainment, adding significantly to the variance accounted for. Self-esteem contributed independently to social mobility but its effect became trivial when other predictor variables were included.

Although they had large direct effects, the path weights of parental social class and intelligence to own social class attainment (.13 and .18, respectively; Fig. 3) were somewhat lower than expected with reference to previous research outcomes. For example, Deary et al. (2005) reported estimates of .43 for IQ at age 11 and of .22 for parental social class for paths to a latent trait of social class attainment at age 50. Such discrepancies in path coefficients are possibly due to the comparatively young age of the current sample. At the age of 30, careers are still in evolution and will be more firmly established by midlife (Breen & Goldthorpe, 2001; Deary et al., 2005; Jencks, 1979; Nettle, 2003; Strenze, 2007). In agreement with that, the total amount of variance accounted for by the current model is comparatively low (33%); however, the model is likely to gain explanatory power and accuracy as the examined cohort members grow older.

Educational qualifications were found to account for 10.9% of the total variance in social status attainment and partly mediated the effects of parental social class, intelligence, childhood disturbance and locus of control. In contrast to Deary et al.'s (2005) model, intelligence predicted educational attainments to a far greater extent than social class of origin. This finding reflects societal and historical changes, as a greater proportion of individuals born in 1970 benefited from more school and further education compared to people born in 1921, among whom the majority had completed education by the age of 14, and whose educational and career paths were disrupted by World War II (Breen & Goldthorpe, 2001; Deary et al., 2005).

In agreement with previous research (Breen & Goldthorpe, 2001; Deary et al., 2005; Nettle, 2003), parental social class and childhood intelligence were correlated at $r=.38$ (Fig. 3). This association is possibly due to a mixture of genetic contributions to mental ability and environmental provision (Blanden, Gregg, & Macmillan, 2007). However, these genetic and environmental influences cannot be separated in the present study.

4.1. Childhood behaviour

Previous research has demonstrated negative effects of childhood behavioural maladjustment on academic achievement and occupational success (Caspi, 2000; Caspi et al., 2005; Jackson, 2006). In the current study, mother ratings of childhood behavioural disturbance had highly stable individual differences over a time-span of six years: behaviour disturbance at age 10 accounted for 46.3% of the variance in childhood disturbance at 16 years (Fig. 2). Therefore, behavioural problems appear to be distinctive already at a very young age and to manifest throughout adolescence. Moreover, teacher ratings of childhood behaviour at age 10 were closely related to mother's observations suggesting a considerable inter-rater agreement.

Mother and teacher ratings of childhood behaviour significantly predicted own social class attainment, which were partially mediated by educational qualifications. That said, the combined direct and indirect effects of TR10 and MR16 on educational and own social status attainment were lower than those of parental social class and intelligence. Nevertheless, childhood behavioural disturbance contributes significant independent variance to intergenerational social mobility and, thus, constitutes a part of the multivariate picture of adult life development.

4.2. Self-esteem and locus of control

Previously, locus of control and self-esteem were found to be closely related and to predict academic and occupational achievement (Rosenberg & Pearlin, 1978; Wang et al., 1999). Indeed, self-esteem and locus of control were found to be highly correlated ($r=.46$) supporting the hypothesis that individuals with increased self-esteem are more likely to endorse an internal locus of control (Abdallah, 1989). However, self-esteem did not show a consistent and significant contribution to own social occupational attainment. Locus of control's—admittedly small—effect on own social status was completely mediated by educational qualifications.

Previous research on locus of control, self-esteem and social status attainment is somewhat inconsistent (Flouri, 2006). Goldsmith et al. (1997) found that high levels of self-esteem promote higher wages, whereas locus of control only had a mediating function. In contrast, Dunifon and Duncan (1998) and Feinstein (2000) verified locus of control as a significant determinant of earnings. Osborne Groves (2005) confirmed the effect of locus of control on labour market returns for women in the UK and US, but did not find significance for self-esteem. Generally, self-esteem has been suggested to be predictive of academic achievement (Dweck, 1999), personal aspirations (Schoon, 2001) and educational qualifications (Flouri, 2006). A possible explanation for the current null findings may lie within the administered self-esteem scale LAWSEQ (Lawrence, 1973, 1978). In LAWSEQ, 6 out of 10 items focus on children's social competency in school settings (for example, 'Do other children often break friends or fall out with you?', and 'Do you often have to find

new friends because your old friends are playing with somebody else?'). However, self-esteem is defined as a stable sense of personal worth including confidence, mastery, and independence (Maslow, 1943; Rosenberg, 1965) and thus, the employed scale may not assess all relevant components of the psychological construct 'self-esteem'.

Pearlin and Kohn (1966) suggested that middle class parents encourage children's self-direction, promoting an internal locus of control. This is in contrast to working class parents, who emphasise conformity to externally imposed conditions. However in the present model, locus of control was more closely related to TR10 and intelligence than to parental social class. This finding confirms previous research (e. g. Gale, Batty, & Deary, 2008) and questions whether locus of control was a by-product of social class origin.

The substantial overlap of locus of control, intelligence and TR10 may be partially due to the shared cognitive-based setting of assessment (i.e. in school under teacher's supervision). Alternatively, the three scales may tap into the same dimension of individual differences. Intelligence enables learning, knowledge attainment and understanding (e. g. Gottfredson, 2002), all of which facilitate pupils' school performance and academic achievement. Successful performance encourages a sense of personal competency and, thus, students are likely to attribute school achievements to their own ability and effort rather than external circumstances. In the CARALOC scale, 6 out of 11 items specifically refer to academic performance attesting that the measurement of locus of control in the BCS 1970 is closely linked to school experiences. An internal locus of control is likely to be conveyed in pupils' degree of self-discipline, perseverance and responsibility with regard to school work and studying attitudes. In turn, teacher ratings will reflect children's mental capacity as well as their willingness and effort to learn, which in sum will indicate pupils' adequate behavioural adjustment.

Albeit current explanations remain speculative prior to replication, the current results suggest that *g* does not only reflect individual differences in mental ability but also in behavioural adjustment and working attitudes. Moreover, parental social class was related to *g*, locus of control and childhood behaviours. Thus, social mobility seems to be subject to a highly inter-connected complex of psychological variables, which plausibly share joint roots. That said, the observed overlaps are likely to be due to genetic as well as environmental influences; future research will need to disentangle the latter.

4.3. Strengths and limitations

This study benefits from a large, longitudinal and nationally representative sample, drawn from the BCS 1970. The greatest strengths of the current investigation are multifaceted and comprehensive assessments of individuals from age 10 to age 30, including the thorough examination of childhood behaviour scales in the BCS 1970. The current study has also several limitations.

First, members of the more manual occupational classes were found to be slightly underrepresented in the give sample population, which potentially biases results. Second, occupational social class attainment was assessed at the comparatively young age of 30 years, which inevitably limits possibilities of intergenerational social mobility. Many cohort members would not, by then, have chosen a final career. Third, social mobility was measured in terms of discrepancies between the parental occupational social class at cohort members' age of 10 and their social status at the age of 30 on the OPCS Registrar General's Classification of Occupations (OPCS, 1970, 1980). This conceptualisation may be less comprehensive than measures employed elsewhere including latent traits with several indicator variables like income levels, housing conditions, car driving, and deprivation (e. g. Deary et al., 2005; Goldsmith et al., 1997). Finally, the findings of the current investigation only apply to men, as women were excluded from all analyses.

4.4. Conclusions

In conclusion, the present study confirms strong effects of parental social class, intelligence and educational qualifications on intergenerational social mobility. Educational qualifications accounted for the greatest amount of variance in the outcome variable mediating the effects of the predictors to some extent. Childhood intelligence was the best predictor of educational attainment and also had a substantial direct effect on own social status attainment. Childhood behaviours observed by teachers and mothers at children's age of 10 and 16 affected independently educational and occupational status attainment. In contrast, the effects of locus of control on own social status attainment were fully mediated by educational qualifications, and strongly confounded by general cognitive ability. The findings highlight: a) the significance of vocational and academic training for intergenerational social mobility; b) the effects of mental ability *and* behavioural constructs on social status attainment in adulthood; and c) the continuous persistence predefining effects of parental social class origin. Finally, *g*, locus of control and childhood behaviour shared a substantial amount of variance suggesting that high mental ability is associated with social well-adjustment and a sense of self-determination.

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Appendix A. Standardized residual covariance matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Parental class	.00																			
2. Locus	.00	.00																		
3. Education	.00	.00	.00																	
4. Attention def (MR16)	.06	−.34	−.11	.03																
5. Own social class	.00	.00	.00	−.07	.00															
6. Aggression (TR10)	5.67	37.45	3.43	16.56	7.48	.00														
7. Hand skills(TR10)	2.00	13.86	4.92	1.38	4.69	463.79	.00													
8. Con diff (TR10)	−1.54	−11.71	−2.74	18.19	−3.77	−15.34	−122.77	.00												
9. Anxiety (TR10)	−.22	2.86	2.32	1.09	3.25	−141.27	307.03	−16.52	.00											
10. Restlessness (MR10)	.13	.81	.16	−.06	.13	13.94	−8.64	−14.57	−5.37	−.01										
11. Clumsiness (MR10)	.13	.32	.08	.04	.08	8.59	4.96	−1.99	1.45	.06	−.02									
12. Aggression (MR10)	−.01	−.08	.01	−.04	−.02	2.47	−4.71	−2.34	−2.59	.16	−.10	.00								
13. Restlessness (MR16)	−3.37	25.96	2.23	2.98	4.77	475.65	−458.99	−872.96	−329.76	−4.08	−.98	2.06	−94.22							
14. Clumsiness (MR16)	1.08	7.03	1.05	.31	2.12	−267.20	61.63	−479.09	−78.21	−2.60	−1.27	−.36	−210.39	−6.59						
15. Aggression (MR16)	−3.62	−8.31	−1.90	−1.99	−1.61	353.91	−183.01	−138.30	−238.25	−.18	.38	−.41	17.17	255.48	9.38					
16. Attention def (MR16)	−2.39	−22.10	−2.11	3.42	−4.81	622.61	177.10	820.68	−86.59	.16	.50	−1.74	304.11	−53.81	−238.89	71.30				
17. MA (*g*)	−.11	.14	.26	−1.28	.21	−30.18	−13.72	−61.36	−6.41	−.01	.20	−.19	−8.71	4.42	−19.90	−36.42	.00			
18. SIM (*g*)	.01	−.29	−.04	−.13	−.04	30.18	17.19	7.23	7.76	.40	.25	.07	16.22	2.32	−4.94	−2.29	−.19	.00		
19. DEF (*g*)	.08	.01	−.03	−.27	−.02	43.96	28.70	−4.35	10.83	.74	.59	.02	43.99	11.62	−6.03	−7.98	−.82	.45	.00	
20. DIG (*g*)	−.16	1.26	−.09	−.53	−.06	3.10	2.73	−37.38	−7.97	.20	.15	−.23	16.69	4.99	−14.13	−24.01	.44	−.17	−.51	.00

Note. Values above +/−2.58 indicate model misspecification. The residual covariance matrix is not supplied when using FIML estimation with missing data in AMOS. The matrix above results from an analysis including a sub-sample of men with complete data on all variables ($N = 1319$). Model fit indices were as follows: χ^2 (141) = 783.25; NFI = 849; TLI = .879; CFI = .911; RMSEA = .059. Where applicable, latent traits extracted from set of observed variables are shown in parentheses. Key: DEF = Word definition test score; SIM = Word similarities test score; MA = Matrices test score; DIG = Recall of digits test score; *g* = Latent trait of general intelligence; Con Diff = Concentration difficulties; Attention Def = Attention Deficit; Locus = Locus of control; TR10 = Latent trait of teacher ratings of childhood behaviour; MR10 = Latent trait of mother ratings at children's age 10; MR16 = Latent trait of mother ratings at children's age 16.

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