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The relationship between parenting dimensions and adult achievement: Evidence from the Whitehall II study.

Running head: Parenting and adult achievement

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## **Abstract**

This paper examines the association between three dimensions of perceived parenting – warmth, strictness, and expectation – and adult cognitive and socioeconomic achievement outcomes. Structural equation models (N=7035) were used to examine simultaneously the influence parenting on adult achievement while controlling for the influence of parental socioeconomic circumstances. Very low and very high level of parental warmth was associated with poor adult achievement. Strictness had a negative and parental expectation a positive relationship with adult achievement. These associations were independent of parental socioeconomic circumstances. Own education was found to mediate 27-56% of the relationship between parenting dimensions and adult achievement. Parental expectation was most strongly related to adult achievement. We conclude that parenting plays a significant role in the development of adult achievement, both cognitive ability and socioeconomic achievement. Moderate levels of warmth, low levels of strictness and high parental expectation are associated with high adult achievement.

**Keywords:** parenting, cognition, attachment, warmth, strictness, expectation

## **Introduction**

The association between childhood circumstances and adult achievement is likely to be multifaceted, with both socioeconomic circumstances in childhood and parenting practices considered to be important influences (Guo & Harris, 2000; Kaplan, Turrell, Lynch, Everson, Helkala, & Salonen, 2001). The quality of parenting has itself been found to be associated with socioeconomic circumstances of the parents, be it educational characteristics, income or occupational achievement, both in theoretical and empirical analysis (DeGarmo, Forgatch, & Martinez, 1999; Kohn & Schooler, 1983; Patterson, 1982). Adverse socioeconomic circumstances in childhood are related to adverse educational, social and emotional outcomes for children (Douglas, 1964; Repetti, Taylor & Seeman, 2002; Rutter, 1985; White, 1982). Parental socioeconomic circumstances can be seen to be a distal parameter linked to proximal family processes such as parenting in the development of cognitive ability in children (DeGarmo et al., 1999). The critical research question is whether parenting is linked to adult achievement after controlling for the effects of parental socioeconomic circumstances.

There has been some interest in examining the links between childhood socioeconomic circumstances and adult cognition (Kaplan et al., 2001) but there is as yet little work on the links between parenting and adult achievement. Retrospective accounts of parenting have been linked to development of personality, affective disorders, substance abuse, and psychopathology among adults (Parker, Tupling, & Brown, 1979; Parker, Barrett, Hickie, 1992; Perris, Arrindell, Perris, Eiseman, Van der Ende, & Von Knorring, 1986; Perris, Arrindell, & Eisenmann, 1994; Reiss et al., 1995; Rodgers 1996a; 1996b). These studies assessed parenting using retrospective accounts of levels of 'care' (emotional warmth) and 'control' (overprotection), and found that the experience of lack of emotional warmth and excessive control to be important predictors of negative adult outcomes. A recent study found parenting characterized by harsh discipline to be detrimental to intellectual development in

children (Guo & Harris, 2000). The importance of emotional warmth and overprotection to *adult* achievement remains unknown.

Another aspect of parenting that has been seen to be important by the classic studies on social class and underachievement among children is parental interest/expectation (Douglas, 1964; Fraser, 1959; CACE, 1967). Parental expectation is seen to influence socialization behaviors, parent-child interaction patterns, and the value placed on achievement. The evidence linking expectation to achievement in children and adolescents appears fairly robust (Hellenga, Aber, & Rhodes, 2000; Hill, 2001; Kuklinski & Weinstein, 2001; Patrikakou, 1996), but it is unclear if this effect persists into adulthood.

Emotional warmth/care, overprotection/strictness, and parental interest/expectation are three widely assessed measures of parenting. The first two have been found to have an impact on mental health in adults (Parker et al., 1979; Perris et al., 1986; 1994; Reiss et al., 1995; Rodgers 1996a; 1996b), and strictness and parental expectation has been linked to achievement in children and adolescents. In this study we examine the importance of retrospective accounts of parenting to adult achievement, with a further focus on whether this relationship is statistically independent of parental socioeconomic circumstances.

Three further features of this study need to be highlighted. First, we examine the role played by parental socioeconomic position (SEP), multiple measures were used as different indicators of parental SEP are not interchangeable in terms of their relationship to cognitive development (White, 1982). Mother's education (Bacharach & Baumeister, 1998; Kaplan et al., 2001; Mercy & Steelman, 1982; Scarr & Weinberg, 1978), father's occupation (Kaplan et al., 2001), father's education (Scarr & Weinberg, 1978) and economic hardship (Brody, Flor & Gibson, 1999) play a unique role in the development of cognitive ability. Second, the hypothesis that the relationship between parental SEP and adult cognition is mediated to some extent via the education pathway (Hill & Standfort, 1995; Kaplan et al., 2001) is tested in our

analyses. Finally, in order to assess robustness of association we define adult achievement in two ways: first assessed via standard measures of cognitive function and then as socioeconomic achievement composed of measures of income and occupational position.

To summarize, we investigate the relationship between three measures of perceived parenting and adult achievement, measured as adult cognitive ability and adult socioeconomic position. Two questions are addressed in this paper.

1) What are the long term effects of perceived parenting style on adult achievement? Which of the parenting variables examined (warmth, strictness and expectation) is critical to adult achievement? Does education play a mediating role?

2) Is this relationship independent of parental socioeconomic circumstances?

## **Materials and Methods**

### Participants: The Whitehall II Study

The Whitehall II study was established in 1985 as a longitudinal study to examine the socioeconomic gradient in health and disease among 10,308 civil servants (6,895 men and 3,413 women) (Marmot et al., 1991). All civil servants aged 35-55 years in 20 London based departments were invited to participate by letter. In total, 73 % of those invited agreed to take part in Phase 1. Baseline examination (Phase 1) took place during 1985-1988, and involved a clinical examination and a self-administered questionnaire containing sections on demographic characteristics, health, lifestyle factors, work characteristics, social support and life events. Clinical examination included measures of blood pressure, anthropometry, biochemical measurements, neuroendocrine function, and subclinical markers of cardiovascular disease. Subsequent phases of data collection have alternated between postal questionnaire alone and postal questionnaire accompanied by a clinical examination. Since baseline five phases of data collection rounds have been completed, with the most recent phase of data collection (Phase 6) completed in 2001. Data on measures of parenting, both

measures of adult achievement and education were collected at Phase 5 (1997-1999), mean age of respondents at phase 5 was 55.96 years (SD = 6.04).

Measures: All measures are taken from Phase 5 of the study (1997-1999).

Parental socioeconomic position (SEP): Four indicators variables were used to measure parental SEP. These were: Mother's education, assessed through the question – “How old was your mother when she finished full-time education?” Father's education, assessed through the question – “How old was your father when he finished full-time education?” Father's social class, assessed through Registrar General's Social Class classification, recoded on a 6 point scale, 1 denoting low and 6 denoting high social class. In order to assess financial difficulties in childhood respondents were asked to recall conditions in the house before they were 16 years of age. A four item scale was used: father/mother unemployed when they wanted to be working, family had continuing financial problems, family did not have an inside toilet, and family did not have a car. Participants responded on a yes/no scale and the “no” responses were summed so that a high score indicated a lack of financial problems in childhood. High scores on the latent construct of parental SEP indicates better socioeconomic circumstances in childhood.

Perceived parenting: The Whitehall II questionnaire on perceived parenting is composed of 7 items for each parent (see appendix 1). Three constructs, reflecting research in this domain, were assessed: warmth, (4 items for each parent, Cronbach's alpha = .89, Range = 1-32, M = 21.17, SD = 5.64), strictness (2 items for each parent, Cronbach's alpha = .70, Range = 1-16, M = 8.99, SD = 2.64), and parental expectation (1 item for each parent, Cronbach's alpha = .73 Range = 1-8, M = 5.66, SD = 1.63). Responses are based on a four point scale, the higher the score the higher the parental warmth, strictness and expectation.

Mediators

Education was measured as the highest level of education achieved, with the respondent choosing one of 11 categories in the questionnaire. This was regrouped into five standard hierarchic levels: (1) no formal education, (2) lower secondary education, (3) higher secondary education, (4) university degree, (5) higher university degree.

#### Outcome variables

Adult achievement was assessed using two latent constructs: adult cognitive function and adult socioeconomic position (SEP).

Cognitive function was assessed via the AH4 and Mill Hill. The AH 4-I (Heim, 1970) is composed of a series of 65 items – 32 verbal and 33 mathematical reasoning items of increasing difficulty. This is a test of inductive reasoning that measures the ability to identify patterns and infer principles and rules. Participants had 10 minutes to complete this section (Maximum possible score = 65, M = 46.45, SD = 11.32). The Mill Hill Vocabulary test (Raven, 1965) assesses knowledge of verbal meaning and encompasses the ability to recognize and comprehend words. We used the test in its multiple format, which consists of a list of 33 stimulus words ordered by increasing difficulty, and six response choices per word (Maximum possible score = 33, M = 23.86, SD = 5.26).

Adult SEP was assessed via occupational position and income. Occupational position in this cohort is measured using the civil service employment grade. All jobs in the civil service have a grade of employment. Employment grade ranges from grade 1 to grade 6, people in different grades differ with respect to salary, social status and level of responsibility. On January 1, 1987 salaries ranged from £62,100 for grade 1 to £3,061 for grade 6. For analyses presented in this paper employment grade 6 represents high grade and 1 represents low grade. Income was assessed via a question that asked respondents to pick a category that corresponded most closely with their annual personal income (“amount received annually from salary or wages, or pensions, benefits and allowances before deduction of tax”). There



were 8 categories, ranging from “less than £9,999” to “more than £70,000”. For the purposes of analysis the two highest and the two lowest personal income categories were collapsed to leave 6 categories. These categories are as follows, 6 =  $\geq$  £50,000; 5 = £35,000 - £49,999; 4 = £25,000 - £34,999; 3 = £20,000 - £24,999; 2 = £15,000 - £19,999; and 1 =  $\leq$  £14,999.

### Statistical analysis

Exploratory analyses revealed warmth to have a quadratic relationship with all outcome variables in the analysis (see Figure 1). As introduction of a quadratic term to the model would have made the interpretation of the effects unwieldy, we decided to undertake analysis in a piecemeal fashion. The sample was divided into two equal groups using the warmth variable to split the sample. Participants in group 1 reported receiving low to moderate warmth from their parents and group 2 reported moderate to high warmth. Subsequent analyses were carried out on these two groups separately. Initial data exploration was carried out using SPSS 10.

The next step in the statistical analysis was intended to meet three goals: to examine the interrelationships between variables in an integrated manner, to quantify the effects of perceived parenting on adult achievement outcomes and to assess both direct and indirect effects. We used structural equation modeling (SEM) to achieve both these objectives. As stated earlier, SEM was used as it allows estimation of several regression estimates simultaneously. Figures 2 and 3, Models I and II respectively, depict the models used. All observed variables are enclosed in boxes, and unobserved variables in ellipses. The unobserved variables are latent constructs and error terms. Error terms are associated with all endogenous variables and represent measurement error along with effects of variables not measured in the study. Model I shown in Figure 2 allows the estimation of direct and indirect effects of parenting on adult cognition, assessed through the Mill Hill and AH-4. Paths a, b, and c assess the direct effect of warmth, strictness and parental expectation on adult cognition.

Path d represents the effect of education on adult cognition, adjusted for parenting measures included in the model. Paths a\*d, b\*d, and c\*d assess the indirect effect (mediated through education) of warmth, strictness and parental expectation on adult cognition.

Model II adds parental socioeconomic position (SEP) to Model I to examine the parental SEP adjusted effects of parenting on adult cognition. Parental SEP has been modeled as a latent construct composed of mother's and father's education, father's occupational position and a measure of economic status. Paths a, b, and c in Model II represent the effects of parenting on cognition adjusted for parental SEP. Path d represents the effect of education on adult cognition adjusted for parental SEP and parenting variables. Path e represents the direct effect of parental SEP on adult cognition; the indirect effects are mediated through education and the parenting variables. In both Model I and II the measures of perceived parenting were allowed to correlate and these relationships are denoted by x, y, and z.

The analysis was carried out using AMOS version 4.01 (Arbuckle & Wothke, 1995). Model fit was assessed using multiple criteria as the  $\chi^2$  statistic is overly sensitive to model misspecification when the sample sizes are large (Kline, 1998). We used root mean square error of approximation (RMSEA) and comparative fit index (CFI) to assess model fit. An RMSEA value close to zero and a CFI value close to 1 indicates a good fitting model (Mueller, 1996). The AMOS program allows maximum likelihood estimation based on incomplete data, known as full-information maximum likelihood (FIML). This approach is based on the direct maximization of the likelihood of all observed data, not just from cases with complete data. FIML is preferable to estimation based on complete data (the listwise deletion approach) as FIML estimates will show less bias and be more reliable than the listwise deletion approach even when data deviate from missing at random and are non-ignorable (Arbuckle, 1996). The results were checked using asymptotically distribution free

methods (as some of the data are not normally distributed) and similar results to FIML were found.

## **Results**

The Whitehall II study was composed of 10,308 individuals at baseline (Phase 1, 1985-1988). A total of 355 participants died between Phases 1 and 5 (mean follow-up of 11 years) and 7035 participants were included for analysis in this paper. Missing data were more common among those occupying low employment grade ( $p < 0.02$ ) and older individuals ( $p < 0.001$ ).

Descriptive analysis related to the two 'warmth' groups is presented in Table 1. The proportion of men and women in the two groups is similar and there are no age differences between them. Individuals in group 2, the moderate to high 'warmth' group, report greater strictness and expectation from their parents. Table 2 presents the correlations between all the variables under consideration. Differences in correlations in the two 'warmth' groups were tested using Fisher's  $r$ -to- $z$  transformation (2-tailed). As is clear from Table 2 the main differences between the two 'warmth' groups relates to the way warmth and strictness correlate with some of the indicators of parental SEP and all the measures of adult achievement. Group 1 (low to moderate warmth) respondents show a significantly stronger relationship between warmth and adult achievement, further evidence of this relationship evident in Figure 1. In group 2, perception of high warmth from parents was associated with poor adult achievement. The strongest evidence for social patterning among the parenting variables is evident in the relationship between all indicators of parental SEP and parental expectation. In both 'warmth' groups high parental SEP is associated with greater parental expectation. The two 'warmth' groups differ in the way in which economic status is related to the parenting variables. In 'warmth' group 1, higher economic status was associated with

significantly more warmth ( $r = .19$ ), more strictness ( $r = .07$ ), and greater parental expectation ( $r = .15$ ) as compared to ‘warmth’ group 2.

The next step consisted of testing the linkages between perceived parenting and adult achievement. Two models were specified to test these relationships. Model II (Figure 3) includes parental SEP in addition to the basic model (Model I, Figure 2) examining the link between perceived parenting and adult achievement. Two sets of analyses were run, first with adult achievement measured by adult cognition (Table 3) and second with adult SEP representing adult achievement (Table 4). All effects in Table 3 and 4 are reported using standardized regression coefficients, also known as “betas”. These coefficients are calculated from standardized data and reflect the impact on the outcome variable of a change of 1 standard deviation in the predictor variables. The advantage of the standardized regression coefficient is that allows assessment of the relative importance of predictor variables to be made across different models and measures of adult achievement.

Table 3 shows the results obtained with adult cognitive function as an outcome. The direct effects for the parenting variables represent their independent effects on adult cognition; the indirect effects represent their effects on cognition mediated through education. All three parenting variables were associated with adult cognition. Results from Model I show that out of the three parenting variables it is expectation that is most strongly related to adult cognition in both ‘warmth’ groups and the size of the effect is similar. An increase in 1 standard deviation in parental expectation is associated with an increase in .29 and .28 standard deviation in adult cognition in groups 1 and 2 respectively. Strictness is associated with poorer cognition in both ‘warmth’ groups, the effect being slightly stronger in ‘warmth’ group 2. Increase in warmth is associated with higher cognitive ability only in group 1, excessive warmth from parents (group 2) is associated with poorer cognition. As expected, education mediates a fair proportion of the relationship between parenting variables and adult

cognitive ability. Parental expectation (groups 1 and 2,  $\beta = .26$ ,  $p < .001$ ) and strictness (groups 1,  $\beta = -.16$ ,  $p < .001$ ; group 2,  $\beta = -.15$ ,  $p < .001$ ) are associated with education in a similar way in both groups. Warmth is positively related to education in group 1 ( $\beta = .09$ ,  $p < .001$ ) and negatively in group 2 ( $\beta = -.09$ ,  $p < .001$ ).

The results associated with Model II in Table 3 represent the addition of parental SEP to the model (Figure 3). Parental SEP is positively associated with education ( $\beta = .40$ ,  $p < .001$ ), warmth ( $\beta = .15$ ,  $p < .001$ ), strictness ( $\beta = .05$ ,  $p < .001$ ), and expectation ( $\beta = .23$ ,  $p < .001$ ) in group 1 (low to moderate warmth); and only with education ( $\beta = .38$ ,  $p < .001$ ) and expectation ( $\beta = .20$ ,  $p < .001$ ) in group 2 (moderate to high warmth). Parental SEP has a direct effect on adult cognition in group 1 ( $\beta = .11$ ,  $p < .001$ ) and not in group 2 ( $\beta = .00$ ,  $ns$ ). Controlling for parental social class in Model II does not greatly alter the effects of parenting variables on adult cognition.

Table 4 shows a repeat of the analysis on different measures of adult achievement. Results show that the relationships between parenting variables and adult SEP are similar to that with adult cognition. The effect sizes of the associations of the parenting variables are similar for both sets of adult achievement variables. Education plays an equally important mediating role in both types of measures of adult achievement. The adjustment for parental SEP attenuates the relationships in Model I only to a small extent. For both adult achievement outcomes, parental SEP has a direct effect on adult achievement only in the low to moderate ‘warmth’ group, making its total effect more important in these groups.

## **Discussion**

The objective of this study was to evaluate the role of parenting dimensions on adult achievement while controlling for distal influences of parental social class; and examining the moderating role of own educational attainment. Initial data exploration showed parental warmth to have a negative quadratic relationship with adult achievement, leading us to split

analysis groups in order to better capture the quantitative relationship between our variables. In our data, perception of emotional warmth from parents is not related to adult achievement in the way it is to mental health as warmth from parents has consistently been found to be associated linearly with good mental health (Parker et al., 1979; Perris et al., 1994; Reiss et al., 1995; Rodgers 1996a; 1996b). Current theoretical perspectives on parenting allow three different interpretations of these results:

One, the results reported here support Rutter's hypothesis (1985) on different aspects of the environmental influences being important for different outcomes. He views optimal cognitive development as dependent on parental responsiveness and reciprocal parent-child interactions, characterized by an 'authoritative-reciprocal' parenting pattern. It is possible that excessive parental warmth is incompatible with parenting styles most conducive to optimal cognitive development.

Two, attachment theory and research offer a theoretical framework for the study of relationships between childhood circumstances and adult outcomes (Enns, Cox, & Larsen, 2000; Main, Kaplan, & Cassidy, 1985; McCarthy, 1999; Murphy, Brewin, & Silka, 1997). The central premise here is that secure attachment to the primary caregiver predicts good adult functioning. Individuals with secure attachment histories tend to describe their childhood in balanced ways while those with insecure histories tend to describe it either as unloving, cold and neglecting experiences or experiences that are improbably positive (Main & Hesse, 2001; Shedler, Mayman, & Manis, 1993). It is possible that in the present study, some respondents who reported extremely warm parenting show similar distortions in their recollection of their experiences with their parents.

Finally, it is possible that the results here are an artifact of outcome-dependent misclassification of exposure (recall bias). It is possible that those, whose adult achievements that are somewhat limited can sometimes be more inclined to remember childhood in a

particularly favorable light, perhaps as a way of compensating for their current dissatisfaction, in that poor adult achievement might be compensated for by memories of too warm a childhood. Further research on this question on other data is required to assess the importance of recall bias on the association between “warmth” and adult outcomes.

Our data do not allow us choose one interpretation over the others. However, the results clearly found all three parenting variables to be significantly related to both adult cognition and adult SEP. Warmth had a positive relationship with achievement in the low to moderate achievement group and a negative relationship in the moderate to high ‘warmth’ group. This effect was evident for both types of outcomes, leading to the conclusion that excessive warmth from parents is not conducive to high adult achievement. Strictness (Guo & Harris, 2000) and high parental expectation (Douglas, 1964; Fraser, 1959; CACE, 1967) are associated with adult achievement in a similar way as they are to intellectual development in children; the former has a detrimental effect and the latter a beneficial effect. Of the three dimensions of parenting included in this study, it is parental expectation that is most strongly related to adult achievement outcomes. The parenting dimensions were related to adult achievement outcomes even after adjustment for parental SEP, demonstrating the importance of parenting to adult achievement irrespective of the socioeconomic context.

The mechanisms by which parenting influences adult achievement outcomes requires further investigation. Good parenting is seen to be beneficial because it provides social support (Wolfradt, Hempel, & Miles, 2003), influence skill-building activities in the home, adaptive behaviors, and educational achievements (Belsky & Fearon 2002; Hill & Standfort, 1995; Kaplan et al., 2001). Rutter (1985) suggests that environmental influences on cognition in children work directly through “acquisition of knowledge and skills” and indirectly via characteristics such as “children’s concept of themselves, their aspirations and attitudes to learning, their self-esteem, their commitments to education and their styles of interaction with

parents, teachers, and others in the environment.” Persistence of the effects of parenting on achievement in adulthood can be hypothesized to be related to the acquisition of skills, attitudes and habits influencing the manner in which the individual responds to challenges and opportunities in new environments. The results reported here are robust, in that similar conclusions on parenting can be drawn from quite different ways of looking at adult achievement.

Modeling parental socioeconomic circumstances in our study vindicates the ecological perspective that views the larger social system as playing an important distal role in influencing parenting practices (Brody et al., 1999; Brofenbrenner, 1979), as parental socioeconomic circumstances were indeed related to parenting dimensions. As reported in another study (Kaplan et al., 2001) poor childhood socioeconomic circumstances in our study were associated with poor cognitive ability in adulthood. The educational achievement of individuals was strongly related to their parental SEP. In fact, education mediated between 27 and 56 % of the association between parenting practices and adult achievement. The results certainly support the view that "education" is a mechanism through which childhood circumstances affect adult achievement (Hill & Standfort, 1995). In our analysis education is related to parental socioeconomic circumstances, parenting and adult achievement.

#### Limitations of the study

There are some caveats to the conclusions drawn in this study. First, parenting practices are not the only pathway through which childhood socioeconomic circumstances influence adult achievement. A recent paper proposes 4 other pathways: physical environment at home (a safe, high quality living environment is conducive to learning), level of cognitive stimulation in the home, child's health status (poor health is detrimental to cognitive development), and childcare (amount and quality of non-maternal care) (Guo & Harris, 2000). Second, parenting dimensions have been assessed using self-report retrospective accounts,



making them susceptible to various biases. However, self reports have been found to correlate closely with other independent methods of evaluation of parenting (Parker, 1984). Third, the only mediator of parenting of adult achievement specified in our model was education. Personality dispositions (Haughen & Lund, 1999) and mental health measures (Reiss et al., 1995) are other possible mediators. Finally, a word of caution is in order given the attributes of our sample. As Whitehall II is an occupational cohort it is less likely to include those who experienced severe adversity or trauma in early relationships and did not achieve steady employment. However, our results do show that parenting plays a significant role in the development of achievement outcomes in adults among non-poor populations as well.

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Table 1. Characteristics of the ‘warmth’ groups.

‘warmth’ groups				
		Group 1	Group2	Comparing ‘warmth’ groups 1 & 2
		Low to moderate warmth	Moderate to high warmth	
N		3490 (49.6%)	3545 (50.4%)	
Male % / Female %		67.3% / 32.7%	66.6% / 33.4%	$\chi^2 = 0.36, p = 0.56$
Age	M (S.D.)	55.74 (5.95)	55.99 (6.13)	$t = -1.71, p = 0.09$
Warmth	M (S.D.)	16.59 (3.78)	25.68 (2.84)	$t = -114.22, p = 0.0001$
Strictness	M (S.D.)	8.77 (2.90)	9.20 (2.34)	$t = -6.92, p = 0.0001$
Expectation	M (S.D.)	5.19 (1.74)	6.13 (1.37)	$t = -25.18, p = 0.0001$



Table 2. Correlation matrix for relationship between parenting and achievement variables in the two ‘warmth’ groups.†

Predictors	†	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>	X <sub>9</sub>	X <sub>10</sub>	X <sub>11</sub>	X <sub>12</sub>
X <sub>1</sub> Warmth	1	1											
	2	1											
X <sub>2</sub> Strictness	1	.28*‡	1										
	2	-.04*	1										
X <sub>3</sub> Expectation	1	.42*‡	.54*‡	1									
	2	.11*	.30*	1									
X <sub>4</sub> Mother’s education	1	.04	.00	.08*‡	1								
	2	.02	.04	.16*	1								
X <sub>5</sub> Father’s education	1	.01	.00	.09*	.36*‡	1							
	2	.02	.00	.12*	.46*	1							
X <sub>6</sub> Father’s class	1	.07*‡	.02	.13*	.18*	.33*	1						
	2	.01	.01	.14*	.19*	.33*	1						
X <sub>7</sub> Financial difficulties	1	.19*‡	.07*‡	.15*‡	.16*	.21*	.26*	1					
	2	.02	.00	.05*	.21*	.25*	.27*	1					
X <sub>8</sub> Education	1	.15*‡	.00 ‡	.20*	.19*	.23*	.23*	.21*	1				
	2	-.05*	-.07*	.20*	.23*	.28*	.21*	.17*	1				
X <sub>9</sub> Occupation	1	.17*‡	.00 ‡	.22*	.13*	.09*	.21*	.18*‡	.54*	1			
	2	-.09*	-.06*	.22*	.18*	.11*	.15*	.14*	.52*	1			
X <sub>10</sub> Income	1	.16*‡	.04*‡	.16*‡	.13*	.10*	.16*	.19*	.44*	.63*‡	1		
	2	-.09*	-.04*	.12*	.17*	.15*	.13*	.19*	.46*	.68*	1		
X <sub>11</sub> AH 4	1	.17*‡	.04*‡	.21*	.18*	.06*	.17*	.20*‡	.44*	.58*	.46*	1	
	2	-.09*	-.06*	.16*	.15*	.08*	.12*	.14*	.42*	.60*	.49*	1	
X <sub>12</sub> Mill Hill	1	.14*‡	.00 ‡	.19*	.22*‡	.10*	.19*‡	.15*	.44*	.54*‡	.34*‡	.66*	1
	2	-.09*	-.11*	.15*	.15*	.05*	.11*	.12*	.41*	.59*	.39*	.67*	1

† 1 and 2 denote ‘warmth’ groups 1 (low to moderate ‘warmth’) and 2 (moderate to high ‘warmth’).

\* Correlation significant at the .001 level

‡ Correlations in the two ‘warmth’ groups significantly different at p<.05.

Table 3. Effect (standardized regression coefficient)<sup>a</sup> of parenting on cognitive function assessed via AH-4 and Mill Hill.

		<b>Model I</b>		<b>Model II</b> (Model I + parental SEP)	
		‘warmth’ <b>group 1</b>	‘warmth’ <b>group 2</b>	‘warmth’ <b>group 1</b>	‘warmth’ <b>group 2</b>
		β (% of total effect) <sup>†</sup>	β (% of total effect) <sup>†</sup>	β (% of total effect) <sup>†</sup>	β (% of total effect) <sup>†</sup>
warmth	direct	.07 (58.3%)	-.11 (73.3%)	.07 (70.0%)	-.11 (73.3%)
	indirect	.05 (41.7%)	-.04 (26.7%)	.03 (30.0%)	-.04 (26.7%)
	total	.12	-.15	.10	-.15
strictness	direct	-.07 (43.8%)	-.12 (60.0%)	-.07 (53.8%)	-.12 (63.2%)
	indirect	-.09 (56.2%)	-.08 (40.0%)	-.06 (46.2%)	-.07 (36.8%)
	total	-.16	-.20	-.13	-.19
expectation	direct	.15 (51.7%)	.15 (53.6%)	.13 (61.9%)	.15 (62.5%)
	indirect	.14 (48.3%)	.13 (46.4%)	.08 (38.1%)	.09 (37.5%)
	total	.29	.28	.21	.24
parental SEP	direct	NA	NA	.11 (30.6%)	.00 (00.0%)
	indirect	NA	NA	.25 (69.4%)	.23 (100.0%)
	total	NA	NA	.36	.23
<b>Correlations</b>					
warmth & strictness		.28	-.04	.28	-.04
warmth & expectation		.43	.11	.41	.11
strictness & expectation		.54	.30	.55	.30
<b>Model Fit</b>					
Chi-square (df)		17.09 (6)		413.41 (51)	
RMSEA (95% CI)		.016 (.007 - .026)		.033 (.030 - .036)	
CFI		1		0.998	

<sup>a</sup> All non-zero regression coefficients are significant at  $p < .001$ .

<sup>†</sup> % of total effect that is direct and indirect.

Table 4. Effect (standardized regression coefficient)<sup>a</sup> of parenting on adult SEP assessed via occupational position and income.

		<b>Model I</b>		<b>Model II</b> (Model I + parental SEP)	
		'warmth' <b>group 1</b>	'warmth' <b>group 2</b>	'warmth' <b>group 1</b>	'warmth' <b>group 2</b>
		$\beta$ (% of total effect) <sup>†</sup>	$\beta$ (% of total effect) <sup>†</sup>	$\beta$ (% of total effect) <sup>†</sup>	$\beta$ (% of total effect) <sup>†</sup>
<b>warmth</b>	direct	.08 (61.5%)	-.10 (66.7%)	.07 (70.0%)	-.10 (66.7%)
	indirect	.05 (38.5%)	-.05 (33.3%)	.03 (30.0%)	-.05 (33.3%)
	total	.13	-.15	.10	-.15
<b>strictness</b>	direct	-.07 (43.8%)	-.07 (43.8%)	-.07 (50.0%)	-.07 (46.7%)
	indirect	-.09 (56.2%)	-.09 (56.2%)	-.07 (50.0%)	-.08 (53.3%)
	total	-.16	-.16	-.14	-.15
<b>expectation</b>	direct	.13 (46.4%)	.14 (48.3%)	.12 (60.0%)	.14 (58.3%)
	indirect	.15 (53.6%)	.15 (56.2%)	.08 (40.0%)	.10 (41.7%)
	total	.28	.29	.20	.24
<b>parental SEP</b>	direct	NA	NA	.09 (25.0%)	.00 (00.0%)
	indirect	NA	NA	.27 (75.0%)	.26 (100.0%)
	total	NA	NA	.36	.26
<b>Correlations</b>					
warmth & strictness		.28	-.04	.28	-.04
warmth & expectation		.43	.11	.41	.11
strictness & expectation		.54	.30	.55	.30
<b>Model Fit</b>					
Chi-square (df)		62.39 (6)		485.26 (51)	
RMSEA (95% CI)		0.37 (.029 - .045)		0.36 (.033 - .039)	
CFI		0.999		0.998	

<sup>a</sup> All non-zero regression coefficients are significant at  $p < .001$ .

<sup>†</sup> % of total effect that is direct and indirect.

Figure 1. Deciles of warmth against adult achievement.

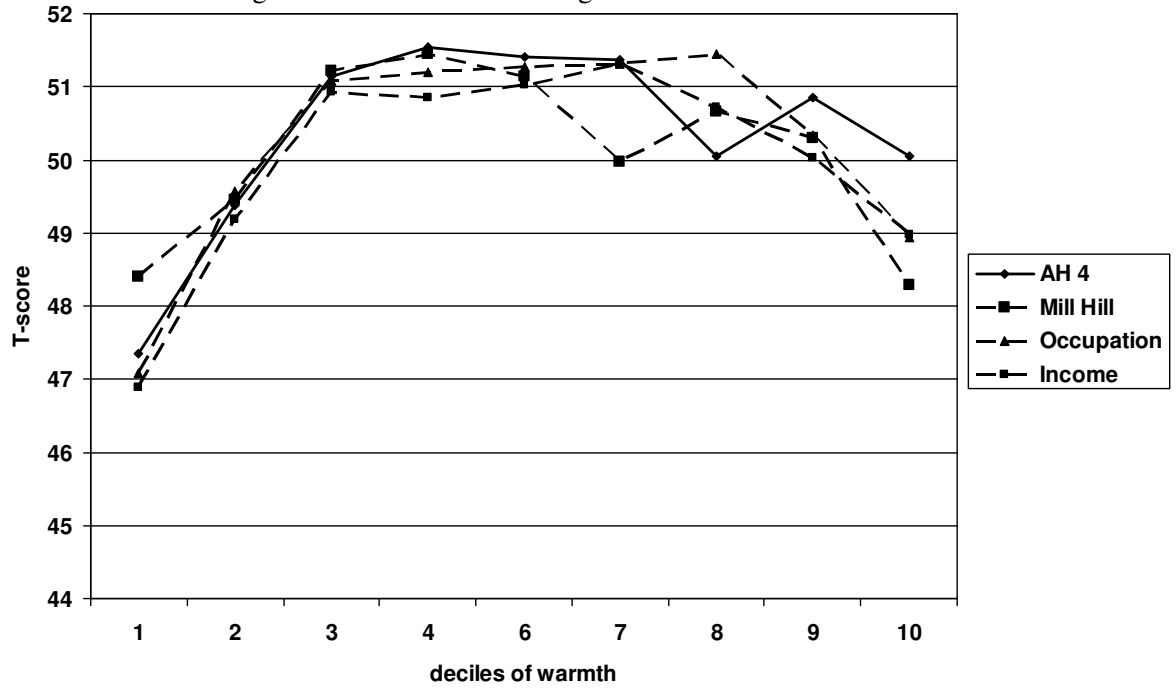
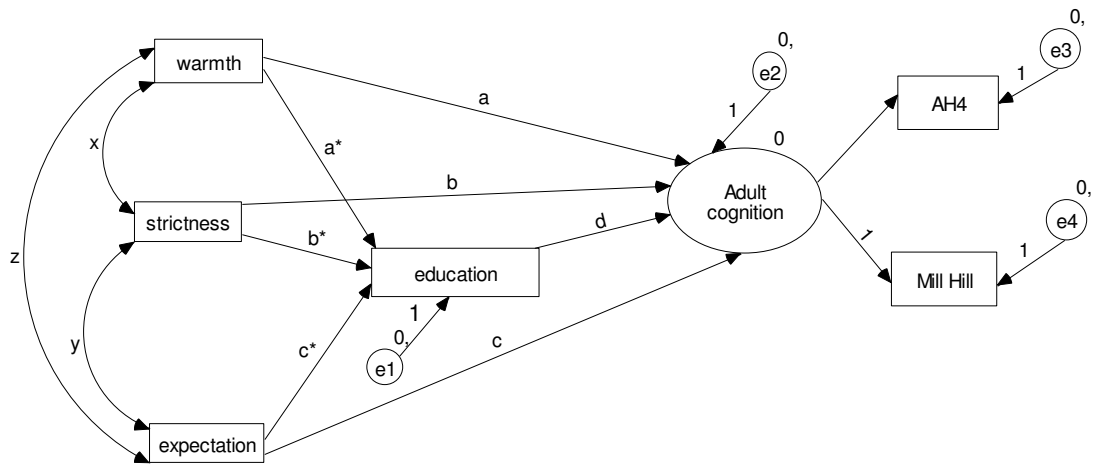


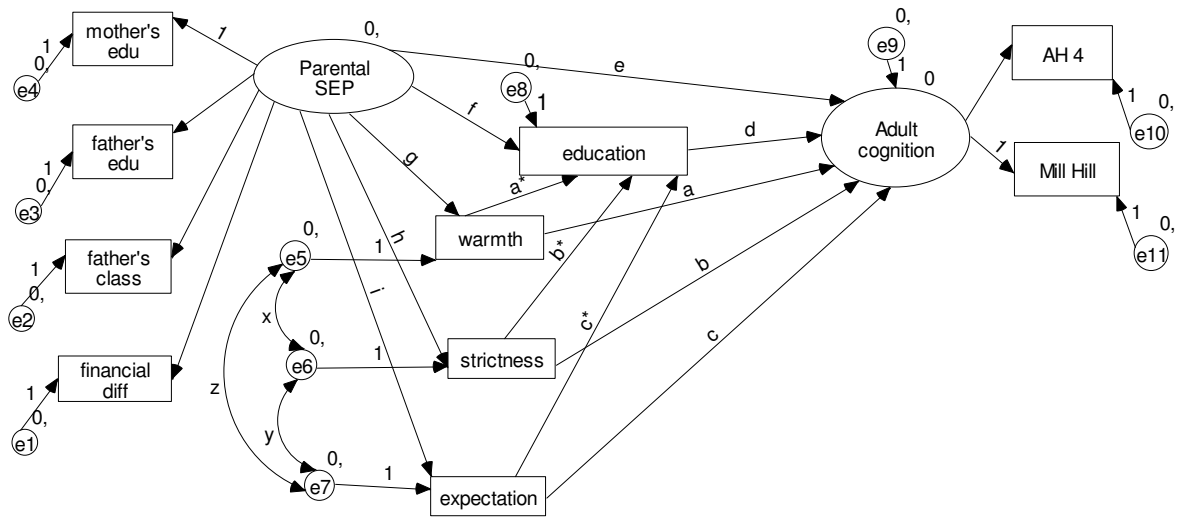
Figure 2. The effect of perceived parenting on adult cognition, with own education in the model (Model I).



**Note**

1. The first set of analysis has adult cognitive function as an outcome (shown in Figure 2, results Table 3) and the second set has adult SEP (composed of occupational position and income) as an outcome (results Table 4).
2. All observed variables are in boxes, unobserved variables and error terms (e1 to e4) are in ellipses.
3.  $a^*$ ,  $b^*$ ,  $c^*$ ,  $a$ ,  $b$ ,  $c$ , and  $d$  represent standardized regression coefficients; and  $x$ ,  $y$ , and  $z$  represent correlation coefficients (see Tables 3 & 4 for results).

Figure 3. The effect of perceived parenting on adult cognition, with education and parental social class in the model (Model II).



Note

1. The first set of analysis has adult cognitive function as an outcome (shown in Figure 2, results Table 3) and the second set has adult SEP (composed of occupational position and income) as an outcome (results Table 4).
2. All observed variables are in boxes, unobserved variables and error terms (e1 to e4) are in ellipses.
3.  $a^*$ ,  $b^*$ ,  $c^*$ ,  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $e$ ,  $f$ ,  $g$ ,  $h$ , and  $i$  represent standardized regression coefficients; and  $x$ ,  $y$ , and  $z$  represent correlation coefficients (see Tables 3 & 4 for results).

## **Appendix 1**

### **Perceived parenting (first set for mother followed by another for father)**

1=Not at all    2=a little    3=Quite a lot    4=a great deal.

1.     How much did she understand your problems and your worries?
2.     How much could you confide in her about things that were bothering you?
3.     How much love and affection did she give you?
4.     How much time and attention did she give you when you needed it?
5.     How strict was she with her rules for you?
6.     How harsh was she when she punished you?
7.     How much did she expect you to do your best in everything you did?