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To cite this article: Adrian Furnham & Helen Cheng (09 Nov 2023): Correlates of Conscientiousness: Findings from the Millennium Cohort Study, The Journal of Genetic Psychology, DOI: [10.1080/00221325.2023.2279143](https://doi.org/10.1080/00221325.2023.2279143)

To link to this article: <https://doi.org/10.1080/00221325.2023.2279143>



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Published online: 09 Nov 2023.



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Correlates of Conscientiousness: Findings from the Millennium Cohort Study

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ABSTRACT

This study explored correlates of the trait Conscientiousness drawing on longitudinal data from the Millennium Cohort Study (MCS), with a sample of 7,436 mothers. Data were collected when participants' children were born and again at ages nine months, 3, 11, and 14 years. Structural equation modeling showed that the family poverty indicator, self-esteem, parent-child relationship, children's behavioral problems, and education all had significant and direct effects on maternal trait Conscientiousness. The strongest predictor was self-esteem (measured over 13 years previously), followed by children's behavioral problems and parent-child relationship quality. The implications for helping mothers and their children are considered and limitations are discussed.

ARTICLE HISTORY

Received 16 August 2023
Accepted 31 October 2023

KEYWORDS



Maternal conscientiousness; family poverty indicator; maternal self-esteem; parent-child relationship; children's behavioural problems; longitudinal

Introduction

This research concerns the correlates of one of the Big-Five personality traits, namely Conscientiousness, using longitudinal data. While most studies on the Big-Five personality traits have considered them as independent variables (predictors), moderator or mediator variables, very few have used them as the dependent variables (criterion variables). That is, we are interested in individual predictors of the trait Conscientiousness over time in a large heterogeneous population (Roberts et al., 2003, 2009).

It is not clear why so much research has considered personality traits as independent, predictor variables of a wide range of behaviors (education, health, work) rather than the dependent variable: that which is influenced by a range of other factors. Most studies appear to assume that traits are relatively stable over time, and observable from early adolescence, though it is not clear which biological and environmental factors shape any particular trait. One obvious explanation is the difficulty of good longitudinal research: that is trying to understand how various factors might influence the development of, or change in, traits over time. In this study we examine how a range of variables measured over a 14 year period relate to adult trait Conscientiousness

Kern (2020) has noted that trait Conscientiousness is correlated with numerous positive, socially valued outcomes, such as longer marriages, job success, good physical and mental health, and longevity. Conscientiousness is related to how a person thinks, typically interacts with others, as well as makes sense of events and situations throughout life. She suggested that future research should focus on the understanding of the stable and dynamic nature of Conscientiousness, and the how it can be developed through intervention.

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In this paper, we explore various determinants of the trait Conscientiousness using longitudinal data from a study including both behavioral and psychological variables. Such data provides insight into the development, processes and mechanisms involved in Conscientiousness which has been extensively studied because of its many life correlates and consequences (Friedman et al., 1993; Gelissen & de Graaf, 2006; Jackson, 2006; Jackson et al., 2010; Linz & Semykina, 2009; Moutafi et al., 2004; Sutin et al., 2010)

Trait Conscientiousness

There is extensive literature which suggests Conscientiousness is associated with being efficient, organized, reliable, responsible, achievement-oriented, competent, dependable, and productive (Furnham, 2008). Parents, teachers and employers value the trait and attempt to shape and encourage it in their children, students and employees. It is, therefore, of particular interest to try to understand how it develops over time.

Trait Conscientiousness seems to be associated with stable, middle-class families and childhoods (Spielmann et al., 2022), where confident parents establish healthy and happy relationships with their children and vice versa. Few have suggested that there are strong genetic determinants of this trait or that there are biological markers. It seems that it is mainly learnt and reinforced in early life.

The taxonomists of Conscientiousness argue that there are various distinguishable but related parts (MacCann et al., 2009; Roberts et al., 2005). These include Industriousness, Perfectionism, Tidiness, Procrastination, Refrainment, Preference, Caution, Task Planning and Perseverance.

There are consistent findings from correlational studies that portray a small but significant positive association between Conscientiousness, educational achievement and occupational prestige (Corbeanu, 2023; Spielmann et al., 2022). In a review Duckworth et al. (2012) chose a simple descriptive sub-title to their review paper: “Conscientious adults excel in both objective and subjective success”. There is also some evidence that indicates sex differences in Conscientiousness, which some used to explain why females outperform males in school grades despite evidence suggesting a minute difference in intelligence (Furnham, 2008).

Roberts et al. (2003) have noted that Conscientiousness plays a role in most major life domains, predicting higher achievement in both high school and college, independent of cognitive ability, and success in work outcomes, including job performance, leadership, income and occupational attainment. Moreover, it predicts marital stability and depression above and beyond Neuroticism.

There have been a few longitudinal studies with the trait Conscientiousness as the dependent variable. Roberts and Bogg (2004) demonstrated that Social Responsibility (a facet of Conscientiousness), assessed at age 21, predicted family, work and substance use outcomes in midlife. Kern et al. (2009) examined relations among Conscientiousness, career success, and mortality risk across a 65-year period with data from 693 male participants from the Terman Life Cycle Study. They examined associations among childhood personality, midlife objective career success, and lifelong mortality risk showing that Conscientiousness and career success each predicted lower mortality risk. They also established that childhood Conscientiousness moderated the success–longevity link and was most relevant for least successful individuals.

In an important review of the development of Conscientiousness Eisenberg et al. (2014) concluded that elements of Conscientiousness are evident by early childhood and that *self-regulation skills* are likely a core developmental component of Conscientiousness. They focused on three domains of functioning in childhood—self-regulation, academic motivation, and committed compliance and internalization of standards of behavior—that were seen as relevant to the development of adult conscientiousness. Self- emotion regulation includes situation selection, situation modification, attentional deployment, cognitive change, and response

modulation. Further, like others, they argue that contribution of heredity to the Conscientiousness environmental factors likely contribute to a major part.

In a study most relevant to this Kim and Kochanska (2019) examined a community sample of 102 community mothers, fathers, and children from toddlerhood to adolescence. They had data on the children's *effortful control* at ages 2 years and lengthy discipline interactions with each parent, observed from preschool to early school age (at ages 4.5, 5.5, and 6.5 years). The dependent variable was parents rated adolescents' Conscientiousness using an established questionnaire (at age 14). They essentially supported the theoretical model of emotional control from childhood to committed compliance to trait Conscientiousness.

Recent work in this area has moved on neural connectivity. Indeed, Yi et al. (2023) have argued and demonstrated intrinsic brain networks, particularly those involved in higher-order cognitive functions, impact children's Conscientiousness.

This study

Inevitably, we were confined by the data set we had. Two studies have used this data set to explore early correlates of trait Neuroticism; Cheng and Furnham (2020) found that a family poverty indicator, psychological distress, parent-child relationship, and children's behavioral problems all had significant and direct effects on trait Emotional Stability (Neuroticism), accounting for 26% of the total variance. The strongest predictor was maternal psychological distress, followed by children's behavioral problems, suggesting that the latter might be both a cause of the former, and a factor increasing trait Neuroticism over time. In this study we were concerned that these two variables would impact negatively on the development of Conscientiousness.

More recently, Furnham and Cheng (2023) found that psychological distress and self-esteem, alongside parent-child relationship, children's behavioral problems and educational qualifications, all had modest but significant and direct effects on the maternal trait Openness. The strongest predictor was educational qualifications, though all effect sizes were small. Age was significantly and positively associated with the outcome variable.

In this study we chose to explore a number of variables that the literature suggested relate to the Trait Conscientiousness. We had data on four factors over 13 years before the assessment of Conscientiousness, just nine months after the participants' (all mothers) children were born. These factors were age, self-esteem, psychological distress, and a measure of socio-economic status. We also had a parental report on the parent-child relationship a decade before. Finally, we had a record of the participant's educational achievement and relationship problems a little over three years before Conscientiousness was assessed.

We had essentially four sets of variables. The first was maternal education which we hypothesized would be related to Conscientiousness (positively) as it has been shown to be both a cause and consequence of educational experience (Kim et al., 2016). Next, we had two relatively stable individual difference measures: Malaise (Psychological Distress) and Self-esteem, both of which we hypothesized to relate to Conscientiousness: the former because of the unstable life-style associated negatively with that trait, and the latter because it too is both a part cause and consequence of a stable, happy and successful life style. That is, low self-esteem individuals frequently distressed would have a life style not conducive to developing emotional regulation. Third, we had two measures of their relationship with their child: a measure of the relationship and the number of behavioral problems manifest. Early signs of Conscientiousness would involve a planful, organized and responsible lifestyle which would, we hypothesize, lead to a better mother-child relationship and less behavioral problems. Thus we hypothesized that both of these variables would be negatively associated with the development of Conscientiousness. Finally, we had a social class variable (family poverty indicator) which we assumed would be related to trait Conscientiousness as it has been shown to be related strongly to middle class values and life-style (Kern, 2020).

Based on the above literature reviewed, we hypothesized that the family poverty indicator, maternal psychological distress and self-esteem, parent-child relationship, and children's behavioral problems would significantly and independently link with the outcome variable.

Method

Sample

The present research draws on data collected for the Millennium Cohort Study (MCS), a survey of 18,818 babies born between September 2000 and January 2002 into 18,552 families living in the UK (Dex & Joshi, 2005). The first sweep of the Millennium Cohort Study was carried out between 2001 and 2002 when most babies were 9-months old. At age 11 years 14,134 children completed tests of cognitive ability (response = 87%). Testing took place in school, and written, informed consent was given by the parents. At age 16 years, 11,562 (86%) cohort members completed a measure on school motivation. At 33 years, 11,142 participants provided information on their educational qualifications obtained (response = 72%), and at 42 years 9,592 participants provided information on their occupational levels (response = 62%). At 50 years, 8,532 participants completed a questionnaire on personality trait Conscientiousness (response = 69%). The analytic sample comprises 5672 cohort members (52 per cent females) for whom complete data were collected at birth, at 11 years, and the outcome measure at 50 years. Bias due to attrition of the sample during childhood has been shown to be minimal (Davie et al., 1972; Fogelman).

Data was collected from the baby's parents *via* personal interviews and self-completion questionnaires. The families were followed up. The following analyses are based on survey data at ages nine months, three years, 11 years, and 14 years. The analytical sample consisted of 7,436 mothers of cohort members who had completed data on the measures used in the study.

Measures

1. *Family poverty indicator*: The family household income was reported at birth. Those considered to be in poverty had an equivalised income 60% below the UK median before housing costs: 1 = Yes, 0 = No (Ketende & Joshi, 2008).
2. *Maternal psychological distress* was assessed at nine months old using the Rutter Malaise Inventory (Rutter et al., 1970), which assesses depression, anxiety and psychosomatic illness. Cronbach's alpha was .75.
3. *Self-esteem*: assessed at nine months old. It consists of six items from the Rosenberg Self-Esteem Inventory (Rosenberg, 1965). Cronbach's alpha was .80.
4. *Parent-child relationship*: assessed at age three using the 15-item Pianta scale (Pianta, 1992). Cronbach's alpha was .77.
5. *Children's Behavioral Problems*: assessed at age 11 using the Strength and Difficulties Questionnaire (SDQ) (Goodman, 1997, 2001; Goodman & Goodman, 2009), which measures hyperactivity, emotional symptoms, conduct problems and peer problems. Cronbach's alpha was .73.
6. *Maternal educational qualifications*: assessed at age 11, and responses were coded to the National Vocational Qualifications levels (NVQ) five-point scale, from 1 = NVQ Level 1 to 5 = NVQ Level 5.
7. *Maternal personality trait Conscientiousness*: assessed at age 14 with the International Personality Item Pool (IPIP) (Goldberg, 1999), a three-item self-completion questionnaire. Cronbach's alpha was 0.53.

There was minimal missing data in the final set analyzed.

Results

Correlational analysis

Table 1 depicts the correlations, means and SDs of all variables in the study. Maternal trait Conscientiousness was significantly and positively associated with self-esteem, parent-child relationship and maternal education, and significantly and negatively associated with family poverty, maternal psychological distress and children's behavioral problems ($p < .001$). Thus, hypotheses (H1) to (H4) were supported. Maternal age at childbirth was significantly and positively associated with parent relationships and negatively associated with the family poverty indicator, maternal psychological distress and children's behavioral problems. It should be acknowledged of course that although correlations were significant, due to the very large N, they were very small.

Structural Equation Modeling

We utilized Structural Equation Modeling (SEM) to examine the paths linking the family poverty indicator, maternal depression, parent-child relationships, and maternal personality traits of extroversion and emotional stability. Paths in the model are designed to correspond with the time sequence in which the variables occurred. Testing the Structural Equation Model model testing was done using the SEM program IBM SPSS AMOS 24 (Arbuckle, 2009), using maximum likelihood estimations formulated on incomplete data, known as the Full Information Maximum Likelihood (FIML) approach (Arbuckle, 1996).

Figure 1 displays the standardized path coefficients of the structural equation model. The error variance for each observable and latent variable is included in the model (not shown in the diagrams).

Model fit

The χ^2 statistic is overly sensitive when used on large sample sizes or when observed variables are non-normally distributed. The root mean square error of approximation (RMSEA) gives a

Table 1. Pearson product-moment correlations of maternal trait Conscientiousness and other variables in the study.

Variables	Mean (SD)	1	2	3	4	5	6	7
1. Maternal trait Conscientiousness child age at 14 years	17.65 (3.01)	–						
2. Maternal age child at 9 months	43.99 (5.69)	.05***	–					
3. Family poverty indicator child at 9 months	.24 (.43)	–.10***	–.33***	–				
4. Maternal psychological distress child at 9 months	1.58 (1.66)	–.12***	–.09***	.14***	–			
5. Maternal self-esteem child at 9 months	18.86 (2.73)	.17***	.07***	–.09***	.48***	–		
6. Parent-child relationship child age at 3 years	64.88 (6.58)	.15***	.12***	–.11***	–.27***	.26***	–	
7. Child behave problems child age at 11 years	6.89 (5.10)	–.14***	–.19***	.20***	.26***	–.21***	–.40***	–
8. Maternal educational qualifications child age 11 years	3.07 (1.24)	.13***	.23***	–.25***	–.05***	.09***	.05***	–.18***

Note: Variables were scored such that a higher score indicated mothers being more open to experience.

*** $p < .001$.

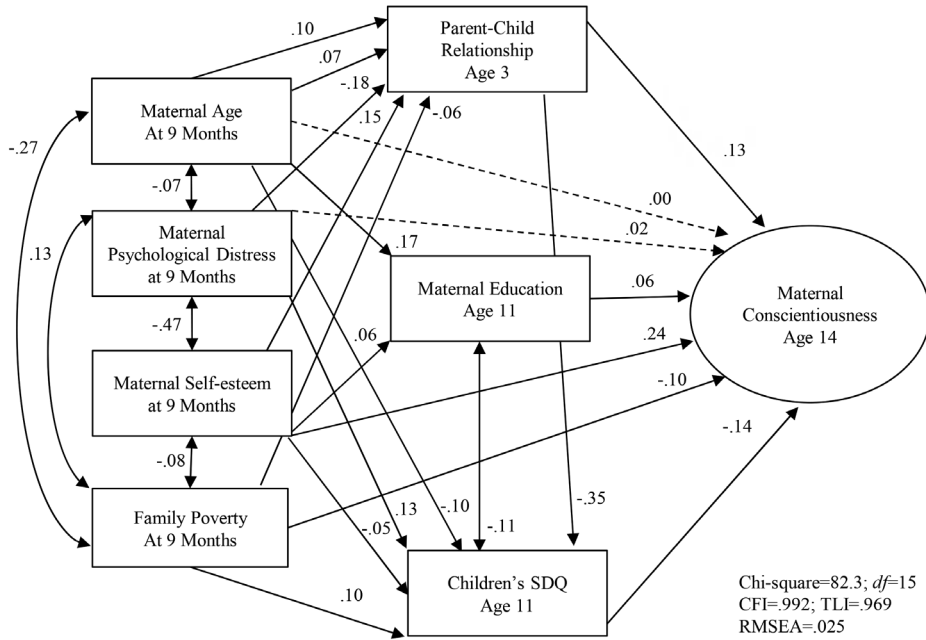


Figure 1. Predicting maternal trait Conscientiousness path model.

measure of the discrepancy in fit per degrees of freedom (< .05 indicates a good fit). The final index of choices was the Comparative Fit Index (CFI) and the Tucker-Lewis Index (or Non-normed Fit Index), where values above .95 indicate a very good fit and values above .90 are interpreted as good (Bentler, 1990).

Table 2 shows the unstandardized estimate, standard error, and standardized estimate of each indicator of the latent variable, alongside the predictors of the outcome variable for the complete SEM model. The solid lines indicate that the corresponding path coefficients are statistically significant, and the dashed lines indicate that the path coefficients are non-significant. For the latent variable of maternal trait Conscientiousness, the loading ranged from .34 to .45, indicating reasonable coherence of the underlying construct for the latent variable.

Table 2. Unstandardized estimate, standard error and standardized estimate of the latent and observable variables of SEM that predict maternal trait Conscientiousness.

Variables	Unstandardized estimate	Standard error	Standardized estimate
<i>Maternal Conscientiousness indicators</i>			
I see myself as someone who tends to be lazy (reversed)	1.00		.45
I see myself as someone who does a thorough job	.79	.08***	.34
I see myself as someone who does things efficiently	.76	.07***	.43
<i>Predicting maternal trait Conscientiousness</i>			
Maternal age	.001	.002	.001
Family poverty indicator	-.15	.03***	-.097
Maternal psychological distress	-.01	.01***	-.02
Maternal self-esteem	.05	.01***	.24
Parent-child relationship	.01	.002***	.13
Children's behavioral problems	-.02	.003***	-.14
Maternal educational Qualifications	-.03	.01**	.06

p < .01, *p < .001.

The model portrayed a good fit. Chi-square was 82.5 ($df=15$, $p < .001$), the CFI was .99, the TLI was .97, and the RMSEA was .03. [Figure 1](#) exhibits that family poverty indicator, self-esteem, parent-child relationship and children's behavioral problems all had significant and direct effects on maternal personality trait Conscientiousness. The strongest predictor was maternal self-esteem, followed by children's behavioral problems and parent-child relationship quality.

Discussion

Those interested in the nature-nurture basis of personality traits have tended to suggest that whilst there is substantial evidence of the heritability of traits, there is always the all important interaction with the environment. Studies on the heritability of Conscientiousness (Røysamb et al., 2018; Takahashi et al., 2021) have demonstrated that environmental factors play an important part in the development of this important trait, though it is not always clear what those factors are or how they operate.

This study examined a set of psychological, behavioral and demographic factors that may affect the adult trait Conscientiousness, drawing on large nationally representative longitudinal data collected in the UK. We were aware of the mothers/participants' age, economic situation, self-esteem and psychological distress 14 years previous to the assessment of Conscientiousness. Likewise, we knew of the parent-child relationship earlier, and their education and reported child relationship problems three years before.

The results of the current research reveal that the family poverty indicator (essentially a measure of socio-economic status), psychological distress and self-esteem, mother-child relationship, and children's behavioral problems were all significant and independent predictors of maternal trait Conscientiousness, measured when their children were at age 14 and the mothers in their early 40s.

Our findings suggest the most powerful distal predictor of Conscientiousness was Self-esteem. It is not difficult to speculate on the nature of this relationship, which is no doubt bi-directional. Self-esteem is related to self-efficacy and is essentially confidence in one's own worth, abilities or personality. There is vast literature attesting to its importance in life because it predicts outcomes, such as academic achievement, educational attainment, happiness, marriage and relationship satisfaction and anti-social behavior. Whilst it is relatively difficult to change, there is evidence that various strategies can boost self-esteem with a number of desirable consequences.

The second strongest distal predictor was socio-economic status. Children who grow up in a deprived and unstable environment have less opportunity to acquire the habits and behavior patterns associated with Conscientiousness, and may develop untidiness, procrastination and lack of perseverance.

Maternal distress at birth, possibly related to the trait Neuroticism, did not directly relate to Conscientiousness but was closely related to reports of their parent-child relationship at age three and the child's behavior problems at age 11. Malaise, which is remarkably stable over time (Furnham & Cheng, 2015), relates to mother-child difficulties and relationships. Malaise is associated with depression and psychosomatic illness, and it is not difficult to see how and why this trait influences parent-child relationships even a decade after being assessed. Depressed or ill mothers do not have the time, energy and possibly inclination to socialize their children to the habits and behaviors associated with the trait Conscientiousness or even to model it.

Many studies have continued to show the long term benefit of Conscientiousness. For instance South and Krueger, (2014) showed that Conscientiousness moderates genetic and environmental influences on problem alcohol use: greater levels of conscientiousness buffer against the random effects of the environment.

This study's results confirmed and extended the findings in the area. For many practitioners, the question is how best to boost or install conscientious behavior in children because of its many obvious benefits. Clearly supporting mothers financially and emotionally to improve their self-esteem and their relationship with their children would help to establish a more consistent and stable environment which is conducive to the development and maintenance of trait Conscientiousness.

Limitations

Like all studies, this study had limitations. As with all research using cohort studies, the variables explored were constrained by the availability of the data. There have been many speculations about the early experience correlates of Conscientiousness, such as parenting style, IQ and family stability (Deary et al., 2005; Roberts et al., 2003, 2005, 2009) and it would have been desirable to have this data as it would have expanded our understanding of Conscientiousness correlates.

Ideally, it would have been beneficial to have a robust measure of Conscientiousness that was consistent when measuring it the first and last time, 13 years apart. However, there is evidence that Conscientiousness is relatively stable over time (Roberts & Bogg, 2004). Another limitation is the attrition of respondents. Since sample attrition is greatest amongst individuals in more deprived circumstances, our results may be a conservative estimate of the long-term influence of social inequalities experienced during early childhood. The sample design allowed for this disproportionate representation of families living in areas of child poverty. To account for this, special weights were applied when analyzing the data (Plewis et al., 2004). Nonetheless, future research should attempt to reduce this disparity by offering some incentive to complete the study at each follow-up. In addition, all measures depended on the mothers' accurate report, which brings concomitant problems of method invariance.

Disclosure statement

There is no conflict of interest.

Data availability

This is available to anyone who registers.

Registration

This paper was not pre-registered with the journal.

Ethics

This was sought and obtained (CEHP/514/2017).

Informed consent

Participants gave consent for their anonymised data to be analyzed and published.

Funding

The author(s) reported there is no funding associated with the work featured in this article.

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