

# Factors affecting adult trait neuroticism in a nationally representative sample

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## **Abstract**

This study explores factors in childhood and adulthood that affect adult trait Neuroticism in a large, nationally representative sample. 5785 participants provided information on family social background measured at birth; Intelligence assessed at 11 years; Behavioural problems measured at 11 years; Malaise assessed at age 23; Educational qualifications obtained at 33 years; Occupational levels at 42 years, and personality trait Neuroticism measured at 50 years. Structural equation modelling showed that sex, childhood Behavioural problems, childhood Intelligence, Malaise in early adulthood, and Occupation were all significant and independent predictors of adult trait Neuroticism. Parental social status was significantly and negatively associated with Malaise at age 23, but was not a significant predictor of trait Neuroticism at age 50yrs. Education predicted Neuroticism mainly through occupation. The strongest predictor of trait Neuroticism at 50yrs was Malaise measured at 23yrs, with a corrected correlation of  $r=.42$  over the 27 year period. This study shows that adult trait Neuroticism is, in part, marked by childhood factors such as Behavioural Problems and Intelligence as well as early adult measures of psychological morbidity and stress. Limitations and alternative explanations are noted.

## **Introduction**

This study explores factors in childhood and early adulthood that may affect adult mid-life trait Neuroticism. Neuroticism is perhaps the most powerful, Big-Five personality predictors of mental well-being (Argyle, 2001), physical health (Sutin, Terracciano, Deiana, Naitza, Ferrucci, Uda, Schlessinger, & Costa, 2010), and work success (Cheng & Furnham, 2012), though there is both test-item and conceptual overlap between these measures and concepts which may, in part, explain the relationship. Relatively few studies have examined the determinants of Neuroticism or its stability over time though there are some important recent reviews of the current state of knowledge (Ormel et al. 2013). Neuropsychological correlates remain unclear and the current evidence is equivocal and contradictory (Cunningham, Arbuckle, Jahn, Mowrer & Abduljalil, 2010).

### The Stability of Personality

There have been many studies that examine the stability of psychological characteristics over time such as aggression (Huesmann, Lefkowitz, Eron & Walder, 1984) and intelligence (Deary, Whalley, Lemmon, Starr, & Crawford, 2000). The debate about the equivocal nature of both findings and conclusions regarding continuity vs. change revolves around a number of issues such as the reliability and validity of personality tests used (to account in part for measurement error); the moderator variables considered (like sex, education and ethnicity); the age at which people are measured (i.e. adolescents, adults, old age); the time span that shows most change and stability; how change is measured (such as mean level change, rank order, ipsative change); the stability of the environments of people and what, if anything leads to empirically demonstrated real change (Cramer, 2003; Loehlin & Martin, 2001; Martin, Long, & Poon, 2002; Roberts, Caspi & Moffitt, 2001; Roberts, Walton & Viechtbauer, 2006; Srivastava, John, Gosling & Potter, 2003). There has therefore been a longstanding debate called the plaster vs

plasticity debate where the former advocates argue that personality is set like plaster early in life (after adolescents, and certainly before 30) while those who support the plasticity model stress how much and how often personality changes over time (Helson, Jones & Kwan, 2002; Lucas & Donnellan, 2011). The lifespan personality psychologists have also provided interesting models to explain how personality factors influence behaviour over time, for instance with respect to health (Friedman & Kern, 2014).

The data to test hypotheses in this area has been difficult to obtain and results from different data bases have patterns to them though there inevitably remains many disagreements (Ardelt, 2000; Conley, 1985; McCrae & Costa, 1994). All agree that there is evidence of both *stability and change*, though there is disagreement about when, why and how much change occurs. From these studies it may be possible to draw the following conclusions: Personality seems most stable between the ages of 30 and 60yrs particularly using established Big Five measures to assess it. Next, there are modest increases in Emotional Stability (low Neuroticism) and Agreeableness over this period with Extraversion and Agreeableness showing least change (both with a slight decline) and Conscientiousness showing most change (an increase). Third, males seem more stable than females (Roberts et al., 2001, 2006).

### This Study

Various studies have been reported using longitudinal data and cross-lagged correlation coefficients, path analysis and structural equation modelling where the causal ordering in the analysis has not matched the time at which data was gathered (Cheng & Furnham, 2012; Furnham & Cheng, 2013; McManus, Keeling & Price, 2004). That is, because it is generally accepted that some factors are generally stable over adulthood (like height) it is assumed that when they are measured is relatively unimportant (i.e. people remain very similar in height

from 20-60yrs). It is however generally accepted it is desirable to measure variables according to the causal modelling pattern and also check the reliability of those measures.

In this study Neuroticism measured at 50 years is the major variable of interest. Previous studies using this data set (British ESRC data) have established the links between family social status at birth and childhood intelligence, as well as, later educational and occupational achievement (Deary, et al., 2005; Feinstein & Bynner, 2004; Schoon, 2010; Spinath, Spinath, Harlaar, & Plomin, 2006), between family social background and occupational attainment (Duncan, Featherman, & Duncan, 1972; Duncan & Brooks-Gunn, 1997) and health (Wilkinson, & Pickett, 2006).

This study set out to explore factors in childhood and adulthood that affect adult trait Neuroticism using a longitudinal, nationally representative sample in the UK. In particular, it examines the effects of parental social class, childhood behavioural problems and intelligence, malaise, education, and occupation on adult trait Neuroticism, taking account the effect of sex on the outcome. Neuroticism in this data set was not measured until the age of 50 years but we do have measures of Malaise at 23 years. There are a number of measures and concepts which are clearly related and overlapping: fatigue, negative affectivity, neuroticism, malaise, minor psychiatric morbidity. Some writers have tried to draw some distinctions between the two concepts. Thus Charlton (2009) saw Neuroticism as relating more to anxiety and emotional instability and malaise to fatigue and physical symptoms. Certainly the Malaise inventory items are much more related to physical conditions such as headache, backache, stomach upsets, eye pain and rheumatism though it does contain a number of items similar to traditional measures of Neuroticism such as: “Do you often feel depressed?”; “Are you easily upset or irritated?”; and “Do you often get worried about things?”. Indeed it has been shown that it measures both

Psychological and Physical Malaise (Grant, Nolan & Ellis, 1990). Malaise may be seen as a measure of minor psychiatric morbidity and stress, while Neuroticism is more a measure of trait negative affectivity and emotional instability.

There are however many studies on the test-retest reliability of personality traits, over periods of time. For instance the test-retest reliability of the Neuroticism measure from the Big Five reported  $r=.87$  over three months and  $r=.83$  over 6 years, though for other related measures it is lower in the region of  $r=.70$  depending on the instrument and the population group (McCrae & Costa, 2010). One study that looked at the test-retest reliability of Malaise on three occasions measured two years apart on a sample of over 1000 New Zealand adults, showed correlations of between  $r=.58$  and  $r=.63$  (McGee, Williams, & Silva, 1986). It is therefore essential to take into account the reliability of the instruments when testing the stability of personality over time.

Based on the past literature and the data bank we are using we tested six hypotheses:

H1. Childhood behavioural problems (positively) and childhood intelligence (negatively) would be significantly associated with adult trait Neuroticism (and malaise). There is much evidence in the clinical literature to suggest adult Neuroticism can be traced back to early life (Bowlby, 1988).

H2. Sex would be significantly and positively associated with both Malaise and trait Neuroticism. All tests that measure Neuroticism and its correlates suggest that females score higher than males (McCrae & Costa, 2010).

H3. Family socio-economic conditions would be significantly associated with Malaise measured at 23yrs. This is based on the idea that people in poorer families have greater stress and lower social stability which increases chances of Malaise (Power & Manor, 1992, Stansfeld, Clark, Rodgers, Caldwell, & Power, 2011).

H4. Educational qualifications would be significantly and negatively associated with trait Neuroticism. This is based on the literature which suggested that there is a negative correlation between Neuroticism and exam and work success (Slaughter & Kausel, 2009).

H5. Occupational levels would be significantly and negatively associated with trait Neuroticism. This is based on the literature on personality correlates of occupational success which suggests that Neuroticism is consistently negatively, and Conscientiousness positively related to multiple measures of success like salary, speed of promotion and organisational level reached (Furnham, Crump, & Ritchie, 2013).

H6. Malaise, measured at 23year would be the most significant predictor trait Neuroticism measured at 50 years. This is based on the stability of personality over time, referenced above.

## **Method**

### *Participants*

The National Child Development Study 1958 is a large-scale longitudinal study of the 17,415 individuals who were born in Great Britain in a week in March 1958 (Ferri, Bynner, & Wadsworth, 2003). 12,409 mothers completed a questionnaire of children's behavioural problems when participants were at age 11 (response = 76%). 14,134 children at age 11 completed tests of cognitive ability (response = 87%). Testing took place in school, and written, informed consent was given by the parents. At 23 year, 12,384 participants completed questionnaire of malaise (response = 76%). 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 Neuroticism (response = 69%). The attrition rate is normal for this sort of study. The analytic sample for this analysis

comprised 5,785 cohort members (49 per cent females) for whom there was a complete data set of the variables we examined. Bias due to attrition of the sample during childhood has been shown to be minimal and not problematic (Davie, Butler, & Goldstein, 1972; Fogelman, 1976).

### *Measures*

Family social background includes information on parental social class and parental education. Parental social class at birth was measured by the Registrar General's measure of social class (RGSC). RGSC is defined according to occupational status (Marsh, 1986). Where the father was absent, the social class (RGSC) of the mother's father was used. RGSC was coded on a 6-point scale: I professional; II managerial/technical; IIIN skilled non-manual; IIIM skilled manual; IV semi-skilled; and V unskilled occupations (Leete & Fox, 1977). Scores were reversed in the following analyses.

Parental education is measured by the age parents had left their full-time education. Childhood intelligence was assessed at age 11 in school using a general ability test (Douglas, 1964) consisting of 40 verbal and 40 non-verbal items. The Behaviour Adjustment Scale (Rutter, Tizard, & Whitmore, 1970) consists of 14 items. It was answered by mothers when participants were 11 years old. Examples of items are whether the child "frequently fights/very quarrelsome", or "often appears miserable/unhappy". Responses (3-point, never=1, sometimes = 2, frequently = 3) were summed to provide scores on children's behavioural problems. The Alpha was 0.66 in the study.

Malaise was assessed at age 23 years using Rutter Malaise Inventory (Rutter, Tizard, & Whitmore, 1970). It comprises of 24 items with Yes/No. The inventory covers emotional disturbance and associated physical symptoms. Examples of items are whether the participant "often feels miserable and depressed", or "often suddenly become scared". The Alpha was 0.79 in the study. It has been evaluated a number of times (Hirst & Bradshaw, 1983).

At 33 years, participants were asked about their highest academic or vocational qualifications. Responses were coded to the six-point scale of National Vocational Qualifications levels (NVQ) ranging from 'none' to 'university degree or equivalent'. At 42 years participants provided information on their occupational levels which are coded according to the RGSC described above, using a 6-point classification. Personality trait Neuroticism was assessed at 50 years, from the International Personality Item Pool (IPIP) (Goldberg, 1999). Responses (5-point, from "Strongly Agree" to "Strongly Disagree") It is comprised of 10 items. Examples are "I get stressed out easily", or "I worry about things". Cronbach's alpha coefficient was 0.88 in the study.

## **Results**

### *Correlational Analysis*

Table 1 shows the correlations between the observed variables in the study, and the means and standard deviations of each measure. The associations between trait Neuroticism and other variables measured in the study (in bold) were all significant except the associations between parental social status variables. However, parental social status variables were significantly and negatively associated with Malaise in early adulthood as hypothesised (H3). Childhood behavioural problems were positively but intelligence negatively associated with adult trait Neuroticism (H1). Education and occupation were associated with trait Neuroticism in the expected direction (H4 and H5), and malaise was positively associated with trait Neuroticism (H6). Sex was significantly associated with both Malaise and Neuroticism (H2), women tended to score higher on these two measures than men. Thus all six hypotheses were supported.



Once corrections for attenuation had been made the correlation between Malaise at 23yrs and Neuroticism at 50yrs had been done the correlation rose to  $r=.42$ .

Insert Table 1 about here

### *Structural Equation Modelling*

Structural Equation Modelling (SEM) was used to assess the links between sex, family social status, childhood behavioural problems, childhood intelligence, malaise, education, occupation, and personality trait Neuroticism. Paths in the models are designed to correspond with the time sequence in which the variables occurred. The SEM model testing was carried out using the structural equation modelling program AMOS 18 (Arbuckle, 2009). We used the Full Information Maximum Likelihood estimates tend to show less bias and are more reliable than LD estimates even when the data deviate from missing at random and are non-ignorable (Arbuckle, 1996).

Insert Table 2 about here

Table 2 shows the loadings of the two latent variables of family social status and childhood intelligence were shown in for family social status (ranged from .61 to .78) and childhood intelligence (.92 for verbal tests and .85 for non-verbal tests).

Figure 1 shows the standardised path coefficients of the structural equation model. The solid lines indicate that the corresponding path coefficients were statistically significant and dashed lines indicate that the path coefficients were non-significant. Measurement errors for observable variables were included in the model (not shown in the diagram).

The  $\chi^2$  statistic is overly sensitive when sample sizes are large. The indices of choices are the Comparative Fit Index (CFI), and the Tucker Lewis Index (or Non-normed Fit Index) where values above .95 indicate a very good fit. The root mean square error of approximation (RMSEA) gives a measure of the discrepancy in fit per degrees of freedom (<.05 indicates a good fit) (Bentler, 1990).

Insert Figures 1 about here

The model showed a good fit. Chi-square was 255.3 ( $df = 22$ ,  $p < .001$ ), the CFI was .983, the TLI was .948, and the RMSEA was .043. Figures 1 shows that childhood behavioural problems, childhood intelligence, sex, malaise and occupation were all significant and independent predictors of adult trait Neuroticism, accounting for 14% of total variance. Childhood factors appeared to have a slightly stronger associations with malaise measured in early adulthood than Neuroticism. The strongest predictor of trait Neuroticism was malaise measured twenty-seven years earlier. According to Cohen (1992), the  $f^2$  values of .02, .15, and .35 are termed small, medium, and large, respectively. Our  $f^2$  could therefore be considered large.

## **Discussion**

This study is among the first to look at the childhood and early adult psychological and sociological factors that affect adult trait Neuroticism. The results show that after controlling for demographic and social factors and early psychological distress, childhood behavioural problems and intelligence remain significantly and independently associated with adult Neuroticism. The results for gender differences in Neuroticism are well established and most

test manuals show different norms for males and females with females at all ages scoring higher than males.

Childhood intelligence measured at 11 is correlated with adult Neuroticism. There is a growing literature on the association between trait Neuroticism and intelligence which confirms this association (Moutafi, Furnham, & Paltiel, 2005). However this is nearly always explained by test anxiety influencing test performance. That is, Neurotics who are prone to trait and state anxiety under-perform in tests, not necessarily because they are less intelligence, but that their test-taking strategies which are less efficient than emotionally stable people let them down. On the other hand, it is possible that brighter people choose various life options such occupations and relationships which are less stressful and hence cause less anxiety.

Indeed the results of this study show that childhood intelligence is directly related to adult Neuroticism but also indirectly through occupation which shows more intelligent children attain jobs with higher occupational status which over time effects Neuroticism. The analysis using the same data set of physical health at 50years also showed childhood intelligence being a significant predictor underlying the idea that intelligence is a good measures of general fitness and functioning in many settings (Cheng & Furnham, 2013).

It is interesting to note that behavioural problems in childhood directly relate to adult Neuroticism. This may be due to the fact that this measure is, in part, an observational measure of Neuroticism. Thus items include “worries about many things”; “irritable touchy, is quick to fly off the handle”; “is miserable or tearful”. These items are clearly measuring the same concept as trait Neuroticism, which may in part account for the correlation of  $r=.11$  almost 40

years apart. Note that this is a correlation between maternal observation data (at 11yrs) and self-report data (at 50yrs).

Not unexpectedly, the clearest and most powerful predictor of adult Neuroticism was Malaise aged 23 years, which was assessed 27 years before the Neuroticism measure was used. The correlation was .35, and the path model showed clearly the importance of this direct link. When the correlation was corrected for unreliability it rose to  $r=.42$ . The question remains as to whether is interpretable as robust evidence for the stability of personality over time: that is, is this evidence for the plaster or plasticity hypothesis? There are three problems in explaining this finding. The first, is that whilst clearly correlated the two measures are not identical, and their correlation is not known. Next, there is the issue of measurement error, in this case particularly linked to dissimulation and socially desirability responses. In this study those issues have been controlled for as much as possible. Also most predictors were assessed much earlier than Malaise, so that higher correlations between these two temporally closer Malaise and Neuroticism is possibly to be expected due to measurement artifacts. Third, there are issue concerning mediating and moderating variables which this study only partly examines. In this study there is some evidence of occupation being a mediating variable, but there are others which may be more important such as the stability of marriages, family life and physical health.

Whilst it is tempting to interpret longitudinal findings as causal it is always possible that there are other explanations such as a common mediated genetic explanation which may account for the relationship between intelligence and neuroticism. Further these results cannot conform a pathway model which may suggest that people who score high on Neuroticism generate a stressful life style, or perceive it to be thus, which suggests a possible causal pathway.

Inevitably this study had limitations. It would have been most desirable to have measures of both Neuroticism and Malaise early in life, even before 23 years as in this study, and later in life in this case 50 years. We could then do a direct comparison across time as opposed to using the early Malaise score as proxy for Neuroticism. It would also have been desirable to have data on other factors such as trauma, relationship breakdown etc. which may have moderated the relationship between early adulthood and later mid-adulthood Neuroticism. Finally, it would have been desirable to have non self-report methods for both measures as they are known to be open to socially desirable responses.

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### **Conflict of Interest**

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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**Table 1.** Pearson correlations among variables used in the study

	Mean SD	1	2	3	4	5	6	7	8	9	10	11
1. Neuroticism at age 50	28.84 (7.03)	–										
2. Sex	.49 (.50)	<b>.134</b>	–									
3. Parental social class	3.30 (1.23)	<b>-.023</b>	-.004	–								
4. Paternal education	15.52 (1.98)	<b>-.020</b>	.020	.470	–							
5. Maternal education	15.50 (1.54)	<b>-.009</b>	.038	.344	.509	–						
6. Verbal scores at age 11	24.30 (8.62)	<b>-.068</b>	.120	.259	.235	.209	–					
7. Non-verbal scores at age 11	22.77 (6.95)	<b>-.110</b>	.017	.263	.231	.194	.779	–				
8. Behavioural problems at age 11	20.06 (3.34)	<b>.113</b>	-.086	-.046	-.041	-.037	-.133	-.115	–			
9. Malaise at age 23	2.36 (2.59)	<b>.351</b>	.236	-.111	-.077	-.034	-.146	-.161	.119	–		
10. Education at age 33	2.70 (1.44)	<b>-.085</b>	-.082	.313	.303	.265	.464	.446	-.115	-.217	–	
11. Occupation at age 42	4.04 (1.21)	<b>-.084</b>	-.045	.226	.202	.186	.348	.325	-.104	-.158	.493	–

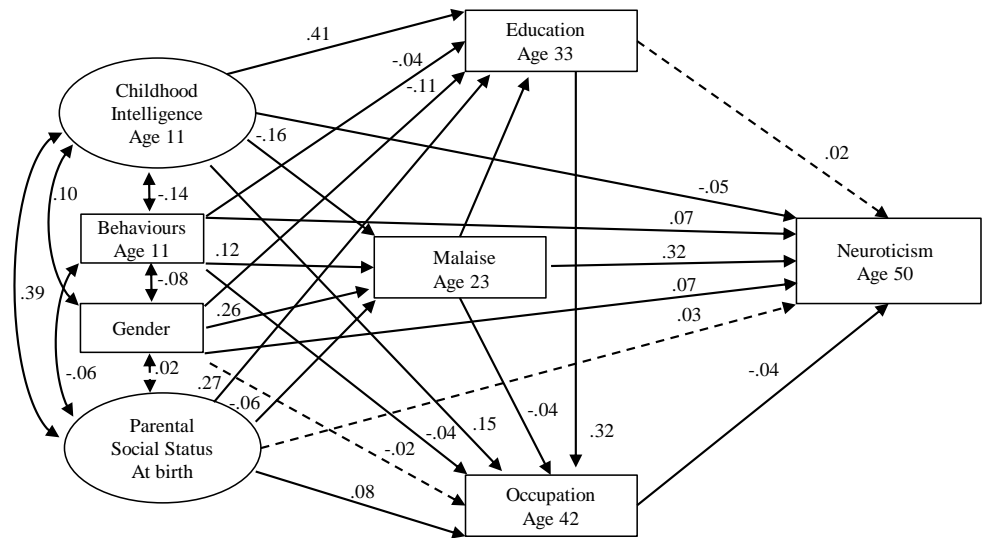
*Note:* Variables were scored such that a higher score indicated being female, higher scores on trait Neuroticism, a more professional occupation for the parent and higher age parents left school, higher verbal and non-verbal cognitive ability scores, higher scores on childhood behavioural problems, higher scores on malaise, highest educational qualification, and more professional occupation. Correlations of  $r > .05$  are significant at  $p < .001$ .

**Table 2.** Measurement of the latent variables and SEM of trait neuroticism

<i>Variables</i>	Unstandardised estimate	Standard error	Standardised estimate
<i>Parental social class</i>			
RGSC	1.000		.613
Father's education	2.051	.064***	.776
Mather's education	1.293	.042***	.630
<i>Childhood intelligence</i>			
Verbal	1.000		.918
Non-verbal	.744	.014***	.848
<i>Predicting neuroticism</i>			
Gender	.957	.184***	.068
Parental social class (latent)	.331	.172	.030
Childhood intelligence (latent)	-.041	.015***	-.046
Childhood behavioural problems	.151	.029***	.072
Malaise	.874	.038***	.322
Education	.093	.088	.019
Occupation	-.167	.091*	-.039

Note: \* $p < .05$ ; \*\*\* $p < .001$ .

**Figure 1.** Path model: Predicting Neuroticism.



Chi-square=255.3  
 df=22  
 CFI=.983; TLI=.948  
 RMSEA=.043