



Hay fever in childhood, traits Neuroticism and Conscientiousness as independent predictors of the occurrence of hay fever in adulthood

Journal of Health Psychology
2016, Vol. 21(10) 2367–2375
© The Author(s) 2015
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/1359105315576784
hpq.sagepub.com


Helen Cheng^{1,2}, Jessica Deighton³, Miranda Wolpert^{3,4}, Benjamin P Chapman⁵, Ekaterina N Kornilaki⁶, Luke Treglown¹ and Adrian Furnham^{1,7}

Abstract

The study investigated the associations between social and psychological factors in childhood and adulthood and the occurrence of adulthood hay fever in a longitudinal birth cohort study. A total of 5780 participants with data on parental social class, childhood hay fever up to age 7 years, childhood cognitive ability at age 11 years, educational qualifications at age 33 years, personality traits, occupational levels and adult hay fever (all measured at age 50 years) were included in the study. Using logistic regression analyses, results showed that childhood hay fever identified by medical doctors and traits Emotional Stability and Conscientiousness were significantly and independently associated with the occurrence of hay fever in adulthood.

Keywords

cross-sectional and longitudinal, hay fever, traits Emotional Stability and Conscientiousness

Introduction

The associations between personality and health and illness are increasingly well documented (Hampson and Friedman, 2008). Based on the Big Five factor model, traits Conscientiousness and Neuroticism have been found to be significantly associated with a number of health outcomes and longevity/mortality (Bogg and Roberts, 2004; Chapman et al., 2011; Goodwin and Friedman, 2006; Hagger-Johnson et al., 2012; Kern and Friedman, 2008). The relationship between personality and health are generally viewed as correlational rather than causal as the same biological mechanisms may underlie both (Matthews et al., 2009).

In a study using data of a nationally representative sample of 3032 adults in the United

¹University College London, UK

²University of London, UK

³UCL and Anna Freud Centre, UK

⁴CORC, UK

⁵University of Rochester, USA

⁶University of Crete, Greece

⁷BI Norwegian Business School, Norway

Corresponding author:

Adrian Furnham, Research Department of Clinical, Educational and Health Psychology, University College London, London WC1E 6BT, UK.
Email: a.furnham@ucl.ac.uk

States, Goodwin and Friedman (2006) reported that Conscientiousness (protectively) and Neuroticism (adversely) were found to be significantly associated with a list of illnesses, including diabetes, high blood pressure, persistent skin problems, stroke and ulcer. Furthermore, among adults with physical illnesses, associations were found between decreased likelihood of physical limitations and personality, especially Conscientiousness.

However, the research on personality correlates with hay fever (allergic rhinitis (AR)) has been described as insufficient and still up for debate (Bielous et al., 2010; Watten and Faleide, 1996). This study looks at social and psychological correlates of adult hay fever problems. It concentrates on the role of personality traits and the incidence and reporting of hay fever.

There is conflicting evidence within the literature about whether a link exists between AR and major depression. Hurwitz and Morgenstern (1999) analysed the rates of co-morbidity between hay fever and major depression, finding that those with hay fever were 67–103 per cent more likely to develop major depression. In a household population survey in the United States, Derebery et al. (2008) found that individuals with active AR symptoms were twice more likely to report depression than non-sufferers (17.2% vs 8.3%). Analysing the database of a health care provider, Cuffel et al. (1999) found that the odds for depressive and anxiety disorders were 1.7 and 1.41 times higher in hay fever than in the non-AR sample. Bell et al. (1993) investigated the correlates of shyness as a risk factor for hay fever, revealing that individuals with hay fever had significantly higher shyness and depression scores, indicating a vulnerable temperament. When assessing the narrow-band scales of the Child Behaviour Checklist, Watten and Faleide (1996) found that children with hay fever exhibited higher scores on the depression scale, social withdrawal scale, somatic complaints scale and the aggression scale. Most children diagnosed with attention-deficit hyperactivity disorder (ADHD) also displayed symptoms and skin prick test results consistent with AR (Brawley et al.,

2004). In a study involving 7- to 12-year-old children attending primary care, Garralda and Bailey (1986) found that children identified with emotional and conduct disorders often reported somatic complaints such as hay fever. Goodwin (2002) investigated the relationship between self-reported hay fever and psychological disorders, finding that, when socio-demographic variables are adjusted for, hay fever was significantly twice as common among individuals who had major depression. When co-morbidity is controlled for, however, major depression ceased to have a significant relationship with hay fever. Furthermore, Addolorato et al. (1999) found no difference in depression (as measured by the Zung self-rated depression scale) when comparing women with hay fever with healthy women matched for age and socio-demographic variables.

Wittkower (1938) deduced through personal assessments that hay fever sufferers have a higher rate of neurotic symptoms than healthy individuals. Reliable and repeated measures have shown a link between anxiety and hay fever. However, Addolorato et al. (1999) found significant differences in state and trait anxiety (measured by the State-Trait Anxiety Inventory (STAI)) in their sample. They stipulated that allergic symptoms are the result of mast-cell mediator release, and 'Psychological stress, particularly in subjects with trait anxiety, could enhance the mediator release due to allergen crosslinking to IgE at the mast-cell surface' (Addolorato et al., 1999: 286).

Goodwin (2002) reported that, when accounting for co-morbidity, having panic attacks is the only significant clinical association with increased hay fever frequency. Hay fever patients have been found to differ from healthy individuals by being significantly more anxious, ambitious and obsessive, but no more emotionally unstable or maladjusted (Rees, 1959). Vamanshankar et al. (2013) found that patients with hay fever were correlated with Cluster C traits – anxious or fearful disorders, including avoidant, dependent and obsessive personality disorder – indicating that hay fever is associated with a dominant-anxious trait, as

seen with Bell et al.'s (1993) tendency towards shyness.

While associations between clinical symptoms have been investigated, other research has attempted to assess non-psychiatric personality correlates of hay fever. A large proportion of this research uses the Minnesota Multiphasic Personality Inventory (MMPI) (Hathaway & McKinley, 1951). However, while some common findings have prevailed, there is a disparity with results. Gauci et al. (1993) found that individuals with hay fever had higher scores on the MMPI Hypochondriasis (Hs) and Social Introversion (Si) scales, with lower scores on Correction and Ego Strength scales. A comparison between perennial and seasonal hay fever revealed that wheal diameter (which measures the extent of negative reaction to substances by underlying levels of IgE) was positively correlated with Si, while the seasonal hay fever wheal diameter alone was positively correlated with Depression (D), Psychasthenia (Pt), Schizophrenia (Sc) and Psychopathic Deviance (Pd) (Gauci et al., 1993). Graif et al. (2006) also showed that the severity of the symptoms reported by patients with hay fever did not associate with the size of their reaction to the aeroallergen but with the psychological factors of Hs and somatic awareness. Lv et al. (2010) found that allergic and non-allergic profiles differed significantly on six scales of the MMPI: Hs, D, Hysteria (Hy), Pt, Si and Sc. Male sufferers are thought to have higher scores on Paranoia (Pa) and Si, while females have higher Hs, D and Hy scores in non-psychiatric samples (Muluk et al., 2003). Despite mixed results, consistent findings of Hs, Hy and D indicate neurosis has a strong element within hay fever, while higher scores on Pt suggest that anxiety is also a key factor.

Bielous et al. (2010) investigated the link between subjects with AR and personality, as measured by the Eysenck Personality Questionnaire-Revised (EPQ-R) (Eysenck et al., 1985), and found that those with AR have significantly higher scores on extraversion and lower scores on Neuroticism. Despite not being significant, the median lie scores for those with AR

were much higher than those without (8.35 vs 7.23). The authors stated these results are difficult to interpret; Eysenck stated that those who score high on Neuroticism and high or low on extraversion are prone to chronic somatic diseases. One explanation could be that the findings are the result of social desirability bias as indicated by the high lie scores. It is not clear why hay fever sufferers would seem to have higher lie scores or higher social disability.

Hypotheses

The data for this study were from a representative longitudinal sample. We decided to investigate a set of childhood and adulthood factors that may influence the occurrence of adult hay fever: parental social class at birth, sex, childhood occurrence of hay fever, intelligence, education and occupation, as well as personality traits (the Big Five factor model). We made three predictions: considering the possible biological determinants of many physical illnesses, it is hypothesised that hay fever at age 7 years identified by medical doctors would be strongly correlated with hay fever at 50 years; based on the literature on the negative associations between Conscientiousness and a number of illnesses mentioned above, it is hypothesised that more Conscientious people would report less hay fever and that more neurotic people would report more hay fever.

Method

Sample

The National Child Development Study 1958 is a large-scale longitudinal study of 17,415 individuals who were born in Great Britain in a week in March 1958 (Ferri et al., 2003). The following analysis is based on data collected when the study participants were born, at ages 7, 11, 33 and 50 years. A total of 14,134 children at age 11 years completed tests of cognitive ability (response=87%). At age 50 years, 8532 participants completed a questionnaire on personality traits (response=69%). Respondents

also provided information on educational attainment at age 33 years, occupational levels at age 50 years and prevalence of hay fever at 50 years. The analytic sample comprises 5780 cohort members (50% females) with complete data. Analysis of response bias in the cohort data showed that the achieved adult samples did not differ from their target samples across a number of critical variables (social class, parental education and gender), despite a slight under-representation of the most disadvantaged groups (Plewis et al., 2004). Bias due to attrition of the sample during childhood has been shown to be minimal (Davie et al., 1972; Fogelman, 1976).

Measures

Childhood measures. Parental social class at birth was measured by the Registrar General's measure of social class (RGSC). RGSC is defined according to occupational status and the associated education, prestige or lifestyle (Marsh, 1986) and is assessed by the current or last held job. Where the father was absent, the social class (RGSC) of the mother was used. RGSC was coded on a six-point scale – I: professional; II: managerial/technicians; III: skilled non-manual; IV: skilled manual; V: semi-skilled; and VI: unskilled occupations (Leete and Fox, 1977).

At birth, mothers were interviewed and provided information on gestational age and birth weight, and mothers were interviewed again when participants were at age 7 years on whether cohort members ever had hay fever identified by medical doctors. Childhood cognitive ability tests (Douglas, 1964) were accessed when cohort members were aged 11 years, consisting of 40 verbal and 40 non-verbal items, and were administered at school.

Adulthood measures. At age 33 years, participants were asked about their highest academic or vocational qualifications. Responses are coded to the six-point scale of National Vocational Qualifications (NVQ) levels which ranges from 'none' to 'university degree/equivalent NVQ 5 or 6'. Data on current or last occupation held by cohort

members at age 50 years were coded according to the RGSC, described above (parental social class), using a six-point classification mentioned above. Personality traits were assessed by the 50 questions from the International Personality Item Pool (IPIP) (Goldberg, 1999). Responses (five-point, from 'Strongly Agree' to 'Strongly Disagree') are summed to provide scores on the 'Big-Five' personality traits: Extraversion, Emotionality/Neuroticism, Conscientiousness, Agreeableness and Intellect/Openness. At age 50 years, 12,316 cohort members were invited for interviews and 9790 were interviewed (79%), who provided information on the prevalence of hay fever. It was a self-report question 'Have you had hay fever and/or PA rhinitis in the past 12 months?' with 'Yes/No' response.

Statistical analyses

To investigate the occurrence of hay fever in adulthood, we first performed *T*-tests to examine sex differences in the prevalence of hay fever in childhood and adulthood and the change of the condition over time, and conducted analysis of variance (ANOVA) to examine differences in the characteristics of those reporting and not reporting hay fever. Second, we examined correlations of the measures used in the study. Following this, we carried out a series of logistic regression analyses predicting the occurrence of hay fever at age 50 years from a set of childhood and adulthood factors, using STATA version 12. Model 1 examines the childhood factors in influencing the occurrence of hay fever in adulthood; Model 2 examines adult social factors, together with childhood factors, in influencing the outcome variable; and Model 3 examines personality factors, together with childhood factors and adult social factors, in influencing the prevalence of adult hay fever. Gestational age and birth weight were controlled in all three models.

Results

Descriptive analysis

In total, 14.0 percent participants reported that they suffered from hay fever in adulthood. There

Table 1. Social and demographic characteristics of the study population and rate of hay fever at age 50 years.

	<i>n</i>	%	Rate of hay fever (%)
Sex			
Male	2869	49.6	13.9
Female	2911	50.4	14.1
Parental social class at birth			
Unskilled (V)	419	7.3	14.1
Partly skilled (IV)	671	10.1	12.2
Skilled manual (III)	2811	48.1	13.8
Skilled non-manual (III)	645	11.0	13.8
Managerial\technicians (II)	917	16.8	14.8
Professional (I)	317	6.6	16.7
Educational qualifications at age 33 years			
No qualifications	405	6.2	12.3
CSE 2–5/equivalent NVQ 1	639	8.4	10.6
O Level/equivalent NVQ 2	1995	33.4	13.5
A level/equivalent NVQ 3	905	16.6	14.8
Higher qualification/ equivalent NVQ 4	958	18.7	15.8
University degree/ equivalent NVQ 5, 6	878	16.7	15.4
Own current social class at age 50 years			
Unskilled (V)	117	2.2	15.4
Partly skilled (IV)	609	9.2	12.2
Skilled manual (III)	1014	14.7	11.7
Skilled non-manual (III)	1210	20.0	13.4
Managerial\technicians (II)	2459	46.5	15.3
Professional (I)	371	7.3	15.9

CSE: certificate of secondary education; NVQ: National Vocational Qualifications.

were no significant sex differences in the occurrence of this condition in adulthood (13.9% for men and 14.1% for women). In childhood, the rate of identified hay fever was 5.6percent, and there were significant sex differences. It appears that the prevalence of asthma was greater for boys than for girls in childhood (6.5% for boys and 4.8% for girls). *T*-test showed that the differences were statistically significant between boys and girls at age 7 years ($t(df=5778)=2.52, p<.01$). Furthermore, there were significant increase in the rate of reported hay fever from childhood to adulthood ($t(df=5779)=16.66, p<.001$).0 Table 1 shows the characteristics of the study population and the prevalence of hay fever at 50 years.

Table 1 shows there was no clear pattern of the rate of hay fever in adulthood across parental social class, cohort members’ own educational attainment and current occupational levels. Table 2 shows means, standard deviations (SDs) and correlations between all variables in the study.

Among childhood and social factors, hay fever in childhood, intelligence, education and occupation were all significantly ($p<.01$) and positively associated with adult hay fever. Among the personality factors, high Agreeableness, low Neuroticism, high Conscientiousness and high Openness were significantly ($p<.05$ to $p<.01$) associated with the outcome variable.

Regression analysis

Table 3 shows the results of three models described above using the logistic regression.

Model 1 shows that childhood hay fever and childhood intelligence were significant predictors of the prevalence of adult hay fever. Model 2 shows that after entering adult social factors into the equation, childhood hay fever remained a significant predictor of adult hay fever. Model 3 shows that when both childhood and adulthood social and psychological factors were entered into the equation, childhood hay fever and personality traits Emotional Stability and Conscientiousness were the significant predictors of adult hay fever.

Discussion

The psychological and personality correlates of adult hay fever are less researched. This study set out to explore family socio-economic conditions, hay fever in childhood, education and occupation, and personality traits in influencing the prevalence of adult hay fever.

Among our three hypotheses that hay fever in childhood identified by general practitioners (GPs) would be significantly associated with adult hay fever and that Conscientiousness would be negatively and Neuroticism would be positively associated with the prevalence of hay fever, two have been supported and one has

Table 2. Bivariate correlations of variables in the study.

Variables	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11	12
1. Hay fever at age 50	.14 (.35)	–											
2. Hay fever at age 7	.06 (.23)	.177	–										
3. Sex	.50 (.50)	.002	–.035	–									
4. Parental social class	3.29 (1.22)	.021	.038	–.026	–								
5. Childhood intelligence	103.7 (13.0)	.043	.036	.072	.264	–							
6. Educational qualifications	2.62 (1.47)	.046	.030	–.088	.322	.498	–						
7. Own occupational levels	4.10 (1.20)	.031	.009	–.014	.200	.324	.440	–					
8. Extraversion $\alpha=.73$	29.27 (6.66)	.016	.015	.065	.035	.042	.082	.119	–				
9. Agreeableness $\alpha=.81$	36.90 (5.28)	.037	–.020	.397	.053	.142	.100	.108	.357	–			
10. Conscientiousness $\alpha=.77$	33.79 (5.43)	.044	–.018	.101	.042	.073	.086	.097	.164	.282	–		
11. Emotional stability $\alpha=.88$	28.56 (7.18)	–.033	.016	–.135	.039	.106	.104	.082	.230	.040	.215	–	
12. Openness $\alpha=.79$	32.48 (5.23)	.043	.011	–.029	.136	.290	.321	.234	.404	.332	.233	.101	–

SD: standard deviation.

Bold values $p<.05$.

Variables were scored such that a higher score indicated being female, the presence of hay fever in childhood or adulthood, a more professional occupation for parents or cohort members, higher scores on childhood intelligence, highest educational qualification, and higher scores on Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness.

been rejected. Childhood hay fever is the strongest predictor of adult hay fever, indicating the persistence of liability towards such symptoms. It also shows the effect of bio-physiological features on this health condition.

This study shows that personality trait Neuroticism is significantly associated with the occurrence of hay fever in adulthood, even after taking into account childhood and adulthood socio-demographic factors, intelligence and hay fever occurred in childhood. It is not clear, though, whether high Neuroticism worsens the symptoms of hay fever or the suffering of hay fever increases the levels of Neuroticism, as both measures were assessed at the same time.

While it is understandable that individuals who have higher scores on Neuroticism tend to report more hay fever, it is intriguing that trait Conscientiousness is a significant but positive predictor of adult hay fever. Correlational analysis also shows the significant and positive

associations between adult hay fever and intelligence, education, occupation and trait Intellect.

It has been argued that Conscientiousness has been linked to health because conscientious people are more likely to lead healthier lives and follow medical advice (Kern and Friedman, 2008). The fact that the correlation for hay fever runs in the opposite direction to that of other diseases may be hypothesised to relate to the fact that these individuals continue to be active and take exercise outdoors, despite their propensity to hay fever, and this may account for their raised hay fever rates relative to their less conscientious peers. It is known that conscientious and responsible individuals function in a prophylactic manner towards their health. They choose or create healthier environments and make on a daily basis numerous decisions that minimise health risks (Friedman and Kern, 2014). It is thus possible, as the hygiene hypothesis holds, that they minimise their exposure to allergens, germs or parasites increasing

Table 3. Odds ratios (95% CI) for hay fever at age 50 years, according to parental social class, hay fever in childhood, intelligence, educational qualifications, current social class and the Big-Five personality traits.

	Odds ratio (95% CI)			#p value
	Model 1	Model 2	Model 3	
Childhood factors				
Sex	1.09 (0.94, 1.27)	1.10 (0.93, 1.30)	0.96 (0.80, 1.15)	0.664
Parental social class at birth (<i>unskilled as reference group</i>)				
Partly skilled	0.85 (0.59, 1.22)	0.86 (0.59, 1.23)	0.82 (0.56, 1.20)	0.301
Skilled manual	0.96 (0.71, 1.29)	0.94 (0.70, 1.28)	0.91 (0.67, 1.25)	0.573
Skilled non-manual	0.90 (0.63, 1.29)	0.87 (0.60, 1.25)	0.84 (0.58, 1.23)	0.355
Managerial/technicians	0.97 (0.69, 1.36)	0.92 (0.60, 1.30)	0.91 (0.64, 1.29)	0.592
Professional	1.09 (0.72, 1.65)	1.02 (0.67, 1.56)	0.95 (0.61, 1.47)	0.815
Hay fever up to age 7 years	4.25 (3.30, 5.46)***	4.25 (3.31, 5.48)***	4.13 (3.18, 5.35)***	0.000
Childhood intelligence at age 11 years	1.11 (1.03, 1.20)*	1.07 (0.99, 1.18)†	1.08 (0.99, 1.19)†	0.090
Adult social factors				
Educational qualifications (<i>no qualification as reference group</i>)				
CSE 2–5/equivalent NVQ 1		0.80 (0.54, 1.19)	0.74 (0.48, 1.12)	0.157
O Level/equivalent NVQ 2		0.99 (0.70, 1.39)	0.92 (0.64, 1.32)	0.655
A level/equivalent NVQ 3		1.04 (0.71, 1.52)	1.00 (0.68, 1.49)	0.987
Higher qualification/equivalent NVQ 4		1.11 (0.76, 1.61)	1.02 (0.68, 1.52)	0.937
University Degree/equivalent NVQ 5, 6		0.98 (0.65, 1.47)	0.91 (0.59, 1.40)	0.664
Own social class (<i>unskilled as reference group</i>)				
Partly skilled		0.74 (0.42, 1.31)	0.82 (0.44, 1.51)	0.521
Skilled manual		0.71 (0.41, 1.24)	0.74 (0.41, 1.35)	0.326
Skilled non-manual		0.77 (0.44, 1.33)	0.78 (0.43, 1.41)	0.409
Managerial/technicians		0.87 (0.51, 1.49)	0.91 (0.51, 1.43)	0.748
Professional		0.95 (0.52, 1.75)	0.97 (0.51, 1.86)	0.928
Adult personality factors				
Extraversion			0.98 (0.90, 1.07)	0.657
Emotional stability			0.92 (0.85, 0.99)*	0.036
Agreeableness			1.08 (0.98, 1.20)	0.106
Conscientiousness			1.15 (1.06, 1.25)**	0.002
Openness			1.03 (0.94, 1.14)	0.503

CI: confidence interval; CSE: certificate of secondary education; NVQ: National Vocational Qualifications. Controlling for gestational age and birth weight. #p values of the final model. †p < .10, *p < .05, **p < .01 and ***p < .001.

their susceptibility to allergic diseases. For example, there is evidence showing that individuals who live in ‘clean’ environments measured with levels of triclosan (a compound found in antibacterial soap and other sanitary products) report more hay fever symptoms (Rees Clayton et al., 2011). This might in part explain why Conscientiousness is a positive predictor of hay fever.

This finding of the study is among the first to show the opposite associations between hay

fever and socio-economic status and trait Conscientiousness. Future studies are needed to confirm or refute these findings.

Nevertheless, the findings of the study demonstrate the importance of personality factors that may influence some health conditions such as hay fever. Treatment of these health problems may have a more effective outcome when personality factors are considered along with physical conditions.

Limitations

This study is based on a British cohort and may not be representative internationally. Furthermore, this study is based on available variables in the dataset rather than being based on the study designed for the purpose; thus, variables included in the study do not have a wide scope in investigating correlates of the outcome variable.

Acknowledgements

Data from the Cohort Studies were supplied by the ESRC Data Archive. Those who carried out the original collection of the data bear no responsibility for its further analysis and interpretation.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

- Addolorato G, Ancona C, Capristo E, et al. (1999) State and trait anxiety in women affected by allergic and vasomotor rhinitis. *Journal of Psychosomatic Research* 46: 283–289.
- Bell IR, Martino GM, Meredith KE, et al. (1993) Vascular disease risk factors, urinary free cortisol, and health histories in older adults: Shyness and gender interactions. *Biological Psychology* 35: 37–49.
- Bielous A, Babel P, Pilecki W, et al. (2010) In search of personality pattern in allergic rhinitis. *Allergy* 65 (S92): 624.
- Bogg T and Roberts BW (2004) Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin* 130: 887–919.
- Brawley A, Silverman B, Kearney S, et al. (2004) Allergic rhinitis in children with attention-deficit/hyperactivity disorder. *Annals of Allergy, Asthma & Immunology* 92(6): 663–667.
- Chapman B, Roberts BP and Duberstein P (2011) Personality and longevity: Knowns, unknowns, and implications for public health and personalized medicine. *Journal of Aging Research* 759170: 1–24.
- Cuffel B, Wamboldt M, Borish L, et al. (1999) Economic consequences of comorbid depression, anxiety, and allergic rhinitis. *Psychosomatics* 40(6): 491–496.
- Davie R, Butler N and Goldstein H (1972) *From Birth to Seven*. London: Longman.
- Derebery J, Meltzer E, Nathan RA, et al. (2008) Rhinitis symptoms and comorbidities in the United States: Burden of rhinitis in America survey. *Otolaryngology-Head and Neck Surgery* 139: 198–205.
- Douglas JWB (1964) *The Home and the School*. London: Panther Books.
- Eysenck SBG, Eysenck HJ and Barrett P (1985) A revised version of the psychoticism scale. *Personality and Individual Differences* 6: 21–29.
- Ferri E, Bynner J and Wadsworth M (2003) *Changing Britain, Changing Lives: Three Generations at the Turn of the Century*. London: Institute of Education.
- Fogelman K (1976) *Britain's 16-Year-Olds*. London: National Children's Bureau.
- Friedman H and Kern M (2104) Personality, well-being and health. *Annual Review of Psychology* 65: 719–742.
- Garralda ME and Bailey D (1986) Children with psychiatric disorders in primary care. *Journal of Child Psychology and Psychiatry* 27(5): 611–624.
- Gauci M, King MG, Saxarra H, et al. (1993) A Minnesota multiphasic personality inventory profile of women with allergic rhinitis. *Psychosomatic Medicine* 55: 533–540.
- Goldberg LR (1999) A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In: Mervielde I, Deary I, De Fruyt F, et al. (eds) *Personality Psychology in Europe*. vol. 7. Tilburg: Tilburg University Press, pp. 7–28.
- Goodwin RD (2002) Self-reported hay-fever and panic attacks in the community. *Annals of Allergy, Asthma & Immunology* 88: 556–559.
- Goodwin RG and Friedman HS (2006) Health status and the Five factor personality traits in a nationally representative sample. *Journal of Health Psychology* 11: 643–654.
- Graif Y, Goldberg A, Tamir R, et al. (2006) Skin test results and self-reported symptom severity in allergic rhinitis: The role of psychological factors. *Clinical and Experimental Allergy* 36: 1532–1537.
- Hagger-Johnson G, Sabia S, Nabi H, et al. (2012) Low conscientiousness and risk of all-cause, cardiovascular and cancer mortality over 17 years: Whitehall II cohort study. *Journal of Psychosomatic Research* 73: 98–103.

- Hampson S and Friedman HS (2008) Personality and health: A life span perspective. In: John OP, Robins RW and Pervin L (eds) *The Handbook of Personality*. 3rd ed. New York: Guilford Press, pp. 770–794.
- Hathaway SR and McKinley JC (1951) *The MMPI Manual*. New York: The Psychological Corporation.
- Hurwitz EL and Morgenstern H (1999) Cross-sectional associations of asthma, hay fever, and other allergies with major depression and low-back pain among adults aged 20–39 years in the United States. *American Journal of Epidemiology* 150: 1107–1116.
- Kern ML and Friedman HS (2008) Do conscientious individuals live longer? A quantitative review. *Health Psychology* 27: 505–512.
- Leete R and Fox J (1977) ‘Registrar General’s social classes: Origins and users. *Population Trends* 8: 1–7.
- Lv X, Han D, Xi L, et al. (2010) Psychological aspects of female patients with moderate-to-severe persistent allergic rhinitis. *Journal for Oto-Rhino-Laryngology, Head and Neck Surgery* 72: 235–241.
- Marsh C (1986) Social class and occupation. In: Burgess R (ed.) *Key Variables in Social Investigation*. London: Routledge, pp. 123–152.
- Matthews G, Deary I and Whiteman M (2009) *Personality Traits*. Cambridge: Cambridge University Press.
- Muluk NB, Oguzturk O, Koc C, et al. (2003) Minnesota multiphasic personality inventory profile of patients with allergic rhinitis. *Journal of Otolaryngology – Head & Neck Surgery* 32: 198–202.
- Plewis I, Calderwood L, Hawkes D, et al. (2004) National Child Development Study and 1970 British Cohort Study. Technical Report: Changes in the NCDS and BCS70 populations and samples over time, Institute of Education, Centre for Longitudinal Studies, London.
- Rees Clayton EM, Todd M, Beam Dowd J, et al. (2011) The impact of bisphenol A and triclosan on immune parameters in the U.S. Population, NHANES 2003–2006. *Environmental Health Perspectives* 119(3): 390–396.
- Rees L (1959) The role of emotional and allergic factors in hay fever. *Journal of Psychosomatic Research* 3: 234–241.
- Vamanshankar H, Hedge KS, Chaturvedi J, et al. (2013) Do patients with allergic rhinitis have a particular personality trait? *Journal of Laryngology and Ontology* 127: 378–382.
- Watten RG and Faleide AO (1996) Behavioural and mental health profiles in childhood hay fever. *British Journal of Health Psychology* 1: 349–355.
- Wittkower E (1938) Studies in hay fever patients (The allergic personality). *The British Journal of Psychiatry* 84: 352–369.