



Personality and risk of adult asthma in a prospective cohort study



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ABSTRACT

Objective: Traits conceptualized according to the five-factor model of personality have been found to predict numerous health outcomes and may also be predictive of asthma. Prior longitudinal studies on personality and asthma remain however sparse, have been restricted to only two traits (i.e., neuroticism and extraversion), and yielded inconsistent results. We therefore aimed to examine the potential relationships of all five-factor personality traits with incident asthma.

Methods: We combined the 2009 and 2011 data from the population-based German Socio-Economic Panel study for longitudinal analyses ($n = 12,202$). Personality traits were measured by an established 15-item version of the Big Five Inventory. Asthma was measured by participant-reports of having ever received such a diagnosis by a physician. We estimated multivariable risk ratios (RRs) and corresponding 95% confidence intervals (CIs) of trait-specific scores (continuous or categorized by tertiles) and incident asthma by Poisson regression.

Results: Neuroticism was the only trait which was predictive of asthma (RR for the z-score = 1.17, 95% CI = 1.02–1.34; RR for the highest versus the lowest tertile = 1.59, 95% CI = 1.12–2.25). Associations between personality traits and asthma risk did not differ by sex (p -values for interaction ≥ 0.07). There were no two-way interactions between personality traits when we tested all potential combinations (all p -values for interaction ≥ 0.20).

Conclusion: The present study suggests that high levels of neuroticism may predispose adults to develop asthma. Future longitudinal studies are needed to confirm our findings and to shed light on the potential psychophysiological processes underlying the observed association.

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Introduction

Personality is considered to underlie consistent patterns of behaviors, thoughts and feelings, and predicts both psychological and physical health [1,2]. One widely recognized approach to assess personality is the five-factor model (“Big Five”), which differentiates the five bipolar dimensions neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience [3]. Individuals scoring high on neuroticism are characterized by emotional instability and proneness to experiencing distress; high extraversion is conceptualized as sociability and an open expression of impulses; high agreeableness is manifested in behavioral characteristics that are perceived as kind and cooperative, while high conscientiousness reflects a tendency to be organized, dependable and to exhibit self-discipline. Finally, openness reflects the degree of curiosity and a preference for novelty and variety of experience [3,4].

Several of these traits have been found to predict health outcomes, which may involve at least two underlying pathways [2]: First, personality affects how stress is perceived and dealt with [2,5,6], and, as a consequence, may determine one's physiological response to stress [7,8]. Such responses, in turn, are assumed to contribute to the development of disease, especially if those stress responses are chronic. Second, personality traits have been identified as determinants of health behaviors, such as smoking and a sedentary lifestyle [9,10], which represent major risk factors for chronic disease. Since psychological stress and health behaviors have been implicated in the etiology of asthma [11–13], one may hypothesize that personality traits predict asthma.

To date, two prospective studies, from Finland [14] and from Germany [15], have examined the relationship between personality traits and incident asthma. Both investigations were restricted to only two of the Big Five traits, i.e., neuroticism, and extraversion. In the German cohort study, published by our group, neuroticism predicted asthma, but extraversion did not [15]. We hypothesized that elevated neuroticism may contribute to asthma due to its property of predisposing individuals to experiencing distress [15]. By contrast, the Finnish study found that only high extraversion scores were associated with an increased risk of asthma among women, which was partially attributed to poor health behavior (i.e., smoking) [14]. Thus, the limited

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number of longitudinal studies on the relationship of neuroticism and extraversion with asthma yielded conflicting results.

It appears warranted to also examine the other Big Five traits as potential predictors of asthma, in particular conscientiousness and agreeableness. There is emerging consensus that conscientiousness is a powerful predictor of health across the life course [1]. High conscientiousness may affect health in part through engagement in healthy lifestyles [1,10,16,17] and through better coping [18], and consequently lower levels of stress [19,20]. In particular, it has been hypothesized that individuals with high levels of conscientiousness are more likely to choose healthier social and physical environments [1] and that they may be more likely to prepare for predictable stressors [6]. Also, conscientious individuals may be less likely to behave impulsively thereby avoiding stress due to inconsiderate decisions in interpersonal, financial, and health-related domains of life [6]. Hence, we hypothesize that increased conscientiousness is associated with a reduced risk of asthma.

Likewise, we hypothesize that elevated levels of agreeableness exert protective effects on asthma risk. High agreeableness is associated with less interpersonal conflict [21], stronger social networks [22], a higher probability of receiving social support [6,19] and with better utilization of such support to cope in particular with interpersonal stress [6]. Since interpersonal stressors (e.g., relationship problems) and low social support have been associated with incident asthma [15,23,24], the risk of asthma may decrease with increasing levels of agreeableness. The remaining trait, “openness to experience”, has typically been found to be unrelated to mental or physical health [6,25–27]. We therefore do not expect an association between openness to experience and asthma risk.

In summary, evidence on the relationship between personality and incident asthma is sparse, being limited to two prospective studies [14,15]. These studies investigated only neuroticism and extraversion and yielded inconsistent findings. Expansion of research efforts to consider the remaining traits appears promising however. It was therefore the aim of this study to examine the associations of all the Big Five traits with incident asthma.

Methods

Study population

We drew on data from the German Socio-Economic Panel [GSOEP] study [28]. Since 1984, interviews or questionnaires were used annually to collect data for the GSOEP. Briefly, a random sample of German household was identified and each individual living in a selected household and who was aged 17 years or above was eligible for participation. The GSOEP complies with national laws and informed consent was obtained from all participants [29]. The current study combined primarily the 2009 (baseline) and the 2011 (follow-up) GSOEP data sets for prospective analyses as the required data were only gathered at these waves. A total of 20,792 individuals participated in the 2009 assessment (94% response rate). These assessments were based on personal interviews (e.g., face-to-face or by telephone) or traditional self-administration of questionnaires with or without the presence of an interviewer. In 2009, approximately 56% of the respondents were interviewed, 41% completed questionnaires and 3% mixed both approaches. Removing those with missing data on any of the employed baseline variables (see below) yielded a sample of 16,801 individuals. In total, 12,800 of these baseline participants were followed up in 2011 (76%). For prospective analyses, this sample was further restricted to those who had reported in 2009 to be free of asthma ($n = 12,202$).

Personality and asthma

In 2009, personality was measured by a 15-item instrument [30], which had been used in prior GSOEP publications [31,32]. Briefly, that instrument had been derived from the German 25-item Big Five

Inventory [33] based on theoretical considerations and psychometric analyses [30]. Importantly, the theoretically expected five-factor structure of the instrument was confirmed by factor analyses and the identified trait-specific subscales showed close correlations with the corresponding subscales of the 25-item Big Five Inventory [30]. Each of the traits was assessed by three items presented as statements (e.g., “I am someone who is frequently worried” or “I am someone who is reserved”). Participants were asked to specify their level of agreement with each statement using a seven-point Likert scale (1 = “Does not apply at all” to 7 = “Applies perfectly”). We calculated trait-specific scores, each with a potential score ranging from 3 to 21. In 2009 and 2011, asthma was included in a tick-off list of conditions introduced by the question “Has a physician ever diagnosed you with one or several of the following conditions?”. Incident asthma was operationalized as positive reports of asthma in 2011.

Statistical analyses

Trait-specific scores were utilized both as continuous variables (z-scores) and as categorized variables (tertiles, the lowest tertile being the reference group). Utilization of continuous exposure variables is usually considered to provide greater statistical power than categorized variables. Splitting variables into three or more categories, by contrast, provides a better illustration of potential dose–response relationships, which represent a criterion possibly supporting causal interpretation of observed associations [34]. The relationship between traits and incident asthma was quantified by Poisson regression with a log-link function and empirical (robust) variance using SAS 9.4 [35]. Associations were expressed as risk ratios (RRs) and corresponding 95% confidence intervals (CIs). All personality traits were included in the same model (thus mutually adjusted) which was then first controlled for age and sex (Model I), and subsequently for education and employment (Model II). To determine as to what extent potential associations may be accounted for by lifestyle-related factors, smoking, physical exercise, and overweight/obesity (categorized based on body mass index [BMI] calculated from reported height and weight) were finally added (Model III). While information on all other confounders was gathered at baseline in 2009, data on smoking and BMI were not available at that assessment. This information was therefore taken from the 2008 GSOEP data set while assuming that the distribution of these variables within the sample had not changed considerably between 2008 and 2009. Trends across trait-specific tertiles were assessed by entering an ordinal variable in a separate statistical model. Studies have suggested that personality traits may be particularly predictive of health outcomes if analyzed in combination, for instance, conscientiousness \times neuroticism [1], conscientiousness \times agreeableness [36] or extraversion \times agreeableness [37]. In line with earlier research [37,38], we therefore examined all paired combinations (potential two-way interactions) between personality traits in shaping asthma risk. This was done by inclusion of corresponding interaction terms in the regression models. In addition, consistent with earlier studies [14,15], we examined effect-modification by sex by adding interaction terms to the fully adjusted models. We decided to further stratify our analyses for those models suggesting significant interactions.

Results

The cumulative incidence of adult asthma equalled 1.75% (214 cases), which is in line with reports from other epidemiological studies [39]. As shown in Table 1, the study participants were middle-aged, had received, on average, 12 years (SD [standard deviation] = 2.7) of formal education, and about half of the sample was female. Bearing in mind the potential scoring range of 3 to 21, scores on conscientiousness were fairly high.

Table 2 shows the results from the prospective analysis. Neuroticism emerged as the only predictor of asthma from the fully adjusted models: an increase of the neuroticism score by one SD was associated with a 17% excess risk of asthma (RR for the z-score = 1.17, 95% CI = 1.02–1.34). Moreover, the risk of asthma increased across tertiles of the neuroticism score (p for trend <0.01) with 59% excess risk in those with high versus low

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