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Personality and Medical Illness Burden Among Older Adults in Primary Care

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Abstract

Objective—To examine the association between Five Factor Model personality traits (Neuroticism, Extraversion, Openness to experience, Agreeableness, Conscientiousness) and physician-quantified aggregate morbidity in a sample of older adults in primary care.

Methods—A total of 449 primary care patients, ranging in age from 65 to 97 years (75 ± 6.9 (mean $\pm$ standard deviation)), completed the Neo-Five Factor Inventory (NEO-FFI) and extensive interviews. A physician-investigator completed the Cumulative Illness Rating Scale (CIRS), a well-validated measure of aggregate morbidity based on a review of medical records.

Results—Bivariate analyses demonstrated that all five domains of the NEO-FFI were associated with CIRS scores. Multivariate regression controlling for age, gender, education, depression, smoking, hypertension, total cholesterol, alcohol or substance misuse, and other personality traits showed that greater Conscientiousness was independently associated with lower CIRS scores ($\beta = -0.10$, $t(435) = -1.96$, $p = .05$). Other independent predictors of less morbidity were younger age, absence of hypertension, and lower levels of depression.

Conclusion—Our results point toward the necessity of considering Conscientiousness and other personality traits in studies of risk factors for aggregate morbidity. More detailed characterization of at-risk populations will increase the likelihood of constructing informed and effective prevention, intervention, and policy initiatives.

Keywords

personality; older adults; medical illnesses; primary care

INTRODUCTION

The Five Factor Model (FFM) of personality has proven a fruitful conceptual framework for health research (1) because it organizes personality traits into five general domains, which predict various health outcomes: a) Neuroticism or the tendency to experience negative affect and affective instability; b) Extraversion or dispositions toward energetic activity, sociability, and positive affect; c) Openness to experience, which involves interest in novel people, ideas, and things, as well as intellectual and esthetic tendencies; d) Agreeableness or a tendency toward warmth, amiability, and trust; and e) Conscientiousness, which entails qualities such as diligence, goal-orientation, fastidiousness, and dependability. In addition to conferring risk for the onset and exacerbation of specific conditions such as coronary heart disease (2), personality traits may enhance risk for overall morbidity (3–5).

Three distinct yet overlapping explanations can be offered to explain the documented associations between personality and disease: pathophysiological, health behavioral, and social (6). Proposed pathophysiological processes include dysregulated sympathetic reactivity, hypothalamic-pituitary-adrenal axis activity, or immune functioning among those high in the trait Neuroticism (7–10) or low in the trait Extraversion (11). With respect to health behaviors, low levels of Conscientiousness may increase the risk for engaging in health-damaging practices such as smoking, drinking, or impulsive behavior, and avoiding health-protective behaviors such as maintaining a healthful diet, exercising regularly, or seeking and adhering to needed treatments (12–15). Finally, personality dispositions such as Neuroticism and Extraversion may also influence health via social channels. For instance, individuals high in Neuroticism are more likely to generate or respond strongly to conflictual social transactions (16) that may affect risk on a psychophysiological basis or via behavioral channels.

Over the course of the lifespan, the cumulative effects of such potentially pathogenic processes may result in higher levels of overall medical morbidity (17). Thus, if a trait such as Neuroticism results in slow, cumulative systemic damage due to chronic sympathetic overactivation and poor health-behavioral choices such as smoking and lack of exercise, a variety of ill health conditions may be evident by later life.

Primary care settings are rich and unique resources for studies on personality and aggregate morbidity, serving as the point of first contact for most individuals with most diseases. Given that traits influence symptom reporting (18) and self-reports of health independent of actual physical illness (19), the exclusive reliance on self-reported health data are of limited use in research aimed at gaining a deeper understanding of pathogenic mechanisms. Primary care settings maintain detailed medical records of patients, based on physical examination, laboratory results, and other health assessments, and an extensive history of such health data are often available for older adults. In the current study, ratings of overall morbidity were made based on a review of all available medical chart data, permitting an assessment of morbidity more thorough and valid than can be attained by relying exclusively on self-report surveys.

To date, the only studies that examine the associations between traits and aggregate morbidity have relied on self-report data. In a population-based sample of adults between 40 and 65 years of age residing in Heidelberg, Germany, individuals who reported suffering from multiple diseases in response to a survey checklist scored higher on a measure of Neuroticism than those with fewer than two diseases (3). In a population-based study of Dutch adults between 18 and 64 years of age, Neuroticism was associated with a self-report index of cumulative medical morbidity after controlling for mental illnesses, age, marital status, birthplace, education, income, religious practice, self-esteem, parental bonding, gender, and exercise (4). Neuroticism, measured in adolescence and young adulthood, was also independently associated with the number of chronic medical conditions reported at 36 and 43 years of age in a large United Kingdom cohort, controlling for gender, parental social class, and Extraversion (5).

These findings indicate that personality may be an important predictor of self-reported morbidity in middle-aged community cohorts. Focusing primarily on Neuroticism and secondarily on Extraversion, these studies have not examined other important elements of the FFM such as Conscientiousness, and we know of no research on personality and cumulative morbidity in older adults. Furthermore, few studies have been able to adjust for other medically documented covariates from patient records such as physician-assessed hypertension or laboratory values for lipid panels, which may be associated with burden across multiple organ systems (20).

In this article, we tested three hypotheses concerning Neuroticism, Extraversion, and Conscientiousness. First, based on prior work linking traits to self-reported cumulative morbidity (4,5), we hypothesized that Neuroticism would be associated with greater overall illness burden. We were also interested in distinguishing the effects of Neuroticism from episodic depressed mood, so we controlled for the latter with items from the Hamilton Depression Rating Scale (HDRS) (21).

Second, we hypothesized that Conscientiousness would be inversely associated with cumulative medical morbidity. Conscientiousness has been linked to a wide array of health behaviors (13) such as alcohol and cigarette use, which are likely to influence cumulative morbidity by later life. Not surprisingly, Conscientiousness has also emerged as a significant predictor of all-cause mortality (22,23). To assess the extent to which higher Conscientiousness might confer benefits via other channels unrelated to smoking and drinking, we controlled for self-reported lifetime history of cigarette use and any lifetime diagnosis of alcohol abuse or dependence based on the Structured Clinical Interview for DSM-IV Disorders (24).

Third, we hypothesized that higher Extraversion would be associated with lower morbidity. Extraversion and its components such as sociability and activity may have broad effects on health. Extraversion has been related to blood pressure, epinephrine, and natural killer cell cytotoxicity (11). Sociability has been linked to stronger immune response (25); Extraversion's activity facet is associated with exercise behavior (26); and positive affect is associated with longevity (27). Finally, both hypertension and hypercholesterolemia may eventuate in burden and dysfunction across multiple organ systems tapped by our measure of aggregate morbidity (20). Because our interest was on the effects of personality traits independent of these biomedical risk factors, we also controlled for these variables as well in all analyses.

METHODS

Sample

Participants were members of an ongoing study of depression and medical comorbidity in later life (28); they were patients aged 65 years and were capable of giving informed consent; they presented for primary care on selected recruitment days in several private internal medicine practices and university-affiliated internal medicine or family medicine clinics. After a complete description of the study, written informed consent was obtained using procedures approved by the University of Rochester Research Subjects Review Board.

A total of 716 individuals completed the first wave of data collection in 2001 to 2002. Ranging in age from 65 to 97 years (75 ± 6.9 (mean $\pm$ standard deviation)), they were predominantly Caucasian (92%) and female (64%). After the initial interview, the interviewer instructed the participant to complete and mail back a postage-paid packet of questionnaires including the Neo Five Factor Inventory (NEO-FFI), a personality measure (29). Of 488 (67%) individuals who returned the personality measure, 449 had complete data including cholesterol laboratory values reported in the analyses here. Multivariate analyses demonstrated that these individuals did not differ in gender or medical burden from the overall sample but were younger (odds ratio (OR) = 0.98, 95% Confidence Interval (CI) = 0.95–1.00, $p = .046$) and more educated (OR = 1.09, 95% CI = 1.02–1.15, $p = .005$). On average, they were 74.63 (SD = 6.32) years old and had 14.25 (SD = 2.38) years of education, whereas those without complete data were 76.02 (SD = 7.69) years of age and had 13.58 (SD = 3.10) years of education.

Measures

NEO-FFI—The NEO-FFI (29) is a 60-item personality inventory designed to assess the broad domains of the FFM: Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness. The present study used a modified form of the NEO-FFI with enlarged type so that participants with lower vision could easily read it. The NEO-FFI has been successfully used in a similar primary care setting (19,30), and in an elderly Medicare sample (31). Cronbach's internal consistency estimates for the composite scales in the present sample ranged from 0.73 (Openness) to 0.88 (Neuroticism). To permit the examination of each personality domain's specific elements, item cluster subcomponents have been developed (32) and cross-validated (33).

Cumulative Illness Rating Scale (CIRS)—The CIRS (34) is a scale that quantifies the level of overall medical burden through ratings of disease severity across major organ systems. For our purposes, the following subtotals were summed to yield an aggregate composite of physical morbidity: cardiovascular/respiratory (combining cardiac; vascular; upper respiratory; eyes, ears, nose, and throat items), genitourinary, musculoskeletal, neurological, gastrointestinal (combining upper and lower gastrointestinal and hepatic items), and endocrine/metabolic. The CIRS ratings based on chart review correlated highly with the ratings based on pathological examination at autopsy (35). The CIRS was coded by an experienced physician investigator who was blind to personality data, based on his review of the participants' primary care charts including history, physical examinations, laboratory tests, and all other sources of health-relevant information maintained by primary care physicians. A score of 0 indicates no medical burden in an organ system; a score of 1 indicates mild burden; 2 indicates moderate burden; 3 indicates severe burden; and 4 indicates a rare degree of extremely severe burden.

HDRS—The 24-item version of the HDRS (21) is a reliable and validated interviewer-administered measure of depressive symptom severity within the previous week that has been used with older adults in primary care (34). Because the HDRS is not based solely on patient self-report, it reduces measurement problems associated with the underreporting of some depressive symptoms on self-report inventories (36). However, many HDRS items assess somatic symptoms and are likely to be endorsed as a reflection of physical disease, not depression, which could spuriously increase the correlations between the HDRS and the cumulative illness burden. For this reason, only the 12 cognitive/emotional items on the HDRS were used, consistent with a previous study (37).

Covariates—In the present study, the Structured Clinical Interview for DSM-IV-TR Disorders (DSM-IV SCID) was used to code the presence of lifetime alcohol or substance abuse or dependence diagnoses (24). All active, partially remitted, and remitted alcohol or substance abuse or dependence diagnoses were coded as present. Interviewers asked if the subjects had smoked 100 cigarettes in their lifetime, coded either yes or no. We were interested in lifetime history of alcohol or substance misuse and cigarette smoking because our focus was on the cumulative effects of health-damaging practices, and the ill effects of smoking and alcohol/substance misuse may persist beyond cessation. From primary care charts, we also coded the history of hypertension as present or absent. Finally, total cholesterol levels from the most recent visit were also recorded from charts.

Statistical Analyses

The association between traits and illness burden were tested in three stages. First, bivariate correlations between CIRS scores and each of the traits were examined. Then, age, gender, education, self-reported lifetime history of cigarette use, any lifetime history of alcohol or substance abuse or dependence, lifetime history of hypertension, total cholesterol levels, and

HDRS cognitive/emotional scores were entered as covariates along with each personality factor in multivariate linear regressions, one for each trait. Finally, another multivariate model entered all five traits simultaneously with covariates to control for potential overlap between personality factors. Traits, which were significant in this final model, were then decomposed into the item cluster subcomponents (32,33) to identify specific aspect(s) of the general trait associated with cumulative morbidity.

RESULTS

Table 1 displays the mean and SD values of each variable for the sample. CIRS scores suggest a moderate level of overall medical burden, in the vicinity of other elderly primary care populations (37). Table 2 displays the results of the regression models. At the bivariate level, all variables except gender, lifetime history of cigarette use, and alcohol/substance diagnoses were associated with cumulative illness burden. Older, less educated, more depressed, more neurotic, less extraverted, less conscientious, less open, and less agreeable adults suffer from greater aggregate medical illness. Individuals with histories of hypertension and higher cholesterol levels also had more overall morbidity at the bivariate level. In multivariate models examining each trait individually and at the same time controlling for age, gender, education, self-reported lifetime smoking history, lifetime alcohol/substance diagnoses, lifetime history of hypertension, total cholesterol levels, and cognitive/emotional symptoms of depression, lower Extraversion ($B(SE) = -0.05 (0.022)$, $t(439) = -2.39$, $p = .017$, $d = -0.11$), and lower Conscientiousness ($B(SE) = -0.065 (0.022)$, $t(439) = -2.95$, $p = .003$, $d = -0.14$) remained significantly associated with overall illness burden, as did lifetime history of hypertension and cognitive/emotional symptoms of depression. In the final multivariate model containing all five personality traits and covariates, lower Conscientiousness ($B(SE) = -0.050 (0.025)$, $t(435) = -1.96$, $p = .051$, $d = -0.10$) and older age remained ($B(SE) = 0.094 (0.02)$, $t(435) = 4.74$, $p < .001$, $d = 0.22$) significant predictors of overall morbidity, as did history of hypertension ($B(SE) = 0.998 (0.27)$, $t(435) = 3.61$, $p < .001$, $d = 0.16$) and cognitive/emotional symptoms of depression ($B(SE) = 0.09 (0.04)$, $t(435) = 2.25$, $p = .025$, $d = 0.12$). When alcohol and smoking covariates were removed, the Conscientiousness effect remained unchanged ($B(SE) = -0.05 (0.025)$, $t(437) = -1.97$, $p = .05$, $d = -0.10$).

Next, we attempted to gain a sense of the practical magnitude of the Conscientiousness effect by comparing it with the age effect. Using the regression coefficients of the final multivariate model, we calculated the decrease in CIRS scores that would be expected if one were to move from the lowest decile (raw score 25) to the highest decile (raw score 42) of Conscientiousness. This difference (17 points), multiplied by the regression coefficient (0.049), yields a 0.833-point reduction in CIRS scores. By comparison, 20 years of age, multiplied by the regression coefficient of 0.096, results in a CIRS change of 0.96 points. The difference in overall medical morbidity between individuals at the lowest and highest deciles of Conscientiousness is about 87% ($0.833/0.960 = 0.868$) of what one would expect when comparing two older adults separated by 10 years of age, after adjusting for all other covariates.

Next, we conducted analyses to identify the specific aspect(s) of Conscientiousness independently associated with cumulative morbidity. Candidates included its three individual subcomponents: orderliness, goal striving, and dependability. As Chapman (33) suggested, linear combinations of subcomponents were also entered. These analyses showed that the linear combination of orderliness and goal striving ($B(SE) = -0.065 (0.032)$, $t(434) = -1.98$, $p = .049$, $d = -0.10$) was significantly associated with morbidity.

DISCUSSION

To our knowledge, this is the first study to examine personality–aggregate illness burden associations, using both a comprehensive taxonomy of personality traits and a physician-quantified measure of aggregate medical morbidity. Drawing on previous literature, we hypothesized that Neuroticism, Extraversion, and Conscientiousness would be associated independently with general medical morbidity. In a final multivariate model controlling for demographic variables, lifetime history of smoking, alcohol-related diagnoses, hypertension, total cholesterol levels, and depressive symptoms, Conscientiousness was the single personality trait associated with cumulative illness burden.

Why do conscientious people bear less overall illness in late life? Part of the explanation may be that conscientious individuals are less likely to engage in health-damaging behaviors. A meta-analysis found that Conscientiousness is inversely associated with alcohol, drug, and tobacco use and risky sex (13). Individuals high in Conscientiousness are less likely to be involved in accidents of any kind, particularly traffic accidents (38), probably because they avoid risky driving (13) and, in general, are more conservative in their evaluation of risk (39). The potentially pathogenic behaviors associated with low Conscientiousness may catalyze disease processes or invite long-lasting injury in earlier phases of life and thereby contribute to overall morbidity in old age. Conversely, over the course of a lifetime, certain everyday habits like maintaining a lower fat diet (40) and abstaining from tobacco are likely to promote general health in old age.

Subcomponent analyses clarified that the influence of Conscientiousness on morbidity can be ascribed to the joint effect of orderliness and goal striving. These subcomponents describe people who are orderly, neat, clean, well organized, steadfast, and determined. It is possible that individuals who tend toward neatness and cleanliness may reduce their exposure to pathogens. Individuals who cultivate and pursue well-defined goals may also possess a sense of self-discipline, which translates into better adherence to medical regimens and healthier lifestyles. These hypotheses about the role of health behaviors in mediating the influence of Conscientiousness on morbidity require further empirical investigation. It is also possible that Conscientiousness decreases illness burden via psychophysiological or social mechanisms, and there might be a genetic basis responsible for both Conscientiousness and lower levels of medical morbidity in older adults. Research is needed to examine these issues as well.

From a population perspective, the contribution of Conscientiousness to morbidity is not trivial. Compared with older primary care patients who are very high in Conscientiousness, those who are very low in this trait have accumulated 87% as much medical illness burden as would be expected from a comparison of two groups of older adults separated by 10 years of age. Arising from nomothetic data, our estimate applies to differences between individuals at the population level, assumes linearity in all effects, and is restricted to the study's age range. Nonetheless, it highlights the influence of personality traits on aggregate morbidity in the elderly.

Turning to clinical research implications, people who are low in Conscientiousness may routinely disregard health maintenance that requires effort, such as periodic check-ups or follow-up appointments. They may eschew treatments that require organization and attention to detail, such as regularly timed doses of medication. These patients may require interventions to increase treatment adherence, involving, for example, treatment regimens that are simpler and easier to execute. Further research may clarify the cognitive and behavioral mechanisms, which lead individuals low in Conscientiousness to ill health. Findings from these studies could then be translated into tailored interventions.

The present study must be qualified by its limitations. First, the cross-sectional design precludes causal interpretations. Although Conscientiousness tends to increase steadily into old age (41), it is possible that health declines may diminish it. For instance, in individuals high in illness burden, poor health reports from physicians might reduce conscientious behaviors through creating a sense of helplessness or inevitability over health declines; conversely, physician reports of low levels of illness burden may reinforce Conscientiousness in patients, causing it to increase. Bidirectional relationships probably exist between personality, health behaviors, and illness burden, and prospective designs are needed to establish sequences of causality. Second, not all possible health behavioral or other mediating influences were measured, and future studies might delineate the specific mechanisms through which Conscientiousness may influence health. Third, this study included predominantly white, relatively well-educated, older primary care patients; the results may not generalize to other samples of older adults. Fourth, the CIRS, although far more objective than the self-report survey measures of medical conditions, is not immune to patient report biases. Portions of primary care records may be influenced by patient report, which may in turn be a function of personality. However, the use of examiner-rated depressive symptoms and alcohol/substance diagnoses are strengths of the study. To our knowledge, this is the first study to use a comprehensive taxonomy of traits in an investigation of physician-rated illness burden based on full medical chart data. Our results point toward the necessity of considering personality traits in large-scale epidemiological studies of disease and morbidity to better characterize at-risk populations and increase the likelihood of constructing informed and effective prevention, intervention, and policy initiatives.

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Glossary

FFM	Five Factor Model
NEO-FFI	Neo Five Factor Inventory
CIRS	Cumulative Illness Rating Scale
SCID-IV TR	Structured Clinical Interview for the Diagnosis of DSM-IV disorders

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TABLE 1

Descriptive Statistics

	M or %	SD
Gender		
Male	37.2% (<i>n</i> = 167)	
Female	62.8% (<i>n</i> = 282)	
Age, years	74.62	6.32
Education, years	14.25	2.38
Lifetime smoking history of 100 cigarettes		
Yes	60.8% (<i>n</i> = 273)	
No	39.2% (<i>n</i> = 176)	
Lifetime alcohol/substance abuse or dependence		
Yes	20% (<i>n</i> = 90)	
No	80% (<i>n</i> = 359)	
Lifetime hypertension		
Yes	72.6% (<i>n</i> = 326)	
No	27.4% (<i>n</i> = 123)	
Total cholesterol level, mg/dl	194.96	36.88
NEO-FFI Neuroticism, raw score/(T-score)	14.76/(44.37)	7.55/(11.98)
NEO-FFI Extraversion, raw score/(T-score)	28.55/(51.37)	6.10/(10.15)
NEO-FFI Openness to experience, raw score/(T-score)	26.88/(49.74)	5.76/(9.82)
NEO-FFI Agreeableness, raw score/(T-score)	35.42/(54.80)	4.94/(9.68)
NEO-FFI Conscientiousness, raw score/(T-score)	34.28/(49.55)	5.85/(9.84)
HDRS cognitive/emotional	2.67	3.56
Cumulative illness rating scale	7.32	2.75

NEO-FFI = Neo Five Factor Inventory; T-scores based on normative sample (Costa & McCrae, 1992); HDRS = Hamilton Depression Rating Scale.

TABLE 2
Associations of Personality Traits and Covariates With the Cumulative Illness Rating Scale

	Bivariate	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age, years	0.24**	0.23**	0.23**	0.23**	0.23**	0.22**	0.22**
Gender	0.02	-0.04	-0.02	-0.02	-0.01	-0.03	-0.02
Education, years	-0.11*	-0.04	-0.05	-0.04	-0.04	-0.06	-0.03
Lifetime alcohol/substance abuse or dependence	0.01	0.01	0.01	0.01	0.00	0.00	0.02
Lifetime smoking history of 100 cigarettes	0.00	0.02	0.01	0.02	0.01	0.01	0.00
Lifetime history of hypertension	0.19**	0.17**	0.17**	0.17**	0.16**	0.16**	0.16*
Total cholesterol levels (mg/dl)	-0.09*	-0.09†	-0.09†	-0.08†	-0.08†	-0.08†	-0.08†
HDRS cognitive/emotional	0.18**	0.11*	0.14**	0.18**	0.17**	0.14**	0.12*
Neuroticism	0.16**	0.09†	—	—	—	—	0.00
Extraversion	-0.17**	—	-0.11*	—	—	—	-0.06
Openness to experience	-0.10*	—	—	-0.04	—	—	-0.03
Agreeableness	-0.12*	—	—	—	-0.08†	—	-0.04
Conscientiousness	-0.20**	—	—	—	—	-0.14**	-0.10*

Standardized regression coefficients for variables predicting scores on the Cumulative Illness Rating Scale. Base Model = age, gender (1 = female), education, cigarette history (1 = positive), lifetime alcohol abuse or dependence diagnosis (1 = positive), lifetime history of hypertension (1 = positive), total cholesterol levels, and HDRS cognitive/emotional. Model 1 = base model plus Neuroticism, Model 2 = base model plus Extraversion, Model 3 = base model plus Openness to experience, Model 4 = base model plus Agreeableness, Model 5 = base model plus Conscientiousness, Model 6 = base model plus Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness.

HDRS = Hamilton Depression Rating Scale.

* $p < .05$.

** $p < .01$.

† $p < .10$.