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Personality Traits and the Risk of Sensory Impairment: Evidence from the National Health and Aging Trends Study

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Abstract

Objective: Sensory impairment has pervasive effects on older individuals' quality of life and health. Although recent research found an association between personality traits and the risk of hearing and vision impairment, data on older adults is limited, and no study has examined dual-sensory impairment. Therefore, the present study examined the prospective relationship between personality traits and risk of hearing, vision, and dual sensory impairment among older adults.

Method: Participants were older adults aged 67 to 94 years (N= 829) from the National Health and Aging Trends Study (NHATS). Personality traits, demographic, clinical (body mass index, diabetes, and high blood pressure), and behavioral (smoking and physical activity) factors were assessed in 2013/2014. Objective measures of hearing and vision were obtained in 2021.

Results: Controlling for demographic factors, higher conscientiousness was associated with a lower risk of hearing (OR: 0.81; 95%CI: 0.67–0.97, p=.022), vision (OR: 0.83, 95%CI: 0.71–0.97, p= .022) and dual sensory impairment (OR: 0.70, 95%CI: 0.56–0.86, p<.001). Higher openness (OR: 0.81, 95%CI: 0.68–0.97, p=.023) and neuroticism (OR: 0.74, 95%CI: 0.62–0.88, p<.001) were associated with a lower risk of hearing impairment. Clinical and behavioral covariates partially accounted for these associations.

Conclusion: Consistent with other age-related health and cognitive outcomes, conscientiousness may be protective against sensory impairment. Surprisingly, neuroticism had a protective effect for hearing, but not vision. The findings provide novel evidence for an association between personality and sensory impairment among older adults.

Keywords

Personality; sensory impairment; hearing; vision; older adults

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Declaration of Competing Interest
None.

1. Introduction

Loss of vision and hearing are challenging age-related sensory impairments. Indeed, objective measures of vision and hearing impairment have been associated with increased depressive symptoms [1], worse cognitive function [2], higher risk of dementia [3] and higher risk of mortality [4]. In addition, dual sensory impairment, defined as the presence of both hearing and vision impairment, has a pervasive effect on health [5] and stronger than either hearing or vision impairment alone [4]. There is thus a need to identify factors associated with risk of sensory impairment.

Existing research indicate that personality traits defined by the Five-Factor Model [6] are associated with a range of health behaviors and outcomes across adulthood and old age. For example, higher neuroticism (the tendency to experience vulnerability to stress and negative emotions) is related to higher physical inactivity [7], higher risk of frailty [8], higher limitations in independent activities of daily living (IADL) [9], higher risk of stroke [10], and higher risk of incident dementia [11]. In contrast, higher conscientiousness (the tendency to be responsible and disciplined) has been associated with lower risk of stroke [10], and incident dementia[11]. Higher extraversion (the tendency to be sociable and outgoing) and openness (the tendency to be curious and creative), as well as conscientiousness, are related to a physically active lifestyle[7], lower risk of frailty[8], limitations in IADL [9], and better functional health [12]. Evidence for an association between agreeableness and health in old age has been less consistent [9–12].

Personality traits are also related to the risk of hearing impairment [13]: higher neuroticism has been prospectively related to higher risk of hearing impairment, whereas higher conscientiousness and openness have been prospectively related to better hearing acuity and lower risk of hearing impairment over four years; no associations were found for extraversion and agreeableness [13]. The prospective association between personality and hearing impairment has been studied among individuals aged over 50 years and over a four-year follow-up. To our knowledge, no study has yet replicated these findings or addressed whether the associations generalize to adults older than 65 years and over longer follow-ups.

There is preliminary evidence for an association between personality and vision. Specifically, one study found that decreases in extraversion and increases in neuroticism were associated with decreases in vision[14]. However, this research was limited to neuroticism and extraversion and did not test the association with the three other traits. There are reasons to expect an association between conscientiousness and vision impairment. Indeed, conscientiousness is related to clinical and behavioral factors such as lower diabetes and hypertension [15], lower likelihood of smoking [16], and higher physical activity [7], which are associated with lower risk of vision impairment [17–20].

Furthermore, existing research have focused either on hearing or vision impairment; no research has examined the relationship between personality and dual sensory impairment. The identification of this association is important given the deleterious implications of dual sensory impairment, such as higher risk of dementia and mortality [3,4].

Based upon the National Health and Aging Trends Survey (NHATS), the present study examined the prospective relationship between personality and sensory impairment assessed up to 8 years later among individuals aged 65 years and older. Consistent with past research [13], it was hypothesized that higher neuroticism would be related to higher risk of hearing impairment, whereas higher conscientiousness and openness were expected to relate to lower risk of hearing impairment [13]. Also building upon existing research [14], higher neuroticism was expected to relate to higher risk of vision impairment, whereas higher extraversion was expected to relate to lower risk of vision impairment. Given that conscientiousness is associated with clinical and behavioral factors leading to vision impairment [7,15,16], it was hypothesized that higher conscientiousness would be related to lower risk of vision impairment. Finally, higher neuroticism was expected to relate to higher risk of dual-sensory impairment, whereas it was hypothesized that higher conscientiousness would be associated with lower risk of dual-sensory impairment. No association between agreeableness and sensory impairment was expected.

Additional analyses were conducted to test whether the association between personality and sensory impairment was accounted for by clinical (body mass index (BMI), diabetes, hypertension) and behavioral (smoking, physical activity) factors. Although these variables could be considered confounding factors, they could also mediate the association between personality and sensory impairment.

2. Methods

2.1 Participants

Participants were from the National Health and Aging Trends Study (NHATS). The NHATS is a prospective cohort study of Medicare enrollees aged 65 years and older conducted by the Johns Hopkins Bloomberg School of Public Health, and approved by the Johns Hopkins Bloomberg School of Public Health Insitutional Review Board (IRB). All participants provided informed consent. One third of the sample provided data on personality, demographic factors (age, sex, education, and race), clinical (diabetes, high blood pressure, BMI), and behavioral (smoking and physical activity) factors in 2013 (wave 3). Another third of the sample provided this data in 2014 (wave 4). The two waves were combined, resulting in a baseline sample of 2770 participants with complete personality and demographic data. Vision and hearing data were available in 2021 (Wave 11). From the baseline sample, 1941 individuals were excluded because they did not have sensory function data at follow-up. The final sample was 829 participants aged 67 to 94 years (58% women; Mean Age= 75.53 years, SD= 5.61) who had complete personality, demographic, and sensory function data. Attrition analyses indicated that participants with follow-up data had lower neuroticism (d= .14), higher extraversion (d= .23), openness (d= .28), agreeableness (d= .11) and conscientiousness (d= .32) at baseline than those without follow-up data. They were also younger (d=.85), more educated (d= .37), and less likely to be African American (17% vs. 22%) compared to participants without follow-up data. Descriptive statistics are in Table 1.

2.2. Personality

Personality traits were assessed using a 10-item version of the Midlife Development Inventory (MIDI) [21]. Participants rated adjectives that assessed neuroticism (e.g., worrying and nervous), extraversion (e.g., outgoing and talkative), openness (e.g., creative and imaginative), agreeableness (e.g., warm and caring), and conscientiousness (e.g., organized and thorough). They indicated how well each adjective described them on a scale from 1 (*not at all*) to 4 (*a lot*). The mean for each trait was computed across the two items. Cronbach alphas were .74, .71, .71, .54, and .58 for neuroticism, extraversion, openness, agreeableness, and conscientiousness, respectively.

2.3. Sensory Impairment

Vision was measured using a tablet-based platform that assessed distance acuity, contrast sensitivity, and near acuity [22–24]. These tests assessed binocular vision with habitual corrections (such as glasses or contact lenses), to evaluate visual function under everyday conditions [22–24]. Participants were seated 59 inches from the tablet for distance acuity and contrast sensitivity testing. Distance acuity assessed the spatial resolution of the visual system, and was measured by showing five letters per screen to participants, which became smaller with each successive screen. Participants were asked to read the letters aloud from left to right. The test was stopped when participants gave fewer than 3 correct answers on a given screen or when they completed the screen with the smallest letters. A distance acuity vision score was computed as the logarithm of the minimum angle resolution (logMAR) using the formula 0.02* (55-S_D), where S_D is the number of correct letters for the test. Values over 0.30 LogMAR indicated distance acuity impairment and were coded as 1; values equal to or lower than 0.30 LogMAR were coded as 0 [22–24]. Contrast sensitivity was the amount of contrast needed to identify a character. Participants were shown two letters per screen that became lighter with each successive screen. Participants read the letters aloud from left to right. The test stopped when no correct answer was given on a screen or when the screen with the lowest contrast was reached. Contrast sensitivity was expressed in Log contrast sensitivity, using the formula 0.40+ (0.05*S_C), where S_C refers to the sum of correct letters for contrast sensitivity. Values more than one standard deviation below the sample mean were categorized as impaired contrast sensitivity (1= impairment, 0= no impairment) [22–23]. Finally, near acuity is the ability to see at usual reading distance. It was assessed by asking participants to hold the tablet at their usual reading distance. Five lower case letters per screen were shown, which became smaller with each successive screen. Participants read the letters out loud from left to right. The test was discontinued when less than three correct answers were given or when the screen with the smallest letters was completed. Near acuity was expressed in LogMAR and computed as (0.02*(55-S_N)) + $\log_{10}$ (40/X), where S_N was the sum of correct letters and X was the reading distance in centimeters. Near acuity impairment was defined as values over 0.3 logMAR (1=impairment, 0= no impairment) [22–24]. To be consistent with recent research [24], vision impairment was coded as 1 (at least one vision impairment) and 0 (no impairment) across the three tasks. Performance on each vision test and the overall vision impairment category have been related to critical age-related outcomes such as worse cognitive function and higher dementia risk in the NHATS[24].

Hearing was assessed using pure-tone audiometry with an electronic tablet-based portable audiometer (SHOEBOX Ltd., Ottawa, Canada) [25]. This test is considered the gold standard to measure peripheral hearing loss by assessing the entire auditory system. Participants took out their hearing devices before the test. Tones were presented through a headset at six different frequencies (in Hz) and at different decibels (in dB HL) for each ear. Participants raised a hand when they heard a tone. Pure tone averages were calculated in the better-hearing ear as the average of hearing threshold levels at four frequencies: 500 Hz, 1,000 Hz, 2,000 Hz, and 4,000 Hz. Hearing impairment was defined as values equal to or over 26 dB HL (1=impairment, 0=no impairment) [25].

Consistent with existing research [3,4,26,27], performance on measures of distance acuity and hearing impairment were used to compute a dual sensory impairment score. Participants with both distance acuity and hearing impairment were coded as 1; those without dual impairment were coded as 0. This measure of dual sensory impairment has been related to higher risk of incident dementia [3] and mortality [4,26] in past research.

2.4. Covariates

Age (in years), sex (1=female, 0=male), education, race (1=African American, 0=other), and wave of personality assessment (1=2013, 0=2014) were included as covariates. Education was measured on a scale from 1 (No schooling completed) to 9 (Master's, professional or doctoral degree). Analysis on vision impairment also controlled for the use of glasses, contacts, or any vision aid for distance acuity, contrast sensitivity, and/or near acuity during the vision tests.

Additional analyses controlled for diabetes, high blood pressure, BMI, physical activity, and smoking. Participants indicated whether they had been diagnosed with diabetes or high blood pressure (yes/no). Self-reported height and weight were used to calculate BMI as kg/m^2. Physical activity was assessed with two items: "In the last months, did you ever go walking for exercise" and "In the last month, did you ever spend time on vigorous activities that increased your heart rate and made you breathe harder?" (yes/no). Answers were summed across the two items. Smoking was coded as 1 for current smokers and 0 for never/former smokers.

2.5. Data Analysis

Logistic regression was used to examine whether baseline personality was related to the risk of vision, hearing, and dual sensory impairment at follow-up. Each personality trait was z-scored and examined in separate analyses. Demographic factors and wave of personality assessment were controlled in each analysis. The use of vision aids was also controlled for in the analysis of vision impairment and dual sensory impairment. Additional logistic regression analyses included diabetes, high blood pressure, BMI, physical activity, and smoking as additional covariates. These analyses examined whether these clinical and behavioral factors accounted for the association between personality and hearing, vision, and dual sensory impairment. Supplemental logistic regression examined personality and distance acuity, contrast sensitivity, and near acuity.

Since hearing aids were removed for the test, sensitivity analyses were conducted to test whether the use of hearing aids moderated the association between personality and hearing impairment. Finally, the association between personality and the continuous measure of hearing acuity, distance acuity, contrast sensitivity, and near acuity was examined with linear regression.

3. Results

Consistent with the hypothesis, conscientiousness and openness were related to a lower risk of hearing impairment, controlling for the covariates (Table 2, Model 1). In contrast to the hypothesis, however, neuroticism was associated with a lower likelihood of hearing impairment at follow-up. A one standard deviation (SD) higher conscientiousness, openness, and neuroticism were respectively related to a 23%, 23%, and 35% reduced likelihood of hearing impairment. These associations persisted when clinical and behavioral factors were included (Table 2, Model 2). Extraversion and agreeableness were unrelated to hearing impairment.

As hypothesized, conscientiousness was related to a lower likelihood of vision impairment at follow-up, controlling for covariates (See Table 2, Model 1). The results suggested that a one SD higher conscientiousness was associated with a 20% reduced likelihood of vision impairment. Neuroticism, extraversion, openness, or agreeableness were unrelated to vision impairment (Table 2, Model 1). The association between conscientiousness and vision impairment became non-significant when diabetes, high blood pressure, BMI, physical activity, and smoking were included as covariates (Table 2, Model 2).

Higher conscientiousness was related to a lower risk of dual sensory impairment (Table 3, Model 1). For every SD higher conscientiousness, the likelihood of dual sensory impairment decreased by 43%. This association was reduced but remained significant when diabetes, high blood pressure, BMI, physical activity, and smoking were included in the analysis (Table 3, Model 2). Neuroticism, extraversion, openness, and agreeableness were unrelated to dual sensory impairment.

Additional analyses indicated that higher conscientiousness was associated with a reduced likelihood of impairment in distance acuity (OR= 0.78, 95%CI= 0.64–0.96, p=.016) and contrast sensitivity (OR= 0.81, 95%CI=0.66–1.00, p=.047), but not near acuity (OR= 0.90, 0.76–1.06, p=.19) (Supplementary Table S1). No other trait was related to distance acuity, contrast sensitivity, or near acuity (Supplementary Table S1). Sensitivity analyses further indicated that higher conscientiousness was related to better continuous measure of contrast sensitivity (β= 0.09, SE= 0.03, p=.008) (Supplementary Table S2) and that higher conscientiousness (β= −0.08, SE= 0.03, p=.008), agreeableness (β= −0.07, SE= 0.03, p=.025) and neuroticism (β= −0.06, SE= 0.03, p=.046) were related to higher continuous measure of hearing acuity (Supplementary Table S3). Use of a hearing aid did not moderate the association between personality and hearing impairment (all interaction terms *ns*).

4. Discussion

The present study examined the prospective association between personality traits and sensory impairment. As hypothesized, conscientiousness was associated with a lower risk of vision impairment, hearing impairment, and dual sensory impairment assessed up to 8 years later. Also consistent with expectations, openness was related to a lower risk of hearing impairment. In contrast to the hypothesis, however, neuroticism was associated with lower risk of hearing impairment and was unrelated to vision and dual impairment. Extraversion and agreeableness were unrelated to sensory impairment across the different functions. These associations were observed controlling for demographic factors, and most persisted when accounting for clinical and behavioral factors. Overall, the present study advances existing knowledge by providing novel evidence for an association between personality and sensory impairment across different functions among older adults.

Conscientiousness was the most consistent personality correlate of sensory impairment, similar to other health and cognitive outcomes [8,9,11,28,29]. Using an older sample and a longer follow-up, this study replicates and extends a previous study on conscientiousness and hearing impairment [13]. To our knowledge, this is also the first study to test whether conscientiousness is associated with vision and dual sensory impairment. Furthermore, supplemental analyses revealed that higher conscientiousness was associated with a lower risk of impairment in distance acuity and contrast sensitivity. There are several pathways that could explain these associations. Conscientiousness is associated with preventive behaviors [30], including health screenings [31]. Individuals higher in conscientious may thus engage in frequent hearing and vision screening, limit their noise exposure, and adopt vision-related preventive behaviors, which may ultimately reduce the likelihood of both hearing and vision impairment. In addition, their behavioral and clinical profiles, characterized by lower smoking [16], higher physical activity [7], lower BMI [32], lower risk of diabetes and hypertension [15] may benefit sensory functioning. Consistent with this hypothesis, clinical and behavioral factors partially accounted for the associations between conscientiousness and hearing, vision, and dual sensory impairment, which suggests that they may act as mediators of these associations. Biological factors may also explain part of these associations. Indeed, higher conscientiousness is related to lower inflammation[33], less mitochondrial dysfunction[34], and lower metabolic syndrome [35], which are associated with lower risk of hearing and visual impairment [36–40].

Higher openness was associated with lower risk of hearing impairment. This result extends previous research on this association [13] in an older sample and longer follow-up. Behavioral pathways may explain part of this association. Indeed, higher openness has been associated with better hearing acuity in part through its relationship with more frequent physical activity [13]. In addition, openness has been related to lower systemic inflammation [33], which is associated with lower risk of hearing impairment [39].

Surprisingly, higher neuroticism was associated with lower risk of hearing impairment. This finding is in contrast with the hypothesis and existing evidence of an association between this trait and higher risk of impaired hearing [13]. One main difference between past research and the present study is the measure of personality. The previous study used the full version of the MIDI to assess personality, whereas the present study used a version of this inventory that only had items that referred to worry and nervousness. The lower reliability of the two items could produce chance findings, especially given the relatively small sample size. Another possibility is that endorsing "nervous" may measure a tendency to be hypervigilant, which could give some advantages in a hearing test. Some research indicates that higher scores on the neuroticism facet "worried/vulnerable" is associated with better health [41], which may also manifest in higher hearing acuity. However, using the same neuroticism scale, NHATS studies have found that higher --not lower-- neuroticism is a risk factor for poor health outcomes, such as frailty [8], motoric cognitive risk syndrome [42], and cognitive impairment [43]. More facet-level research is needed to better understand this mixed evidence between neuroticism and hearing impairment.

In contrast to the hypothesis and a previous study [14], neuroticism and extraversion were unrelated to vision impairment. In addition to the neuroticism items discussed above, another reason for the difference could be that the previous study focused on the association between within-person changes in extraversion and neuroticism and changes in vision [14]. The present study focused on between-person effects and found extraversion and neuroticism unrelated to vision impairment. Furthermore, extraversion is related to some behavioral factors associated with lower risk of vision impairment, such as physical activity [7], but is mostly unrelated to clinical risk factors such as diabetes and hypertension[44,45], which may explain in part why this trait is unrelated to vision.

The present study adds to existing knowledge in several ways. First, it contributes to the literature on factors related to dual-sensory impairment [46,47] by providing the first evidence of a role for personality traits. Second, this study complements existing knowledge on the association between personality and health in old age [8,9,11]. Sensory impairment could be a one pathway that links conscientiousness to a range of health and cognitive outcomes. For example, dual-sensory impairment has been associated with IADL [48], dementia [3], and mortality [4]. Future research could test whether dual sensory impairment mediates the link between conscientiousness and IADL [9], dementia [11], and mortality [49]. Furthermore, supplemental analyses revealed that conscientiousness is associated with lower risk of impairment in distance acuity and contrast sensitivity. Given that worse distance acuity and contrast sensitivity have been related to higher risk of dementia [3,50], they may be potential vision-specific pathways linking lower conscientiousness to higher risk of incident dementia. Third, from a practical perspective, the present study suggests that personality assessment may be useful in identifying older individuals at risk for sensory impairment. Poor sensory function can in turn, increase the risk of worse cognition, higher depressive symptoms, and functional limitations. Individuals with lower conscientiousness may be targeted by interventions which may contribute to a lower risk of sensory impairment, and have broader protective effects by mitigating the risk of falls, cognitive decline, or altered quality of life. In addition, interventions could be directed toward increasing conscientiousness [51], ultimately reducing the risk of sensory impairment across different functions and attenuating its consequences.

The present study has several strengths, including examination of the prospective association between personality traits and sensory impairment in a sample of older adults, an 8-year follow-up, and objective measures of hearing and vision. This research also had several limitations. Although personality was modeled as a predictor of sensory impairment, it is also possible that sensory impairment may lead to change in personality. Longitudinal research with repeated waves of personality and sensory function is needed to examine these reciprocal relationships. Furthermore, baseline measures of sensory function were not available. Therefore, it was not possible to test whether personality is associated with change in sensory impairment over time. The personality measure was also very brief and limited to the five broad traits. A facet-level approach is needed for a more detailed understanding of personality and sensory impairment. One must also be cautious about the brief and coarse measures of physical activity and smoking. Furthermore, the present study only controlled a limited set of behavioral and clinical factors that may potentially explain the link between personality and sensory impairment. Future research should consider including additional factors and more reliable measures. Finally, the present findings are based on a US sample of older Medicare beneficiaries; more research is needed to examine whether the associations replicate in other cultures, and among samples that are more diverse across race, educational levels, and economic backgroud.

The present study found evidence that personality is prospectively associated with sensory impairment among older adults. Higher conscientiousness was related to a lower risk of hearing, vision, and dual sensory impairment, whereas higher openness and neuroticism were associated with lower risk of hearing impairment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1.

Baseline Characteristics of the Sample

Variables	***M/% (n)***	***SD***
Age (Years)	75.53	5.61
Sex (%/nwomen)	58% (484)	-
Race (%/nAfrican American)	17% (138)	-
Education	5.78	2.28
BMI[a]	28.39	5.61
Diabetes (%/n)	26% (218)	-
High blood pressure (%/n)	67% (554)	-
Smoking (%/n)	5% (45)	-
Physical activity	1.14	0.79
Neuroticism	2.14	0.80
Extraversion	3.25	0.72
Openness	2.97	0.80
Agreeableness	3.61	0.48
Conscientiousness	3.36	0.64
Hearing Impairment (%/n)	76% (634)	-
Vision Impairment (%/n)	34% (286)	-
Dual Sensory Impairment (%/n)	12% (97)	-

Note. N= 829;

[a]N= 819

Table 2

Summary of Logistic Regression Analysis Predicting Follow-up Hearing and Vision Impairment from Baseline Personality Traits

	Hearing Impairment				Vision Impairment			
	Model 1[a]		Model 2[b]		Model 1[c]		Model 2[d]	
	OR (95%CI)	p-value	OR (95%CI)	p-value	OR (95%CI)	p-value	OR (95%CI)	p-value
Neuroticism	0.74 (0.62–0.88)	<0.001	0.76 (0.63–0.91)	0.002	0.99 (0.85–1.16)	0.93	1.00 (0.85–1.19)	0.96
Extraversion	0.96 (0.80–1.14)	0.62	0.93 (0.78–1.12)	0.45	0.90 (0.77–1.05)	0.17	0.91 (0.77–1.06)	0.22
Openness	0.81 (0.68–0.97)	0.023	0.80 (0.67–0.96)	0.018	0.89 (0.76–1.04)	0.13	0.91 (0.77–1.07)	0.23
Agreeableness	0.86 (0.72–1.04)	0.11	0.86 (0.71–1.03)	0.10	0.92 (0.79–1.08)	0.31	0.92 (0.78–1.08)	0.30
Conscientiousness	0.81 (0.67–0.97)	0.022	0.83 (0.69–1.00)	0.046	0.83 (0.71–0.97)	0.022	0.86 (0.74–1.01)	0.07

Note. OR: Odds Ratio; 95% CI: 95% Confidence Intervals;

[a] Model 1: Adjusted for age, sex, education, race and wave of personality assessment; N= 829

[b] Model 2: Adjusted for age, sex, education, race, wave of personality assessment, diabetes, high blood pressure, BMI, physical activity and smoking; N= 819;

[c] Model 1: Adjusted for age, sex, education, race, wave of personality assessment and vision aids; N= 824

[d] Model 2: Adjusted for age, sex, education, race, wave of personality assessment, vision aids, diabetes, high blood pressure, BMI, physical activity and smoking; N= 814

Table 3

Summary of Logistic Regression Analysis Predicting Follow-up Dual Sensory Impairment from Baseline Personality Traits

	Dual Sensory Impairment			
	Model 1[a]		Model 2[b]	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Neuroticism	0.92 (0.73–1.15)	0.46	0.95 (0.75–1.19)	0.64
Extraversion	1.04 (0.83–1.30)	0.73	1.06 (0.84–1.34)	0.62
Openness	0.83 (0.66–1.03)	0.096	0.86 (0.68–1.08)	0.19
Agreeableness	1.02 (0.81–1.28)	0.88	1.03 (0.82–1.29)	0.83
Conscientiousness	0.70 (0.56–0.86)	<0.001	0.74 (0.59–0.92)	0.007

Note: OR: Odds Ratio; 95% CI: 95% Confidence Intervals;

[a]Model 1: Adjusted for age, sex, education, race, wave of personality assessment and vision aids; N= 824

[b]Model 2: Adjusted for age, sex, education, race, wave of personality assessment, vision aids, diabetes, high blood pressure, BMI, physical activity and smoking; N= 814