No evidence of “healthy neuroticism” in the Hawaii Personality and Health Cohort

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Abstract

Background. Heterogeneity in the effects of trait neuroticism on mortality has inspired recent theories of “healthy neuroticism,” or the possibility that neuroticism can lead people down either healthy or unhealthy behavioral pathways. The logical extension of this theory is that some construct – perhaps another trait, financial resource or health-relevant situation – changes the relationship between neuroticism and health. The other possibility is that different components of neuroticism lead to different health behaviors, and therefore different outcomes. **Purpose.** The current study systematically examines the relationship between neuroticism and various health indicators including perceptions of health, behaviors, health outcomes and biomarkers of health. Measures of neuroticism include both adult-self-reports and teacher-reported personality assessed when participants were in grade school. Finally, we examine both potential moderators of the effect of neuroticism and examine its facet-structure. **Methods.** The current study examines three potential moderators (i.e., conscientiousness, socio-economic status and health status) of neuroticism and the bi-factor structure of neuroticism in search of evidence of healthy neuroticism. Moreover, the current study utilizes both adult and childhood measures of personality and SES, as well as a variety of health outcomes, from self-reported behavior to biological markers. Sample sizes range from 299 to 518. **Results.** The relationship between neuroticism and health was not consistently moderated by any other variable, nor were facets of neuroticism differentially related to health. **Conclusions.** Despite a systematic investigation of the potential “paths” which may differentiate the relationship of neuroticism to health, no evidence of healthy neuroticism was found.

One catalyst for the increasing recognition that personality traits influence health outcomes has been the greater awareness and adoption of common trait taxonomies, allowing researchers the ability to compare findings across samples. For instance, research founded within the Big Five taxonomy has allowed researchers to demonstrate consistent linkages between traits like conscientiousness and neuroticism and health outcomes, typically showcasing the benefits associated with the former and detriments for those individuals higher on the latter (1-3; for a review, see 4). However, this summary of the literature ignores a substantial number of studies which find null (e.g., 5-7) or protective effects of neuroticism on health (e.g., 8-12). Though commonly cast as a universally maladaptive trait for health, researchers also have suggested the possibility that neuroticism may prove beneficial in some circumstances, leading to the concept of “healthy neuroticism” (13). The current study sought to comprehensively examine the evidence for healthy neuroticism using data from the long-running Hawaii Longitudinal Study of Personality and Health (14-16). Specifically, we sought to examine four potential influences on whether neuroticism may prove adaptive for an individual’s health and health behavior: (1) the individual’s level of conscientiousness, (2) whether the individual reports having a chronic disease, (3) the individual’s socioeconomic status, and (4) if the associations with health differ based on the facet of neuroticism. Each of these possibilities reflect previous theoretical and empirical literature on the role of neuroticism on health outcomes, and each can potentially lead to healthy neuroticism effects.

Conscientious Neuroticism

A common tendency in research on personality and health is to focus on traits as independent factors influencing health. Such a perspective fails to properly consider that any one individual’s personality reflects a constellation of Big Five (and other) traits, and that association with any single trait may vary depending on a person’s standing on another trait. With respect to neuroticism, one common theory has focused on the interaction between neuroticism and conscientiousness, insofar that it may benefit individuals to be relatively high on both dimensions (17,18). The rationale behind conscientious neuroticism reflects the notion that neurotic conscientious individuals are prone toward health behavior

(19), and this effect may be only further amplified when those individuals also are somewhat anxious or vigilant by disposition, which in turn will keep individuals focused on promoting health.

Evidence for this claim has been found for specific health outcomes and health behaviors. For instance, researchers using the Midlife in the United States data have found a conscientiousness-by-neuroticism interaction when predicting the inflammation biomarker Interleukin-6 (17). In addition, this interaction held when predicting smoking behavior following the onset of disease (20). However, these findings pertain to a narrowly defined health outcome and may depend on specific circumstances. It is unclear whether conscientious neuroticism would prove adaptive across a variety of health outcomes and health behaviors. Indeed, this interaction did not hold when predicting smoking for the general population without disease (20), suggesting that disease status may be an important factor to consider.

The Moderating Role of Chronic Disease

Following from the smoking study discussed above (20), one possibility is that the role neuroticism plays in health and health behavior is altered in the presence of chronic disease. Individuals may respond to the onset of chronic illness with an increase in health-related vigilance. Alternatively, if individuals have not experienced past disease onset, it is less important for them to focus on identifying symptoms or signs of disease progression. Neuroticism has been linked more broadly to higher symptom reporting (21, 22), in line with the central argument for why the trait could prove “healthy” in some instances (13), namely that higher rates of symptom reporting could result from heightened health vigilance. Unfortunately, outside of that one study (20), research has failed to address whether neuroticism’s impact on health and health behavior differs based on chronic disease status.

The Moderating Role of Socioeconomic Status

Central to the theory that neuroticism could be adaptive is that vigilant or anxious individuals are able to enact healthier behaviors when confronted with health concerns (13). Neuroticism has been linked to greater health care costs (23) and more doctor visits (24), presumably related to the associations between the trait and greater vigilance and symptom reporting. However, it is unclear whether these associations would hold across socioeconomic strata, insofar that individuals from poorer backgrounds

may not have the resources available for these frequent visits. Moreover, even if neuroticism could promote healthier behaviors such as exercise and activity engagement, these opportunities are limited for those without sufficient resources. Similarly, neuroticism may fail to promote health for less educated individuals, who may have limited knowledge of best health practices. Support for this claim comes from recent work predicting inflammatory makers (25). In that study, neuroticism proved a risk factor for greater inflammation among low-SES participants, but was related to a reduced risk for inflammation in those higher in SES. In addition, higher neuroticism has been linked to greater longevity among women with higher socio-economic status (26). The current study sought to replicate and extend this interaction by testing whether it holds across different health and health behavior measures.

Differing Facets of Neuroticism

A final possibility reflects another common issue resulting from the movement in health psychology toward broader trait dimensions, namely that these dimensions reflect constellations of lower-order traits, or facets, that may not all work in tandem. Neuroticism is comprised of facets that reflect different aspects of emotional instability, including depression, anxiety, anger or hostility, impulsivity, and self-consciousness (27). However, as noted above, the notion of a “healthy neurotic” is largely reflective of the anxiety component of the trait domain (13). Contrarily, one would not expect depression or hostility to promote health and health behavior, and indeed, both depression (28) and hostility (29) have been linked instead to greater mortality risk.

Previous work has demonstrated the utility of “moving beyond” the Big Five when predicting health outcomes. For instance, regarding neuroticism, work suggests that the impulsivity component may be the facet most associated with obesity (30, 31), likely due to impulsive eating habits. However, multiple facets appear negatively linked to self-rated health (32), including anxiety, the facet most associated with “healthy neuroticism.” Though it appears important to consider neuroticism at the facet level, little support exists for the facet predictions aligned with the healthy neuroticism concept.

The current study

While we are not the first study to seek evidence of healthy neuroticism, the current study may have the highest likelihood of identifying such evidence, if it exists, for two reasons. First, the current study contains both adulthood and childhood personality measures. Concurrent assessments of predictors and outcomes often have the largest effect sizes, making them easier to detect. However, in the case of personality and cumulative health outcomes, traits often only have small effects at any single time point present moment, with more easily observed effects accruing over time (4, 33). For example, an adult smokes a single cigarette in response to high levels of neuroticism, having a small impact on one's health. In contrast, if a teenager chooses to initiate a smoking habit in response to high levels of neuroticism, the resulting sustained behavior may have an enormous impact. In addition, many health habits are set in late adolescence and early adulthood, and these choices are likely influenced by personality at that age. By examining both adulthood and childhood personality, we leveraged both the possibilities of stronger effects due to concurrent assessment and stronger effects due to the accrual of behaviors over time.

Second, the current study utilized multiple measures of health. As with many studies of personality and health, we examined how traits may predict self-rated health and health behavior. Additionally, we predicted major chronic disease status. Finally – and unlike the majority of studies – we employed biomarker data as objective outcomes. By examining a large variety of health indicators, we are able to not only increase the likelihood of identifying healthy neuroticism, but we are also able to better understand the mechanisms of this effect. For example, if we identify these effects for the clinical biomarkers but not behaviors, it would provide evidence that researchers need to move beyond lifestyle behaviors when explaining the value of healthy neuroticism, such as considering stress reactivity.

Methods

Participants

Participants came from the Hawaii Personality and Health Cohort. This cohort was originally assessed between 1959 and 1967, when teachers in entire elementary-school classrooms on two Hawaiian Islands assessed children ($N = 2,418$) on their personality traits at the end of the school year, one time for each child. In 1998, efforts to find these children, now middle-aged adults, were begun. When each

member of the original cohort was located (i.e., rolling recruitment), he or she was invited to join the study. Since joining, participants have completed one or more of seven questionnaires (Q1–Q7) and, from 2003 onward, have been invited to attend a half-day medical and psychological examination. In addition to the childhood personality assessment, measures used here were drawn from items in Q5 (adult personality; assessed in 2008), Q6 (self-rated health, smoking, alcohol use, and chronic disease status; assessed in 2013), and Q7 (exercise and flossing; assessed in 2015), and the clinic visit (physical health outcomes; assessed at age 50).

To be included in the subsample for this study, participants had to have completed either the Q5 adult personality questionnaire or the childhood personality questionnaire and at least one of these portions of the study: Q6, Q7 or the clinical assessments. This resulted in a subsample of 1,115 participants (51% female). However, the sample sizes for various analyses differ, given which participants completed which surveys. The largest sample size was for regressions of systolic blood pressure on the interaction of childhood neuroticism and conscientiousness ($N = 802$), and the smallest was for the regression of alcoholic behaviors on the facets of neuroticism ($N = 544$). Sample sizes for each regression are listed in Supplementary File 1. At this time, researchers at the Oregon Research Institute have archived the child data from the Hawaii and Personality Cohort, and portions of the adult follow-up assessments (14). Additional waves of data will be added to these as resources become available.

Measures

Adult Neuroticism. In 2008, participants completed the 120-item IPIP-NEO from the International Personality Item Pool (34, 35), in which participants are asked to rate how well a statement describes them on a scale from 1 (*Not at all*) to 5 (*Very much*). Neuroticism was measured using 24 statements, including “I worry about things” and “I become overwhelmed by events” ($\alpha = .88$). Trait levels of neuroticism were measured by averaging responses to these items ($M = 2.57$, $SD = 0.55$). Neuroticism was standardized for these analyses.

Facets of adult neuroticism. Six facets of neuroticism can be estimated using these items: anxiety, anger, depression, self-consciousness, immoderation and vulnerability. Each of these was

measured using four of the 24 items in the neuroticism scale. Facets were estimated using a bifactor approach, described below.

Childhood neuroticism. For the children in the present sample, teachers assessed their entire elementary school classrooms (Grades 1, 2, 5, or 6; M age 10 years) by rank-ordering children on each of a comprehensive set of 43–49 personality attributes, using a 7 or 9-step quasi-normal distribution. Definitions developed by teachers for each attribute were provided. These were converted to standardized scores, and orthogonal factor scores for the Big Five were derived for within each subsample of children using all available items in each subsample (15). The average reliability of the neuroticism factor scores across subsamples was estimated at $\alpha = .68$ (36).

Self-Rated Health. Participants rated their own general health, compared to others of their same age and sex, on a scale from 1 (*Poor*) to 5 (*Excellent*; $M = 3.36$, $SD = 1.00$).

Health Behaviors. In 2013, participants reported whether they had (1) or had not (0) ever smoked cigarettes (48% said yes). Current smokers reported the number of cigarettes they typically smoked per day and non-smokers were assigned a value of 0 for this variable ($M = 0.34$, $SD = 0.91$).

Participants also reported whether they had (1) or had not (0) consumed alcohol at any point in their lives (86% said yes). Current drinkers reported on how many days of the week they drank alcohol ($M = 1.68$, $SD = 1.97$), how many drinks they consumed when they drank ($M = 1.29$, $SD = 1.62$), and how many days a week they engaged in binge drinking (defined as five or more drinks in one sitting; $M = 0.58$, $SD = 1.49$), and non-drinkers were assigned a value of 0 for each of these variables.

In 2015, participants reported on how frequently they engaged in strenuous exercise (defined as feeling your heart beat rapidly), moderate exercise (defined as not exhausting) and mild exercise (defined as minimal effort). Responses were coded as zero times (1), one or two times (2), three or four times (3), five or six times (4) or seven or more times a week (5). On average participants engaged in strenuous exercise 1.98 times a week ($SD = 1.19$), moderate exercise 2.69 times a week ($SD = 1.28$), and mild exercise 2.93 times a week ($SD = 1.34$). Participants also reported on how frequently they flossed: never (0), sometimes (1) or always (2; $M = 1.59$, $SD = 0.80$).

Chronic disease status. In 2013, participants reported whether they had ever been diagnosed with the following chronic diseases or health events: heart attack, heart disease, stroke, thyroid disease, migraine, cancer, chronic fatigue syndrome, Type I diabetes, Type II diabetes. The total number of diseases reported was a primary outcome ($M = 0.71$, $SD = 0.98$). In addition, we examined whether a participant had been diagnosed with any heart condition (heart attack or heart disease; 13.4%). This condition was chosen for closer consideration due to its relatively large base rate, compared to the other conditions, and the substantial impact it has on American mortality rates.

Objectively assessed health. Starting in 2003 ($M_{\text{age}} = 51.00$, $SD = 2.93$), participants were invited to a half day clinic assessment which included the collection of urine and blood samples that were tested for various biomarkers. The following biomarkers were used as individual outcomes: fasting blood glucose ($M = 100.68$, $SD = 26.14$), total cholesterol/HDL ratio ($M = 4.29$, $SD = 1.53$), systolic blood pressure ($M = 122.39$, $SD = 15.72$), and waist-to-hip ratio ($M = 0.88$, $SD = 0.09$). These outcomes were standardized. We control for participants' age at the clinic visit in analyses.

Moderators. Adult conscientiousness was measured in 2008 using 24 statements from the IPIP-NEO, including "I complete tasks successfully" and "I am always prepared" ($\alpha = .88$; $M = 4.01$, $SD = 0.46$). Neuroticism and adult conscientiousness were negatively correlated ($r = -.51$). Typically, it is advised that variables be uncorrelated in moderation analyses; however, this interaction was examined in prior studies of healthy neuroticism (e.g., 17, 20) despite correlations between the variables. Childhood conscientiousness was assessed using the same procedures described above for childhood neuroticism (average $\alpha = .77$)(36).

Educational attainment was used as a proxy for adult socio-economic status (SES). Education was assessed on a scale from 1 (8th grade education or less) to 9 (professional or postgraduate degrees). The current sample was well educated ($M = 6.89$, $SD = 1.81$) All participants had completed at least junior high. Childhood SES was a linear combination of father's education, mother's education (both assessed on a scale from 1 [8th grade or less] to 9 [professional or postgraduate degree]) and whether the parents

owned a home before the participant had entered school (1 – Yes, 0 – No). Each variable was standardized, and then the average of the three standardized variables was used as the participant's score.

Chronic disease was a binary variable defined as whether a participant had been diagnosed with one of the chronic diseases listed above (47%). We acknowledge that this variable encompasses a wide range of health problems, including heart disease, diabetes, and chronic fatigue. However, we wanted to use a variable that broadly represented having major health problems – as those studies which find protective effects of neuroticism represent broad populations of older adults – and because we would expect any major health problem to incite anxiety in a person high in neuroticism.

Analyses

Question 1: To what extent is neuroticism associated with health (i.e., self-rated health, health outcomes, health behaviors and clinical indicators of health)?

To assess the extent to which neuroticism is related to health, we examined both bi-variate correlations and coefficient estimates from generalized linear models. We examined both the effects of adult neuroticism – because concurrent measurements are likely to yield the largest effects sizes – and childhood neuroticism – which may have cumulative effects on health accruing over long spans of time. Generalized linear models controlled for gender and age at the clinic assessment. For outcomes that were normally distributed (i.e., self-rated health, moderate and mild exercise, flossing, clinical indicators), linear models were estimated using ordinary least squares. For binary outcomes (i.e., heart conditions, ever smoking, and ever drinking alcohol), binary logistic regression were used. For most count outcomes (number of cigarettes smoked, number of drinks per day, days drinking per week, number of days of binge drinking per week and strenuous exercise), generalized linear models with a negative binomial distribution were used. For number of chronic diseases, we used a Poisson distribution, because models using the negative binomial failed to converge in a few instances.

Question 2: Does conscientiousness moderate the effect of neuroticism on health?

Next, we examine the extent to which conscientiousness moderated the effect of neuroticism on health. To do so, we added conscientiousness and the interaction of conscientiousness and neuroticism to

each of the generalized linear models described above. When adult neuroticism was the predictor, adult conscientiousness was chosen as the moderator; when childhood neuroticism was the predictor, childhood conscientiousness was the moderator. We used a broad interpretation of healthy neuroticism: in these models, a significant interaction term in any of these models was interpreted as an example of “healthy neuroticism.” This encompasses both instances when neuroticism has no effect on health and instances when neuroticism is protective.

Question 3: Does SES moderate the effect of neuroticism on health?

We examine the extent to which SES moderated the effect of neuroticism on health. Here we add SES and the interaction of SES and neuroticism to the models described in Question 1. When adult neuroticism was the predictor, adult education was chosen as the moderator. When childhood neuroticism was the predictor, childhood SES was used as the moderator. If the interaction term in any of these models is significant, this would suggest that SES is a “healthy neuroticism” moderator.

Question 4: Does chronic disease moderate the relationship between neuroticism and health?

Here we examine whether having been diagnosed with a chronic disease status moderates the effect of neuroticism on health. We add the binary disease status variable and the interaction of this variable with adult neuroticism to the models described in Question 1. We also chose not to examine number of chronic diseases or likelihood of having a heart condition as outcomes, given they were substantially overlapping with the moderating variable. If the interaction term in any of these models is significant, this would suggest that chronic disease status is a “healthy neuroticism” moderator.

Question 5: Do facets of neuroticism predict health, and if so, do they predict health in opposing directions?

To determine whether facets of neuroticism had differing effects on health, we used a bifactor model approach. In this model, all items were set to load on general trait neuroticism. Simultaneously, each item was set to load on its corresponding facet. We constrained the covariance between general neuroticism and each of the facets to be 0. This approach has been used in other studies of personality facets and outcomes (37, 38). Fit for this model was very good (RMSEA = .04, CFI = .952). For each

outcome, we used this model and added a set of regression pathways by regression the health outcome onto latent general neuroticism and each latent facet simultaneously. If any of the pathways from personality (neuroticism and its facets) to health are positive (i.e., indicating greater levels of a facet or trait are linked to better health), this would suggest that some facets of neuroticism are “healthy”.

Results

Question 1: To what extent is neuroticism associated with health (i.e., self-rated health, health outcomes, health behaviors and clinical indicators of health)?

First, we examined the bivariate correlations of adult neuroticism and childhood neuroticism with health outcomes, behaviors and indicators, as shown in Table 1. Sample sizes ranged from 558 (outcome: ever drink alcohol) to 802 (systolic blood pressure). Adult neuroticism was associated with worse self-rated health ($r = -.37, p < .001$), increased likelihood of having been diagnosed with a heart condition ($r = .08, p = .033$), more chronic diseases ($r = .15, p < .001$), more cigarettes smoked ($r = .09, p = .016$), less strenuous exercise ($r = -.10, p = .014$), and larger waist-to-hip ratios ($r = .08, p = .038$). Childhood neuroticism was not associated with any of the health variables. Next, we used linear models to estimate the relationship of adult neuroticism and childhood neuroticism to health, controlling for gender, birth year and highest level of education. These results are shown on the right side of Table 1. Adult neuroticism was associated with self-rated health ($b = -0.59, 95\% \text{ CI } [-0.73, -.46], p < .001$), number of chronic diseases ($b = 0.25 [0.07, 0.42], p = .005$), more cigarettes smoked ($b = 0.61 [0.07, 1.18], p = .030$), greater likelihood of consuming alcohol ($b = 0.44 [0.02, 0.89], p = .044$), larger amounts of binge drinking ($b = 0.53 [0.05, 1.02], p = .030$), and waist-to-hip ratio ($b = 0.17 [0.06, 0.28], p = .003$). Childhood neuroticism was not associated with any of the health variables after controlling for age and gender.

Question 2: Does conscientiousness moderate the relationship between neuroticism and health?

In only one of the nineteen models did adult conscientiousness moderate the effect of adult neuroticism on health. The results of all models are shown in Table 2. In this model, as adult conscientiousness increased, adult neuroticism had a stronger, positive relationship with binge drinking (b

= 1.26 [0.18, 2.53], $p = .022$). In only one of the nineteen models did childhood conscientiousness moderate the effect of childhood neuroticism on adult health. In this model, higher childhood conscientiousness strengthened the relationship between higher childhood neuroticism and greater waist-to-hip ratios. ($b = 0.01$ [0.001, 0.012], $p = .025$). Sample sizes ranged from 558 (ever smoked cigarettes) to 802 (systolic blood pressure). To conserve space in the current paper, and to avoid confusing readers, we do not provide estimates of slopes at different levels of moderators here. However, we have plotted the simple slopes at one standard deviation above and below the means, and these plots are available in the Supplementary Files 1 and 3.

Question 3: Does SES moderate the relationship between neuroticism and health?

In none of nineteen models did adult SES moderate the effect of adult neuroticism on health. In none of nineteen models did childhood SES moderate the effect of childhood neuroticism on adult health. Sample sizes for the adult predictor models ranged 562 (alcoholic drinks per sitting) to 593 (flossing). Sample sizes for the childhood predictor models ranged from 636 (cholesterol/HDL ratio) to 693 (flossing). Results for all models are shown in Table 3.

Question 4: Does chronic disease moderate the relationship between neuroticism and health?

Chronic disease status was indicated by a binary variable, 0 (no chronic diseases) or 1 (one or more chronic diseases). Results are shown in Table 4. We did not examine the health outcomes of heart condition or number of chronic diseases, as these were confounded with the moderator. In only one of the sixteen models did adult chronic disease status moderate the effect of adult neuroticism on health. This interaction was associated with the likelihood of drinking alcohol ever in the lifespan ($b = 1.27$, $OR = 3.56$ [1.46, 8.89], $p = .005$) but no other health variables. Sample sizes ranged from 484 (cholesterol/HDL ratio) to 588 (number of cigarettes smoked).

Question 5: Do facets of neuroticism predict health, and if so, do they predict health in opposing directions?

Both the loadings of variables on to latent factors and the results of the regressions with the bifactor variables can be found in Table 5. Finally, we found no evidence that facets of adult neuroticism

showed opposing associations associated with health and health behaviors. Instead, general neuroticism and one facet, immoderation, were both associated with worse health. General neuroticism was associated with worse self-rated health ($b = -0.55 [-0.72, -0.38], p < .001$), and smoking a greater number of cigarettes ($b = 0.18 [0.04, 0.32], p = .013$). Immoderation was associated with worse health behaviors and worse health. Specifically, immoderation was associated with worse self-rated health ($b = -0.68 [-1.17, -0.20], p = .005$), greater numbers chronic conditions ($b = 0.48 [0.15, 0.80], p = .004$), less mild exercise ($b = -0.41 [-0.79, -0.03], p = .036$), greater cholesterol ($b = 0.60 [0.08, 1.11], p = .025$), and a greater waist-to-hip ratio ($b = 0.99 [0.43, 1.55], p < .001$). Immoderation was also associated with great flossing, although the evidentiary value of this finding was low ($b = 0.37 [0.01, 0.73], p = .042$). All other facets were either negatively associated with health and health behaviors, or showed no association. Sample sizes ranged from 544 (ever drink alcohol) to 590 (flossing).

Discussion

The current study sought to identify indicators of healthy neuroticism by examining multiple potential moderators of neuroticism and health and the role of facets of neuroticism, which may have competing effects on health. Even when examining both adulthood and childhood personality and using of a variety of health indicators, there was no evidence that the relationship between neuroticism and health depends on levels of conscientiousness, socio-economic status, or chronic disease status. Moreover, there is no evidence that facets of neuroticism have effects on health in differing directions.

We examined nineteen interactions for each combination of neuroticism and moderators, with only a few significant effects found. We chose not to interpret these significant effects because we do not believe they represent true population effects but are instead the result of sampling variability and chance. This point is underscored by the fact that some of these effects are in the direction opposite of what would have been predicted. For example, greater childhood conscientiousness is associated with stronger relationships between child neuroticism and adult waist-to-hip ratio, suggesting neuroticism is healthier at higher levels of conscientiousness, rather than less. This is in contradiction to other studies of neuroticism and conscientiousness (e.g., 17, 20). Irregularities across these studies may be due to

differences in inclusion criteria; the current study removed a greater number of participants to maintain consistency across analyses. If this is the case, contradictions in results underscores the current study: these interactions may be non-existent or too small to reliably detect. In summation, the current study provided no substantial evidence to support the healthy neuroticism theory.

Statistical analyses cannot disprove a theory, and we acknowledge that there is still much to explore regarding the role of neuroticism on health. For example, many descriptions of healthy neuroticism refer to the adaptability of vigilance (33, 39-42, 20), yet little research on trait vigilance and its relationship to personality can be found (c.f., 43). Similarly, neuroticism is widely accepted to be a trait that refers to fluctuating patterns of emotion and reactivity (44). Examinations of emotional response and the ways in which emotion may be adaptive could also illuminate pathways from neuroticism to longevity. Indeed, personality and health researchers may need to think outside the box and beyond the self-report questionnaire to untangle these relationships.

However, we do caution the creative researcher. Theories of healthy neuroticism arose from the need to address heterogeneity in findings from a literature defined by large panel studies. This heterogeneity may be due to an important psychological variable or process that is inconsistently sampled across studies, or this heterogeneity may be due to random noise. We will never be able to say with certainty that it is the latter, so we may need to decide on standards of credibility for the former. Along these lines, we advocate for emphasis on base rates of potential moderators or processes. The examination of the high-conscientiousness, high-neuroticism effect is unlikely to yield many significant results, given that these traits tend to be negatively correlated with each other (17). Panel studies may be needed to garner sample sizes sufficiently large to examine this effect, but this should influence our interpretation of the phenomenon as a whole. That is, if these large studies are needed to isolate these individuals, then this effect is an unlikely candidate for explaining heterogeneity across studies.

It is unclear why other studies have found interactions between neuroticism and variables of interest while the current study did not. The current study is limited by its relatively small sample size, compared to other studies of neuroticism and mortality, and we may lack the power to detect these

interactions. It may be that published studies suffer from file drawer problems. More specifically, by focusing on single outcomes – such as mortality or smoking – instead of providing a comprehensive investigation, these studies fail to see the larger pattern of null results. Indeed, in the current study, one of our 19 interactions between child neuroticism and conscientiousness was statistically significant. If we had chosen to examine only that model, the current study might provide more favorable evidence for a moderator-based theory. Finally, we were unable to examine some of the outcomes previously studied, such as interleukin-6 (17) or mortality (13). Perhaps the effects of healthy neuroticism are more limited to these outcomes.

Overall, the current study searches for and ultimately fails to find any indication of a healthy neuroticism effect, even when examining the most likely moderators of neuroticism and health, neuroticism across the lifespan, and the facets of neuroticism. Future research should consider other pathways through which neuroticism may influence health, including state-level processes.

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Table 1. The zero-order and modeled associations of neuroticism and childhood neuroticism with health variables.

	Zero-order correlations (<i>r</i> estimate)		Linear models controlling for covariates (<i>b</i> estimate)	
	Adult Neuroticism	Child Neuroticism	Adult Neuroticism	Child Neuroticism
Self-rated health	-0.37* [-0.44, -0.31]	-0.06 [-0.11, 0.02]	-0.59* [-0.73, -0.46]	-0.08* [-0.16, -0.01]
Heart condition	0.08* [0.00, 0.16]	-0.03 [-0.11, 0.03]	0.21 [-0.25, 0.67]	-0.01 [-0.24, 0.22]
Number chronic diseases	0.15* [0.07, 0.22]	0.02 [-0.04, 0.08]	0.25* [0.07, 0.42]	0.07 [-0.03, 0.17]
Cigarettes ever	0.07 [0.00, 0.15]	0.02 [-0.06, 0.1]	0.25 [-0.05, 0.55]	0.07 [-0.08, 0.22]
Cigarettes	0.09* [0.02, 0.16]	-0.01 [-0.07, 0.06]	0.61* [0.06, 1.18]	0.04 [-0.23, 0.31]
Alcohol ever	0.05 [-0.04, 0.13]	-0.07 [-0.14, 0]	0.45* [0.02, 0.89]	-0.10 [-0.31, 0.11]
Alcohol days/Week	-0.03 [-0.11, 0.05]	-0.02 [-0.08, 0.06]	-0.02 [-0.22, 0.18]	-0.01 [-0.11, 0.09]
Alcohol drinks/sitting	0.01 [-0.08, 0.09]	-0.05 [-0.11, 0.01]	0.09 [-0.09, 0.27]	0.00 [-0.09, 0.10]
Alcohol binge days/week	0.05 [-0.03, 0.12]	-0.02 [-0.08, 0.04]	0.53* [0.05, 1.02]	0.07 [-0.19, 0.32]
Strenuous exercise	-0.10* [-0.17, -0.03]	-0.04 [-0.12, 0.04]	-0.11 [-0.22, 0.00]	-0.01 [-0.06, 0.04]
Moderate exercise	-0.05 [-0.11, 0.02]	-0.03 [-0.11, 0.06]	-0.09 [-0.24, 0.05]	-0.03 [-0.10, 0.05]
Mild exercise	-0.06 [-0.12, 0.02]	0.00 [-0.06, 0.07]	-0.10 [-0.25, 0.05]	0.00 [-0.07, 0.07]
Flossing	0.06 [-0.01, 0.13]	-0.05 [-0.12, 0.02]	0.11 [-0.03, 0.25]	-0.03 [-0.10, 0.05]
Blood glucose	0.08 [-0.01, 0.16]	-0.03 [-0.09, 0.03]	0.14 [0.00, 0.27]	-0.02 [-0.09, 0.05]
Cholesterol/HDL ratio	0.01 [-0.05, 0.08]	-0.04 [-0.1, 0.03]	0.02 [-0.13, 0.17]	-0.01 [-0.09, 0.06]
Systolic blood pressure	0.01 [-0.07, 0.09]	0.03 [-0.03, 0.1]	0.02 [-0.12, 0.16]	0.05 [-0.02, 0.12]
Waist-to-Hip ratio	0.08* [0.01, 0.16]	-0.07 [-0.13, 0]	0.17* [0.06, 0.28]	0.01 [-0.04, 0.06]

Zero-order correlations are presented in the first two columns with bootstrapped 95% confidence

intervals. Modeled associations use ordinary least squares, binary logistic regression or negative binomial

regression, depending upon the outcome. Unstandardized regression coefficients and 95% confidence intervals are presented. All models control for gender and age at the time of outcome measurement. * indicates $p < .05$.

Table 2. Conscientiousness as a moderator of neuroticism and childhood neuroticism.

Outcome	Adulthood predictors			Childhood predictors		
	Neuroticism	Conscientiousness	N x C	Neuroticism	Conscientiousness	N x C
Self-rated health	-0.54* [-0.70, -0.38]	0.13 [-0.06, 0.32]	0.11 [-0.17, 0.38]	-0.08* [-0.16, -0.01]	0.03 [-0.04, 0.11]	-0.01 [-0.08, 0.06]
Heart condition	0.23 [-0.31, 0.75]	0.08 [-0.55, 0.72]	0.80 [-0.22, 1.95]	-0.01 [-0.24, 0.22]	0.05 [-0.19, 0.30]	0.10 [-0.12, 0.31]
Number chronic illnesses	0.23* [0.02, 0.43]	-0.05 [-0.29, 0.20]	-0.02 [-0.37, 0.35]	0.07 [-0.02, 0.16]	-0.07 [-0.16, 0.03]	0.02 [-0.06, 0.11]
Ever smoked	0.17 [-0.17, 0.52]	-0.18 [-0.60, 0.23]	0.04 [-0.57, 0.65]	0.08 [-0.07, 0.23]	-0.32* [-0.49, -0.16]	-0.02 [-0.17, 0.12]
Number cigarettes	0.57 [-0.06, 1.24]	-0.06 [-0.85, 0.72]	0.20 [-1.11, 1.44]	0.03 [-0.24, 0.30]	-0.18 [-0.45, 0.08]	-0.04 [-0.29, 0.21]
Ever drank	0.43 [-0.07, 0.96]	0.05 [-0.56, 0.66]	0.42 [-0.45, 1.22]	-0.09 [-0.30, 0.12]	0.06 [-0.18, 0.28]	-0.14 [-0.33, 0.05]
Alcohol (days per week)	-0.05 [-0.27, 0.18]	-0.06 [-0.34, 0.22]	0.05 [-0.36, 0.45]	-0.01 [-0.11, 0.09]	-0.02 [-0.13, 0.09]	-0.06 [-0.16, 0.04]
Alcohol (drinks per sitting)	0.09 [-0.12, 0.3]	-0.01 [-0.27, 0.25]	-0.05 [-0.44, 0.34]	0.01 [-0.09, 0.10]	-0.04 [-0.14, 0.06]	-0.08 [-0.17, 0.02]
Alcohol (binge per week)	0.44 [-0.08, 0.99]	-0.31 [-1.00, 0.37]	1.26* [0.18, 2.53]	0.02 [-0.22, 0.27]	-0.21 [-0.47, 0.03]	-0.20 [-0.41, 0.02]
Exercise (strenuous)	-0.05 [-0.18, 0.07]	0.11 [-0.04, 0.27]	-0.04 [-0.23, 0.17]	-0.01 [-0.06, 0.04]	-0.02 [-0.07, 0.04]	0.02 [-0.03, 0.07]
Exercise (moderate)	-0.09 [-0.27, 0.08]	0.00 [-0.20, 0.21]	0.12 [-0.15, 0.39]	-0.03 [-0.10, 0.05]	-0.05 [-0.13, 0.02]	0.01 [-0.06, 0.07]
Exercise (mild)	-0.01 [-0.19, 0.16]	0.19 [-0.02, 0.39]	0.08 [-0.20, 0.35]	0.00 [-0.07, 0.07]	-0.06 [-0.13, 0.02]	-0.01 [-0.07, 0.06]
Flossing	0.05	-0.11	-0.16	-0.02	-0.05	-0.02

	[-0.12, 0.22]	[-0.31, 0.09]	[-0.42, 0.11]	[-0.10, 0.05]	[-0.12, 0.03]	[-0.09, 0.04]
Blood glucose levels	0.08	-0.12	-0.04	-0.02	-0.08*	0.00
	[-0.08, 0.24]	[-0.32, 0.07]	[-0.32, 0.24]	[-0.10, 0.05]	[-0.16, -0.01]	[-0.07, 0.07]
Cholesterol/HDL ratio	0.00	-0.06	0.09	-0.02	-0.11*	0.02
	[-0.18, 0.17]	[-0.28, 0.15]	[-0.23, 0.40]	[-0.09, 0.05]	[-0.18, -0.04]	[-0.04, 0.09]
Systolic blood pressure	0.10	0.16	0.24	0.05	-0.03	-0.01
	[-0.06, 0.26]	[-0.03, 0.36]	[-0.04, 0.52]	[-0.02, 0.12]	[-0.10, 0.04]	[-0.07, 0.06]
Waist to hip ratio	0.15*	-0.05	0.01	0.01	-0.10*	0.06*
	[0.01, 0.28]	[-0.21, 0.11]	[-0.21, 0.24]	[-0.05, 0.06]	[-0.15, -0.04]	[0.01, 0.10]

Neuroticism, conscientiousness, childhood neuroticism and childhood conscientiousness, are standardized. Regression coefficients (standardized when the outcome is continuous and the model is estimated using ordinary least squares) and 95% confidence intervals are presented. All models control for gender and age at outcome measurement. * indicate $p < .05$.

Table 3. Socio-economic status as a moderator of neuroticism and childhood neuroticism. Neuroticism, childhood neuroticism and moderators are all standardized, allowing for easier interpretation of the simple slopes. Regression coefficients (standardized when the outcome is continuous and the model is estimated using ordinary least squares) and 95% confidence intervals are presented. All models control for gender and age at outcome measurement. * indicates $p < .05$.

Outcome	Adulthood predictors			Childhood predictors		
	Neuroticism	SES	N x SES	Neuroticism	SES	N x SES
Self-rated health	-0.55* [-0.69, -0.42]	0.22* [0.13, 0.3]	0.00 [-0.15, 0.14]	-0.09* [-0.16, -0.02]	0.29* [0.19, 0.38]	-0.05 [-0.13, 0.04]
Heart condition	0.23 [-0.25, 0.71]	-0.01 [-0.28, 0.29]	-0.05 [-0.55, 0.47]	0.00 [-0.24, 0.23]	-0.31* [-0.61, -0.01]	-0.08 [-0.37, 0.21]
Number chronic illnesses	0.24* [0.06, 0.42]	-0.13* [-0.23, -0.02]	-0.17 [-0.35, 0.01]	0.09 [-0.01, 0.18]	-0.16* [-0.28, -0.05]	0.04 [-0.07, 0.15]
Ever smoked	0.19 [-0.13, 0.51]	-0.54* [-0.74, -0.34]	-0.26 [-0.64, 0.10]	0.08 [-0.07, 0.24]	-0.23* [-0.43, -0.04]	0.16 [-0.02, 0.36]
Number cigarettes	0.37 [-0.16, 0.91]	-0.69* [-1.07, -0.35]	-0.12 [-0.82, 0.54]	0.12 [-0.16, 0.4]	-0.53* [-0.90, -0.18]	0.28 [-0.04, 0.64]
Ever drank	0.40 [-0.05, 0.87]	-0.21 [-0.51, 0.06]	-0.04 [-0.57, 0.46]	-0.09 [-0.31, 0.12]	-0.15 [-0.42, 0.12]	-0.08 [-0.34, 0.18]
Alcohol (days per week)	0.03 [-0.18, 0.24]	0.18* [0.05, 0.30]	-0.02 [-0.26, 0.22]	-0.01 [-0.11, 0.1]	0.23* [0.10, 0.36]	-0.08 [-0.20, 0.05]
Alcohol (drinks per sitting)	0.07 [-0.12, 0.26]	-0.06 [-0.18, 0.05]	-0.02 [-0.23, 0.19]	-0.01 [-0.1, 0.09]	0.02 [-0.11, 0.14]	-0.05 [-0.17, 0.07]
Alcohol (binge per week)	0.48 [-0.01, 0.98]	-0.31* [-0.63, 0.00]	-0.11 [-0.73, 0.47]	0.06 [-0.20, 0.32]	-0.02 [-0.33, 0.29]	0.08 [-0.24, 0.41]
Exercise (strenuous)	-0.11 [-0.22, 0.00]	0.00 [-0.06, 0.07]	-0.01 [-0.13, 0.11]	0.00 [-0.05, 0.05]	0.00 [-0.06, 0.07]	-0.06 [-0.12, 0.00]
Exercise (moderate)	-0.11 [-0.27, 0.04]	0.01 [-0.08, 0.09]	0.13 [-0.04, 0.29]	-0.01 [-0.09, 0.06]	0.07 [-0.02, 0.16]	-0.06 [-0.15, 0.03]
Exercise (mild)	-0.12 [-0.28, 0.03]	0.00 [-0.08, 0.09]	0.13 [-0.03, 0.29]	0.01 [-0.06, 0.08]	0.08 [-0.01, 0.17]	-0.04 [-0.13, 0.05]
Flossing	0.09 [-0.06, 0.23]	-0.10* [-0.18, -0.01]	-0.04 [-0.20, 0.11]	-0.02 [-0.09, 0.05]	-0.13* [-0.22, -0.04]	0.07 [-0.02, 0.15]

Blood glucose levels	0.10 [-0.04, 0.25]	-0.13* [-0.21, -0.05]	-0.05 [-0.19, 0.10]	-0.02 [-0.10, 0.05]	-0.15* [-0.24, -0.06]	0.04 [-0.06, 0.13]
Cholesterol/HDL ratio	-0.02 [-0.18, 0.14]	-0.13* [-0.22, -0.04]	0.04 [-0.12, 0.21]	-0.02 [-0.10, 0.06]	-0.05 [-0.14, 0.04]	0.00 [-0.09, 0.09]
Systolic blood pressure	-0.02 [-0.17, 0.12]	-0.12* [-0.20, -0.04]	0.13 [-0.02, 0.28]	0.03 [-0.04, 0.11]	-0.09* [-0.17, 0.00]	0.06 [-0.03, 0.14]
Waist to hip ratio	0.13* [0.01, 0.25]	-0.14* [-0.21, -0.08]	0.05 [-0.07, 0.17]	0.00 [-0.06, 0.06]	-0.11* [-0.18, -0.05]	0.04 [-0.03, 0.11]

Table 4. Chronic disease as a moderator of neuroticism.

Outcomes	Neuroticism	Chronic Disease	N x Chronic Disease
Self-rated health	-0.47* [-0.66, -0.29]	-0.47* [-0.61, -0.32]	-0.15 [-0.41, 0.12]
Ever smoked	0.11 [-0.30, 0.53]	0.15 [-0.18, 0.48]	0.26 [-0.34, 0.86]
Number cigarettes	0.24 [-0.51, 1.01]	0.37 [-0.25, 0.99]	0.62 [-0.50, 1.76]
Ever drank	-0.16 [-0.78, 0.47]	-0.41 [-0.90, 0.08]	1.27* [0.38, 2.19]
Alcohol (days per week)	-0.01 [-0.28, 0.26]	-0.32* [-0.54, -0.1]	0.06 [-0.33, 0.45]
Alcohol (drinks per sitting)	0.05 [-0.19, 0.29]	-0.28* [-0.48, -0.08]	0.17 [-0.19, 0.53]
Alcohol (binge per week)	0.45 [-0.21, 1.13]	-0.38 [-0.92, 0.16]	0.28 [-0.69, 1.27]
Exercise (strenuous)	-0.07 [-0.22, 0.08]	-0.07 [-0.20, 0.05]	-0.05 [-0.28, 0.18]
Exercise (moderate)	-0.03 [-0.24, 0.17]	-0.17 [-0.34, 0.00]	-0.07 [-0.38, 0.24]
Exercise (mild)	0.04 [-0.17, 0.24]	0.04 [-0.13, 0.21]	-0.28 [-0.59, 0.03]
Flossing	0.11 [-0.09, 0.30]	0.15 [-0.01, 0.31]	0.02 [-0.27, 0.32]
Blood glucose levels	0.01 [-0.20, 0.23]	0.46* [0.29, 0.63]	0.19 [-0.11, 0.49]
Cholesterol/HDL ratio	0.04 [-0.20, 0.28]	0.13 [-0.05, 0.32]	0.05 [-0.28, 0.38]
Systolic blood pressure	-0.02 [-0.24, 0.19]	0.32* [0.16, 0.48]	0.06 [-0.23, 0.36]
Waist to hip ratio	0.07 [-0.10, 0.24]	0.41* [0.28, 0.54]	0.14 [-0.09, 0.38]

Neuroticism is standardized and chronic disease status is binary (0 = no chronic disease, 1 = one or more chronic diseases). Regression coefficients (standardized when the outcome is continuous and the model is estimated using ordinary least squares) and 95% confidence intervals are presented. All models control for gender and age at outcome measurement. * indicates $p < .05$.

Table 5. The effects of general neuroticism and facets on health variables.

<i>Factor loadings from bifactor structural equation model</i>							
Item	General Neuroticism	Anxiety	Anger	Depression	Self- consciousness	Immoderation	Vulnerability
Worry about things	.32	.50					
Fear for the worst	.49	.41					
Am afraid of many things	.55	.31					
Get stressed out easily	.53	.59					
Get angry easily	.33		.77				
Get irritated easily	.45		.63				
Lose my temper	.42		.69				
Am not easily annoyed	.26		.26				
Often feel blue	.65			.40			
Dislike myself	.73			.05			
Am often "down in the dumps"	.70			.54			
Feel comfortable with myself (-)	.51			-0.02			
Find it difficult to approach others	.46				.51		
Am afraid to draw attention to myself	.29				.41		
Only feel comfortable with friends	.37				.53		

Am not bothered by difficult social situations (-)	.16	.12	
Go on binges (overeating, gambling, etc.)	.36		.35
Rarely overindulge (-)	.14		.45
Easily resist temptations (-)	.06		.47
Am able to control my cravings (-)	.29		.47
Panic easily	.48		.38
Get overwhelmed by events	.49		.58
Feel that I can't deal with things	.61		.15
Remain calm under pressure (-)	.35		.40

Coefficient estimates from regression models

Self-rated health	-0.55* [-0.72, -0.38]	-0.58 [-1.92, 0.77]	0.01 [-0.25, 0.27]	0.70 [-0.46, 1.86]	-0.25 [-0.57, 0.07]	-0.68* [-1.17, -0.20]	4.63 [-4.93, 14.19]
Heart condition	-0.010 [-0.06, 0.05]	0.02 [-0.28, 0.32]	0.00 [-0.07, 0.06]	0.10 [-0.13, 0.33]	0.05 [-0.03, 0.14]	0.02 [-0.09, 0.12]	0.64 [-1.64, 2.92]
Number chronic illnesses	0.10 [-0.05, 0.24]	0.3 [-0.52, 1.12]	0.02 [-0.16, 0.20]	-0.16 [-0.78, 0.46]	0.16 [-0.09, 0.40]	0.48* [0.15, 0.80]	-1.52 [-7.05, 4.02]
Ever smoked	0.06 [-0.02, 0.14]	-0.1 [-0.51, 0.31]	0.03 [-0.07, 0.12]	-0.13 [-0.42, 0.16]	-0.02 [-0.14, 0.11]	0.14 [-0.02, 0.30]	-1.24 [-5.02, 2.54]
Number cigarettes	0.18* [0.04, 0.32]	-0.25 [-0.97, 0.47]	0.08 [-0.07, 0.24]	0.04 [-0.49, 0.58]	-0.05 [-0.26, 0.16]	-0.01 [-0.28, 0.26]	-1.02 [-6.49, 4.45]
Ever drank	0.31 [-0.34, 0.96]	2.59 [-4.05, 9.23]	0.02 [-0.41, 0.46]	0.72 [-0.72, 2.16]	1.44 [-1.65, 4.53]	2.11 [-2.49, 6.7]	-4.12 [-13.64, 5.40]
Alcohol (days per week)	-0.08 [-0.4, 0.24]	-0.41 [-2.34, 1.52]	0.18 [-0.26, 0.63]	0.42 [-1.18, 2.02]	0.05 [-0.44, 0.54]	0.05 [-0.66, 0.75]	3.99 [-9.01, 16.99]
Alcohol (drinks per sitting)	0.14 [-0.11, 0.38]	-1.05 [-2.9, 0.80]	0.17 [-0.21, 0.54]	0.49 [-1.05, 2.03]	-0.18 [-0.61, 0.25]	0.28 [-0.35, 0.91]	4.84 [-8.07, 17.76]

Alcohol (binge per week)	0.24 [0, 0.47]	-1.30 [-3.41, 0.82]	0.17 [-0.25, 0.58]	0.66 [-1.16, 2.48]	-0.16 [-0.6, 0.29]	0.37 [-0.30, 1.04]	6.61 [-8.91, 22.13]
Exercise (strenuous)	-0.28 [-0.61, 0.05]	-0.33 [-2.03, 1.37]	0.09 [-0.14, 0.33]	-0.33 [-0.73, 0.06]	-0.25 [-0.54, 0.05]	-0.36 [-0.8, 0.08]	0.63 [-1.39, 2.64]
Exercise (moderate)	-0.02 [-0.3, 0.26]	0.80 [-1.17, 2.78]	0.01 [-0.23, 0.25]	-0.42* [-0.82, -0.03]	-0.05 [-0.33, 0.24]	-0.44 [-0.89, 0.01]	-0.90 [-3.28, 1.48]
Exercise (mild)	-0.10 [-0.38, 0.18]	0.41 [-1.00, 1.83]	0.01 [-0.19, 0.21]	-0.33 [-0.67, 0.00]	-0.11 [-0.35, 0.13]	-0.41* [-0.79, -0.03]	-0.28 [-1.95, 1.40]
Flossing	0.05 [-0.23, 0.33]	-0.15 [-1.55, 1.26]	-0.08 [-0.28, 0.11]	0.29 [-0.05, 0.63]	0.05 [-0.19, 0.29]	0.37* [0.01, 0.73]	0.29 [-1.4, 1.97]
Blood glucose levels	0.26 [-0.03, 0.54]	1.20 [-0.81, 3.22]	-0.03 [-0.24, 0.17]	-0.71 [-1.80, 0.38]	0.00 [-0.36, 0.36]	0.36 [-0.15, 0.87]	-1.55 [-3.97, 0.88]
Cholesterol/HDL ratio	-0.03 [-0.32, 0.26]	1.03 [-0.67, 2.73]	-0.05 [-0.25, 0.15]	-0.26 [-1.12, 0.61]	0.00 [-0.30, 0.31]	0.60* [0.08, 1.11]	-1.36 [-3.36, 0.64]
Systolic blood pressure	0.05 [-0.20, 0.30]	0.20 [-0.84, 1.25]	0.08 [-0.06, 0.22]	-0.40 [-1.02, 0.22]	0.01 [-0.23, 0.24]	0.32 [-0.04, 0.68]	-0.64 [-1.98, 0.70]
Waist to hip ratio	0.34* [0.09, 0.59]	-0.01 [-0.97, 0.96]	-0.01 [-0.17, 0.15]	0.35 [-0.20, 0.90]	0.24 [-0.05, 0.53]	0.99* [0.43, 1.55]	-0.13 [-1.33, 1.07]

Regression coefficients and 95% confidence intervals are presented. All models control for gender and age. * indicate $p < .05$.