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Openness to Experience and Mortality in Men: Analysis of Trait and Facets

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Abstract

Objectives—We examined whether specific facets are more robust predictors of mortality risk than overall trait openness in a sample of older men.

Methods—The current investigation used data from 1,349 men from the Veterans Affairs Normative Aging Study. From 1990–1991 to 2008, 547 (41%) had died. We used exploratory factor analysis to extract facets of openness, followed by proportional hazards modeling to examine 18-year mortality risk.

Results—Two facets emerged from the openness adjectives: intellect and creativity. In the fully adjusted model, only creativity predicted mortality risk. A 1-*SD* increase in creativity was associated with a 12% decrease in mortality risk.

Discussion—The study demonstrated that consideration of facets allows for a more precise understanding of the personality–health association. Higher levels of creativity predict longer survival in a sample of older men which provides preliminary support of the protective role creativity has on health even at advanced ages.

Keywords

openness; personality; mortality; creativity; facets

Introduction

There is growing empirical evidence of the predictive association between personality traits and mortality (Hampson & Friedman, 2008). Most of this work has focused on conscientiousness and neuroticism, but recent investigations have revealed that higher levels of openness to experience are protective against mortality risk (Iwasa et al., 2008; Taylor et al., 2009). However, some of this new evidence suggests certain facets of openness are better predictors of mortality than others (Jonassaint et al., 2007; Swan & Carmelli, 1996). The overall effect of openness may be largely driven by only one or two sub dimensions of this trait. The current investigation took up this question, examining which facets of

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openness confer either a protective or damaging effect on all-cause mortality risk over an 18-year period.

Personality and Mortality Risk

The five factor model (FFM) is a comprehensive framework representing five broad personality domains widely replicated through empirical investigations (Caspi, Roberts, & Shiner, 2005; Costa & McCrae, 1992). Traditionally, the Big Five personality traits include conscientiousness, neuroticism, agreeableness, extraversion, and openness. Measuring the Big Five traits is now commonplace in empirical research on aging and health, and even though different measures vary in trait names and definitions they are highly correlated and factor analytically aligned (Grucza & Goldberg, 2007). However, there are criticisms about the inability of the Big Five to fully capture an individual's personality and the arbitrary nature of selecting traits through factor analysis procedures (McAdams, 1992).

Despite these criticisms, personality traits such as conscientiousness and neuroticism have emerged as important predictors of health outcomes, most notably mortality (Hampson & Friedman, 2008). One trait, however, openness to experience, has received relatively little attention in the personality–health literature. Openness encompasses various features, including imagination, unconventionality, creativeness, intellectuality, and broad interests (Caspi et al., 2005). Not every measure of openness will capture all of these characteristics, but in general, it distinguishes between intellectually and artistically curious individuals from those having traditional beliefs and a straightforward lifestyle. Although there is less empirical support documenting an association between openness and mortality (Iwasa et al., 2008; Taylor et al., 2009) compared with the other Big Five traits, indirect evidence has long suggested a connection given that certain constructs related to openness are clear predictors of mortality risk. For example, both intelligence and academic attainment confer a protective effect on mortality (Deary, Batty, Pattie, & Gale, 2008; Gottfredson & Deary, 2004).

There is now preliminary evidence as to why openness is (inversely) related to mortality, and more generally, to health. Williams, Rau, Cribbet, and Gunn (2009) found that those with low openness had greater blood pressure reactivity and decreases in respiratory sinus arrhythmia after experiencing laboratory stressors, both indicative of an elevated stress response. Oswald et al. (2006) also implicated low openness with blunted physiological reactivity, as indicated by dysregulated cortisol responses to a simulated laboratory stressor. The case is building that physiological mechanisms are potential conduits that link trait openness with health and mortality.

Although this new line of research connecting openness to mortality via stress response is promising, most prior investigations into openness and mortality generally have not find any effect, protective or otherwise (Christensen et al., 2002; Maier & Smith, 1999; Weiss & Costa, 2005; Wilson, Mendes de Leon, Bienas, Evans, & Bennett, 2004). However, this may have been due to methodological limitations such as restricted samples, high mean age at entry, or relatively short mortality follow-up periods. For example, Christensen et al. (2002) studied chronically ill renal patients with a 4-year follow-up and a mean age of 57 at entry. Weiss and Costa's (2005) participants had a 5-year follow-up and a mean age of 80 at entry. Wilson et al. (2004) used a sample of mostly retired Catholic clergy with a 5-year follow-up and a mean age of 75 at entry. Lastly, Maier and Smith (1999) used a German sample of the oldest old (range 70 to 103) with a 5-year follow-up and mean age of 85 at entry. These are all important studies, but the sample composition and short length of follow-up may have reduced their ability to observe an effect of openness.

Why would these factors potentially mask the effect of openness on mortality? In many restricted samples (e.g., renal patients, the oldest old), the long-term forces that shape mortality have likely been overridden by short-term forces. More proximal factors influence mortality in people with end-stage conditions or who are in advanced older age. For example, smoking exerts its effect on overall mortality risk over a long period of time (20–30 years or more), and once smokers have developed lung cancer, the behavior of smoking itself ceases to be an important predictor. It is likely that personality traits act in a similar manner. This may have limited the ability of some of the earlier investigations to find a connection between openness and morality risk, as they often had samples that were comprised of patients with advanced disease or had a large portion of the oldest old among their respondents. Overall, using studies with longer follow-ups may strengthen the ability to observe significant main effects.

Facet Level Analysis

As openness is a broad and comprehensive construct, it can be broken down into less broad (but correlated) subtraits, often called "facets." Previous investigations have demonstrated that compared with more broad personality traits, using more narrowly focused personality facets account for more variance in predicting various, complex behavior outcomes (Ashton, Jackson, Paunonen, Helmes, & Rothstein, 1995; Paunonen & Ashton, 2001; Paunonen, Haddock, Forsterling, & Keinonen, 2003). Paunonen and colleagues concluded that "a judicious selection of such lower-level predictor scales, from both within and beyond the Big Five domain, is a good way to maximize prediction accuracy" (p. 431).

Facets are not only potentially more powerful in predicting actual behaviors, but also more accurate in predicting health outcomes. For example, studies in the early 1960's concentrated on the then-popular Type A behavior pattern and the association with increased risk of coronary heart disease (CHD; Friedman & Rosenman, 1959; Rosenman & Chesney, 1980). However, further inquiry into the Type A profile revealed that hostility was the specific facet driving the Type A-CHD association (Barefoot, Dahlstrom, & Williams, 1983; Dembroski, MacDougall, Costa, & Grandits, 1989; Hecker, Chesney, Black, & Frautchi, 1988; Matthews, Gump, Harris, Haney, & Barefoot, 2004; Williams, Nieto, Sanford, Couper, & Tyroler, 2002). In addition, more recent investigations of conscientiousness have also found certain of its facets are better predictors of health outcomes than others (Bogg & Roberts, 2004).

In terms of openness, two studies have shown that consideration of particular facets can provide a more precise understanding of the overall openness–mortality association. First, Swan and Carmelli (1996) found higher levels of Curiosity (assessed via the State-Trait Personality Inventory) conferred a protective effect against mortality risk over a long follow-up period of 15 years (adjusting for education, cholesterol, smoking, cancer, cardiovascular and neuropsychological health, and depression). Second, Jonassaint et al. (2007) found that the "feelings" and "actions" facets of the NEO-PI-R (Costa & McCrae, 1992) Openness Scale predicted all-cause mortality (adjusting for cardiac disease severity). However, the overall domain of NEO-assessed openness did not predict mortality risk—only specific facets did.

Current Study

The current study attempted to build on the premise that specific facets can provide more focused prediction of health outcomes such as mortality. The two main goals were (a) identify the underlying facets of the Goldberg (1992) openness measure via factor analysis, and (b) to determine if specific facets of openness are better predictors of long-term mortality risk via proportional hazards modeling. This study can identify the precise personality characteristics that impact health during adulthood and insight into how older adults maximize their lifespan.

Method

Sample

The current study examined participants from the Department of Veterans Affairs (VA) Normative Aging Study (NAS), a longitudinal investigation of aging founded at the Boston VA Outpatient Clinic in 1963 (Bossé, Ekerdt, & Silbert, 1984). The aim of the NAS was to follow a geographically stable sample of men to understand the characteristics of healthy aging, precursors of age-related diseases, and the influence of these diseases on the aging process.

At the end of 1991, there were 1,485 active participants in the NAS sample (e.g., not lost to follow-up or already deceased). Participants were sent the personality questionnaire as part of a mail survey starting in November 1990. Reminders and a second mail survey were sent to participants who had not responded within several weeks of the initial mailing. Questionnaires were received through July of 1991, although most were returned by March of 1991.

The present investigation includes data from 1,349 men who completed the Goldberg (1992) Markers of the Big Five personality traits in 1990–1991. The age range of participants at the time of the personality measure in 1990–1991 was 45–89 ($M = 64.9$, $SD = 7.75$). Nonresponders were less likely to be retired, but did not differ on income level, percentage ever married, or self-rated health. The NAS participants who responded to the survey containing the Goldberg Markers were generally representative of the original sample of NAS veterans, who themselves were representative of the World War II/ Korea generation of men (Spiro, Schnurr, & Aldwin, 1994).

Openness to Experience

Openness was assessed via the Goldberg (1992) markers of the Big Five. Goldberg refers to these particular markers as assessing “intellect,” but over the past 20 years, this factor has become commonly known as *openness*. The openness measure consists of 20 adjectives which participants rated how accurately each adjective portrayed them using a 9-point Likert-type scale. Responses ranged from 1 (*extremely inaccurate*) to 9 (*extremely accurate*) for each adjective. Ten adjectives mark the “open” pole (e.g., Artistic, Creative) and 10 adjectives mark the “closed” pole (e.g., simple, unimaginative) of the openness dimension. Cronbach’s alpha for the Openness Scale was .86 in this sample.

Education

Education was assessed in 1961–1969 during the intake period for the NAS. Educational level ranged from completion of only grade school up to an advanced graduate or professional degree with a mean level of education being 12 years. This is comparable to the overall population of U.S. men who served during World War II, Korea, and the early years of the Cold War.

Health

Physical health, an important correlate of mortality risk, was measured via the Seriousness of Illness Rating Scale (SIRS; Wyler, Masuda, & Holmes, 1968) as modified by Bossé, Aldwin, Levenson, and Ekerdt (1987). For each participant, a SIRS score was compiled by a single trained rater who coded responses to the question, “Is there any physical condition, illness, or health problem that bothers you now?” The most serious condition named was rated from 0 (*no problem reported*) to 124 (*life-threatening conditions such as cancer*). SIRS ratings were assessed in 1988, approximately 2 years prior to completion of the personality measures because this was the closest occasion to the personality assessment. Validation studies of the SIRS have been conducted to assess the reproducibility of this measure and have found a high concordance in the ranking of disease items among physicians and medical residents (Wyler, Masuda, & Holmes, 1970).

Smoking

Smoking behavior (cigarettes, cigars, and pipes) was assessed via a health exam conducted near the time of the Goldberg personality assessments (1990–1991). Respondents indicated whether they (a) had never smoked, (b) were occasional smokers, (c) were current smokers, or (d) had quit smoking. A dummy variable was created that indicated whether a participant was a current smoker or not.

Mortality in the NAS

Vital status of participants is monitored by periodic mailings and when deaths are identified, death certificates are obtained for validation. Survival time for decedents was the interval between the date a given person's questionnaire was completed (in late 1990 or early 1991) to the date of their death; survivors (censored observations) had survival times that equaled or exceeded the length of the follow-up (censored at 7/31/2008). Of the 1,349 men who completed the personality measure, 547 died (41%) during the 18-year follow-up period. The mean survival time for decedents was 11.01 years (*SD* = 4.55; range = 0.80–18.50 years).

Data Analysis

To elucidate the underlying factor structure of the 20 openness adjectives, we used principal axes extraction with oblimin rotation. We choose an exploratory factor analysis because Goldberg's (1992) measure did not have a set underlying facet structure like other personality measures such as the NEO Personality Inventory (Costa & McCrae, 1992). On the basis of prior studies using the Goldberg's personality measure, we first ipsatized the 20 openness adjectives before conducting the factor analysis. By ipsatizing, or centering responses on a within-participant basis (raw item minus the mean score for each person on all personality adjectives), we reduced multicollinearity and response bias (Mroczek, Ozer, Spiro, & Kaiser, 1998). In addition, without ipsatization there was an artificial separation of the positive and negative pole adjectives.

To investigate the impact of facets on mortality risk, we used survival analysis (proportional hazards, or hazard rate modeling). Survival analysis takes into account continuous survival time, varying ages at entry into the study, and occurrence of dichotomous outcome event, such as mortality (Cox, 1972). These survival models yield estimates (hazard ratios) of how much a 1-unit increase in a predictor increases, or decreases, the chances of dying. For ease of interpretation, we converted all Openness Scale scores (trait and facet) to standard deviation units. The hazard rate models were expressed as follows:

$$h(t_{ij})=h_0(t_j)e^{[\beta_1(\text{age}_{1i})+\beta_2(\text{education}_{2i})]}$$
$$h(t_{ij})=h_0(t_j)e^{[\beta_1(\text{age}_{1i})+\beta_2(\text{education}_{2i})+\beta_3(\text{openness}_{3i})]}$$
$$h(t_{ij})=h_0(t_j)e^{[\beta_1(\text{age}_{1i})+\beta_2(\text{education}_{2i})+\beta_3(\text{openness}_{3i})+\beta_4(\text{smoking}_{4i})+\beta_5(\text{health}_{5i})]}$$
$$h(t_{ij})=h_0(t_j)e^{[\beta_1(\text{age}_{1i})+\beta_2(\text{education}_{2i})+\beta_3(\text{facet}_{3i})+\beta_4(\text{facet}_{4i})+\beta_5(\text{smoking}_{5i})+\beta_6(\text{health}_{6i})]}$$

In these equations, $h(t_{ij})$ is the log of an individual's risk of dying at time *t*. The term $h_0(t_j)$ is the baseline hazard function, or the risk of dying when all predictors are set to zero. The terms in the exponent $\beta_1(\text{age}_{1i})$, $\beta_2(\text{education}_{2i})$, β_3 (openness_{3i}), $\beta_4(\text{smoking}_{4i})$, and β_5 (health_{5i}), are the effects of these indicators on risk of death. The first model adjusts for the demographic characteristics age and education. The second model adds in the effect of personality. The third model is the fully adjusted model, which includes the demographics, effect of openness, as well as smoking and SIRS. The fourth model tests the effect of extracted facets on mortality.

Results

The data analysis proceeded in two phases. First, we factored Goldberg's (1992) Openness Scale to determine the optimal number of facets, and to identify their content. In the second step, we used the extracted facets to determine whether certain facets were better predictors of mortality risk above overall trait openness.

Phase 1: Factor Analysis of Openness

Prior to extraction and rotation of factors, we first ensured the factorability of Goldberg's (1992) personality measure. The Kaiser-Meyer-Olkin measure of sampling adequacy was .90, which is well above the recommended value of .70 (Kaiser, 1974). Also, more than half of the adjective communalities were above .30 indicating enough common shared variance among the adjectives to factor analyze. To extract the optimal number of facets we examined the eigenvalues and the scree plot. The first four eigenvalues were 5.59, 1.04, 0.70, and 0.49. On the basis of these values and examination of the scree plot point of discontinuity, we concluded that two facets were the optimal number to extract from the 20 openness adjectives. Table 1 displays factor loadings for the 20 openness adjectives. We used direct oblimin (oblique) rotation to allow for correlation between the two facets because the adjectives comprising each facet are all subsumed by general trait openness. Examining the factor loadings of all 20 openness items, seven items were below the suggested .35 cutoff (Gorsuch, 1983) suggesting there was not enough common variance among these items (e.g., shallow, simple, philosophical). Thus, a total of 13 items were above the .35 cutoff and were used to define the two extracted facets. The two-factor solution accounted for 39% of the total common variance in trait openness.

Conceptualizing the labels for each of the two facets was relatively straightforward. The eight adjectives loading on the first facet included items such as unintelligent, unintellectual, and uninquisitive. We "reflected" this facet to produce a more clear dimension, following Gorsuch's (1983, p. 181) suggestion to reverse the direction of factors to enhance interpretability. We labeled facet one *intellect*, as it seemed to capture the essence of the factor these adjectives were intended to mark (Goldberg, 1992). Five adjectives loaded on the second extracted facet: creative, imaginative, artistic, innovative, and uncreative. We labeled this *creativity* because it represented a more creative oriented component of openness. We calculated scale scores for each facet by summing the items that loaded on a given facet (see Table 1). Any given item went into only one facet—none were used in more than one. For ease of interpretation, we standardized each facet so that they were expressed in standard deviation units.

The internal consistency for the two extracted facets was adequate (intellect Cronbach's alpha = .85; creativity Cronbach's alpha = .79). The skewness and kurtosis suggested an approximate normal distribution (intellect: skewness = −.35 and kurtosis = −.20; creativity: skewness = −.36 and kurtosis = .11). The correlation between the two facets was .12 indicating a weak positive association between intellect and creativity. However, both intellect and creativity had strong positive correlations with general trait openness (see Table 2).

Phase 2: Predicting Mortality from Openness and Facets

Correlations, means, standard deviations, and ranges are displayed in Table 2 for all variables. Table 3 displays the survival models for the broad trait openness. In Model 1, a standard deviation increase in age was associated with an 11% increased mortality risk, but education was not a significant predictor. Adding the effect of trait openness in Model 2 revealed that openness was not a significant predictor of mortality. Further analyses (not shown) indicated that openness was a significant predictor of mortality in an unadjusted model without age and education (hazard ratio = 0.83; CI = 0.76–0.83; $p < .001$). Specifically, age explains why trait openness predicts mortality. The effect of openness remained nonsignificant after adding the health and smoking variables in Model 3. In Model 3, age, current illness (SIRS ratings), and being a current smoker were all significantly associated with an increased mortality risk. Each standard deviation increase in age predicted an 11% increase in mortality risk. Each standard deviation increase in SIRS predicted a 29% increase in mortality risk. Finally, being a current smoker was associated with a 57% increase of mortality, compared with those who never smoked or had quit.

To delve deeper into the effect of openness has on mortality risk, we then tested the effects of the two facets (see Table 4). In Model 1, age was a significant predictor of mortality risk in that each standard deviation increase was associated with an 11% increased mortality risk. Education was not a significant predictor of mortality. In Model 2, the creativity facet (but not intellect) predicts mortality risk, adjusted for age. Each standard deviation increase in creativity was associated with an 8% reduction in mortality risk. The creativity facet remained a significant predictor of mortality risk in the fully adjusted Model 3 that included smoking status and SIRS. The hazard ratio even became somewhat larger (in the protective direction), in that a standard deviation difference in creativity resulted in a 12% reduction in mortality risk—net of age, education, smoking, and physical health (SIRS). Moreover, being a smoker was associated with a 61% increased risk of dying and each standard deviation increase in SIRS predicted a 29% increased risk of dying.

Discussion

There are two main conclusions from the current study. First, the contrast/comparison of trait versus facet for openness provides evidence that more narrowly focused facets, as opposed to broad traits, can lead to more accurate predictions of key health outcomes (in this case, mortality) and can thus deepen our understanding of the personality–health relationship. If we had not investigated the facets underlying the Goldberg’s Openness Scale, we would have concluded openness was not significantly related to mortality risk. Indeed, it may be the case that certain facets of traits are related to health processes such is the case with the hostility facet of the Type A behavior pattern (Barefoot et al., 1983). Future investigations into facets will sharpen our understanding of how personality traits influence health and ultimately, mortality.

The second important finding is that higher levels of creativity in this sample of older men predicted a reduced risk of dying over the 18-year study follow-up. Two prior studies hinted at the value of openness facets in predicting mortality and other health outcomes (e.g., Jonassaint et al., 2007; Swan & Carmelli, 1996). However, this was the first study to demonstrate the efficacy of facets over a long-term (18 year) mortality follow-up in a large community dwelling sample. Moreover, creativity predicted mortality risk above and beyond age, education, smoking, and health status.

The current findings are intriguing given that both overall openness and the intellect facet did not predict mortality but the creativity facet did. From a series of models not presented, we reversed the order of variable entry and included the personality predictors first before adding the covariates (age and education). In these unadjusted models, both trait openness and Intellect did predict mortality, but once age was entered, the personality effects were rendered nonsignificant. It appears that age explains why trait openness and Intellect facet predicts mortality. As individuals age, they generally decrease in trait openness, which is reflected in the correlational findings in Table 2. However, the two facets have very different correlations with age. Intellect is correlated (.17) with age, whereas creativity is only slightly but negatively correlated (−.04). Age of course is strongly predictive of mortality risk, and the differences between these two correlations could be why creativity predicts and Intellect does not. Intellect tends to rise with age (or at least is higher in older cohorts) and thus its association with mortality may be spurious and simply due to its relationship with age. However this is not the case with creativity which is basically unrelated to age.

In addition, creativity predicted mortality regardless of level of education and SIRS ratings. The main question remaining is why creativity would predict mortality risk. First, the low correlation between creativity and age suggests creativity levels in this sample of older men are unaffected by age, which is important because there is some indication that certain aspects of openness such as curiosity may lead to greater adaptive responses to the challenges associated with aging (Swan & Carmelli, 1996). When life stressors or unique problems arise in the lives of older adults, those creative and curious individuals may have the advantage of being inquisitive and more willing to try new approaches to stress management or health care (Costa & McCrae, 1990), which parallels the Jonassaint et al. (2007) finding that a similar facet to curiosity, openness to actions, was related to longevity. Specifically, individuals scoring lower on the openness to actions facet may have a reduced capacity to adapt effectively to health events or life events, or to accept changes in their lives or environment.

Creativity not only can potentially enable people of any age to adapt better to life circumstances, but also has particular salience for older adults. It may confer on them an ability to better confront the problems associated with increasing age and declining health, and may have important effects on slowing cognitive aging. Indeed, diminished curiosity in old age is related to pathological aging of the central nervous system (Daffner, Scinto, Weintraub, Guinessey, & Mesulam, 1994). Creative and curious individuals likely engage in a lifetime of intellectual and divergent thinking abilities even into old age, which may ultimately allow them to retain or even discover new approaches to adapt to life’s challenges (McCrae, 1987). Compelling longitudinal evidence also exists that maintaining an intellectually engaged lifestyle promotes more successful cognitive aging and even reduced risk of developing Alzheimer’s disease (Hertzog, Krammer, Wilson, & Lindenberger, 2009).

Although to our knowledge there is no empirical evidence connecting creativity to physiological mechanisms, another hypothesis states that higher levels of general trait openness act as a buffer from stress through physiological reactivity. As noted earlier, Williams et al. (2009) found that young adults who scored higher on openness had lower blood-pressure reactivity, increased respiratory sinus arrhythmia, and modest increases in positive affect when exposed to a laboratory-induced stressor. Likewise, Jonassaint et al. (2007) found that when adults were subjected to a laboratory mental stressor, Black individuals scoring higher on openness (as well as Aesthetics, Feelings, and Ideas facets) had lower levels of c-reactive protein (CRP), with higher CRP levels being indicative of several health problems (e.g., diabetes, hypertension). Taylor et al. (2009) also found a negative relationship between openness and blood pressure, which partially mediated the relationship between openness and mortality. It appears there is some underlying connection between openness and stress reactivity.

Overall, these above mentioned mechanisms are hypothetical in nature, clearly setting the stage for future direct tests of mechanisms or mediators between openness, specific facets, and health outcomes over the life course. The current study does, however, provide direct evidence that creativity is a predictor of longevity even at advanced ages, and that the effect is not trivial. For illustration, using the hazard rates from our models we can approximate that a standard deviation change in creativity is approximately equal to a standard deviation increase in age (8 years). Thus, a person who was one standard deviation higher than another on creativity would be analogous to comparing individuals 8 years apart in age. In a sample of older adults, the effect of 8 years on health is quite consequential. Otherwise said, individuals scoring higher on the more creative aspects of openness have a health advantage over those scoring lower on this facet. This study provides a framework for examining openness and facets as a predictor of declining health, as well as a possible target for intervention. Preliminary intervention studies in older adults show the feasibility of changing levels of openness through cognitive training (Jackson, Hill, Payne, Roberts, & Stine-Morrow, in press), but it is yet to be seen if these changes are retained and lead to more positive health changes.

Limitations

Goldberg's (1992) adjective markers were originally developed to measure an overall dimension of openness and not to differentiate among underlying facets. Thus, the exploratory nature of the factor analysis performed in the current study needs to be replicated in future studies. Mroczek et al. (1998) validated the use of this measure to capture the Big Five in this sample of older adults by means of ipsatization to reduce multicollinearity, but it is not certain whether this influenced the factorability of this measure. Specifically, not all adjectives significantly loaded on the two facets extracted. This may be partly due to the high degree of multicolinearity among the adjectives and the unipolar format of the personality measure.

A second limitation is the possibility that levels of openness or facets may have changed, at least for some individuals, during the 18-year follow-up. Thus, in the years immediately preceding death, openness or its facets may have been higher or lower for some people than it was at the 1990–1991 measurement. This raises intriguing possibilities regarding the role of trait change in predicting mortality (e.g., Mroczek & Spiro, 2007; Turiano et al., 2012) but multiple waves of data using this personality measure is not available in the NAS.

A final limitation is the generalizability of findings because the current investigation did not include women. The NAS began in the 1960's when women were not initially recruited for the study. In addition, the sample is more than 90% White, thus further limiting the generalizability of our findings. Future investigations should investigate possible gender and ethnic differences in personality and mortality risk.

Conclusions

The current study demonstrated that a specific facet of openness, creativity, predicted long term mortality risk over an 18-year follow-up period. More importantly, this effect remained after controlling for age, education, smoking status, and health status. This is one of the longest mortality follow-up involving openness and its facets. Using personality to predict future health, especially mortality, provides an innovative and easy way to detect disparities in health.

Future work should attempt to replicate these findings and to determine why creativity confers a protective effect. If higher levels of creativity do influence stress reactivity or cognitive processes in old age, then targeting this aspect of personality for intervention would be worthwhile. The current study not only provides the foundation for uncovering why creativity is important in the lives of older adults, but it also suggests that personality facet level analysis may be a more precise tool in understanding how personality influences health. Overall, promoting creativity throughout the life course, and especially at older ages, may delay the cognitive and physical health declines associated with normative aging.

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Table 1

Summary of Exploratory Factor Analysis Results for Openness

	Factor loadings	
Item	**Intellect**	**Creativity**
Unintelligent	**−.82**	−.12
Unintellectual	**−.81**	−.09
Unreflective	**−.68**	−.06
Uninquisitive	**−.62**	−.07
Intellectual	**.55**	.07
Bright	**.54**	.05
Unsophisticated	**−.54**	−.01
Introspective	**.45**	.04
Creative	.02	**.83**
Imaginative	.28	**.59**
Artistic	.11	**.57**
Innovative	.30	**.36**
Uncreative	−.26	**−.35**
Complex	.34	.02
Unimaginative	−.34	−.31
Shallow	−.33	−.12
Deep	.31	.04
Philosophical	.29	.03
Simple	−.24	−.05
Imperceptive	−.12	−.01
Eigenvalues	5.59	1.04

Note: Factor loadings > 0.35 appear in bold.

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Table 2

Correlations and Descriptive Statistics

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Openness	—						
2. Intellect	.60***	—					
3. Creativity	.63***	.12***	—				
4. Age[a]	−.16***	.17***	−.04***	—			
5. Education	.26***	.09***	.03*	.03	—		
6. Current smoker	−.03	−.01	−.03	−.10***	−.07*	—	
7. SIRS health	−.03	−.05	−.01	.09***	−.06*	−.05	—
M	6.08	4.30	5.50	64.91	5.34	0.10	40.10
SD	0.91	0.87	1.47	7.75	1.78	0.30	44.83
Range	2.70–9.00	1.85–9.00	1.00–9.00	45–89	2.00–9.00	0–1	0–124

Notes: $N = 1,351$; SIRS = Seriousness of Illness Rating Scale.

[a] Baseline age in 1990–1991 upon completion of Goldberg personality measure.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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Table 3

Survival Models for Trait Openness Predicting Mortality Risk

	Model 1	Model 2	Model 3
Predictors	**Hazard ratio (CI)**	**Hazard ratio (CI)**	**Hazard ratio (CI)**
Age	1.11 [1.10, 1.12]***	1.11 [1.10, 1.12]***	1.11 [1.10, 1.13]***
Education	0.97 [0.92, 1.02]	0.97 [0.92, 1.02]	0.99 [0.93, 1.04]
Openness		0.92 [0.84, 1.01]	0.95 [0.86, 1.06]
Current smoker			1.57 [1.14, 2.19]**
SIRS health			1.29 [1.17, 1.42]***
−2 log	7264.00	6573.45	4669.15
AIC	7266.00	6579.45	4679.15

Notes: N = 1,351; SIRS = Seriousness of Illness Rating Scale; AIC = Aikaike's Information Criterion; CI = Confidence Interval.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Survival Models for Intellect Predicting Mortality Risk

	Model 1	Model 2	Model 3
Predictors	**Hazard ratio (CI)**	**Hazard ratio (CI)**	**Hazard ratio (CI)**
Age	1.11 [1.10, 1.12]*** f	1.11 [1.10, 1.12]***	1.12 [1.11, 1.13]***
Education	0.97 [0.92, 1.02]	0.97 [0.92, 1.02]	0.97 [0.93, 1.04]
Intellect		1.01 [0.92, 1.11]	1.08 [0.97, 1.22]
Creativity		0.92 [0.85, 0.99]*	0.88 [0.80, 0.97]**
Current smoker			1.61 [1.16, 2.23]**
SIRS health			1.29 [1.17, 1.43]***
−2 log	7563.66	6852.89	4838.86
AIC	7567.66	6860.89	4850.86

Notes: $N = 1{,}351$; SIRS = Seriousness of Illness Rating Scale; AIC = Aikaike's Information Criterion; CI = Confidence Interval.

* $p < .05$.

** $p < .01$.

*** $p < .001$.