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Facets of Conscientiousness and Longevity: Findings from the Health and Retirement Study

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Abstract

Objectives.—Conscientiousness is the strongest personality predictor of longevity. The present study examined which facets of conscientiousness are the most strongly related to mortality risk in a large longitudinal sample of middle-aged and older adults.

Method.—Seven-year mortality data were obtained from participants (total N > 11,000) from the Health and Retirement Study (HRS, 2008–2014). Six facets of conscientiousness, demographic factors, disease burden, smoking and physical inactivity were assessed at baseline.

Results.—Controlling for demographic factors, every standard deviation higher order, traditionalism, virtue, and responsibility was related to an approximately 10% reduced risk of mortality; industriousness was associated with an almost 25% lower likelihood of mortality. Except for traditionalism, these associations were partially accounted by health and behavioral covariates. Self-control was not related to longevity. When all facets and the covariates were simultaneously included, only industriousness was significantly associated with mortality.

Conclusions.—The present study provides new evidence about the specific facets of conscientiousness that are related to longevity.

Keywords

conscientiousness; mortality; facet-level analysis; industriousness

1. Introduction

Among the traits defined by the five factor model of personality [1], conscientiousness, which refers to a tendency to be self-disciplined, organized and thoughtful, is related to a large range of health-related outcomes, including longevity [2–6]. Lifespan models of personality and health postulate that these associations have roots in early life trait

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dispositions [2,3]. Indeed, longitudinal studies have found that higher conscientiousness in childhood predicts lower physiological dysregulation and lower mortality risk in adulthood [2]. A remarkably large number of studies has supported this association between conscientiousness and longevity. For example, an individual-level meta-analysis of participants from 7 large cohort studies [4], and a coordinated analysis of 15 longitudinal samples [5], revealed that conscientiousness is the strongest and most consistent personality predictor of mortality, with higher scores on this trait related to a lower risk of all-cause mortality [4,5]. For example, individuals in the lowest tertile of conscientiousness had a 37% higher mortality risk compared to those in the highest tertile [4]. This robust association is found across samples from different countries, using different personality instruments, and over different follow-ups [5]. According to established theoretical models and their substantial empirical support, conscientiousness reduces mortality risk in part through its association with a range of behavioral and biological pathways, including physical activity, lower risk of obesity, smoking, and drinking, and through its link with higher socioeconomical attainments, higher cognition, and better disease and stress management [3, 6–7].

Additional insights in the conscientiousness-longevity associations can be gained by examining which facets of the broad conscientiousness domain have the strongest associations with longevity. Conscientiousness includes facets that are of an inhibitory nature to help with impulse control (e.g., constraint or self-control) [8]. Conscientiousness also includes facets related to adherence to social norms and ethical principles (e.g., dutifulness or virtue) [8]. Other conscientiousness facets measure more proactive and purposeful aspects, with an emphasis on the aspirations and will to achieve (e.g., industriousness or achievement striving) [8]. Most research, however, has focused on the broad conscientiousness trait, and comparatively fewer studies have been conducted on the facets of conscientiousness that may contribute to longevity. Therefore, the present study aims to extend existing knowledge by examining the association between six facets of conscientiousness and mortality risk.

A growing literature suggests that facet-level analyses allow for a more detailed examination of the association between personality and important life outcomes [8–10]. Furthermore, compared to the five broad factors, the more narrowly defined facets often have greater predictive power when predicting specific outcomes [9–10]. Recent research has found that scoring higher on self-control (cautious and able to delay gratification), order (ability to plan and organize tasks), responsibility (dependable), and industriousness (hard working and competent) was associated with multiple measures of physical health and fitness [11–14]. Indeed, these facets were associated with better self-rated health and fewer chronic illnesses [12] and lower risk of dementia [13]. The same facets were also associated with clinical biomarkers (e.g., lower adiposity, better kidney function, and healthier level of glucose, cholesterol, and inflammation) [14], performance measures (e.g., faster walking speed, stronger grip, and higher peak expiratory flow) [14], and health-related behaviors (e.g., more physical activity and healthier eating behaviors) [15–17]. Fewer associations were found for the facets of traditionalism (compliance with rules, norms and authority) and virtue (a tendency to act in accordance with rules of moral behaviors) [14].

Consistent with evidence for a link with a range of health-related outcomes, conscientiousness facets have been found to relate to longevity. For example, one study found that higher self-discipline (a measure of persistence and determination) was the only conscientiousness facet related to lower mortality risk over 8 years of follow-up among U.S. Medicare patients aged over 65 years ($N=597$) [18]. One meta-analysis found that higher achievement/order and to a lesser extent responsibility/self-control were related to longevity [19]. However, this study combined some facets that are distinct constructs, such as responsibility with self-control and industriousness with order. Such combinations may obscure the contribution of specific facets. Furthermore, most studies were based on small and selective samples.

The present study examined the association between six facets of conscientiousness and longevity in a large longitudinal sample of middle-aged and older adults. Drawing upon past research on the association between conscientiousness facets and health-related outcomes [11–14], it was hypothesized that higher self-control, order, industriousness and responsibility would be associated with lower mortality risk.

2. Method

2.1. Participants

Participants were drawn from the Health and Retirement Study (HRS), a nationally representative longitudinal study sponsored by the National Institute of Aging and conducted by the University of Michigan. The HRS included Americans ages 50 and older and their spouses. Conscientiousness facets were first assessed in 2008 for a random half of the sample, and the other half completed the facets questionnaire in 2010. Both 2008 and 2010 samples were combined as the baseline measure. The final sample included 11,359 participants aged from 50 to 107 years ($M=69.60$, $SD=9.58$; 58% women) with complete personality, mortality and demographic data.

2.2. Conscientiousness facets

Facets of conscientiousness were measured using a 24 items measure [8]. A scale from 1 (*strongly agree*) to 6 (*strongly disagree*) was used to assess how much participants agreed or disagreed with items that assessed self-control (e.g. « I rarely jump into something without first thinking about it »), order (e.g. « I hardly ever lose or misplace things »), industriousness (e.g. « I have high standards and work toward them »), traditionalism (e.g. « Even if I knew how to get around the rules without breaking them, I would not do it »), virtue (« When I was in school, I would rather get a bad grade than copy someone else's homework »), and responsibility (e.g. « I carry out my obligations to the best of my ability »). Each scale was composed of 4 items. The complete list of items is presented in supplementary material. Cronbach alphas ranged from .45 to .63 in the present study, which is similar to past reports (range=.44–.63) [20].

2.3. Mortality.

The National Death Index (NDI) or proxy report from family members, professionals or knowledgeable others, were used to identify vital status. The time elapsed from the month of

baseline interview to the month of death for deceased participants, and to month of the last interview for living participants was used to compute survival time. Vital status was available as of April 2015.

2.4. Covariates.

Demographic covariates included age, sex, education, and race. Additional analysis included smoking, physical inactivity and disease burden. Smoking was coded as 1 for current or former smokers and 0 for never smokers. Physical inactivity was the mean of two items that assessed the frequency of vigorous and moderate activities on a scale from 1 (more than once a week) to 4 (hardly ever or never). Higher means indicated greater physical inactivity. The sum of diagnosed conditions was used for disease burden. Participants were asked whether a doctor ever told them that they suffered from high blood pressure, diabetes, cancer, lung disease, heart condition, stroke, and arthritis.

2.5. Data Analysis

Cox regression was used to examine the association between each facet of conscientiousness and mortality. Time to event (in years) was predicted by each facet, controlling for age, sex, education and race. Cases were censored at the last interview at which they were still alive (April 2015). In additional analyses, smoking, physical inactivity and disease burden were included as covariates. The analyses were conducted with the facets entered separately, with a follow-up analysis with all six facets entered simultaneously. The proportionality assumption was met for all facets. This study also tested whether age, modeled as a continuous variable, moderated the link between the facets and mortality risk.

3. Results

Descriptive statistics are presented in Table 1. A total of 1,569 individuals died (14%) over a median follow-up of 4 years (range: 1 month–7 years), for a total of 50,495 person-years. The results revealed that five out of six facets were related to mortality risk (Table 2). Specifically, one standard deviation higher scores on order, traditionalism, virtue, and responsibility was associated with nearly 10% reduced mortality risk, and industriousness was associated with nearly 25% reduced mortality risk (See Table 2). There was no significant association between self-control and mortality risk. Follow-up analyses indicated that individuals who scored in the bottom quartile of industriousness had almost double the risk compared to those who scored in the top quartile (HR: 1.85, 95%CI: 1.60–2.14, $p < .001$). Compared to individuals in the top quartile, the risk of mortality was approximately 1.4 higher for individuals in the bottom quartile of order (HR= 1.30; 95%CI: 1.14–1.49, $p < .001$), virtue (HR: 1.26, 95%CI: 1.11–1.45, $p < .01$), and responsibility (HR: 1.35, 95%CI: 1.19–1.53, $p < .001$). Finally, individuals in the bottom quartile of traditionalism had about 16% higher mortality risk compared to those in the top quartile of this facet (HR: 1.16, 95%CI: 1.01–1.32, $p < .05$). Age significantly moderated the link between traditionalism (HR_{interaction}: 1.01, 95%CI: 1.00–1.02, $p < .001$), industriousness (HR_{interaction}: 1.01, 95%CI: 1.00–1.01, $p < .05$), responsibility (HR_{interaction}: 1.01, 95%CI: 1.00–1.01, $p < .001$) and mortality. Although higher level of these facets was associated with a lower mortality risk at all ages, the protective effect of traditionalism, industriousness, and responsibility was

stronger for individuals younger than 65 years (traditionalism: HR: 0.79, 95% CI: .68–.92, $p < .01$; industriousness: HR: 0.67, 95% CI: .57–.78, $p < .001$; responsibility: HR: 0.81, 95% CI: .70–.93, $p < .01$) compared to those aged 65 years and older (traditionalism: HR: 0.95, 95% CI: .89–1.00, $p < .05$; industriousness: HR: 0.78, 95% CI: .74–.82, $p < .001$; responsibility: HR: 0.89, 95% CI: .85–.94, $p < .001$).

With the exception of traditionalism, these associations persisted after including disease burden, smoking, and physical inactivity (see Table 2). In regression models that included these health and behavioral factors, the associations between the facets and mortality was reduced by 3% for traditionalism, virtue, and responsibility, by 6% for order, and by 10% for industriousness. The relationship between industriousness and mortality remained significant when all facets and the covariates were simultaneously included (Table 2). In additional analyses, the role of terminal decline was tested by excluding mortality cases that occurred within one year of the baseline assessment. The analysis revealed that the overall pattern of associations between the five facets and mortality remained unchanged.

4. Discussion

The present study adopted a facet-level approach to the study of the association between conscientiousness and longevity. The results revealed that a higher propensity to be organized, responsible, compliant with social and moral norms, and hardworking is related to lower mortality risk, when controlling for demographic factors. Surprisingly, self-control was not a significant predictor in this sample. This study adds to existing knowledge on the association between the broad trait conscientiousness and longevity [2–7] by highlighting the specific aspects of this trait that may drive this association.

In partial support of the hypothesis, higher order, responsibility and industriousness were related to lower mortality risk. This pattern extends recent findings of a link between order, responsibility and industriousness and lower chronic illness and better self-rated health [12]. In addition, being ordered, responsible and industrious is related to health-promoting behaviors, such as physical activity and healthy eating [15–17]. Therefore, it is likely that this better health and behavioral profile may culminate in lower mortality risk. In line with this assumption, disease burden, smoking and physical activity were found to partially account for the link between order, responsibility, industriousness and longevity, but only accounted for a small portion of variance. Additional biological and cognitive pathways may also operate in this association. For example, higher order, responsibility, and industriousness have been related to lower adiposity, inflammation, better kidney function, higher HDL cholesterol [14], and lower cognitive impairment and dementia [13], which may translate into lower mortality risk. Of the six facets, industriousness was the stronger predictor of mortality risk. This result is consistent with recent findings using HRS that industriousness has the strongest association with objective indicators of health [14].

Unexpectedly, higher traditionalism and virtue were related to lower mortality risk. There is little evidence for an association between these two facets and health-related outcomes such as chronic illness and self-rated health [12]. However, one study recently found a higher risk of dementia among individuals scoring in the lowest 10% of virtue [13]. Furthermore, recent

research found that higher traditionalism and virtue are related to performance-based measure of health, such as better lung function and faster walking speed, as well as with lower adiposity [14], which may be conducive to lower mortality risk. In addition, both facets are related to lower risk taking behaviors, smoking, and drug use [8], which are likely to reduce the risk of mortality. Accordingly, in regression models that included health and behavioral covariates, the association between traditionalism and longevity was reduced to non-significance, whereas virtue was still a significant predictor. Therefore, additional processes may explain why being moral and honest may relate to lower mortality risk. In particular, virtue has been associated with biological factors, such as lower hemoglobin A1C [14] and healthy eating behaviors, such as fruit and vegetables consumption [21]. These biological and behavioral pathways may act in the link between virtue and longevity. Finally, we found that traditionalism, industriousness and responsibility were slightly more protective in relatively younger as compared to older individuals. This finding stands in contrast with past research who reported that the association between trait conscientiousness and mortality did not differ by age [4–5]. However, it is similar to recent findings in the HRS that higher traditionalism and responsibility were related to lower dementia risk more strongly among younger as compared to older individuals [13].

Also unexpected, self-control was unrelated to mortality risk. This null result is in contrast to a previous meta-analysis on facets and mortality risk. The meta-analysis, however, combined self-control with responsibility [19], which may have obscured the independent relation of the two facets. This finding also stands in contrast with past research reporting both the protective effects of self-discipline [18] and the general positive effects of self-control for important outcomes [22]. However, it is consistent with report of a null association between self-control and self-rated health [12], and preventive health behaviors [8]. In addition, the size of the association between self-control and biological functioning have been found to be lower than order, industriousness, and responsibility in the HRS [14].

These differences may be due, in part, to how self-control was measured in the HRS. The four items that compose the self-control scale are “I often rush into action without thinking about potential consequences”, “I am easily talked into doing silly things”, “I am careful with what I say to others”, and “I rarely jump into something without first thinking about it”. These items measure the tendency to think carefully before acting that are close to the Deliberation scale in the NEO-PI-R [23]. While the above might seem a subtle distinction, and all facets of conscientiousness are correlated, it is worth noting that that the Deliberation scale of the NEO-PI-R has not been associated with many health outcomes. In particular, higher self-discipline was the only conscientiousness facet related to lower mortality risk among Medicare patients [18]. The NEO-PI-R Self-Discipline (a measure of perseverance) is associated with Robert’s Industriousness facet but not the Self-Control facet [8]. As such, our results are consistent with the previous study, and also with the meta-analysis that higher achievement/order (proactive facets of Conscientiousness closely related to Industriousness) are related to longevity [19].

The present study had several strengths, including the large longitudinal sample of middle-aged and older adults and an up to 7-year follow-up. Among the limitations was the lack of information on the specific causes of death. Future research is needed to test whether there

are differential associations between the conscientiousness facets and mortality depending upon the specific cause of death. Another limitation is the relatively low internal consistency of the scales, which is partly due to their short format that includes few items. Internal consistency, however, is mostly unrelated to the validity of personality facets [24]. Furthermore, the results are specific to a US sample. It is also possible that terminal decline, such as worsening health before death, might have influenced personality and biased the study results. Although we included disease burden as covariate and the pattern of associations remained unchanged when we excluded individuals who died within one year of the personality assessment, such reverse causation effect cannot be completely excluded. More research is needed to examine whether the associations observed between the conscientiousness facets and mortality persist over longer follow-ups. Finally, further research may test for the potential mediating factors of this association. These limitations notwithstanding, the present study provides novel evidence about the specific facets of conscientiousness that are related to longevity.

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Table 1.

Baseline Demographic Characteristics

	Total Sample
Age (years)	69.60 (9.58)
Education (years)	12.84 (2.96)
Sex (% female)	58%
Race (% white)	84%
Disease Burden ^a	2.12 (1.35)
Smoking (% Current/former smokers) ^a	53%
Physical Inactivity ^a	2.63 (1.08)
Self-control	4.72 (.93)
Order	4.30 (.97)
Industriousness	4.69 (1.00)
Traditionalism	4.32 (.92)
Virtue	4.99 (.95)
Responsibility	5.21 (.82)

Note. N= 11,359

^aDue to missing data : N= 10,647 for disease burden, N= 11,356 for smoking, N= 11,180 for physical inactivity

Table 2.

Facets of Conscientiousness and Risk of Mortality

Facet of Conscientiousness	Model 1 HR (95%CI)	Model 2 HR (95%CI)	Model 3 HR (95%CI)
Self-control	.96 (.91–1.01)	.99 (.94–1.05)	1.05 (.99–1.11)
Order	.90 (.85–.94) ***	.95 (.90–1.00) *	.99 (.93–1.05)
Industriousness	.77 (.73–.81) ***	.85 (.81–.90) ***	.86 (.81–.91) ***
Traditionalism	.93 (.88–.97) **	.96 (.91–1.02)	1.01 (.95–1.07)
Virtue	.91 (.87–.96) ***	.94 (.89–.98) *	.98 (.92–1.04)
Responsibility	.88 (.84–.92) ***	.91 (.87–.96) ***	.95 (.90–1.01)

Note. HR: Hazard Ratios.

*
 $p < .05$

**
 $p < .01$

 $p < .001$

Model 1 is the association between each facet of Conscientiousness and risk of mortality controlling for age, sex, education, and race. Model 2 is Model 1 plus the inclusion of disease burden, smoking and physical inactivity, as additional covariates. Model 3 is Model 2 with the six facets entered simultaneously. The coefficients represent the risk associated with a one standard deviation difference in the facets.