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Brief Report

Personality and Falls Among Older Adults: Evidence From a Longitudinal Cohort

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Abstract

Objectives: Falls can have catastrophic consequences, especially for older adults. This study examined whether personality traits predict the incidence of falls in older age.
Method: Participants were older adults aged from 65 to 99 years (*N* = 4,759) drawn from the Health and Retirement Study. Personality traits and demographic factors were assessed at baseline. Falls were tracked for up to 11 years.
Results: Over the follow-up period, 2,811 individuals reported falls. Cox regression analyses that included demographic covariates indicated that lower conscientiousness and higher neuroticism increased the risk of falling. Disease burden, depressive symptoms, and physical inactivity mediated the associations between both traits and falls incidence, whereas smoking status and handgrip strength mediated the neuroticism–falls incidence association.
Discussion: This study provides new prospective evidence that personality predicts the incidence of falls in older adults and suggest that personality assessment may help identifying individuals at higher risk of falling.

Keywords: Conscientiousness, Functional limitation, Neuroticism

A third of older adults aged 65 years and older fall every year, with an estimated medical costs attributable to fatal and nonfatal falls being approximately $50 billion in the United States (Florence et al., 2018). The incidence of falls is a risk factor for loss of functional independence, health service use, and is a leading cause of injury-related deaths (Bergen, Stevens, & Burns 2016). Previous studies have found evidence that muscle mass (Cawthon et al., in press), and chronic conditions (Sibley, Voth, Munce, Straus, & Jaglal, 2014) are related to the risk of falling. In addition, psychological factors may contribute to the risk of falls (e.g., fear of falling; Kvelde et al., 2013). However, little is known about whether this risk in older adults is predicted by an individuals' characteristic ways of thinking, feeling,

and behaving (i.e., personality traits). This information is necessary to better understand both risk factors and mechanisms that underlie falls in advanced age. The results are also critical for developing more complete and effective fall prevention strategies for older adults.

According to the Five-Factor Model (Digman, 1990), personality is defined by five traits: neuroticism, conscientiousness, openness, extraversion, and agreeableness. Only one study to date has examined the association between personality and falls in older age (Kloseck, Hobson, Crilly, Vandervoort, & Ward-Griffin, 2007). The study found that individuals with higher neuroticism and lower conscientiousness were more likely to report having fallen in the past 12 months. However, this previous study was

based on a relatively small sample size (*N* = 199) and the cross-sectional design precluded drawing inferences about the role of personality in predicting future falls among older adults. Personality traits are associated with several processes involved in the risk of falling. Indeed, high neuroticism, low conscientiousness, extraversion, and openness are associated with higher frailty (Stephan, Sutin, Canada, & Terracciano, 2017), which is major determinant of incident falls in older age (Kojima, 2015). Moreover, neuroticism, conscientiousness, and openness prospectively predicted the diagnosis of multiple chronic conditions in older adults (Jokela, Hakulinen, Singh-Manoux, & Kivimäki, 2014), and cognitive impairment (Terracciano, Stephan, Luchetti, Albanese, & Sutin, 2017a), which likely heightens the risk of falls (Muir, Gopaul, & Montero Odasso, 2012; Sibley et al., 2014). In addition to health-related and cognitive determinants, higher neuroticism, lower conscientiousness, and lower openness are related to health-damaging behaviors, such as smoking (Hakulinen et al., 2015a) and physical inactivity (Sutin et al., 2016), which are associated with the risk of falls (Buchner et al., 2017; Ek et al., 2018). Furthermore, neuroticism and conscientiousness are associated with handgrip strength in old age (Tolea et al., 2012, Sutin, Stephan, & Terracciano, 2018), which is related to higher risk of falls (Van Ancum et al., 2018). Finally, high neuroticism, low conscientiousness, and low extraversion are also risk factors for depression (Hakulinen et al., 2015b) and anxiety (Kotov, Gamez, Schmidt, & Watson, 2010), which increase the likelihood of falls (Hallford, Nicholson, Sanders, & McCabe, 2017; Kvelde et al., 2013). In contrast to the other major personality factors, there is less support for a potential role of agreeableness in the incidence of falls.

Using a large national sample of older adults, the present study examined the association between personality and the incidence of falls. Based upon existing research (e.g., Kloseck et al., 2007; Stephan et al., 2017), it was hypothesized that higher neuroticism and lower conscientiousness, extraversion, and openness would be associated with a higher risk of falls over time. Furthermore, we examined whether this relationship was moderated by age and sex. Given their relation to falls in older age and personality traits, the study also tested to what extent disease burden, depressive symptoms, cognitive functioning, physical activity, smoking status, and handgrip strength were mediators of this association.

Method

Participants

This study used data from the Health and Retirement Study (HRS), a national longitudinal study of U.S. older adults. As part of an enhanced face-to-face interview, a random half of the participants completed the Leave-Behind Questionnaire that included a personality measure in 2006, and the other half completed this measure in 2008. Data from both waves were pooled as baseline. HRS assessed falls only among respondents aged 65 years and older. A total of 8,001 participants provided complete data on personality, falls, and demographic data at baseline. Only participants without falls within the past 2 years of the personality assessment were included, leading to the exclusion of 2,808 participants. Of the remaining 5,193 participants, 4,759 also had data on falls at any of the follow-up assessments that occurred every 2 years, up to the 2016 wave. Attrition analysis is presented in the Supplementary Material.

Measures

Falls

Individuals were asked whether they had fallen down in the last 2 years since the last interview. The response to this question was categorized as yes (coded as 1) or no (coded as 0).

Personality

The 26-item Midlife Development Inventory (MIDI; Zimprich, Allemand, & Lachman, 2012) was used to measure personality traits using adjectives that assessed neuroticism, extraversion, openness, agreeableness, and conscientiousness. Participants were asked to rate how much each adjective described themselves on a scale ranging from 1 (not at all) to 4 (a lot). Cronbach *α* ranged from .66 to .78.

Mediators

Disease burden was computed as the sum of the following self-reported conditions: high blood pressure, lung disease, heart disease, cancer, stroke, diabetes, and arthritis. The sum ranged from 0 to 7; higher scores indicated more chronic conditions.

Depressive symptoms were assessed with an eight-item version of the Centers for Epidemiologic Research Depression scale (Wallace et al., 2000). A count variable that ranged from 0 to 8 was formed from the items to create a total depressive symptom score (*α* = .75); higher scores indicated more depressive symptom.

Cognitive functioning was based on the modified Telephone Interview for Cognitive Status (Crimmins, Kim, Langa & Weir, 2011). A composite score was computed from a test of short-term memory, working memory, and mental processing speed (range 0–27); higher scores indicated better cognitive functioning.

Physical inactivity was based on 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). The average of these two items was used, with higher scores indicating less physical activity.

Smoking status was coded as 1 (current and/or former smoker) and 0 (never smoker).

Handgrip strength was recorded in kilograms using a dynamometer; the highest measurement from two trials on each hand was used in the analyses.

Covariates

Sociodemographic factors were age (in years), sex (coded as 1 for men and 0 for women), race (coded as 0 for white, 1 for others) and educational level (reported in years) and were controlled for in a basic model.

Statistical Analyses

Cox proportional hazard models were used to test whether personality was related to the incidence of falls. Time to event was defined as time (in years) from the personality assessment to the date of the first interview at which the participant reported a fall. Cases were censored at the last available assessment as of December 2016 for participants who did not report any falls. All continuous predictors were converted into standard deviation units for ease of interpretation. These analyses were adjusted for age, sex, race, and educational attainment. Supplementary analyses were conducted with the five traits entered simultaneously to evaluate whether the association of each trait with falls was independent of the other traits. In addition, mediational analyses were conducted through a structural equation modeling approach that combines a structural model with a Cox proportional hazards model. As a first step, mediation analyses were conducted for each mediator separately, adjusting for age, sex, race, and education. Then, to determine whether the full set of variables together explain the relation between personality traits and falls, a fully adjusted model that included every mediator was tested. Separate analyses were conducted for each trait.

Results

Descriptive statistics are presented in Table 1. The 4,759 participants included 54% women and were aged from 65 to 99 years at baseline (Mean = 73.58; *SD* = 6.50). Across the mean follow-up of 5.16 years (range = 15 months–11.08 years; total of 24,591 persons-years), 2,811 individuals (59.1%) experienced a fall. As reported in Table 2, Cox regression analyses that included

demographic covariates found that one standard deviation lower conscientiousness was associated with about 20% higher risk of falling. One standard deviation higher neuroticism was associated with a 14% higher risk of falls. Contrary to our expectations, there were no significant associations between extraversion or openness and the incidence of falls. As expected, there was not a significant association for agreeableness. The overall pattern of results remained unchanged when the five traits are entered simultaneously (Table 2).

Table 3 has the results of the mediation analyses. Examination of the indirect effects for each mediator revealed that low conscientiousness and high neuroticism have a significant indirect association with falls through higher disease burden, more depressive symptoms and physical inactivity. In addition, results also indicated that the neuroticism–falls association was mediated by smoking status and handgrip strength. When all mediators were in the fully adjusted model, the direct effect of conscientiousness on falls was attenuated but remained significant ($p < .05$), but the direct effect of neuroticism on falls became nonsignificant ($p = .49$). Cognitive functioning was not a significant mediator for either trait (Table 3).

Discussion

On the basis of data from 4,759 older adults, this study revealed that personality was a significant predictor of incident falls over an up to 11-year follow-up: higher neuroticism and lower conscientiousness were associated with a higher risk of falls over time. The associations were independent of sociodemographic variables. Moreover, this study demonstrated that chronic conditions, depressive

Table 1. Baseline Characteristics of the Sample (*N* = 4,759)

Variables	*M*/% (SD)		
	Total	Nonfallers (*N* = 1,948)	Fallers (*N* = 2,811)
Age (years)	73.58 (6.50)	72.70 (5.39)	74.33 (6.73)
Sex (% female)	54.9%	50.1%	58.2%
Race (% white)	86.5%	83.8%	88.4%
Education (years)	12.62 (2.95)	12.62 (2.87)	12.62 (3.02)
Disease burden[a]	2.08 (1.21)	1.96 (1.19)	2.16 (1.22)
Depression[a]	0.94 (1.51)	0.73 (1.30)	1.08 (1.63)
Cognition[a]	15.24 (3.81)	15.25 (3.77)	15.23 (3.83)
Physical inactivity[a]	2.45 (1.01)	2.40 (1.01)	2.49 (1.00)
Smoking (%)[a]	51.1%	52.8%	49.9%
Handgrip strength[a]	30.80 (10.50)	29.73 (10.24)	32.35 (10.69)
Extraversion	3.23 (0.54)	3.23 (0.52)	3.22 (0.55)
Agreeableness	3.53 (0.46)	3.52 (0.46)	3.53 (0.46)
Conscientiousness	3.37 (0.46)	3.39 (0.45)	3.35 (0.47)
Openness	2.92 (0.54)	2.93 (0.53)	2.92 (0.55)
Neuroticism	1.94 (0.57)	1.91 (0.55)	1.96 (0.58)

Note. [a] *N* differ because data were missing for disease burden, depressive symptoms, cognition, physical inactivity, smoking status, and handgrip strength: *N* = 3,870.

symptoms, physical inactivity, smoking behavior, and handgrip strength mediated the personality–falls association. Extraversion, openness, and agreeableness, were not associated with the incidence of falls. This study thus adds to existing knowledge on factors related to falls among older adults by providing new evidence of the prospective association between personality and incident falls and by identifying mechanisms through which personality may contribute to risk of falling among older people.

The association between high neuroticism and low conscientiousness with higher risk of falls extends existing research that found an association between these traits and higher frailty (Stephan et al., 2017). Our findings are also consistent with existing evidence for a link between higher neuroticism and lower conscientiousness and

physical inactivity (Sutin et al., 2016), poor grip strength (Tolea et al., 2012), smoking behavior (Hakulinen et al., 2015a), disease burden (Jokela et al., 2014) and depression (Hakulinen et al., 2015b), which increase the risk of falls in old age (Buchner et al., 2017; Ek et al., 2018; Kvelde et al., 2013; Sibley et al., 2014, Van Ancum et al., 2018). In contrast, cognition was not a significant mediator of the association between personality and falls in this sample. The inclusion of health-risk behaviors and chronic conditions in the present study explained part of the relation between conscientiousness and falls and thus other factors may also contribute to this association. Lower conscientiousness is related to poor respiratory function (Terracciano, Stephan, Luchetti, Gonzalez-Rothi, & Sutin, 2017b), which is associated with falls in old age (Oliveira et al., 2015).

Contrary to our expectations, extraversion and openness were not associated with the incidence of falls in old age. One potential explanation for this lack of association is that these traits have a more ambiguous relationship with behavioral mechanisms associated with falls among older adults, compared to neuroticism and conscientiousness. For example, extraversion is associated with more physical activity (Sutin et al., 2016) but also with higher likelihood of smoking (Hakulinen et al., 2015a). Finally, agreeableness was not related to falls over time.

The strengths of this study include the use of a large national longitudinal sample, the inclusion of all five major dimensions of personality, the identification of potential mediators, and the prospective data with an 11-year follow-up. But despite these strengths, several limitations should also be considered. The observational study design limits the possibility of determining causal relations. Future research is needed to determine whether the incidence of

Table 2. Summary of Cox Proportional Hazard Ratio Analysis Predicting Incident Falls Risk from Personality Traits ($N = 4,759$)

	Model 1	Model 2
Predictors	Hazard ratios (95% CI)	Hazard ratios (95% CI)
Extraversion	0.96 (0.89 to 1.03)	0.98 (0.89 to 1.07)
Agreeableness	0.98 (0.90 to 1.07)	1.07 (0.96 to 1.19)
Conscientiousness	0.84 (0.77 to 0.91)***	0.81 (0.74 to 0.89)***
Openness	0.99 (0.92 to 1.07)	1.09 (0.99 to 1.19)
Neuroticism	1.14 (1.07 to 1.22)***	1.12 (1.05 to 1.20)***

Notes. Model 1: age, sex, race, and education were included as demographic covariates. Model 2: Model 1 when all five personality traits are entered simultaneously.
***$p < .001$.

Table 3. Summary of Mediation Analyses Predicting Falls From Conscientiousness and Neuroticism

Personality traits MV	Mediating effect			Direct effect			Total effect		
	Estimate	95% CI	p	Estimate	95% CI	p	Estimate	95% CI	p
Conscientiousness									
Disease burden	0.021	0.012 to 0.030	<.001	0.154	0.087 to 0.222	<.001	0.175	0.107 to 0.143	<.001
Depression	0.055	0.042 to 0.069	<.001	0.110	0.041 to 0.178	.009	0.165	0.097 to 0.233	<.001
Cognition	0.005	−0.001 to 0.011	.197	0.170	0.103 to 0.237	<.001	0.175	0.107 to 0.233	<.001
Physical inactivity	0.015	0.006 to 0.025	.007	0.158	0.091 to 0.226	<.001	0.174	0.106 to 0.241	<.001
Smoking	0.013	−0.002 to 0.038	.168	0.171	0.104 to 0.238	<.001	0.184	0.115 to 0.253	<.001
Handgrip strength	0.004	0.000 to 0.009	.140	0.171	0.103 to 0.238	<.001	0.175	0.107 to 0.242	<.001
All mediators	0.080	0.059 to 0.101	<.001	0.095	0.026 to 0.164	.023	0.175	0.106 to 0.245	<.001
Neuroticism									
Disease burden	0.023	0.015 to 0.031	<.001	0.116	0.060 to 0.171	.001	0.139	0.084 to 0.194	<.001
Depression	0.089	0.069 to 0.109	<.001	0.044	−0.014 to 0.102	.221	0.133	0.078 to 0.188	<.001
Cognition	0.003	−0.001 to 0.006	.205	0.137	0.082 to 0.192	<.001	0.140	0.085 to 0.195	<.001
Physical inactivity	0.010	0.004 to 0.016	.006	0.131	0.076 to 0.186	<.001	0.141	0.086 to 0.196	<.001
Smoking	0.019	0.004 to 0.034	.035	0.135	0.080 to 0.190	<.001	0.154	0.097 to 0.211	<.001
Handgrip strength	0.010	0.004 to 0.016	.007	0.129	0.072 to 0.186	<.001	0.141	0.086 to 0.196	<.001
All mediators	0.121	0.096 to 0.146	<.001	0.024	−0.034 to 0.082	.492	0.146	0.088 to 0.203	<.001

Notes. Conscientiousness scores were reverse-coded for ease of interpreting the direction of effects. MV = mediating variable.

falls could affect personality development in old age. In addition, a limitation of the study is that different types of falls, such as injurious or noninjurious falls, were not differentiated. Each type of fall may have different risk factors and occurrence mechanisms (Stel et al., 2003). Finally, the strength of the association between personality traits and falls is relatively small in absolute terms. However, falls is a multidetermined event that is associated with a variety of factors. It is important to note that the effect sizes for personality traits were similar to the effect size of recognized risk factors, such as age, sex, race, and medical condition.

Despite these limitations, the present study provides novel longitudinal evidence that personality is associated with the incidence of falls in older adults. From a clinical perspective, the results suggest that a personality assessment may be useful to identify individuals at higher risk of falling who may benefit from preventive interventions. Indeed, this study provides evidence that engaging in detrimental health behaviors, such as physical inactivity and smoking behavior, explains at least part of the reason why individuals lower in conscientiousness and higher in neuroticism are more likely to fall. This result might provide information for the design of tailored intervention programs to prevent falls. Research with older adults indicates that personalized or tailored interventions can be effective (Rouch et al., 2018). In conclusion, this study paves the way for future research on falls and personality in older age.

Supplementary Material

Funding

Acknowledgments

Conflict of Interest

None reported.

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