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Satisfaction with aging results in reduced risk for falling

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ABSTRACT

Background: Falls are highly frequent in older adults and are associated with increased morbidity and mortality. The present study was designed to assess the role of satisfaction with one's aging process as a predictor of the risk for falling over a four-year period and to identify potential mediators of this relationship.

Methods: The Health and Retirement Study (HRS) is a US nationally representative sample of individuals over the age of 50 years and their spouse of any age. The present study was based on the 2008–2012 waves of the HRS. Analyses were restricted to 4,121 respondents over the age of 50 years, who had fall data in 2008 and 2012 and were eligible to complete the satisfaction with aging measure as part of the 2008 psychosocial questionnaire.

Results: Overall, 38.1% of the sample reported having fallen at least once between 2006 and 2008 and 40.7% reported having fallen at least once between 2010 and 2012. Higher levels of satisfaction with aging in 2008 were found to be protective against falls assessed in 2012 (OR[95%CI] = 0.88[0.79–0.98]) even after adjustment for age, gender, education, ethnicity, medical status, functional status, cognitive functioning, walking speed, balance, vision, depressive symptoms, physical activities, and past falls. Bootstrap procedures have shown that the effect of satisfaction with aging on falls is partially accounted for through its effect on functional decline.

Conclusions: The findings point to the important role of satisfaction with aging as a potential protective mechanism against falls. The results call for the development of psychosocial interventions to reduce falls in older adults.

Key words: epidemiology, satisfaction with aging, falls, frailty, subjective aging

Introduction

Older adults are susceptible to falls, with one in three older adults over the age of 65 years falling at least once each year (Morrison *et al.*, 2013). The detrimental effects of falls are well known, ranging from increased morbidity and disability, a higher risk for hospitalization and institutionalization (Gill *et al.*, 2013) and even an increased risk for death due to fall-related injuries (Stevens *et al.*, 2006).

Past research has identified several risk factors for falls (Rubenstein, 2006; Ambrose *et al.*, 2013; Chang and Do, 2015). These include certain medication, vision impairment, impairments in activities of daily living, gait and balance impairments, and cognitive impairments. Having a history of past falls is also a strong risk for future falls.

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With the exception of fear of falling (Zijlstra *et al.*, 2007), the majority of research, to date, has focused on environmental, physiological, or biological risks for falling, with very limited attention given to psychosocial factors associated with falling (Chang *et al.*, 2004). This is unfortunate given the relative amenability to change of psychosocial factors compared with physiological or biological risk factors (Bryant *et al.*, 2014).

The present study evaluated the role of satisfaction with one's aging process (i.e. satisfaction with aging/attitudes towards aging) (Levy and Myers, 2004; Ailshire and Crimmins, 2011) in predicting risk for falling. Past research has shown that satisfaction with aging is a strong predictor of functional impairment (Sargent-Cox *et al.*, 2012), morbidity (Levy *et al.*, 2002a; Moser *et al.*, 2011), health behaviors (Levy and Myers, 2004), and even mortality (Levy *et al.*, 2002b).

Consistent with these epidemiological findings, there have been several intervention studies demonstrating the positive effects of improving attitudes towards aging on a variety of health

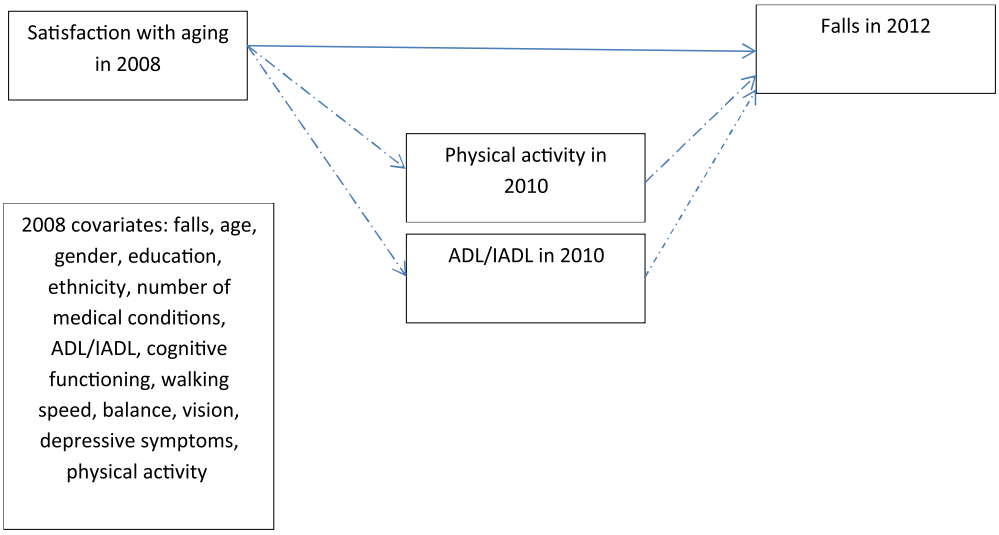

Figure 1. (Colour online) Activities of daily living/instrumental activities of daily living (ADL/IADL) and physical activity as mediators of the relationship between satisfaction with aging and the risk for falling[1]

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outcomes including, physical activity (Wolff *et al.*, 2014), walking (Sarkisian *et al.*, 2007), and memory performance (Hess *et al.*, 2004). However, despite the inherent promise in these interventions, a recent meta-analysis has shown that impacting negative age stereotypes has a greater effect on health behaviors than impacting positive age stereotypes (Meisner, 2012).

A contemporary theory suggested three potential pathways through which satisfaction with aging could impact one's health (Levy, 2009). The firth pathway is a cognitive-psychological pathway which argues for the power of self-fulfilling prophecy. According to this argument, the belief that aging means decline and deterioration, negatively impacts one's health and well-being, whereas positive beliefs about aging are likely to result in positive health outcomes. A related, behavioral pathway suggests that having positive perceptions about old age makes one more susceptible to engaging in positive health behaviors and vice versa. Finally, the third pathway concerns the autonomic nervous system, which is thought to be differentially affected by one's images of old age.

To date, only one study restricted to individuals between the ages of 65 years and 70 years has assessed the predictive value of satisfaction with aging with regard to falls. That study resulted in inconclusive findings, possibly due to its limited age range (Moser *et al.*, 2011). The present study adds to existing knowledge by examining the role of satisfaction with aging in predicting falls in a large US nationally represented sample of individuals over the age of 50 years. To identify explanatory mechanisms, the mediating roles of physical activity and activities of daily living/instrumental activities of daily living (ADL/IADL) were evaluated. It was hypothesized that the effect of satisfaction with aging is partially accounted for by its effect on these variables (Levy and Myers, 2004; Sargent-Cox *et al.*, 2012; Stephan *et al.*, 2015), which have shown to predict falls in past research (Grenier *et al.*, 2014; Kaminska *et al.*, 2015).

Methods

The HRS is a biannual longitudinal panel of US nationally representative individuals over the age of 50 years and their spouses of any age. The HRS is supported by the National Institute on Aging (NIA U01AG009740) and the Social Security Administration. The satisfaction with aging questionnaire was first administered in 2008 as part of the psychosocial questionnaire, which is administered every four years to approximately half the sample. Follow-up data from 2012 were used to assess risk for falling. To assess mediation, physical activity, and ADL/IADL evaluated in 2008 and 2010 were used. See Figure 1 for details.

Measures

Outcome

Participants were asked if they had fallen down in the past two years (1 = yes, 0 = no).

Independent variable

An eight-item measure of attitudes towards aging was used as an indicator of satisfaction with aging.

[1] A straight line represents a direct effect, whereas a dashed line represents an indirect effect.

The first five questions (e.g. "things keep getting worse as I get older;" "I have as much pep as I had last year;" "as I get older things are better than I thought they would be;" "I am as happy now as I was when I was younger;" "the older I get the more useless I feel") were taken from the "Attitude Toward Own Aging" subscale of the Philadelphia Geriatric Center Morale Scale (Lawton, 1975), and the remaining questions (e.g. "so far, I am satisfied with the way I am aging;" "the older I get the more I have to stop doing things that I liked;" "getting older has brought with it many things that I do not like") were used in other studies e.g. (Ailshire and Crimmins, 2011). A composite mean score was calculated after reverse-scoring relevant items, so that a higher score indicated greater satisfaction with aging. This measure has a range between 1 and 6, with a higher score indicating better attitudes (Cronbach's $\alpha = 0.82$). It has adequate criterion validity by its associations with health status, loneliness (Ailshire and Crimmins, 2011), and preventive health service use (Kim *et al.*, 2014).

Mediators

Six difficulties in performing activities of daily living (e.g. walking, bathing, getting in/out of bed) and five difficulties in performing instrumental activities of daily living (e.g. making phone calls, taking medication) were assessed (Juster and Suzman, 1995). Range was between 0 and 11, with a higher score indicating greater impairment (Cronbach's $\alpha = 0.88$).

An average score of vigorous, moderate, and mild physical activity was calculated on a five-point scale, with higher scores representing more frequent activity (Jenkins *et al.*, 2008).

Covariates

Depressive symptoms were measured using eight Center for Epidemiologic Studies Depression Scale (CES-D) items (Radloff, 1977; Steffick, 2000). A composite score was calculated after reverse coding relevant items so that a higher score represents more depressive symptoms (Cronbach's $\alpha = 0.80$).

A composite score of the overall number of medical conditions (e.g. high blood pressure, diabetes, cancer) was constructed (Fisher *et al.*, 2005). Range was between 0 (having no medical conditions) and 6 (having all six conditions).

A composite cognitive functioning score was based on four cognitive tasks (Ofstedal *et al.*, 2005). Immediate recall was evaluated by reading a list of ten nouns to participants and then asking participants to immediately recall the words. Five minutes afterwards, participants were asked to recall the list (i.e. delayed recall). The overall number of words recalled correctly was counted for the two recall tasks. Participants were also asked to count backward from a certain number and to subtract 7 from a number five times. Range was between 0 (severe impairment) and 26 (perfect performance) (Cronbach's $\alpha = 0.64$).

Visual impairment was gathered based on self-report. Respondents were asked to rate their eyesight, including distal and near vision on a five-point scale, with a higher score representing better eyesight. An average composite score was calculated (Cronbach's $\alpha = 0.85$).

Balance was assessed by instructing participants to stand up with the side of the heel of one foot touching the big toe of the other foot for 10 seconds (Crimmins *et al.*, 2008). Range was between 0 and 10, with higher score indicating better balance.

Walking speed was measured as participants walked a 98.5 inch course twice (Crimmins *et al.*, 2008). The two measures were averaged, with a higher score indicating faster walking speed.

Demographic characteristics

Age in years, gender, years of education, and ethnic origin (White, Latino, Black, or other) were gathered based on self-report.

Analysis

Logistic regression analyses were conducted. The 2008 satisfaction with aging score was entered as a predictor. In the adjusted models, all covariates assessed in 2008 were entered (e.g. age, gender, education, ethnicity, medical conditions, physical activity, depressive symptoms, ADL/IADL impairments, cognitive functioning, walking speed, balance, and vision). The same analyses were repeated with having fallen assessed in 2008 and 2012 as outcomes. To predict falls in 2012, baseline falls evaluated in 2008 was included as a potential covariate in the fully adjusted model. Potential interactions between satisfaction with aging, age, sex, and falls in 2008 were examined, but were non-significant.

Mediation was examined using bootstrapping, with $n = 5{,}000$ bootstrap resamples to test whether physical activity and ADL/IADL evaluated in 2010 mediated the relationship between satisfaction with aging assessed in 2008 and the risk for falls assessed in 2012, controlling for all potential covariates. Bootstrapping resamples the data 5,000 times and estimates the indirect effect in each sample to obtain an estimation of the indirect effect and its 95% confidence intervals (CI) (Kenny, 2013). When the 95% CI does not contain zero, the effect is considered significant.

In an additional sensitivity analysis, falls in 2008 were examined as potential predictors of satisfaction with aging assessed in 2012. All analyses were weighted and stratified to account for the complex survey design. Analyses were conducted in Stata 13 (StataCorp, 2013).

Results

Compared with those over the age of 50 years who were eligible to complete the psychosocial questionnaire in 2008, but did not complete the satisfaction with aging questionnaire (n = 1,279), those who completed it (n = 6,816) were significantly younger (mean[SE] = 67.3[0.19] vs. mean[SE] = 72.3[1.48], F[1,56] = 11.63, $p < 0.001$), more educated (mean[SE] = 12.8[0.53] vs. mean[SE] = 11.5[0.10], F[1,56] = 6.44, $p < 0.05$), had fewer ADL/IADL impairments (mean[SE] = 0.78[0.03] vs. mean[SE] = 1.73[0.31], F[1,56] = 9.37, $p < 0.05$) and better cognitive functioning (mean[SE] = 13.48[0.10]vs. mean[SE] = 10.11[0.66], F[1,52] = 26.01, $p < 0.001$). Relative to ethnic minorities, Whites were more likely to complete the satisfaction with aging questionnaire (80.1% White among completers vs. 72.6% among non-completers, χ^2[df] = 11.0[3], $p < 0.05$).

Of those eligible to the 2008 psychosocial questionnaire over the age of 50 years, 4,121 had fall data in 2008 and 2012 and 1,407 had fall data available only in 2008. Those who had fall data available on both waves were significantly younger (mean[SE] = 73.9[0.16] vs. mean[SE] = 79.0[0.36], F[1,52] = 165.8, $p < 0.001$), more educated (mean[SE] = 12.5[0.16] vs. mean[SE] = 11.7[0.13], F[1,52] = 30.86, $p < 0.001$), suffered from fewer medical conditions (mean[SE] = 1.5[0.02] vs. mean[SE] = 2.0[0.04], F[1,52] = 109.72, $p < 0.001$), had fewer ADL/IADL impairments (mean[SE] = 0.75[0.04] vs. mean[SE] = 2.2[0.13], F[1,52] = 130.65, $p < 0.001$), and better cognitive functioning (mean[SE] = 13.2[0.11] vs. mean[SE] = 10.9[0.18], F[1,52] = 137.27, $p < 0.001$) than those with fall data available only in 2008. Those with fall data on both waves were more likely to be White (83.3% vs. 81.8% respectively, χ^2[df] = 17.3[3], $p < 0.01$).

All analyses were restricted to 4,121 respondents over the age of 50 years, who had fall data on both waves and were eligible to complete the 2008 psychosocial questionnaire. Overall, 38.1% of the sample reported having fallen at least once between 2006 and 2008 and 40.7% reported having fallen at least once between 2010 and 2012. With the exception of education and ethnicity those who said "yes" to having fallen down over the past two years in 2008, were significantly different from those who had no falls (see Table 1). In general, those who had a fall were older, more likely to be women and scored less favorably on all health indicators.

Lower levels of satisfaction with aging predicted falls in the cross-sectional and in the longitudinal design even after adjustment (see Table 2). Of note is that in the fully adjusted model, only having a history of past falls (OR [95%CI] = 3.00[2.52–3.57]), being Black rather than White (OR[95%CI] = 0.65[0.45–0.94]) and ADL/IADL impairments (OR[95%CI] = 1.23[1.10–1.38]) exceeded the predictive ability of satisfaction with aging. In contrast, the positive effect of satisfaction with aging was greater than the actual effects of age (OR[95%CI] = 1.03[1.02–1.05]). No other risk factors remained significant in the fully adjusted model.

To assess for mediation, a significant effect of satisfaction with aging assessed in 2008 on ADL/IADL assessed in 2010 (Beta[SE] = −0.05[0.02], p = 0.04) and on physical activity assessed in 2010 (Beta[SE] = 0.09[0.02], $p < 0.001$) was established, after controlling for all covariates assessed in 2008 (e.g. age, gender, education, ethnicity, medical conditions, physical activity, depressive symptoms, ADL/IADL impairments, cognitive functioning, walking speed, balance, and vision). A significant effect of ADL/IADL assessed in 2010 on falls assessed in 2012 was established even after controlling for all covariates (OR[95% CI] = 1.14[1.02–1.21]), but not for physical activity assessed in 2010 (OR[95%CI] = 0.98[0.84–1.15]). Hence, the indirect effect of ADL/IADL assessed in 2010 on falls in 2012 was significant (unstandardized coefficient [95% bias-corrected CI] = −0.005[−0.01–0.007]), but not the indirect effect of physical activity (unstandardized coefficient [95% bias-corrected CI] = −0.001[−0.003–0.007]). The overall direct effect of satisfaction with aging remained significant (unstandardized coefficient [95% bias-corrected CI] = −0.08[−0.12–0.03]) and so did the total effect (unstandardized coefficient[95% bias-corrected CI] = −0.08[−0.13–0.03]).

In an additional sensitivity analysis, falls assessed in 2008 were examined as potential predictors of satisfaction with aging in 2012, but had no significant effect (Beta[SE] = −0.07[0.04], p = 0.08) in the fully adjusted model.

Discussion

Because falls are associated with increased morbidity and mortality, substantial efforts are in place to reduce the risks for falling in older adults

Table 1. Baseline characteristics of the sample ($n = 4{,}121$)

	TOTAL SAMPLE MEAN(SE)/FREQ (%)	NO FALL IN THE PAST TWO YEARS ($N = 2{,}591$) MEAN(SE)/FREQ (%)	HAD A FALL IN THE PAST TWO YEARS ($N = 1{,}530$) MEAN(SE)/FREQ (%)	F[df]/χ^2[df]
Age (years)	73.9 (.17)	73.4 (.22)	74.7 (.25)	13.8[1,52],$p < 0.001$
Women (%)	2,427 (57.8%)	1,472 (54.8%)	955 (62.6%)	24.3[1], $p < 0.001$
Education (years)	12.5 (.13)	12.5 (.14)	12.3 (.16)	1.94[1,52], $p = 0.17$
Ethnicity (%)				5.8[4], $p = 0.15$
White	3,146 (83.3%)	1,922 (82.3%)	1,224 (84.8%)	
Latino	365 (6.9%)	250 (7.0%)	115 (6.7%)	
Black	523 (7.8%)	362 (8.4%)	161 (6.8%)	
Other	86 (2.1%)	56 (2.3%)	30 (1.7%)	
Number of medical conditions (0–6)	1.52 (0.02)	1.4 (0.02)	1.7 (0.04)	35.1[1,52], $p < 0.001$
Number of ADL/IADL impairments (0–11)	0.75 (0.04)	0.52 (0.05)	1.11 (0.06)	63.3[1,52], $p < 0.001$
Cognitive functioning (0–26)	13.2 (0.11)	13.4 (0.13)	12.8 (0.19)	7.0[1,52], $p = 0.01$
Walking speed (seconds)	3.7 (0.07)	3.5 (0.06)	4.1 (0.10)	49.1[1,52], $p < 0.001$
Balance (0–10)	9.7 (0.03)	9.8 (0.03)	9.4 (0.06)	33.6[1,52], $p < 0.001$
Vision (1–5)	3.3 (0.02)	3.4 (0.03)	3.2 (0.03)	24.3[1,52], $p < 0.001$
Depressive symptoms (0–8)	1.3 (0.03)	1.1 (0.04)	1.6 (0.06)	48.1[1.52], $p < 0.001$
Physical activity (1–5)	2.8 (0.02)	2.9 (0.03)	2.7 (0.02)	17.3[1,52], $p < 0.001$
Satisfaction with aging (1–6)	3.8 (0.02)	4.0 (0.03)	3.6 (0.03)	63.7[1,52], $p < 0.001$

ADL/IADL-activities of daily living/instrumental activities of daily living.

Table 2. 2008 Satisfaction with aging as a predictor of falls in 2008 and 2012

	FALLS IN 2008		FALLS IN 2012	
	UNADJUSTED	ADJUSTED	UNADJUSTED	ADJUSTED
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Satisfaction with aging (1–6)	0.71 (0.65–0.78)	0.87 (0.79–0.95)	0.72 (0.67–0.77)	0.88 (0.79–0.98)
F(df)	65.0 (1,52), $p < 0.001$	9.36 (14,39), $p < 0.001$	87.90 (1,52), $p < 0.001$	25.3 (15,38), $p < 0.001$

Logistic regression analyses were conducted.
OR(95%CI) = Odds Ratio(95%Confidence Interval).
Logistic regression analyses were adjusted for age, gender, education, ethnicity, number of medical conditions, ADL/IADL impairments, cognitive functioning, walking speed, balance, depressive symptoms, physical activity, and vision. To predict falls in 2012, analysis was also adjusted for falls in 2008.
ADL/IADL-activities of daily living/instrumental activities of daily living.

(Gillespie *et al.*, 2009). To date, most of these efforts have been geared towards improving balance and physical activity and reducing environmental barriers. The present study points to a new direction for potential interventions. The findings suggest that the subjective experience of satisfaction with one's aging process is protective against falls, not only in a cross-sectional design, but also over time. Further support for the direction of the effect from satisfaction with aging to falls and not vice versa was established as falls assessed in 2008 were a non-significant predictor of satisfaction

with aging assessed in 2012 in the fully adjusted model.

In an attempt to explain the mechanisms behind the association between satisfaction with aging and falls, the present study shows that greater satisfaction with aging results in less physical impairment which in return, also reduces the risk for falling. Although physical activity was associated with satisfaction with aging, it did not predict falls in the fully adjusted model and did not mediate the effects of satisfaction with aging. Hence, the study's hypotheses regarding the mediating roles of physical functioning and physical activity were only partially supported.

Even though the HRS is a nationally representative sample, the generalizability of the present study is somewhat impaired by the fact that most covariates examined in the present study were associated with whether or not fall and satisfaction with aging data were available on both waves. In addition, the reliance on subjective information concerning falls could potentially result in under-report due to shame or stigma. Moreover, the reliance on one's recall of falls that occurred over a period of two years has likely resulted in substantial omissions due to memory slips. Another potential limitation concerns the fact that the sensitivity analysis spans over a longer period of time than the main analysis. This is because fall data between 2006 and 2008 are used to predict satisfaction with aging in 2012, whereas in the main analysis, satisfaction with aging assessed in 2008 is used to predict falls between 2010 and 2012. Finally, although the potential role of several covariates was addressed in the present analysis, medication use, which has shown to be associated with falls in past research (Kelly *et al.*, 2003), was not accounted for in this analysis. Nonetheless, the findings point to the important role of satisfaction with aging as a potential protective mechanism against falls. This association is partially mediated through its effects on physical functioning.

The results call for further development of psychosocial interventions geared towards reducing falls in older adults. One potential direction for intervention could be through improving one's attitudes towards aging (Wolff *et al.*, 2014). A recent intervention study has shown that physical activity can be increased by improving one's views on aging through the provision of positive information about old age or by challenging automatic thinking (Wolff *et al.*, 2014). Consistently, other interventions geared towards improving attitudes towards aging have resulted in improved walking activity (Sarkisian *et al.*, 2007), walking speed, and swing time (Hausdorff *et al.*, 1999). These results combined with the present study point to attitudes towards aging as a potentially important venue for intervention among older adults.

Conflict of interest

None.

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