Purpose in Life and Risk of Falls: A Meta-Analysis of Cross-Sectional and Prospective Associations

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Abstract

Background and Aim: Purpose in life is an aspect of well-being that is associated with better health outcomes in older adulthood. We examine the association between purpose in life and likelihood of a recent fall and risk of an incident fall over time. **Methods:** Purpose in life and falls were reported concurrently and falls were reported again up to 16 years later in four established longitudinal studies of older adults (total $N = 25,418$). **Results:** A random-effects meta-analysis of the four samples indicated that purpose was associated with a 14% lower likelihood of having fallen recently at baseline (meta-analytic $OR = 0.88$, 95% CI [0.84–0.92]). Among participants who reported no falls at baseline ($N = 15,632$), purpose was associated with a nearly 10% lower risk of an incident fall over the up to 16-year follow-up (meta-analytic $HR = 0.92$, 95% CI [0.90–0.94]). These associations were independent of age, sex, race, ethnicity, and education, were not moderated by these factors, and persisted controlling for physical activity and disease burden. **Conclusion and Recommendations:** Purpose in life is a meaningful aspect of well-being that may be useful to identify individuals at risk for falling, particularly among individuals without traditional risk factors, and be a target of intervention to reduce fall risk.

Introduction

Falls are a significant public health concern because they can cause significant injuries, increase risk of disability, reduce quality of life, and increase healthcare costs (Florence et al., 2018; Hartholt et al., 2011). In older adulthood, falls are common: It is estimated that about 28% of older adults fall every year (Moreland et al., 2020). Many of these falls are serious. Common injuries include fractures, head injuries, and broken hips (Choi et al., 2019; Nilsson et al., 2016). As a result, individuals who have fallen are at greater risk of poor outcomes, ranging from reduced mobility to mortality (James et al., 2020; Montero-Odasso et al., 2023).

Risk of falls is determined by multiple factors, including demographic (e.g., age), clinical (e.g., disease burden), and behavioral (e.g., physical inactivity) (Dipietro et al., 2019; Gill et al., 2005). There is a growing literature on aspects of psychological function and risk of falls. Five-factor model personality traits, for example, have been associated with fall risk: Individuals who score higher in neuroticism (the tendency to experience negative emotions and sensitivity to stress) or lower in conscientiousness (the tendency to be organized, disciplined, and responsible) are at greater risk of incident falls up to 11 years later (Canada et al., 2020). Subjective aging has likewise been associated with falls: Individuals who feel younger than their chronological age are less likely to have an incident fall over time (Fundenberger et al., 2022). In contrast, a recent meta-analysis found that depression was unrelated to fall risk (Gambaro et al., 2022). Such factors provide additional information beyond traditional risk factors to identify

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who is at risk of falling and expand the biopsychosocial understanding of falls.

Purpose in life is an aspect of psychological function that may be protective against fall risk. Purpose is defined as the feeling that one's life is goal-oriented and has direction (Ryff, 1995). It is one component of psychological well-being that has been associated consistently with better health outcomes, particularly in older adulthood (Kim et al., 2022). Individuals higher in purpose, for example, are less likely to have a stroke (Kim et al., 2013), develop cardiovascular disease (Cohen et al., 2016), or dementia (Sutin, Luchetti, Aschwanden et al., 2023) and, ultimately, tend to live longer than individuals lower in purpose (Cohen et al., 2016). These better outcomes may be due, in part, to the healthier behavioral patterns associated with purpose, especially physical activity. Purpose is associated with greater engagement in physical activity, an association found when physical activity is self-reported (Sutin, Luchetti, Stephan, and Terracciano et al., 2022) or measured through accelerometer (Hooker & Masters, 2016; Sutin, Stephan, Kekäläinen, Luchetti et al., 2023). Since exercise can prevent falls (Sherrington et al., 2017), purpose may be associated with fewer falls because of the regular engagement in physical activity associated with it. Likewise, the lower disease burden associated with higher purpose (Musich et al., 2018) may also decrease the risk of falls, since chronic disease increases fall risk (Jia et al., 2019).

The present study examined the association between purpose in life and fall risk in four longitudinal samples of older adults. We address the concurrent association between purpose and recent falls and whether purpose is associated with fall risk over time. We test these associations in four samples to evaluate replicability. Further, given that purpose is associated with less disease burden (Musich et al., 2018) and more physical activity (Hooker & Masters, 2016; Sutin, Luchetti, Stephan et al., 2022), which are associated with lower fall risk (Dipietro et al., 2019; Jia et al., 2019), we also examine whether these factors account for the association between purpose and falls. Finally, although purpose tends to be broadly protective against poor outcomes across sociodemographic groups (Shiba et al., 2022; Sutin et al., 2021), we evaluate generalizability within each sample by testing whether the association is moderated by age, sex, race, ethnicity, or education.

Hypotheses

When measured concurrently, we expect higher purpose to be associated with lower likelihood of having fallen recently. We expect that purpose will be a prospective predictor of fall risk such that among participants who had not fallen at baseline, those with higher purpose in life will be less likely to have an incident fall over the follow-up. We further expect disease burden and physical activity to account for some of the association between purpose and risk of falls. Finally, we expect the

associations will be similar across sociodemographic groups.

Method

Participants and Procedure

Participants were from four large-scale longitudinal studies of aging: The Health and Retirement Study (HRS) (Sonnega et al., 2014), the National Health and Aging Trends Study (NHATS) (Freedman & Kasper, 2019),the English Longitudinal Study of Ageing (ELSA) (Steptoe et al., 2012), and The Irish LongituDinal Study of Aging (TILDA) (Donoghue et al., 2018). Detailed information about the methodology of each sample can be found in the above reference for each study. HRS (https://hrs.isr.umich.edu/), ELSA (https://www.elsa-project.ac.uk/), and TILDA (https://tilda.tcd.ie/) are longitudinal studies of aging of individuals over the age of 50 and their spouses (regardless of age) in the United States, England, and Ireland, respectively. The NHATS (https://www.nhatsdata.org/) is a longitudinal study of Medicare beneficiaries aged 65 years and older in the United States. In the HRS, purpose in life was first assessed on a random half of the sample in 2006; the other half completed the measure in 2008. These two assessments were combined as baseline. In NHATS, ELSA, and TILDA, purpose was measured at the baseline assessment in 2011, 2002, and 2009 to 2010, respectively. Falls were assessed in each study at baseline and at every annual (NHATS) or biannual (HRS, ELSA, TILDA) assessment through the most recent wave of available data (2020 in HRS, 2021 in NHATS, 2020 in ELSA, and 2016 in TILDA). In HRS, only participants aged 65 and older were asked about falls; all participants were asked about falls in NHATS (all participants were aged 65 and older in this study). In ELSA, only participants aged 60 and older were asked about falls; all participants were asked about falls in TILDA regardless of age. To be consistent with ELSA, participants aged 60 years and older were selected for analysis in TILDA. All participants with relevant data were included in the analysis. The only exclusions were participants without follow-up data on falls for the longitudinal analysis (see next paragraph for attrition) and participants less than 60 years old in TILDA. Participants were, on average 74.47 ($SD = 7.06$) years old and 57.3% female in HRS, 77.00 ($SD = 7.59$) years old and 58% female in NHATS, 71.03 ($SD = 7.67$) years old and 54.2% female in ELSA, and 69.29 ($SD = 6.43$) years old and 53.2% female in TILDA.

There was attrition for the longitudinal sample in each study. In HRS, of participants at baseline who had not fallen ($N = 5,876$), those without follow-up data ($n = 440$) were older ($d = 0.51$, $p < .001$), had fewer years of education ($d = 0.21$, $p < .001$), lower purpose ($d = 0.39$, $p < .001$), were less physically active ($d = 0.48$, $p < .001$), and had more chronic conditions ($d = 0.32$, $p < .001$);

there were no differences in sex, race, or ethnicity. In NHATS, of participants at baseline who had not fallen ($N=4,818$), those without follow-up data ($n=968$) were more likely to be Black ($\chi^2=5.62$, $p=.020$), had less education ($d=0.18$, $p<.001$), lower purpose ($d=0.09$, $p=.006$), and were less physically active ($\chi^2=8.34$, $p=.004$); there were no differences in age, sex, otherwise identified race, ethnicity, or disease burden. In ELSA, of participants at baseline who had not fallen ($N=4,209$), those without follow-up data ($n=690$) were older ($d=0.34$, $p<.001$), more likely to be male ($\chi^2=5.53$, $p=.020$), had fewer years of education ($d=0.25$, $p<.001$), lower purpose ($d=0.14$, $p<.001$), and less physically active ($d=0.29$, $p<.001$); there were no differences in race or disease burden. In TILDA, of participants at baseline who had not fallen ($N=3,159$), those without follow-up data ($n=332$) were older ($d=0.25$, $p<.001$), had fewer years of education ($d=0.30$, $p<.001$), lower purpose ($d=0.19$, $p<.001$), and less physically active ($d=0.17$, $p=.004$); there were no differences in sex or disease burden.

Measures

Purpose in Life. In HRS, purpose was measured with a seven-item (e.g., "I have a sense of direction and purpose in my life") version of the Purpose in Life subscale from the Ryff Scales of Psychological Well-Being (Ryff, 1989). Items were rated on a scale from 1 (*strongly disagree*) to 6 (*strongly agree*), reverse-scored when necessary, and the mean taken across items (alpha = .74). In NHATS, purpose was measured with the item, "My life has meaning and purpose" rated from 1 (*agree a lot*) to 3 (*agree not at all*). In ELSA and TILDA, purpose was measured with the item, "I feel that my life has meaning" rated from 1 (*often*) to 4 (*never*). The measure of purpose was reverse scored in the direction of higher purpose in each sample (i.e., higher scores indicated more purpose).

Falls. At every biannual assessment in HRS, participants were asked, "Have you fallen down in the last two year?" At every annual assessment in NHATS, participants were asked, "In the last 12 month have you fallen down?" At every biannual assessment in ELSA, participants were asked, "Have you fallen down in the last two year (for any reason)?" In TILDA, participants were asked, "Have you fallen in the last year?" at the baseline assessment and "Have you fallen since the last interview?" at each biannual assessment. Participants responded yes (=1) or no (=0) to the item in each sample.

Sociodemographic Covariates. In each sample, self-reported age in years, sex (0 = male, 1 = female), race [where available], ethnicity [where available], and education were included as covariates. Race in HRS and NHATS was coded into two dummy variables for Black (=1) and otherwise identified (=1) both compared to White (=0). Race in ELSA compared race other than white (=1) to white (=0); ELSA does not release more specific information about race/ethnicity. TILDA is white. Hispanic/Latino ethnicity (yes=1/no=0) was available in HRS and NHATS. Education was reported in years in HRS, on a scale from 1 (*no schooling*) to 9 (*graduate degree*) in NHATS, from 1 (*no qualification*) to 7 (*nvq4/nvq5/degree or equivalent*) in ELSA, and from 1 (*no schooling completed*) to 9 (*master's, professional, or doctoral degree*) in TILDA.

Disease Burden and Physical Activity. Disease burden was the sum of seven chronic diseases in each study: hypertension, diabetes, cancer, lung disease, heart disease, stroke, and arthritis. In HRS and ELSA, physical activity was measured with two items on the frequency of engagement in moderate and vigorous physical activity; the mean was taken across the two items in the direction of greater physical activity. In NHATS, physical activity was measured with an item on engagement in any vigorous physical activity in the last month (yes=1/no=0). In TILDA, participants reported on their physical activity with the International Physical Activity Questionnaire (Craig et al., 2003).

Analytic Approach

Before analyses, all variables were harmonized across samples to facilitate comparisons. Specifically, dichotomous predictors were scored in the same way in each sample (see covariate section above), and continuous variables were standardized within sample such that a one-unit difference corresponded to one standard deviation in the variable.

The cross-sectional association between purpose in life and falls at baseline was tested with logistic regression in each sample. Model 1 controlled for sociodemographic factors (age, sex, race, ethnicity, education). Model 2 further controlled for physical activity and disease burden. Moderation by sociodemographic factors was tested with an interaction between purpose and each sociodemographic factor. For each analysis, results for purpose in life were synthesized across the four studies with a random effects meta-analysis using Comprehensive Meta-Analysis. Heterogeneity of the effect across studies was evaluated with the Q test and I^2.

Cox regression was used to test the association between purpose in life and risk of incident falls. Participants were selected into the longitudinal sample if they reported no falls at baseline and had at least one follow-up assessment. Time in years was coded from baseline to the first instance of a reported fall. Participants who did not fall over the follow-up were censored at their last available assessment. The analysis followed

Table 1. Descriptive Statistics for Variables in the Four Studies.

	Study			
Variable	HRS	NHATS	ELSA	TILDA
Age (in years)	74.47 (7.06)	77.00 (7.59)	71.03 (7.67)	69.29 (6.43)
Sex (female)	57.3% (5,215)	58% (3,597)	54.2% (3,306)	53.2% (2,133)
Race (Black)	11.9% (1,082)	21.8% (1,355)	–	–
Race (Otherwise identified)	2.8% (258)	8.4% (520)	0.8% (46)	–
Ethnicity (Hispanic/Latinx)	7.0% (638)	5.7% (356)	–	–
Education	12.28 (3.16)	5.11 (2.21)	2.80 (2.14)	3.47 (1.58)
Purpose in life	4.51 (0.94)	2.82 (0.43)	3.56 (0.74)	3.74 (0.59)
Disease burden	2.29 (1.30)	2.12 (1.30)	1.35 (1.12)	1.13 (0.99)
Physical activity	2.38 (1.03)	37.1% (2,303)	2.37 (0.97)	1.44 (1.83)
Baseline fall (yes)	35.4% (3,221)	22.4% (1,387)	31.0% (1893)	21.2% (851)
Incident fall (yes)[a]	65.5% (3,562)	54.9% (2,112)	60.4% (2,126)	38.1% (1,078)
Follow-up time	5.98 (3.85)	3.62 (2.91)	6.25 (4.51)	4.02 (1.81)
N baseline/longitudinal	9,097/5,436	6,205/3,850	6,102/3,519	4,011/2,827

Note. Values are means (standard deviations) or percentages (sample size). HRS = Health and Retirement Study; NHATS = National Health and Aging Trends Study; ELSA = English Longitudinal Study of Ageing; TILDA = The Irish LongituDinal Study of Aging.
[a]The percentage of incident falls is calculated from the total sample with longitudinal data.

the same strategy as how the baseline association was tested: Model 1 controlled for sociodemographic factors, Model 2 further controlled for physical activity and disease burden, and moderation was tested by an interaction with each sociodemographic factor. Also similar to the baseline analysis, results for purpose in life were synthesized across the four studies with a random effects meta-analysis and heterogeneity of the effect was evaluated with the Q test and I^2.

Results

Descriptive statistics for each sample are in Table 1. At baseline, 21% to 35% of participants across samples (total $N = 25,418$) reported having fallen recently. Across all four samples, purpose in life was associated with lower likelihood of having fallen (Figure 1A; Supplemental Table S1, Model 1). The pooled estimate indicated that for every standard deviation increase in purpose, there was a 14% reduced likelihood of having had a recent fall. There was modest heterogeneity of the effect across samples ($Q = 7.14$, $p = .070$; $I^2 = 58.0$). Physical activity and disease burden accounted for approximately 25% of the association ($[(HR_{model1} - HR_{model2})/(HR_{model1} - 1)] \times 100$) between purpose and falls (Figure 1B; Supplemental Table S1, Model 2), which, however, remained significant in all samples (except NHATS) and in the meta-analysis. There was no heterogeneity of the effect across samples ($Q = 2.45$, $p = .485$; $I^2 = 0$). The association between purpose and lower risk of a recent fall was not moderated by age, sex, race, ethnicity, or education; no interaction was significant in the individual samples or when meta-analyzed (Supplemental Table S2).
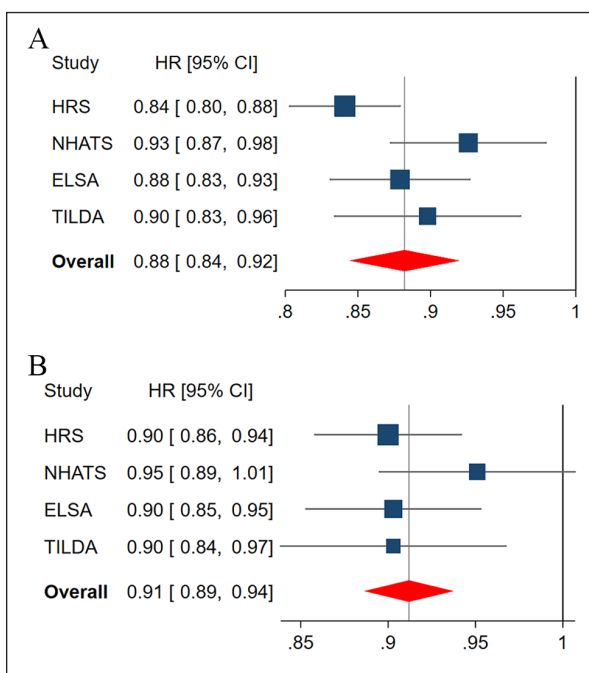

Figure 1. Odds ratios (OR) and 95% confidence intervals for the baseline association between purpose in life and risk of falls in each sample and the meta-analysis controlling for sociodemographic factors (A) and physical activity and disease burden (B).

Among participants without reported falls at baseline ($N = 15,632$), 38% to 65% reported a fall over the 6 to 16 years of follow-up across the four samples. Again, purpose was protective: For every standard deviation increase in purpose, there was an almost 10% reduced risk of an incident fall over the follow-up, controlling
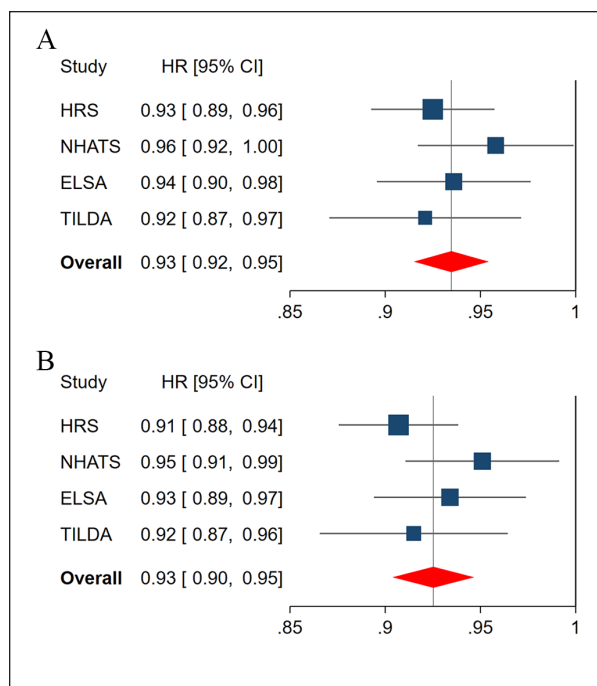
Figure 2. Hazard ratios (HR) and 95% confidence intervals for the longitudinal association between purpose in life and risk of incident falls in each sample and the meta-analysis controlling for sociodemographic factors (A) and physical activity and disease burden (B).

for sociodemographic factors (Figure 2A; Supplemental Table S3, Model 1). There was no heterogeneity of the effect across samples ($Q=3.30$, $p=.348$; $I^2=9.05$). Physical activity and disease burden accounted for approximately 12% of the association between purpose and falls (Figure 2B; Supplemental Table S3, Model 2). Purpose remained a significant independent predictor in all samples and the meta-analysis. Again, there was no heterogeneity of the effect across samples ($Q=1.94$ $p=.585$; $I^2=0$). This association was not moderated by age, sex, race, ethnicity, or education; no interaction was significant in the individual samples or when meta-analyzed, except an age interaction in HRS, which did not replicate in the other samples, and the meta-analysis of age interaction terms was not significant (Supplemental Table S4).

Discussion

The present research indicated that higher purpose in life was associated with lower risk of falls when measured at the same time and lower risk of a new fall over the up to 16-year follow-up period across the four studies. This association was independent of disease burden and physical activity. This association was replicable and generalizable: It replicated across time frame (concurrent and prospective), in four samples from three countries, and was similar across age, sex, race, ethnicity, and education. Purpose in life is thus a

robust psychological factor associated with lower risk of falling.

Purpose in life is an aspect of eudaimonic well-being that reflects the feeling that one's life is goal-oriented and has direction (Ryff, 1995). Such tendencies are associated with better health outcomes in older adulthood (Kim et al., 2022). This literature has focused primarily on the development of significant diseases (e.g., dementia; Sutin, Luchetti, et al., 2023) and mortality (Cohen et al., 2016). Less work has addressed intermediate risk factors that may be in the pathway between purpose and morbidity and mortality. Falls are a common occurrence in older adulthood that increase risk of poor outcomes (James et al., 2020; Moreland et al., 2020). The present research indicates that purpose may be a protective factor associated with lower risk of falls. Fewer falls may be one reason that individuals with more purpose are at lower risk of poor health in older adulthood. Purpose may also help to maintain a higher quality of life through its association with less fear of falling, which can inhibit mobility and social integration (MacKay et al., 2021).

Somewhat surprisingly, physical activity and disease burden accounted for only a modest amount of the association with fall risk, especially incident falls. Individuals who engage in more physical activity and those with fewer chronic diseases tend to be at lower risk of falls (Dipietro et al., 2019; Jia et al., 2019). Individuals with higher purpose also tend to engage in more physical activity (Hooker & Masters, 2016; Sutin, Luchetti, Stephan, et al., 2022) and tend to have fewer chronic diseases (Kim et al., 2022; Musich et al., 2018). As such, we had expected these risk factors to be mechanisms in the pathway between purpose and risk of falls. Yet, physical activity and disease burden accounted for a small portion of the association, and in nearly all cases, purpose was predictive of falls even after accounting for these factors.

There are likely other mechanisms that account for why purpose is associated with lower risk of falls. Individuals with higher purpose, for example, tend to maintain healthy walking speed and strength over time (Kim et al., 2017), which may help to prevent falls. In addition, individuals higher in purpose tend to be more socially integrated (A. R. Sutin, Luchetti, Aschwanden, Lee et al., 2022) and there is some evidence that greater social integration is associated with lower risk of falls (Petersen et al., 2020). Hearing and visual impairments are likewise associated with both lower purpose in life (A. R. Sutin, Luchetti, Aschwanden, Stephan et al., 2022; Xiang et al., 2020) and greater risk of falls (Ehrlich et al., 2019; Jiam et al., 2016), which could be another pathway through which purpose is associated with fall risk. Finally, sleep could be an additional mechanism: Individuals higher in purpose are less likely to develop sleep disturbances over time (Kim et al., 2020), which increase risk of falls (Stone et al., 2014). There are thus likely to be multiple

mechanisms through which purpose reduces risk of falls, particularly over time, and each individual factor may only account for a modest amount of the association.

There was little evidence that the association between purpose and falls was moderated by sociodemographic factors. That is, out of 38 interactions tested, only one was statistically significant in one sample, and it did not replicate in the other three samples and was not significant when synthesized in the meta-analysis. These results indicate that the association between purpose and both concurrent fall risk and incident fall risk over time is similar across age, sex, race, ethnicity, and education, which supports the generalizability of the associations.

This research had several strengths, particularly replication across four independent longitudinal samples. There are also limitations to consider. First, there was not more specific information about falls in any of the studies, so it was not possible to examine whether purpose is more or less predictive of specific types of falls or how injurious was the fall. Likewise, we did not have information on neurological conditions (e.g., Parkinson's disease) or medication use that are also significant risk factors for falls. Second, the purpose and falls measures were not identical in each study, and length of follow-up also varied across the studies; these differences increase heterogeneity in the results, but also provide evidence that the associations are robust across measures and study length. Third, we did not consider the bidirectional association between purpose and falls. That is, experiencing a fall may be associated with decreases in feelingly purposeful. Such bidirectional effects were beyond the scope of present work because the focus was on purpose and risk of falls, particularly incident falls over time. Future research could address the reverse association. Finally, the four samples came from high-income counties, and some samples lacked racial and ethnic diversity. Although the present findings suggest that there are no differences in the association across sociodemographic groups, more research is needed with more diverse samples.

Conclusion

The present research suggests replicable and generalizable associations between purpose in life and risk of falls: Individuals with a higher sense of purpose were less likely to have fallen recently and were less likely to experience an incident fall over the follow-up, even accounting for disease burden and physical activity. Purpose in life may thus be a promising factor to target to help reduce fall risk among older adults.

Recommendations and Implications

This research may have practical implications. Purpose in life may be a promising target of intervention to reduce risk of falls. There are at least two ways that purpose may help to decrease falls. First, it may be helpful to identify people who are at risk, especially people who may not have clinical or behavioral profiles that suggest that they are at risk. Second, purpose itself may be a novel target of intervention to decrease risk of falls. That is, there is evidence that purpose can be increased through intervention (Park et al., 2019). Intervention strategies that help to increase feelings of purpose could be integrated into fall reduction programs as an additional novel component to help reduce risk.

Human Subjects

The research reported in this manuscript relied on de-identified, publicly available datasets and thus did not require IRB approval.

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Supplemental Material

Supplemental material for this article is available online.

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