


Screening Gait Performance, Falls, and Physical Activity among Benedictine and Trappist Monks

Journal of Primary Care & Community Health
Volume 12: 1–7
© The Author(s) 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2150132721990187
journals.sagepub.com/home/jpc


Dennis W. Klima¹  and Adam Davey²

Abstract

Background and Objective: Physical performance in older men has been reported in analyses with veterans and in disease-based cohort research. Studies examining gait performance among older monks, however, are narrow. The purpose of this study was to analyze the impact of a recent fall on gait ability in a cohort of Benedictine and Trappist monks in 4 US monastic communities. The second aim was to analyze physical activity and a recent fall as predictive markers of 2 constructs of gait performance. **Methods:** In this cross-sectional study, 53 Benedictine and Trappist monks over 60 ($x = 74.7 \pm 7.6$; range: 61–94 years) completed a basic sociodemographic and fall history profile, the Timed Up and Go (TUG) Test, Dynamic Gait Index (DGI) and the Physical Activity Scale for the Elderly (PASE). **Results:** Demographic profiles revealed that 10% of participants had fallen over the past 3 months; in addition, those who had fallen were more likely to limit activities because of fear of falling ($P = .005$). Monks who had fallen over the past 3 months demonstrated significantly poorer TUG (12.6 ± 2.1 vs 10.5 ± 1.8 ; $P = .01$) and DGI (17.2 ± 5.3 vs 22.3 ± 2.3 ; $P < .001$) scores. There was a significant association between physical activity and both the TUG (-0.55 ; $P < .001$) and DGI ($.64$; $P < .001$). Multiple regression models demonstrated that physical activity and a fall in the past 3 months predicted 24% of the variance in the TUG ($P < .001$) and 46% of the variance in the DGI ($P < .001$). **Conclusions:** Gait performance is linked to a recent fall episode among older monks. Predictive determinants of functional mobility (TUG) and superimposing tasks on the gait cycle (DGI) include recent fall history and physical activity. Appropriate health promotion activities can be aligned with these lifestyle attributes in monastic communities.

Keywords

fall, physical activity, gait

Dates received: 20 November 2020; revised: 28 December 2020; accepted: 29 December 2020.

Introduction

Sociodemographic and physical health factors impact functional independence and longevity in older adults.^{1,2} Studies pertaining to physical performance in older men have traditionally taken 1 of 3 approaches: (1) performance clustering by 10-year age cohorts, (2) investigations with large population condition-based samples such as men with osteoporosis, and (3) studies with focused men's groups such as the veteran population.^{2–5} Analyses have targeted multiple constructs of physical performance including balance, gait, and activities of daily living.^{4,5} These studies have portrayed the challenges encountered by older men in health promotion.

Falls and fall-related injuries are associated with higher health care costs, decreased quality of life, and disability.^{6,7} Older men are more likely to die from a fall.^{8,9} Men have unique medical and social conditions which may affect

physical health and falls. For example, falls in men have been linked to lower bioavailable testosterone, physical activity, androgen deficiency, and depression.^{3,4,10,11} Those who are frail have a greater incidence of recurrent falls, fracture, and disability.¹² Population-based studies have generally examined single or recurrent fall episodes incurred over the past year; the influence of fall history over the past 3 months, however, has been less identified and reflects a literature gap.^{3,9}

¹University of Maryland Eastern Shore, Princess Anne, MD, USA

²University of Delaware, Newark, DE, USA

Corresponding Author:

Dennis W. Klima, Department of Physical Therapy, University of Maryland Eastern Shore, Hazel Hall, Princess Anne, MD 21853, USA.
Email: dwklima@umes.edu



Physical activity is linked to both falls and gait performance in older men and is a cornerstone of the frailty phenotype.^{10,13} Jeffers reported that men who were recurrent fallers spent more time in sedentary behavior.¹⁰ Similarly, household physical activity declined following an injurious fall among male veterans.¹⁴ Moderate-intensity physical activity is positively associated with both gait speed and single leg stance performance in older men.¹⁵

Our unique approach in this exploratory study was to examine locomotion, physical activity, and recent falls in a special population of older men, Benedictine and Trappist monks. The analysis was a component of a larger liturgical initiative to analyze physical performance in Catholic clergy.¹⁶ Prior studies with clergy and nuns have afforded insight into dementia conditions, physical decline with aging, and resiliency.¹⁷⁻¹⁹ For example, Shah et al¹⁸ demonstrated that Catholic clergy and nuns with a systolic blood pressure of 160mmHg or more demonstrated a greater decline in lower extremity function. Wells et al¹⁹ noted a positive correlation between resiliency and maximum gait speed among older nuns.

Roman Catholic monks lead a unique vocation dedicated to their respective orders. Decreased mortality has been associated with some contemplative Benedictine and Trappist orders because of the simplistic lifestyle.²⁰ Prayer services are attended several times daily, and communal work activity can be dedicated to a specific service activity. Examples include vegetable gardening, woodworking, and herb-based liquor production. Missions abroad are associated with some orders, whereas others are linked to academic instruction and community work. Requisite gait function and physical activity are essential to perform daily duties.²⁰ Focused physical performance and locomotion studies in monks exclusively are rare.

The objectives of the study were to explore the interaction between recent fall history, physical activity, and gait in a physical performance screen. Specifically, the first aim was to determine the effect of a recent fall on gait performance in a cohort of Benedictine and Trappist monks. The second objective was to examine physical activity and a recent fall as predictive determinants of 2 constructs of gait. We hypothesized resultant differences between faller and non-faller gait ability, and that a recent fall and physical activity would be predictive determinants of gait performance.

Methods

A descriptive cross-sectional design was used to examine physical performance in a convenience sample of Benedictine and Trappist monks 60 years of age and older. The study was approved by the Institutional Review Board and monastery senior officials. All participants signed the informed consent.

Testing occurred at 4 monastic communities in the United States. Inclusion criteria mandated independent ambulation with or without an assistive device and independent sit to stand performance over 5 trials. The protocol criteria excluded clergy with cognitive impairment and chronic neuromusculoskeletal or cardiopulmonary pathologies that would preclude test performance, including Parkinson's disease, multiple sclerosis, end-stage chronic obstructive pulmonary disease or organ failure, and terminal cancer. The Six Item Cognitive Screener was utilized to determine orientation, memory, and cognitive readiness for fall and medical history questions.²¹

Participants completed an initial eligibility screen requiring at least 20/40 vision with lens correction, intact protective foot somatosensation, and no prohibitive vestibulo-ocular dizziness.²²⁻²⁴ The testing session for each participant lasted approximately 55 minutes. Blood pressure and body mass index (BMI) were obtained. Participants responded to a demographic survey regarding their medical and fall histories, including fear avoidance and polypharmacy questions. A fall was operationalized to represent an unintentional contact with the ground with subsequent medical follow up.²⁵ Physical activity was assessed with the Physical Activity Scale for the Elderly (PASE). The PASE demonstrates appropriate reliability and validity for measuring 3 areas of physical activity in older adults: leisure, household and work-related tasks.^{26,27} Concurrent validity with activity monitoring has been established, along with test-retest reliability.^{27,28} Comprised primarily of ordinal-based questions, the instrument was congruent with those daily functions performed by monks on a weekly basis. Hours of activities spent in the activities translates to a final calculated index, with higher scores indicating greater activity.

Gait dependent variables included 2 tests of gait performance, the Timed Up and Go (TUG) test, and Dynamic Gait Index (DGI). During the TUG procedure, participants stood from a uniform armchair following the go command, walked a 3-m course at their usual velocity, and returned to the seated position.²⁹ The test demonstrates validity and reliability metrics in the older adult population, including an association with executive function.³⁰⁻³² In contrast, the DGI requires modification of the gait cycle through 8 task demands that include velocity changes, stepping over obstacles, and stairs negotiation.³³ Twenty-four points are possible. The instrument demonstrates appropriate reliability and concurrent and predictive validity; Shumway-Cook and colleagues determined that older adults with scores below 19 were at elevated risk for falls.^{33,34}

Descriptive statistics (mean and standard deviations) were obtained for participants' sociodemographic and physical performance characteristics. The Shapiro-Wilk test evaluated normality of variable distributions. Bivariate analyses

included exploratory parametric independent *T* tests (normally distributed variables), nonparametric Mann–Whitney *U* tests, and Fisher’s Exact test to assess demographic recent fall history differences. Two directed ANOVA analyses examined the effect of recent fall history on TUG and DGI performance with adjusted covariate controls (ANCOVA).

Pearson product moment and nonparametric Spearman rho correlations were utilized to investigate the association between physical activity, gait tests, and continuous demographic variables. Two nested multiple regression models were constructed for each gait measure, with physical activity and recent fall history treated as independent variables.

Data were analyzed with SPSS version 26 (SPSS Inc, Chicago, IL) using $\alpha=0.05$, with a sharpened level ($\alpha=0.025$) for the 2 gait ANCOVA comparisons for recent fall risk. An a priori power analysis (.80 power level) was used to determine sample size for entry of 2 independent predictors into the regression models. Preliminary relative intra-rater reliability was established for both gait measures (>0.90), including individual DGI item kappa ordinal reliability ($>.94$).³⁵

Results

Sixty-six monks were initially screened, and 53 (43 Benedictine and 10 Trappist) participants met the inclusion criteria. Reasons for exclusion included severe dizziness (1), mobility dependence (5), end stage cardiopulmonary disease (3), impaired cognition (1), blindness (2), and terminal cancer (1). Testing sites included monastic communities in Minnesota, Pennsylvania, North Carolina, and South Carolina. Comorbid medical conditions and anthropometric measures are listed in Table 1. Most monks participated in regular physical activity, although fewer participated in a structured exercise program. Participants were generally well educated with college degree attainment. Ten percent reported falling in the preceding 3 months. Monks who had fallen over the past 3 months were more likely to limit their activities because of fear of falling ($\chi^2(1)=11.85; P=.005$).

Fallers performed significantly poorer on gait assessments. ANCOVA comparisons between fallers and non-fallers noted slower TUG (12.6 ± 2.1 vs 10.5 ± 1.8 ; $P=.01$) and lower DGI (17.2 ± 5.3 vs 22.3 ± 2.3 ; $P<.001$) scores. Statistical significance was retained with the more stringent significance adjustment and potential age and BMI confounders. Spearman Rho correlations between physical activity and both the TUG ($\rho=-0.55; P<.001$) and DGI ($\rho=0.64; P<.001$) were robust. As expected, the PASE also correlated ($\rho=-.50; P<.001$) with age. Linear regression models indicated that physical activity and a fall in the past 3 months predicted 24% of the variance in TUG (Table 2) performance ($P<.001$), and 46% ($P<.001$) of the DGI (Table 3). Model multicollinearity

Table 1. Participant Profile.

Demographic and performance profile (n = 53)	M (SD) [95%CI]
Age (years)	74.7 (7.6) [72.8-77.0]
Six item screener (6 pts max)	5.5 (.9) [5.2-5.7]
BMI (kg/m ²)	28.7 (4.8) [27.2-29.9]
Systolic blood pressure	128.2 (12.4) [124.7-131.8]
Diastolic blood pressure	76.1 (8.9) [73.7-78.6]
Number of medications	4.2 (3.5) [3.2-5.2]
Describe general health and activity (# Yes, %)	
Excellent	6 (11.3)
Good	38 (71.7)
Fair	9 (17.0)
Performs regular activity?	36 (67.9)
Participate in structured exercise activity?	14 (26.4)
Medical conditions (# Yes, %)	
Heart disease	18 (34.0)
Diabetes	7 (13.2)
Depression	5 (9.4)
Prostate problems	23 (43.4)
GI problems	10 (18.9)
Cancer	9 (17.0)
Total joint replacement	6 (11.3)
Fall-related variables (#, %)	
Fall in past 3 months?	6 (11.3)
Fear of falling limit activities?	9 (17.0)
Take 4 or more medications?	26 (49.1)
Gait and physical performance M (SD) [95%CI]	
Timed up and go test (s)	10.7 (1.9) [10.2-11.3]
Dynamic Gait Index (24 pts max)	21.7 (3.2) [20.8-22.6]
Physical activity scale for the elderly (#)	136.0 (90.3) [110.8-161.1]

Table 2. Predictive Determinants of the Timed Up and Go Test (n = 53).

Independent variables*	B	SE B	β	t	P
Fall in past 3 months	1.7	.74	.29	2.3	.025
PASE	-.008	.003	-.40	-3.2	.002

*Adjusted R² = .24.

Table 3. Predictive Determinants of the Dynamic Gait Index (n = 53).

Independent variables*	B	SE B	β	t	P
Fall in the past 3 months	-4.4	1.0	-.45	-4.3	<.001
PASE	.02	.004	.47	4.5	<.001

*Adjusted R² = .46.

was not detected with regression diagnostics; additionally, significance of the predictors was not attenuated in models with age or BMI.

Discussion

This is the first study to examine 2 widely used constructs of gait performance in a focused population of older men, Benedictine and Trappist monks. Monastic communities can be restricted to outsiders and studies among clergy, particularly monks, remain limited. Though a decreased mortality has been linked to the simplistic Benedictine and Trappist lifestyle, higher rates of self-reported disability have been described compared to the general population.³⁶ Machenbach et al³⁶ suggested that a judicious lifestyle might benefit mortality at the cost of morbidity. Other ministry studies have proposed that interventions targeting obesity and chronic diseases be a priority given high prevalence rates and occupational stress.^{37,38}

The intertwining of gait performance with fall history is complex. Slower gait velocity is predictive of adverse events in older adults, including hospitalization and falls³⁹ Conversely, older men with recurrent falls retrospectively have demonstrated poorer gait performance.^{40,41} Our findings support that monks with a recent fall demonstrate poorer locomotor ability on gait measures. Interestingly, fallers performed poorer and traversed traditional cutoff scores recognized for fall risk on both tests compared with non-faller performance.^{33,42,43}

Physical activity mirrors a level of routine functional performance in occupational, leisure, and household tasks and is germane throughout the monastic cloistered lifestyle. In the Osteoporotic Fractures in Men study, Janney et al⁴⁴ illustrated a longitudinal decline in physical activity among older men using the PASE tool over a 5-year trajectory, particularly those in the poorest health. Better physical and mental health plus living with others were associated factors with temporal improvement in physical activity. Previous work has noted the relationship between physical activity and gait, though the variable of interest was gait velocity. For example, Morie and colleagues demonstrated that older men more physically active demonstrated faster gait speed than less active peers.⁴⁵ The authors also noted a significant correlation between gait speed and physical activity ($r = .40$; $P < .05$), an association analogous to our observed correlation between physical activity and the TUG. This relationship further supports our hypothesized connection between the 2 domains, with increased physical activity positively linked to better gait performance.

The dilemma of falls and physical activity among older men warrants discussion. Jefferis et al¹⁰ reported a lower activity level among older men with recurrent falls, including fewer steps per day and less minutes in mild, moderate, and vigorous activity. While studies endorse fall risk among older men in poorer health, converse data suggest that falls also can occur in the very active sector of older males with preserved leg strength^{12,46,47} Contributing factors hypothesized include riskier behavior, an over-inflated sense of

capability, and a mismatch between actual and perceived gait ability.^{46,48,49} Kelsey et al⁵⁰ cited a distinct difference between indoors and outdoors fallers; determinants of outdoors fall included male gender and a higher activity level. While we did not see a significant difference in physical activity between recent fallers and nonfallers, this could be attributed to the blend of activity intensities, both high and low, among the monks.

Inquiring about recent fall history over the past 3 months underscores the need for immediate interventions. Grundstrom et al⁵¹ indicated that risk factors for a recent fall in their gender-mixed study included male gender, poorer health, age, and BMI. It should be noted that older adults may fail to recall fall episodes or underreport recurrent falls over longer durations.⁵² Among the monks, those who had fallen over the past 3 months were more likely to limit activities because of fear of falling. A recent fall should thus be regarded as a serious event linked to gait deficits which can, in turn, potentiate a downward functional cascade, including fear of falling and decreased physical activity.^{10,53} Though limited by our cross-sectional design, it is plausible that older men who have recently fallen reduce both speed and degrees of freedom in locomotion with fear avoidance.⁵⁴ Bass et al⁵⁵ suggested that older men should be screened for falls more thoroughly. Furthermore, 1 in 3 male veterans who sustains a hip fracture dies within 12 months.

There are 2 large previous initiatives involving Catholic clergy: the Nun's Study and the Religious Orders Study.^{17,56} Gait variable studies included velocity and extrapyramidal bradykinesia and rigidity symptoms.⁵⁷ Wilson and colleagues noted that gait disorders with Parkinsonian symptoms were strongly associated with mortality among Roman Catholic clergy.⁵⁸ Our findings compliment these 2 existing investigations by providing data more specific to gait performance beyond velocity, though 2 major differences prevail. Our approach was to analyze physical performance through a focused gait assessment, with less emphasis on dementia constraints. Second, our design did not involve longitudinal follow-up and brain donation, key components of both the Nun Study and Religious Order's Study.

Gait performance is a key assessment in geriatric rehabilitation, and gait disorders are common and reflect locomotor degradation.⁵⁹ Of the 2 primary gait dependent variables, less data exist which reflects older men's performance on the Dynamic Gait Index. Unique in its construct, the DGI measures an individual's ability to overlay tasks on the basic gait cycle. Physical activity represented a larger percentage of the variance compared with the TUG, possibly to the more challenging activities associated with tests. Herman et al³⁴ noted men were less likely to use the rail in the final stairs task component.

Our findings have 3 major implications for health promotion and screening. First, performance values can be

used for future age-related comparisons when managing this religious sector in screens and primary care settings. While previous work has noted that Benedictine and Trappist monks have greater self-rated disability, including standing rise times, our mean values did not deviate meaningfully from performance values previously reported for the TUG or DGI.^{29,34,60} Second, our findings reiterate the importance of the link between physical activity and gait ability. Finally, as determinants of gait performance, fall risk and physical activity can be embedded within a directed plan of care. Primary care health professionals often perform interventions with clergy in religious communities, including rectories, convents, and liturgical retirement homes. Our findings offer evidence that effective assessment with salient outcomes measures can further extend to monastic communities. Older monks continue to stay active performing duties that include college tutoring, teaching, and other contributions to the order. Wellness activities that address fall history, screen gait performance, and evaluate physical activity can serve to enhance health promotion and quality of life.⁶¹

Screening findings can facilitate intervention activities. Religious domiciles are candidates for seminar-structured fall prevention programs like Stepping On and A Matter of Balance for clergy and nuns.^{62,63} These programs could be administered within the facility and embed exercise activities. Cognitive-behavioral strategies would also target enhancing balance confidence; given the large number of monks who disclosed fear of falling, this would particularly be beneficial. Some clergy might be candidates for a more individualized rehabilitation program in physical therapy to improve strength, balance, and reactive stepping strategies to reduce fall risk, improve falls efficacy, and enhance quality of life.⁶⁴

Given the focused nature of sample, our data cannot be generalized to all community-dwelling men. As well, the cross-sectional design of the study precludes causal data interpretation. Gait tests were selected based upon a wide variety of functional levels among participants; however, several monks scored a perfect score on the DGI. Future studies may elect to administer a higher-level test with more challenging tasks.⁶⁵ The study was powered to detect 2 key variables. A larger sample would yield insight into additional factors contributing to gait performance, including psychosocial variables. Our monk participants were limited to 4 communities in the United States. Cross-cultural analyses have yielded differences in physical performance comparing older male cohorts in Europe and Asia.⁴⁰

Conclusions

Benedictine and Trappist monks with a recent fall demonstrated poorer performance on the TUG and DGI assessments. Physical activity among these men is positively

associated with both gait tests. A recent fall and physical activity jointly were significant predictive determinants of the TUG and DGI. Descriptive outcomes on the gait measures are in line with performance values previously recorded. Findings serve as a catalyst for health promotion screening and intervention management in monastic communities.


Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The study was funded, in part, by an APTA Geriatrics Adopt-a-Doc Scholarship.

ORCID iD

Dennis W. Klima  <https://orcid.org/0000-0003-0083-5158>

References

1. Diem SJ, Harrison SL, Haney E, et al. Depressive symptoms and rates of bone loss at the hip in older men. *Osteoporosis Int.* 2013;24:111-119. doi:10.1007/s00198-012-1975-0
2. Pieczyńska A, Zasadzka E, Trzmiel T, Pawlaczyk M. Physical activity and fitness in white- and blue-collar retired men. *Am J Men's Health.* 2019;13:1557988319891360. doi:10.1177/1557988319891360
3. Stuart AL, Pasco JA, Jacka FN, Berk M, Williams L. Falls and depression in men: a population-based study. *Amer J Men's Health.* 2018;12:14-18. doi:10.1177/1557988315609111
4. Orwoll E, Lambert LC, Marshall LM, et al. Endogenous testosterone levels, physical performance, and fall risk in older men. *Arch Intern Med.* 2006;166:2124-2131. doi:10.1001/archinte.166.19.2124
5. VanSwearingen JM, Paschal KA, Bonino P, Chen TW. Assessing recurrent fall risk of community-dwelling, frail older veterans using specific tests of mobility and the physical performance test of function. *J Gerontol Biol Med Sci.* 1998;53:M457-M464.
6. Tinetti ME, Kumar C. The patient who falls: "It's always a trade-off". *JAMA.* 2010;303:258-266. doi:10.1001/jama.2009.2024
7. Florence CS, Berger G, Atherly A, Burns E, Stevens J, Drake C. Medical costs of fatal and non-fatal falls in older adults. *J Amer Geriatr Soc* 2018;66:693-698. doi:10.1111/jgs.15304
8. Ambrose AF, Paul G, Haussdorff JM. Risk factors for falls among older adults: a review of the literature. *Maturitas.* 2013;75:51-71. doi:10.1016/j.maturitas.2013.02.009
9. Bloch F, Jegou D, Dhainaut JF, et al. Can metabolic abnormalities after a fall predict short term mortality in elderly patients? *Eur J Epidemiol.* 2009;24:357-362. doi:10.1007/s10654-009-9342-y
10. Jefferis BJ, Iliffe S, Kendrick D, et al. How are falls and fear of falling associated with objectively measured physical

- activity in a cohort of community-dwelling older men? *BMC Geriatr*. 2014;14:114. doi:10.1186/1471-2318-14-114
11. Szulc P, Claustrat B, Marchand F, Delmas PD. Increased risk of falls and increased bone resorption in elderly men with partial androgen deficiency: the MINOS study. *J Clin Endocrinol Metab*. 2003;88:5240-5247. doi:10.1210/jc.2003-030200
 12. Marshall LM, Orwoll ES, Cummings R. A comparison of frailty indexes for the prediction of falls, disability, fractures, and mortality in older men. *J Am Geriatr Soc*. 2009;57:492-498. doi:10.1111/j.1532-415.2009.02137.x
 13. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol Med Sci*. 2001;56:M146-M156.
 14. Gill DP, Zou GY, Jones GR, Speechley M. Injurious falls are associated with lower household but higher recreational physical activities in community-dwelling older male veterans. *Gerontol*. 2008;54:106-115. doi:10.1159/000116113
 15. Izawa KP, Shibata A, Ishii K, Miyawaki R, Oka K. Associations of low-intensity light physical activity with physical performance in community-dwelling elderly Japanese: a cross-sectional study. *PLoS One*. 2017;12:e0178654. doi:10.1371/journal.pone.0178654
 16. Klima DW, Newton RA, Keshner EA, Davey A. Fear of falling and balance ability in older men: the priest study. *J Aging Phys Act*. 2013; 21(4):375-86. doi: 10.1123/japa.21.4.375
 17. Wilson RS, Bienias JL, Evans DA, Bennett DA. Religious orders study: overview and change in cognitive and motor speed. *Aging Neuropsych Cogn*. 2004;112:280-303. doi.org/10.1080/13825580490511125
 18. Shah RC, Wilson RS, Bienias JL, Arvanitakis Z, Evans DA, Bennett DA. Blood pressure and lower limb function in older persons. *J Gerontol: Med Sci*. 2006;61A:839-843.
 19. Wells M, Avers D, Brooks G. Resilience, physical performance measures, and self-perceived physical and mental health in older Catholic nuns. *J Geriatr Phys Ther*. 2012;35:126-131.
 20. de Gouw HW, Westendorp RG, Kunst AE, Mackenbach JP, Vandenbroucke JP. Decreased mortality among contemplative monks in The Netherlands. *Am J Epidemiol*. 1995;141:771-775. doi:10.1093/oxfordjournals.aje.a117500
 21. Callahan CM, Unverzagt FW, Hui SL, Perkins AJ, Hendrie HC. Six-item screener to identify cognitive impairment among potential subjects for clinical research. *Med Care*. 2002;40:771-781. doi:10.1097/00005650-200209000-00007
 22. Gupta N, Wolffsohn JS, Naroo SA. Comparison of near visual acuity and reading metrics in presbyopia correction. *J Cataract Refract Surg*. 2009;35:1401-1409. doi:10.1016/j.jcrs.2009.03.026
 23. Kles KA, Bril V. Diagnostic tools for diabetic sensorimotor polyneuropathy. *Curr Diabetes Rev*. 2006;2:353-361. doi:10.2174/157339906777950598
 24. Dannenbaum E, Paquet N, Hakim-Zadeh R, Feldman AG. Optimal parameters for the clinical test of dynamic visual acuity in patients with a unilateral vestibular deficit. *J Otolaryngol*. 2005;34:13-19. doi:10.2310/7070.2005.03105
 25. Schwenk M, Lauenroth A, Stock C, et al. Definitions and methods of measuring and reporting on injurious falls in randomised controlled fall prevention trials: a systematic review. *BMC Med Res Methodol*. 2012;12:50. doi:10.1186/1471-2288-12-50
 26. Washburn RA, McAuley E, Katula J, Mihalko SL, Boileau RA. The physical activity scale for the elderly (PASE): evidence for validity. *J Clin Epidemiol*. 1999;52:643-651. doi:10.1016/s0895-4356(99)00049-9
 27. Sattler MC, Jaunig J, Tösch C, et al. Current evidence of measurement properties of physical activity questionnaires for older adults: an updated systematic review. *Sports Med*. 2020;50:1271-1315. doi:10.1007/s40279-020-01268-xina
 28. Washburn RA, Ficker JL. Physical activity scale for the elderly (PASE): the relationship with activity measured by a portable accelerometer. *J Sports Med Phys Fitness*. 1999;39:336-340.
 29. Bohannon RW. Reference values for the timed up and go test: a descriptive meta-analysis. *J Geriatr Phys Ther*. 2006;29:64-68. doi:10.1519/00139143-200608000-00004
 30. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *J Am Geriatr Soc*. 1991;39:142-148. doi:10.1111/j.1532-5415.1991.tb01616.x
 31. Herman T, Giladi N, Hausdorff JM. Properties of the 'timed up and go' test: more than meets the eye. *Gerontology*. 2011;57:203-210. doi:10.1159/000314963
 32. Shumway-Cook A, Brauer S, Woollacott M. Predicting the probability for falls in community-dwelling older adults using the timed up & go test. *Phys Ther*. 2000;80:896-903.
 33. Shumway-Cook A, Baldwin M, Polissar NL, Gruber W. Predicting the probability for falls in community-dwelling older adults. *Phys Ther*. 1997;77:812-819. doi:10.1093/ptj/77.8.812
 34. Herman T, Inbar-Borovsky N, Brozgal M, Giladi N, Hausdorff JM. The Dynamic Gait Index in healthy older adults: the role of stair climbing, fear of falling and gender. *Gait Posture*. 2009;29:237-241. doi:10.1016/j.gaitpost.2008.08.013T
 35. Sim J, Wright CC. The kappa statistic in reliability studies: use, interpretation, and sample size requirements. *Phys Ther*. 2005;85:257-268.
 36. Mackenbach JP, Kunst AE, de Vrij JH, van Meel D. Self-reported morbidity and disability among Trappist and Benedictine monks. *Am J Epidemiol*. 1993;138:569-573. doi:10.1093/oxfordjournals.aje.a116897
 37. Proeschold-Bell RJ, LeGrand S. Physical health functioning among United Methodist clergy. *J Relig Health*. 2012;51:734-742. doi:10.1007/s10943-010-9372-5
 38. Webb BL, Chase K. Occupational distress and health among a sample of Christian Clergy. *Pastoral Psychol* 2019;68:331-343. doi:10.1007/s11089-018-0844-y
 39. Montero-Odasso M, Schapira M, Soriano ER, et al. Gait velocity as a single predictor of adverse events in healthy seniors aged 75 years and older. *J Gerontol A Biol Sci Med Sci*. 2005;60:1304-1309. doi:10.1093/gerona/60.10.1304
 40. Rosengren B, Ribom EL, Nilsson JÅ, et al. There is in elderly men a group difference between fallers and non-fallers in physical performance tests. *Age Ageing*. 2011;40:744-749. doi:10.1093/ageing/afr108
 41. Honeycutt PH, Ramsey P. Factors contributing to falls in elderly men living in the community. *Geriatr Nurs*. 2002;23:250-255. doi:10.1067/mgn.2002.128785
 42. Kartiko S, Jeremitsky E, Cripps MW, Konderwicz I, Jarosz E, Minshall CT. Fall prevention initiative: a fall screening and intervention pilot study on the ambulatory setting.

- J Trauma Acute Care Surg.* 2020;88:101-105. doi:10.1097/TA.0000000000002514
43. Vincenzo JL, Patton SK. Older adults' experience with fall prevention recommendations derived from the STEADI. *Health Promot Pract.* Published online July 27, 2019. doi:10.1177/1524839919861967
 44. Janney CA, Cauley JA, Cawthon PM, Kriska AM; Osteoporotic Fractures in Men Study Group. Longitudinal physical activity changes in older men in the Osteoporotic Fractures in Men Study. *J Am Geriatr Soc.* 2010;58:1128-1133. doi:10.1111/j.1532-5415.2010.02861.x
 45. Morie M, Reid KF, Miciek R, et al. Habitual physical activity levels are associated with performance in measures of physical function and mobility in older men. *J Am Geriatr Soc.* 2010;58:1727-1733. doi:10.1111/j.1532-5415.2010.03012.x
 46. Jefferis BJ, Merom D, Sartini C, et al. Physical activity and falls in older men: the critical role of mobility limitations [published correction appears in *Med Sci Sports Exerc.* 2015 Nov;47(11):2486]. *Med Sci Sports Exerc.* 2015;47:2119-2128. doi:10.1249/MSS.0000000000000635
 47. Chan BK, Marshall LM, Winters KM, Faulkner KA, Schwartz AV, Orwoll ES. Incident fall risk and physical activity and physical performance among older men: the Osteoporotic Fractures in Men Study. *Am J Epidemiol.* 2007;165:696-703. doi:10.1093/aje/kwk050
 48. Kruger J, Dunning D. Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. *J Pers Soc Psychol.* 1999;77:1121-1134. doi:10.1037//0022-3514.77.6.1121
 49. Kluit N, van Dieën JH, Pijnappels M. The degree of misjudgment between perceived and actual gait ability in older adults. *Gait Posture.* 2017;51:275-280. doi:10.1016/j.gaitpost.2016.10.019
 50. Kelsey JL, Berry SD, Procter-Gray E, et al. Indoor and outdoor falls in older adults are different: the maintenance of balance, independent living, intellect, and Zest in the Elderly of Boston Study. *J Am Geriatr Soc.* 2010;58:2135-2141. doi:10.1111/j.1532-415.2010.03062.x
 51. Grundstrom AC, Guse CE, Layde PM. Risk factors for falls and fall-related injuries in adults 85 years of age and older. *Arch Gerontol Geriatr.* 2012;54:421-428. doi:10.1016/j.archger.2011.06.008
 52. Hoffman GJ, Ha J, Alexander NB, Langa KM, Tinetti M, Min LC. Underreporting of fall injuries of older adults: implications for wellness visit fall risk screening. *J Am Geriatr Soc.* 2018;66:1195-1200. doi:10.1111/jgs.15360J
 53. Friedman SM, Munoz B, West SK, Rubin GS, Fried LP. Falls and fear of falling: which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. *J Am Geriatr Soc.* 2002;50:1329-1335. doi:10.1046/j.1532-5415.2002.50352.x
 54. Young WR, Williams MA. How fear of falling can increase fall-risk in older adults: applying psychological theory to practical observations. *Gait Posture.* 2015;41:7-12. doi:10.1016/j.gaitpost.2014.09.006
 55. Bass E, French DD, Bradham DD, Rubenstein LZ. Risk-adjusted mortality rates of elderly veterans with hip fractures. *Ann Epidemiol.* 2007;17:514-519. doi:10.1016/j.annepidem.2006.12.004
 56. Snowdon D. *Aging with Grace.* Bantam; 2001.
 57. Bennett DA, Schneider JA, Arvanitakis Z, Wilson RS. Overview and findings from the religious orders study. *Curr Alzheimer Res.* 2012;9:628-645. doi:10.2174/156720512801322573
 58. Wilson RS, Schneider JA, Beckett LA, Evans DA, Bennett DA. Progression of gait disorder and rigidity and risk of death in older persons. *Neurol.* 2002;58:1815-1819. doi:10.1212/wnl.58.12.1815
 59. Mahlknecht P, Kiechl S, Bloem BR, et al. Prevalence and burden of gait disorders in elderly men and women aged 60-97 years: a population-based study. *PLoS One.* 2013;8:e69627. doi:10.1371/journal.pone.0069627
 60. Steffen TM, Hacker TA, Mollinger L. Age- and gender-related test performance in community-dwelling elderly people: six-minute walk test, berg balance scale, timed up & go test, and gait speeds. *Phys Ther.* 2002;82:128-137. doi:10.1093/ptj/82.2.128
 61. Cutts TF, Gunderson GR, Proeschold-Bell RJ, Swift R. The life of leaders: an intensive health program for clergy. *J Relig Health.* 2012;51:1317-1324. doi:10.1007/s10943-010-9436-6
 62. Clemson L, Cumming RG, Kendig H, Swann M, Heard R, Taylor K. The effectiveness of a community-based program for reducing the incidence of falls in the elderly: a randomized trial. *J Am Geriatr Soc.* 2004;52:1487-1494. doi:10.1111/j.1532-5415.2004.52411.x
 63. Sartor-Glittenberg C, Bordenave E, Bay C, Bordenave L, Alexander JL. Effect of a matter of balance programme on avoidance behaviour due to fear of falling in older adults. *Psychogeriatrics.* 2018;18:224-230. doi:10.1111/psyg.12310
 64. Schoene D, Heller C, Aung YN, Sieber CC, Kemmler W, Freiburger E. A systematic review on the influence of fear of falling on quality of life in older people: is there a role for falls? *Clin Interv Aging.* 2019;14:701-719. doi:10.2147/CIA.S197857
 65. Klima DW, Hood E. Gait and balance assessment of older adults. *Curr Geri Rep.* 2020;9:154-162. doi.org/10.1007/s13670-020-00327-5