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Falls Among Adults:

The Association of Cardiorespiratory Fitness and Physical Activity with Walking-Related Falls

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Abstract

Background—Falls are a major cause of deaths, hospitalizations, and emergency room visits in the U.S., but circumstances surrounding falls are not well described. Among the elderly, balance and gait disorders and muscle weakness are associated with increased risk for falling, but the relationship of cardiorespiratory fitness and physical activity with falls is unclear.

Purpose—This purpose of this study is to describe characteristics of falls among adults and assess the association of cardiorespiratory fitness and physical activity with walking-related falls.

Methods—Data on participants enrolled in the Aerobics Center Longitudinal Study (ACLS) from 1970 through 1989 who responded to questions on falls on the 1990 follow-up survey were analyzed in 2008–2009. The percentage of participants reporting at least one fall during the year before the follow-up survey was calculated and the activities at the time of falling were described. The relative risk and 95% CIs for the association of baseline fitness and physical activity with walking-related falls were calculated and logistic regression models for walking-related falls were developed.

Results—Of 10,615 participants aged 20–87 years, 20% (95% CI 19%, 21%) reported falling during the past year. Of those falling, 54% (95% CI 52%, 56%) fell during sports or exercise, 15% (95% CI 14%, 17%) while walking, and 4% (95% CI 3%, 5%) from a stool or ladder. People aged ≥ 65 years were no more likely than younger people to report falling in general, but they were more likely than people aged < 45 years to report falling while walking (RR 1.9; 95% CI 1.2, 3.0 for men; RR 2.2; 95% CI 1.3, 3.9 for women). Men with a low level of fitness were more likely to fall while walking than men who were highly fit (RR 2.2; 95% CI 1.5, 3.3). In the multivariate analysis, walking-related falls were associated with low levels of fitness (AOR 1.8; 95% CI 1.1, 2.8) and with physical inactivity (AOR 1.7; 95% CI 1.1–2.7) in men but not in women.

Conclusions—Falls are common throughout adulthood but activities at time of falls differ by age. Low fitness levels and physical inactivity may increase risk for walking-related falls.

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Introduction

Each year in the U.S., approximately 19,000 people die from unintentional falls, 500,000 are hospitalized, and 8 million are treated in Emergency Departments.¹ Injuries from falls are especially common among the elderly; falls are the leading cause of fatal and nonfatal injuries among people aged ≥ 65 years.^{2,3} Direct medical costs for fall-related injuries in people aged ≥ 65 years exceeded \$19 billion in 2000.⁴

Most studies on the prevalence of falls focus on people aged ≥ 65 years. Previous studies indicate that 25%–50% of people aged ≥ 65 years fall each year.^{5–9} Almost one third of those aged ≥ 65 years who fall report an injury resulting in a physician visit or restriction of activity ≥ 1 day.¹⁰ Data on circumstances of falls are also usually limited to older people. Studies indicate that one third to one half of falls among people aged ≥ 65 years occur while walking.^{5,6,11}

Among older adults, muscle weakness, balance and gait disturbances, functional and cognitive impairment, postural hypotension, central nervous system medications, visual impairment, and foot problems are associated with increased risk for falls.^{12–14} Physical activity has been shown to be associated with increased risk for falling in some studies^{8,15,16} but with decreased risk for falling and fractures in others.^{12,13,17,18} There are currently no data on the relationship between falls and cardiorespiratory fitness (hereafter referred to as “fitness”), an objective and reproducible measure that reflects physical activity habits. It is hypothesized here, however, that because people who are highly fit are less likely to have muscular weakness, they are less likely to fall.^{19,20}

The objectives of this analysis, which includes adults aged ≥ 20 years participating in the Aerobics Center Longitudinal Study (ACLS), are to assess the prevalence of falling in the past year, describe activities in progress at the time of falling, identify characteristics associated with falling while walking, and quantify the association of fitness and self-reported physical activity with walking-related falls. The focus of the analysis is walking-related falls, given that walking is a commonly recommended and reportedly low-risk activity, unlike climbing on ladders or playing sports.^{21–25} Relatively little is known, however, about the magnitude of risk and the characteristics associated with walking-related falls.

Methods

The ACLS is a prospective study designed to measure the effects of fitness and physical activity on various health outcomes. Study participants completed a baseline fitness test (maximal exercise treadmill test using a modified Balke protocol),²⁶ a physical examination, and a personal and family health history questionnaire at the Cooper Clinic in Dallas, TX. Follow-up on health status was conducted periodically by mailed surveys. The study protocol and consent forms were reviewed and approved annually by the Cooper Institute’s IRB.

Most study participants are self-referred or employer-referred for purpose of fitness evaluation and lifestyle counseling.^{27,28} The majority of participants are white, college-educated, and from middle to upper socioeconomic strata.^{28,29} The study population and methods have been described in more detail elsewhere.^{30–33}

Our analysis included participants enrolled in ACLS from 1970 through 1989 with baseline fitness data who responded to a follow-up mail-back survey in 1990. Baseline fitness was measured by minutes on treadmill at time of enrollment. The treadmill test began at 0%

elevation and a speed of 88 m/min. The grade was increased to 2% at 1 minute and 1% per minute thereafter until 25 minutes, at which time it was held constant and the speed was increased 5.4 m/min. The test was terminated when the individual reached exhaustion or when stopped by the supervising physician for medical reasons. Participants not reaching 85% of their age-predicted maximal heart rate were excluded from the current analysis (2% of all study participants) because such a threshold is needed for an accurate measure of fitness.

The 1990 mail-back survey included questions on falling during the past 12 months, the activity at the time of the most recent fall, bone fractures resulting from falls, and number of falls during the past 12 months. These data were not examined in previous analyses of ACLS data. The survey also included questions about physical functioning limitations, current health status, physician-diagnosed medical conditions, alcohol consumption, smoking, dizziness, hearing loss, and use of prescription and nonprescription medications.

Of 14,613 respondents completing the 1990 mail-back questionnaire (65% survey response rate),³⁴ 11,674 (80%) answered questions on falls. Of these, 1,059 (9%) reported functional limitations as defined by responses “no” or “yes with assistance” to questions about ability to do moderate recreational activities; light, moderate, or strenuous household activities; light, moderate, or strenuous daily activity; moderate personal care activities; or activities requiring dexterity. Those with functional limitations were excluded from the current analysis, given that they were at high risk for falls and in need of tailored interventions. 17,35 Those answering “no” to ability to do strenuous recreational activities (such as jogging, basketball, circuit training, skiing, or tennis) were not considered functionally impaired. For 10,615 participants without functional limitations, data from the 1990 survey were merged with baseline data on fitness and physical activity. The current analysis was limited to this cohort of 10,615. This subset of study participants was on average older, fitter, and more physically active than the rest of the ACLS cohort.

Definitions

Participants were classified as having fallen if they answered “yes” to the question “during the past 12 months have you fallen to the floor or ground?” on the 1990 survey. Participants were classified as having fallen while walking if they selected “walking” for the question “in your most recent fall, what were you doing when this occurred?”

Fitness categories (low, moderate, and high tertiles) were based on treadmill time in minutes, stratified by age group and gender. Baseline physical activity was assessed by MET-minutes per week based on self-reported exercise participation on the medical history questionnaire. Participants were asked if they had participated in any of 10 aerobic activities during the past 3 months and if yes, the number of workouts per week and the average duration of workouts. Weekly MET-minutes were calculated based on intensity and duration of activity using the MET values listed in the 2000 Compendium of Physical Activity.³⁶ Participants were categorized as spending ≥ 500 MET-minutes per week or 1–499 MET-minutes per week. Those reporting no current participation in any type of exercise were considered “inactive.” Those who reported participation but did not provide enough detail to calculate MET-minutes were classified as “ >0 , METs unknown.”

On the 1990 survey, respondents were asked to rate their current overall health with choices ranging from “poor” to “excellent.” People were defined as having the following medical conditions if they checked corresponding physician-diagnosed conditions: cardiovascular disease (heart attack, angina, arrhythmias, stroke), hypertension, chronic obstructive pulmonary disease (chronic bronchitis, emphysema), neurologic disease (multiple sclerosis, poliomyelitis, Parkinson’s Disease, muscular dystrophy, cerebral palsy, paralysis due to

spinal injury), arthritis (rheumatoid, osteoarthritis), diabetes (insulin dependent, noninsulin dependent), eye disease (glaucoma, cataracts, detached retina), cancer (breast, lung, skin, colon, rectum, cervical, prostate, pancreas, other). People were considered to have a history of depression or anxiety if they reported seeking assistance from a health professional for those conditions. Prescription drug use was defined as “yes” if the participant responded “yes” to use of any prescription drugs listed, not including estrogen replacement (medications for heart conditions, high blood pressure, high cholesterol, lung conditions, chronic pain/arthritis, insulin or oral diabetic agents, sleeping pills, antidepressants/tranquilizers). Each prescription drug category was also assessed separately (Table 2). Nonprescription drug use was defined as “yes” if a participant responded “yes” to routine use of over-the-counter sleeping pills, aspirin, ibuprofen, or acetaminophen. Dizziness and hearing loss were defined as “yes,” respectively, if a participant indicated he was troubled frequently by them. Alcohol consumption during the past 12 months was categorized as ≥ 5 drinks per week, 1–4 drinks per week, none, and unknown. BMI was calculated based on self-reported weight and height. Miles walked per week were determined based on questions about walking performed regularly during the past 3 months (sessions per week, miles per session) and categorized as 0, 1–6, or ≥ 7 .

Statistical analysis

For most analyses, falling while walking was the primary outcome of interest. The relative risk and 95% CIs for the association of each individual predictor variable with falling while walking were calculated. Logistic regression models with a walking-related fall as the outcome were developed for men and women separately. Variables significantly associated with falling while walking in the bivariate analysis ($p < 0.05$) were recategorized as dichotomous variables if necessary and were available for inclusion in the regression models. BMI was categorized as normal (< 25) or overweight (≥ 25), miles of regular walking per week were categorized as 0 or ≥ 1 , and current health status was categorized as “poor/fair” or “good/very good/excellent.” Forward selection was used to include variables independently associated with falling while walking ($p < 0.1$). The baseline fitness variables were withheld until a model was developed and then added to assess their independent association with falling while walking. Dummy variables for age group were forced into the model. The same procedure was used to assess the contribution of baseline physical activity to walking-related falls. Finally, to assess the effect of years of time elapsed between baseline and the 1990 survey, the final models were applied separately to participants with ≥ 6 years of elapsed time and to those with < 6 years.

Results

Of 10,615 study participants answering the falls questions, 77% were men and 61% were aged 45–64 years with an age range of 20–87 years. The mean (\pm SD) treadmill time at baseline was 17.7 (± 5.4) minutes. Most participants reported ≥ 500 MET-minutes (36%) or 1–499 MET-minutes (18%) of baseline physical activity per week, but 29% reported no regular exercise participation during the past 3 months and 16% reported some exercise but MET-minutes were unknown. The median time from baseline fitness testing to the 1990 survey was 7 years (interquartile range=8) for men and 6 years (IQ range=8) for women.

Of the 10,615 participants answering questions on recent falls in the 1990 survey, 2,110 (20%; 95% CI 19%, 21%) reported falling during the past 12 months (Table 1). Prevalence of falling among participants aged ≥ 65 years was not significantly different from participants aged 20–44 years or 45–64 years. Prevalence of falling was 1.2 times higher among women (22%; 95% CI 21%, 24%) than among men (19%; 95% CI 18%, 20%). Forty percent of those falling (8% of the total study population) reported multiple falls in the past year (Table 1).

Of 2,110 people falling, 2,053 indicated their activity at time of most recent fall: 1,105 (54%) fell during sports or exercise activities, 315 (15%) fell while walking, and 493 (24%) fell during “other” activities (Table 1). Over half (60%; 95% CI 57%, 62%) of men fell during sports or exercise and only 11% (95% CI 10%, 13%) fell while walking, whereas 36% (95% CI 32%, 40%) of women fell during sports or exercise and 28% (95% CI 24%, 31%) fell while walking. Among those aged 20–44 years, 67% (95% CI 63%, 71%) of falls occurred during sports or exercise and 11% (9%, 14%) while walking, whereas among those aged ≥ 65 years, 29% (95% CI, 24%, 35%) of falls occurred during sports or exercise and 22% (95% CI 17%, 27%) while walking. Activity at the time of fall by age and gender is shown in Table 1.

About 8% of people who fell fractured a bone (162/2085). A higher percentage (18%; 95% CI 10%, 26%) of those falling from a stool or ladder reported a fracture than those falling during sports/exercise (6%; 95% CI 5%, 8%). Among those who fell, a higher percentage of participants aged ≥ 65 years (13%; 95% CI 9%, 17%) than those aged 20–44 years reported fractures (5%; 95% CI 3%, 6%). Women who fell were 1.5 times more likely than men who fell to report a fracture (10%, 95% CI 8%, 13% for women; 7%, 95% CI 6%, 8% for men). The percentage of participants reporting fractures from falls is shown in Table 1 by age group and gender.

Overall, 315 (3.0%) of 10,558 participants reported falling while walking. Women were 2.8 times as likely as men to report falling while walking (5.9% vs 2.1%; Table 2). Men with low baseline fitness levels were 2.2 times as likely as highly fit men to fall while walking; women with low baseline fitness levels were 2.0 times as likely to fall (Table 2). Men considered “inactive” at baseline were 2.1 times more likely than those with ≥ 500 MET-minutes per week to fall while walking; “inactive” women were 1.3 times as likely as those who were highly active at baseline to fall, but this difference was not significant. Older age group, frequent dizziness, current health status, arthritis, eye disease, use of any prescription medications, heart condition medications, diabetes medications, and arthritis/pain medications were significantly associated with falling while walking for both men and women. Other characteristics associated with walking-related falls for men or for women are shown in Table 2.

In the multivariate analysis, a low level of baseline fitness was associated with falling while walking among men (AOR 1.8; 95% CI 1.1–2.8) controlling for age group, use of arthritis/pain medications, depression/anxiety, hearing loss, and regular walking (Table 3). In a separate model, no regular physical activity at baseline also independently associated with falling while walking among men (AOR 1.7; 95% CI, 1.1–2.7). When the same models were applied to the subset of men with < 6 years from baseline assessment to 1990 survey, there was a stronger association between walking-related falls and low baseline fitness level and physical inactivity. The association was weaker for the subset of men with ≥ 6 years elapsed time from baseline to 1990 (data not shown). In the multivariate analysis for women, neither baseline fitness nor baseline physical activity was significantly associated with falling while walking when controlling for age group, use of diabetes medications, use of heart medications, frequent dizziness, and BMI (Table 3).

In a separate bivariate analysis of people aged ≥ 65 years, those with a low level of fitness had a higher prevalence of falling while walking than those who were highly fit, but these differences were not significant (RR 1.3 for men; RR 1.4 for women). People aged ≥ 65 years with no regular physical activity were likewise at higher risk of walking-related falls than those with > 500 MET-minutes per week but not significantly so (RR 1.7 for men, RR 1.6 for women).

Discussion

In this study of adults aged ≥ 20 years without physical functioning limitations, 20% reported falling during the past year. The current study is one of a few on falls in adults of all ages and is consistent with a previous study by Li et al reporting that 23% of people aged ≥ 45 years fell during the past year.¹⁶ Falls appeared to be common throughout adulthood, but the activities at time of falling were significantly different for older adults and younger adults, with people aged ≥ 65 years more likely to fall while walking and people aged 20–44 years more likely to fall during sports or exercise.

In the current study, women were more likely than men to report falling, more likely to suffer fall-related fractures, and more likely to report falling while walking than men. Most studies among older adults indicate that although men have a higher death rate from falls, women are more likely to fall than men and are more likely to suffer injuries from falls, perhaps because of lower bone density.^{10,37–39}

Baseline fitness and physical activity appear to be important protective factors against falling while walking, at least among men. The current study is the first study we know of to show that a low level of cardiorespiratory fitness, as measured by a maximal exercise test, is associated with falling while walking. Other studies have indicated that people with impaired agility or balance as measured by the “chair stand” test, gait disturbances as measured by stride time variability or the tandem walk test, or weakness as measured by grip strength are at increased risk for falling.^{5,7–9,11} A low level of baseline fitness was associated with falling while walking in women, but the multivariate analysis indicated that other characteristics, such as older age, use of diabetes medications, use of heart medications, frequent dizziness, and overweight are stronger predictors of walking-related falls.

Our results also indicate that baseline physical inactivity is independently associated with walking-related falls among men. Although some studies indicate that higher levels of physical activity increase risk for injuries in general,^{22,40} regular physical activity may reduce the incidence of nonsport injuries.⁴¹ Many studies show that low-risk physical activity, such as walking, decreases the risk for falling in the elderly and numerous guidelines promote physical activity for this purpose.^{12,13,18,25,42} Nonspecific, nontargeted exercise has not been shown to decrease risk for falls;¹³ however, interventions focusing on exercise have been successful in reducing risk for falls if they include targeted balance and strength components.^{12,13,25}

Of note, baseline fitness and physical activity were more strongly associated with walking-related falls in men with baseline assessment within 5 years of the 1990 questionnaire about falls, indicating that the association between baseline fitness and physical activity with falls decreases over time, perhaps due to changes in fitness over time. Present-day fitness most likely protects more against walking-related falls than past fitness.

In addition to low levels of fitness and physical activity, depression and use of prescription pain medications were independently associated with falling while walking among men. Use of diabetes and heart medications, frequent dizziness, overweight, and older age were independently associated with falling while walking in women. Findings of multiple factors contributing to falls support the need for multifaceted prevention programs now recommended by the American Geriatrics Society and the CDC.^{12,42} Multifactorial assessment and intervention, including gait and balance training, assessment and adjustment of medication regimens, treatment of postural hypotension, or modification of environmental hazards have been shown to be the most successful approach to reducing

falls.^{12,13} Single interventions, such as strength and balance training, have also been shown to be effective when directed at the major risk factor for a particular population.⁴³

Our analysis has several limitations. First, information on falls was by self report, which has been shown to underestimate the frequency of falls.^{44–46} Participants were probably more likely to recall serious falls, such as those resulting in fracture; thus, although the current data indicate that 8% of those falling suffered a fracture, the true percentage of all falls resulting in fracture is most likely considerably lower. Second, some participants may have been misclassified as not falling while walking if they fell multiple times including while walking, but fell for a different reason on the most recent fall. Third, data on all potential confounders, such as visual impairment, balance problems, foot problems, home hazards, or hazardous outdoor conditions, such as broken sidewalks or poor lighting, were not available and could not be assessed. Finally, because the ACLS study population is not a nationally representative sample, the current results may not apply to the U.S. population as a whole.

In summary, falls were common among ACLS participants aged 20–87 years. Over half of falls occurred during participation in sports or exercise. Falls while walking, although infrequent among young adults, were relatively common among older adults, especially older women. For men and to some degree women, fitness and physical activity appear to protect against walking-related falls. Fitness and physical activity convey many health benefits, such as decreased risk for heart disease, stroke, some cancer, and diabetes;⁴⁷ protecting against walking-related falls may be another of their many benefits.

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Table 1
Percentage of ACLS participants reporting falls during the past year, by age group and gender, 1990 mail-back survey (n=10,615)

	Total	Aged 20-44 yrs		Aged 45-64 years		Aged ≥65 years	
		Men	Women	Men	Women	Men	Women
Reported falling in past 12 months	N=10,615 % (95% CI) 20 (19,21)	n=1961 % (95% CI) 23 (21,25)	n=783 % (95% CI) 19 (17,22)	n=5117 % (95% CI) 18 (17,19)	n=1378 % (95% CI) 23 (21,25)	n=1,122 % (95% CI) 20 (17,22)	n=254 % (95% CI) 26 (20,31)
Among those falling:	n=2,110 % (95% CI)	n=444 % (95% CI)	n=152 % (95% CI)	n=912 % (95% CI)	n=318 % (95% CI)	n=219 % (95% CI)	n=65 % (95% CI)
Activity at most recent fall ^a	54 (52,56)	73 (69,77)	50 (42,58)	59 (56,63)	35 (29,40)	36 (29,42)	8 (1,15)
Sports/exercise	15 (14,17)	8 (6,11)	20 (19,21)	11 (9,13)	30 (25,35)	19 (13,24)	33 (22,45)
Walking	4 (3, 5)	3 (1, 4)	3 (0, 5)	5 (4, 6)	4 (2, 7)	6 (3, 9)	5 (0,10)
On stool/ladder	1 (1, 2)	1 (0, 2)	1 (1, 2)	1 (1, 2)	0 (0, 1)	2 (0, 4)	3 (0, 8)
Getting up from lying position	1 (1, 2)	1 (0, 3)	3 (0, 5)	1 (0, 2)	1 (0, 3)	2 (0, 4)	0 (0, 0)
Getting in/out of tub/shower	24 (22,26)	13 (10,16)	24 (18,31)	23 (20,25)	29 (24,34)	36 (30,43)	51 (38,63)
Other	8 (7, 9)	5 (3, 7)	5 (1, 8)	7 (5, 9)	12 (8,15)	11 (7,15)	19 (9,28)
Fractured bone at most recent fall ^b	40 (38,43)	57 (53,62)	35 (27,43)	41 (37,44)	30 (25,35)	30 (24,37)	23 (12,33)
Reported multiple falls (≥2) ^c							

^aMissing data for 57 participants

^bMissing data for 25 participants

^cMissing data for 132 participants

Percentage of ACLS participants who fell while walking during the past year, by gender and selected characteristics, 1990 mail-back survey ($n=10,558^a$)

Table 2

	Men			Women		
	<i>n</i>	%	RR ^b (95% CI)	<i>n</i>	%	RR ^b (95% CI)
Age group (years)	8163	2.1		2395	5.9	
≥65	1119	3.6	1.9 (1.2,3.0)	252	8.3	2.2 (1.3,3.9)
45–64	5094	1.9	1.0 (0.7,1.5)	1365	6.7	1.8 (1.2,2.7)
20–44	1950	1.9	ref	778	3.7	ref
Fitness level (baseline)						
Low	2698	2.9	2.2 (1.5,3.3)	799	7.5	2.0 (1.3,3.0)
Moderate	2704	2.2	1.7 (1.1,2.5)	805	6.5	1.7 (1.1,2.6)
High	2761	1.3	ref	791	3.8	ref
Physical activity, MET-minutes/week (baseline)						
0	2411	2.9	2.1 (1.4,3.1)	667	6.8	1.3 (0.8,1.9)
>0, METs unknown	1270	1.7	1.3 (0.8,2.1)	465	6.7	1.2 (0.8,2.0)
1–499	1447	2.8	2.1 (1.4,3.2)	480	5.0	0.9 (0.6,1.5)
500+	3035	1.4	ref	783	5.4	ref
Miles walked per week						
≥7	1578	3.0	1.9 (1.3,2.7)	749	5.7	0.9 (0.6,1.3)
1–6	1721	2.3	1.4 (1.0,2.1)	585	5.8	0.9 (0.6,1.4)
0	4191	1.7	ref	837	6.5	ref
Current overall health						
Fair/Poor	393	4.6	3.4 (2.0,6.0)	100	8.0	2.0 (1.0,4.2)
Good/Very good	4965	2.4	1.8 (1.2,2.6)	1456	6.9	1.7 (1.2,2.5)
Excellent	2781	1.3	ref	829	4.0	ref
History of cardiovascular disease						
Yes	1086	3.7	2.0 (1.4,2.8)	250	8.0	1.4 (0.9,2.2)
Not noted	7077	1.9	ref	2145	5.7	ref
Hypertension						

	Men			Women		
	<i>n</i>	%	RR ^b (95% CI)	<i>n</i>	%	RR ^b (95% CI)
Fell walking						
Yes	1345	2.4	1.2 (0.8,1.7)	193	8.8	1.6 (1.0,2.5)
No	6818	2.1	ref	2202	5.7	ref
History of COPD ^c						
Yes	171	3.5	1.7 (0.8,3.7)	87	9.2	1.6 (0.8,3.1)
Not noted	7992	2.1	ref	2308	5.8	ref
History of neurologic disease						
Yes	103	7.8	3.8 (1.9,7.5)	30	10.0	1.7 (0.6,5.0)
Not noted	8060	2.1	ref	2365	5.9	ref
History of arthritis						
Yes	529	3.4	1.7 (1.0,2.7)	176	9.7	1.7 (1.1,2.8)
Not noted	7634	2.0	ref	2219	5.6	ref
History of diabetes						
Yes	157	5.1	2.5 (1.2,4.9)	34	11.8	2.0 (0.8,5.1)
Not noted	8006	2.1	ref	2361	5.8	ref
History of cancer						
Yes	804	3.0	1.5 (1.0,2.3)	243	4.5	0.7 (0.4,1.4)
Not noted	7359	2.0	ref	2152	6.1	ref
Eye disease						
Yes	382	4.7	2.4 (1.5,3.8)	105	10.5	1.8 (1.0,3.3)
Not noted	7781	2.0	ref	2290	5.7	ref
Sought care for depression/anxiety						
Yes	668	3.6	1.8 (1.2,2.8)	467	7.1	1.3 (0.9,1.8)
Not noted	7495	2.0	ref	1928	5.7	ref
Frequent dizziness						
Yes	243	7.0	3.6 (2.2,5.8)	105	15.2	2.8 (1.7,4.5)
No	7706	2.0	ref	2204	5.5	ref
Hearing loss						
Yes	1920	2.9	1.6 (1.1,2.2)	231	4.3	0.7 (0.4,1.3)
No	6087	1.8	ref	2086	6.1	ref

	Men			Women		
	<i>n</i>	%	RR ^b (95% CI)	<i>n</i>	%	RR ^b (95% CI)
Any prescription medication						
Yes	2150	3.1	1.7 (1.3,2.4)	524	9.7	2.0 (1.4,2.8)
No	5636	1.8	ref	1640	4.9	ref
Hypertension medications						
Yes	887	2.7	1.4 (0.9,2.1)	195	9.7	1.8 (1.1,2.8)
No	6541	1.9	ref	1880	5.5	ref
Heart condition medications						
Yes	435	3.9	2.0 (1.2,3.3)	53	17.0	3.1 (1.6,5.7)
No	6811	1.9	ref	1945	5.5	ref
Diabetes medications						
Yes	91	6.6	3.4 (1.6,7.6)	12	33.3	5.9 (2.6,13.3)
No	7012	1.9	ref	1985	5.7	ref
Antidepressants/tranquilizers						
Yes	199	2.5	1.3 (0.6,3.2)	112	9.8	1.8 (1.0,3.2)
No	6941	1.9	ref	1907	5.6	ref
Arthritis/pain medications						
Yes	371	5.7	3.1 (2.0,4.9)	134	10.5	1.9 (1.1,3.2)
No	6828	1.8	ref	1893	5.6	ref
Lung condition medications						
Yes	118	5.1	2.7 (1.2,5.9)	39	10.3	1.8 (0.7,4.6)
No	7007	1.9	ref	1962	5.7	ref
High-cholesterol medications						
Yes	556	2.2	1.1 (0.6,2.0)	60	3.3	0.6 (0.1,2.2)
No	6682	1.9	ref	1952	5.9	ref
Prescription sleeping pills						
Yes	202	4.5	2.3 (1.2,4.5)	63	9.5	1.7 (0.8,3.6)
No	6936	1.9	ref	1943	5.8	ref
Over-the-counter medication						
Yes	3596	2.3	1.2 (0.9,1.6)	1038	6.6	1.2 (0.9,1.7)

	Men			Women		
	Fell walking			Fell walking		
	<i>n</i>	%	RR ^b (95% CI)	<i>n</i>	%	RR ^b (95% CI)
No	4449	2.0	ref	1307	5.4	ref
BMI, 1990						
≥30	558	2.3	1.1 (0.6,2.0)	75	10.7	2.2 (1.1,4.4)
25–29	2839	2.2	1.1 (0.8,1.5)	296	12.2	2.5 (1.7,3.6)
<25	3448	2.1	ref	1899	4.8	ref
Alcohol consumption (drinks/wk)						
≥5	2909	1.9	0.7 (0.5,1.0)	490	4.9	0.7 (0.4,1.1)
1–4	2968	1.8	0.6 (0.4,0.9)	984	5.7	0.8 (0.5,1.2)
0	1628	2.9	ref	544	7.2	ref
Current tobacco use						
Yes	693	2.3	1.1 (0.7,1.8)	114	4.4	0.7 (0.3,1.8)
No	7470	2.1	ref	2281	6.0	ref
Marital status						
Single/widowed/divorced	889	2.2	1.1 (0.7,1.7)	430	4.7	0.8 (0.5,1.2)
Married	7191	2.1	ref	1940	6.2	ref

^a 57 participants who fell did not specify activity at the time of fall and are not included in this table. The total number of participants does not add up to 10,558 for each variable because of missing data

^b Relative risk

^c Chronic obstructive pulmonary disease

Table 3

Characteristics associated with falling while walking, logistic regression models, 1990 ACLS mail-back survey

Characteristic	Fitness model AOR (95% CI)	Physical activity model AOR (95% CI)
Men (<i>n</i> =6540)		
Fitness level (baseline)		
Low	1.8 (1.1, 2.8)	
Moderate	1.4 (0.9, 2.3)	
High	ref	
Physical activity, MET-min/wk (baseline)		
0		1.7 (1.1, 2.7)
1–499		1.5 (0.9, 2.5)
>0, unknown		0.9 (0.5, 1.7)
≥500		ref
Age group (years)		
≥65	1.1 (0.6, 2.0)	1.0 (0.6, 1.9)
45–64	0.8 (0.5, 1.3)	0.8 (0.5, 1.3)
20–44	ref	ref
Pain medications	2.7 (1.6, 4.5)	2.7 (1.6, 4.6)
Depression	1.7 (1.0, 2.9)	1.8 (1.1, 3.0)
Hearing loss	1.4 (0.9, 2.0)	1.4 (0.9, 2.1)
Regular walking (≥1 mile/wk)	1.4 (1.0, 2.0)	1.4 (1.0, 2.0)

Women (<i>n</i> =1824)		
Fitness level (baseline)		
Low		
Moderate	1.3 (0.8, 2.2)	
High	1.6 (0.9, 2.7)	
Physical activity, MET-minutes/week (baseline)		
0		1.0 (0.6, 1.6)
1–499		0.8 (0.4, 1.4)
>0, unknown		1.0 (0.6, 1.8)
≥500		ref
Age group (years)		
≥65	1.8 (0.9, 3.7)	1.9 (0.9, 3.9)
45–64	1.7 (1.1, 2.8)	1.8 (1.1, 2.9)
20–44	ref	ref
Diabetes medications	10.2 (2.6, 40.1)	10.1 (2.5, 40.2)
Heart medications	3.0 (1.1, 7.7)	2.9 (1.1, 7.4)
Frequent dizziness	3.0 (1.6, 5.8)	3.1 (1.6, 6.0)
BMI ≥25	2.5 (1.6, 3.9)	2.6 (1.7, 4.0)