ORIGINAL RESEARCH

Leisure Sedentary Time is Associated with Self-Reported Falls in Middle-aged and Older Females and Males: an Analysis of the CLSA

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https://doi.org/10.5770/cgj.26.636

ABSTRACT

Aim

The purpose of this analysis was to report the prevalence of falls and falls-related injuries among those reporting different volumes of weekly sedentary time, and to understand the association of sedentary time and falls, accounting for functional fitness.

Methods

Baseline and first follow-up data from the Canadian Longitudinal Study on Aging (CSLA) were analyzed (n=22,942). Participants self-reported whether they had a fall in the past 12 months (at baseline) and whether they had an injury that was a result of a fall (follow-up). In-home interviews collected self-reported leisure sedentary time using the Physical Activity Scale for Elderly. Functional fitness was assessed using grip strength, timed-up-and-go, and chair rise tests during clinic visits.

Results

The prevalence of falls was higher among those who reported higher sedentary time. For example, among males aged 65 and older who reported lower sedentary time (<1,080 min/week), the prevalence of falls in the past 12 months (at baseline) was 7.8% compared to 9.8% in those reporting higher sedentary time. The odds of reporting a fall (at baseline) was 21% higher in those who reported higher sedentary time (OR: 1.21; 95%CI: 1.11–1.33) in adjusted models. No associations were found between sedentary time and injuries due to a fall.

Conclusions

Reporting high volumes of sedentary time may increase the risk of falls. Future research using device-based estimates of total sedentary time and breaks in sedentary time is needed to further elucidate this association.

Key words: sitting, sedentary behaviour, functional fitness, aging, CLSA

INTRODUCTION

Approximately 18.5% of Canadians are over 65 years, with projections suggesting that by 2068, older adults will make up 21–30% of the population.[1,2] In addition, around 17% of older Canadians experience a fall each year; this accounts for 85% of hospitalizations due to injury, and results in an average hospital stay up to 34 days longer when compared to all other causes of hospitalization.[3,4] Falls are also responsible for 95% of hip fractures in older adults, and the health-care costs of falls in this population is 3.7 times that for individuals between 25 and 64 years.[3,4]

Evidence suggests that age-related physical and physiological changes (reduced vision, peripheral sensation, vestibular sense, neuromuscular control reaction time, and muscle strength), often measured using assessments of functional fitness, are associated with a higher risk of falls, recurrent falls, falls-related injury, medical attention, and hospitalization.[5-7] Exercise, and the subsequent increases in functional fitness, attenuates the risk of falls-related injury by 32–40%, falls-related fractures by 40–66%, and falls-related medical attention by 65%.[8,9] Moderate intensity, structured multi-modal exercise—that is, exercise that includes different modes such as balance, strengthening, and flexibility, performed at least 2 times per week—is required to improve functional fitness and falls-related outcomes in older adults;[9,10] such programs require a considerable amount of resources and time. Although functional fitness is an important target for attenuating falls-related risks, ensuring that older adults accumulate the volume of physical activity and specific exercises necessary to attenuate those risks is a challenge. Only 13% of Canadian older adults meet the physical activity guidelines and even fewer are performing adequate levels of strength or balance training.[11]

One possible solution to falls prevention that is relatively unexplored but related to movement and functional fitness in older adults, is reducing sedentary time. Sedentary time is defined as "any waking behaviour characterized by an energy expenditure ≤1.5 METs while in a sitting or reclining posture".[12] It is a highly prevalent behaviour in all age groups.

In Canada, device-measured data indicate that adults aged 60–69 years are spending approximately 10 hours of their waking time engaging in sedentary pursuits;[13] this coincides with data from a systematic review of sedentary time in older adults spanning 10 countries.[14]

Research suggests that sedentary time is detrimental to a number of different health outcomes, including those relevant to older adults, such as disability and independence.[15] Sedentary time directly impacts functional fitness. For example, a study on healthy older adults (65±5 yrs) found that as little as 10 days of bed rest leads to a decrease in isotonic knee extensor strength by 13.2%, stair-climbing power by 14%, and maximal aerobic capacity by 12%.[16] Evidence also suggests that breaking up sedentary time may be an effective strategy for improving physical function in older adults by 5–50%,[17,18] and this might have an impact on the risk and severity of falls.[19] Sedentary time may also lead to physiological changes affecting neuromuscular control or vestibular systems that increase the risk of falls.[20] There are some clear and direct mechanistic links between sedentary time and falls that need to be elucidated at the population level to inform the development of evidence-based interventions.

Given the burden of falls on the health and quality of life of older adults, as well as the health-care system, it is essential that we investigate novel and feasible solutions that are more accessible than supervised exercise programs. Based on previous research related to sedentary behaviour interventions and functional fitness outcomes in older adults, sedentary time may be an untapped opportunity for improving falls-related outcomes. However, little research to date has explored the association between sedentary time and falls-related outcomes in older adults; this gap in the literature needs to be addressed before designing and implementing sedentary time reduction interventions. Thus, the primary purpose of this analysis was to estimate the prevalence of self-reported falls and falls-related injury based on weekly sedentary time, as well as the associations between sedentary time and falls outcomes. A secondary purpose was to describe functional fitness levels based on sedentary time, and to understand the effect of functional fitness on the association between sedentary time and falls related outcomes.

METHODS

Data Source and Participants

The Canadian Longitudinal Study on Aging (CLSA) is a nationally representative, stratified, random sample of 51,338 Canadian females and males aged 45 to 85 years (at baseline). The purpose of this survey is to collect data on the health and quality of life of Canadians to better understand the processes and dimensions of aging. The study contains two samples: the Tracking cohort and the Comprehensive cohort. The Comprehensive sample was used for the present analysis (Dataset version 5.0 and Follow-up 1 Comprehensive Dataset version 3.0). This sample contains 30,097 participants recruited between 2012 and 2015, with the first follow-up data collected between 2015 and 2018; a detailed description of the cohort, inclusion and exclusion criteria, data collection sites, and retention rates, can be found elsewhere.[11] Briefly, 4.3% withdrew and 2.7% were deceased at first follow-up. The data collection in this sample was done through in-home questionnaires, and clinic visits (physical examinations and biological samples). These participants live within a 25–50 km radius of one of the 11 data collection sites across Canada (Vancouver/Surrey (two sites), Victoria, Calgary, Winnipeg, Hamilton, Ottawa, Montreal, Sherbrooke, Halifax, and St. John's).

The protocol of the CLSA has been reviewed and approved by 13 research ethics boards across Canada. Changes to the CLSA protocol are reviewed annually. Written consent is obtained from all participants. The University of Ontario Institute of Technology Research Ethics Board approved this secondary analysis of the CLSA dataset (REB #16120).

Outcome Variables

Falls in the Last 12 Months (only available at baseline)

All participants were asked: "In the past 12 months, did you have any falls?" Response options for analysis were yes or no.

Injuries Caused by a Fall (at follow-up)

Participants were first asked, "How many times were you injured in the past 12 months?" This was followed by a question regarding the cause of the injury, with one of the response options being "a fall." This provided us with the number of participants injured due to a fall, or falls-related injuries.

Exposure Variables

Sedentary Time (at baseline)

A modified version of the Physical Activity Scale for Elderly (PASE) was used to collect information about leisure sedentary time. The PASE is a valid and reliable tool for measuring sitting time among older adults. It has been shown to have good test–retest reliability over a three- to seven-week interval (0.75, 95% CI=0.69–0.80), and construct validity has also been established.[21] Participants were asked, "Over the past seven days, how often did you participate in sitting activities such as reading, watching TV, computer activities or doing handicrafts?" Response options were: Never (0 days), Seldom (1 to 2 days), Sometimes (3 to 4 days), Often (5 to 7 days). They were also asked, "On average, how many hours per day did you engage in these sitting activities?" Response options were: <30 min, ≥30 min to <1h, ≥1h to <2h, ≥2h to <4h, ≥4h. Responses were used to calculate weekly sedentary time by multiplying the mid-point of each category. For example, if a participant said they engaged in three to four days of sedentary activities for 2–4 hours, they would be engaging in 10.5 hours/week (3.5 days × 3 hr). After inspection of the distribution of weekly sedentary time, the sample was categorized into two sedentary groups (higher sedentary and lower sedentary groups) using a median split of 1,080 min/week (18 hr/week).

Functional Fitness (at baseline)

Three physical function tests were used.

Grip strength was measured using a wireless dynamometer. A detailed protocol can be found on the study website; briefly, the dominant hand was used (when not contraindicated) with participants seated on a chair (no armrests) with the elbows flexed at 90°.[22] The higher value of three attempts was used for each participant, and a higher score is indicative of higher strength.

The Timed Up and Go (TUG) test scores the participant according to the time taken to stand up, cover the two sides of a 3-metres-long course, and sit down again;[23,24] a higher time is indicative of worse physical function.

For the Chair Rise test, participants were asked to stand up and sit down from a standard chair as quickly as possible five times in a row, with arms folded across the chest. The time spent to fulfill the task was recorded using a stopwatch from the initial sitting position (prior to the first stand) to the final standing position (at the end of the fifth stand); a higher time is indicative of worse physical function.

Covariates (at baseline)

Age, sex, income (CAD <$20,000, ≥$20,000 to <$50,000, ≥$50,000 to <$100,000, ≥$100,000 to < $150,000, ≥$150,000), education (less than secondary school graduation, secondary school graduation, no post-secondary education, some post-secondary education, post-secondary degree/diploma) were included in our analysis. These variables were included in models because of their established effects on falls-related outcomes in older adults.[25]

Statistical Analysis

Only participants with complete data were used to analyze prevalence estimates and associations of sedentary time with each outcome variable. Participants without follow-up data were removed (n= 2,333), as were those with missing sedentary time (n= 584), age and sex (n=1), timed up and go time (n=310), grip strength (n=1,831), chair rise time (n=613), education (n=38), and household income (n=1,446). This resulted in a sample of 22,942 participants before removing participants with missing data on the outcome variables. Table 1 shows a comparison between included and excluded participants, with the latter being older and having lower functional fitness. Only participants with complete data were included in our models; this produced different sample sizes for the analysis of each fall and falls-related injuries.

Descriptive analysis stratified by age category (middle-aged <65, older adult ≥65) and sex (males and females) were conducted to report the prevalence of falls and falls-related injuries. Logistic regression models were used to estimate the crude relationship between sedentary time at baseline to

TABLE 1.
Comparison of covariates and exposures between excluded and included participants

Variables[a]		*Excluded*	*Included*
Sedentary Group	Lower	2,358 (48.9%)	14,493 (63.2%)
	Higher	1,880 (39%)	8,449 (36.8%)
	Missing	584 (12.1%)	0 (0%)
Age Group	<65 years	2,272 (47.1%)	14,148 (61.7%)
	≥65 years	2,550 (52.9%)	8,794 (38.3%)
	Missing	0 (0%)	0 (0%)
Sex	Male	2,895 (60%)	11,237 (49%)
	Female	1,927 (40%)	11,705 (51%)
	Missing	0 (0%)	0 (0%)
Education	<Secondary school graduation	356 (7.4%)	1,024 (4.5%)
	Secondary school graduation, no post-secondary education	577 (12%)	1,961 (8.5%)
	Some post-secondary education	414 (8.6%)	1,608 (7%)
	Post-secondary degree/diploma	3,432 (71.2%)	18,349 (80%)
	Missing	43 (0.9%)	0 (0%)
Income	< $20,000	313 (6.5%)	990 (4.3%)
	$20,000 or more, but less than $50,000	903 (18.7%)	4,714 (20.5%)
	$50,000 or more, but less than $100,000	1,105 (22.9%)	8,181 (35.7%)
	$100,000 or more, but less than $150,000	485 (10.1%)	4,732 (20.6%)
	$150,000 or more	292 (6.1%)	4,325 (18.9%)
	Missing	1,724 (35.8%)	0 (0%)
Timed Up and Go		10.5 (4.0)	9.3 (2.0)
Grip Strength		31.8 (11.5)	35.8 (11.8)
Chair Rise		13.8 (4.1)	13.2 (3.7)

[a]Based on chi-squares and Kruskal-Wallis tests, all variables were significantly different between groups.

falls and falls-related injuries. The analysis was then adjusted for functional fitness scores and sociodemographic variables (age, sex, income, education). The analytic weights provided by CLSA were used in the logistic regression models. These weights were proportional to the inflation weights used to adjust for sample representation in CLSA, but rescaled to the sample size and provincial region where each Data Collection Site is located. All analyses were conducted in R version 4.0.3 (The R Foundation for Statistical Computing, https://www.r-project.org/foundation/) and RStudio version 1.3 1093 (RStudio, PCB; Boston, MA), and statistical significance was set at 0.05.

RESULTS

The sample sizes, mean age, and prevalence estimates stratified by sedentary group, age group, and sex are described in Table 2. Among females aged 65 and older in the higher sedentary group, 12.6% reported a fall at baseline. In contrast, only 10% of females aged 45–64 years who reported lower sedentary time reported a fall. Among women aged 65 and older who reported higher sedentary time, 56.3% reported an injury that was due to a fall; in contrast, only 44.1% of males over 65 years who reported higher sedentary time reported such a falls-related injury.

Associations between sedentary groups and falls-related outcomes are presented in Table 3. In unadjusted models, the odds of a fall in the past 12 months (at baseline) was higher among those in the higher sedentary group (OR:1.27; 95% CI 1.16–1.38), and the odds of a falls-related injury (at follow-up) was also higher among those in the higher sedentary group (OR:1.16; 95% CI 1.01–1.32) compared to the lower sedentary group. In adjusted models, the odds of falls in the past 12 months were higher among those in the higher sedentary group (OR:1.21; 95% CI 1.11–1.33). Each second slower in the Timed Up and Go test increased the odds of a fall in the past 12 months (OR:1.03; 95% CI 1.00–1.05) and a falls-related injury at follow-up (OR:1.11; 95% CI 1.06-1.16). Each kilogram more in the Grip Strength test was negatively associated to the odds of a fall in the past 12 months (OR:0.99; 95% CI 0.98–0.99) and a falls-related injury at follow-up (OR:0.97; 95% CI 0.97–0.98).

DISCUSSION

Our aim was to report prevalence of falls by sedentary time, and to determine whether there was an association between sedentary time and self-reported falls or falls-related injury in older adults. Our primary finding is that middle-aged and older adults who report higher volumes of leisure sedentary time are more likely to report a fall, even when accounting for functional fitness (cross-sectional data). Our secondary finding is that functional fitness test scores between those reporting higher and lower sedentary time were not meaningfully different when comparing those who reported a fall or falls-related injury to those who did not (Table 2). These findings are the first to our knowledge to closely investigate the associations of sedentary time and falls in the context of functional fitness of middle aged and older Canadians, and have important implications for the design of future interventions aimed at reducing the risk of falls and falls-related outcomes.

We found that reporting higher volumes of leisure sedentary time increased the odds of reporting a fall in the past 12 months in middle-aged and older females and males. This is not surprising given that research suggests a strong association between sedentary time and functional fitness outcomes.[13] In fact, a 12-week intervention aimed at reducing sitting time in older adults led to significant improvements in functional fitness as measured by the Short Physical Performance Battery.[26] Interestingly, this effect was found despite finding that there were no significant changes in total device-measured sedentary time; however, there were changes in moderate-intensity physical activity. This anomaly could be because breaking up prolonged bouts of sedentary time is more important in terms of providing a stimulus for functional fitness than simply reducing the total amount of time spent sedentary.[18,27] It is important to note that, in the present study, this analysis was cross-sectional, and reverse-causality cannot be ruled out. Thus, it is possible that those who reported more falls increased their sitting time. This would be in line with previous research that suggests an association between sedentary time and fear of falling.[28] Future research is needed to better address concerns related to fear of falling to ensure that older adults, their caregivers, and health professionals are not encouraging behaviours that increase sedentary time.

It is also important to note that we found associations despite using leisure sedentary time, not total sedentary time, as our measure. The results with total sedentary time may have been more robust; however, the CLSA does not contain a total sedentary time variable. This also suggests that those who are at risk of falls may need to reduce time spent sitting while participating in leisure activities in addition total sedentary time. The lack of associations observed between falls-related injury and sedentary time after accounting for functional fitness and other covariates may also be explained by the use of leisure sedentary time instead of total sedentary time. Self-reported measures consistently underestimate sedentary time.[14] Thus, future research using device-measured sedentary time would also allow us to capture total sedentary time to better determine its association with falls-related outcomes.

Our prevalence estimates for falls in the past 12 months at baseline were lower than anticipated. Prevalence ranged from 7–12% compared to 36% from previously published data on community-dwelling older adults.[29] A review of Canadian data published over 10 years ago found that the prevalence of falls in community-dwelling older adults was between 20–33%, and that rates were highest in the oldest-old.[25] Variation in the questions asked, and methods used, to estimate falls and falls-related outcomes could explain some of these differences.

It is also important to note that differences in functional fitness scores between the higher and lower sedentary groups

TABLE 2.
Prevalence of falls and falls-related injury by sedentary time in middle-aged and older females and males

	Falls in the last 12 months (baseline) n = 22,930															
	45-64 years								*65 years and older*							
	Females				*Males*				*Females*				*Males*			
Sedentary Group	*Lower ST*		*Higher ST*		*Lower ST*		*Higher ST*		*Lower ST*		*Higher ST*		*Lower ST*		*Higher ST*	
Sample size[a]	n=4,719		n=2,396		n= 4,778		n=2,251		n=2,323		n=1,795		n= 2,669		n= 1,999	
Occurrence of falls at baseline	*Falls*	*No falls*	*Falls*	*No falls*	*Falls*	*No falls*	*Falls*	*No falls*	*Falls*	*No falls*	*Falls*	*No falls*	*Falls*	*No falls*	*Falls*	*No falls*
Sample size[a]	n=474 (10.0%)	n=4245 (89.9%)	n=290 (12.1%)	n=2106 (87.8%)	n=345 (7.2%)	n=4433 (92.7%)	n=229 (10.1%)	n=2022 (89.8%)	n=281 (12.0%)	n=2042 (87.9%)	n=227 (12.6%)	n=1568 (87.3%)	n=210 (7.8%)	n=2459 (92.1%)	n=197 (9.8%)	n=1802 (90.1%)
Age[b]	55.0 (5.3)	55.0 (5.4)	56.3 (5.0)	56.1 (5.3)[c]	55.2 (5.2)	55.4 (5.4)	56.6 (5.1)	56.3 (5.4)[c]	72.6 (5.5)	72.3 (5.5)	73.3 (5.5)	72.7 (5.6)[c]	73.1 (5.6)	72.7 (5.5)	73.2 (5.4)	72.5 (5.4)
Timed Up and Go Time[d]	8.6 [1.9]	8.6 [1.8]	8.7 [2.1]	8.8 [1.8][c]	8.9 [1.7]	8.8 [1.8]	9.1 [1.8]	8.9 [1.9][c]	9.7 [2.7]	9.6 [2.3]	9.9 [2.6]	9.8 [2.3][c]	9.7 [2.4]	9.6 [2.3]	10.2 [2.6]	9.8 [2.4][c]
Grip Strength[d]	28.7 [8.0]	28.8 [7.2]	27.6 [7.1]	28.0 [7.5][c]	46.9 [13.3]	47.5 [11.7]	45.6 [12.1]	46.5 [12.2][c]	24.0 [5.8]	24.3 [6.8]	23.1 [6.4]	23.6 [6.6][c]	39.7 [10.3]	40.1 [11.7]	37.7 [9.8]	39.5 [10.8][c]
Chair Rise Time[d]	12.3 [3.7]	12.2 [4.1]	12.7 [4.3]	12.6 [4.2][c]	12.2 [4.5]	12.2 [4.0]	13.0 [4.8]	12.3 [4.1][c]	14.0 [5.2]	13.7 [4.6]	14.1 [4.8]	14.0 [4.9]	13.3 [4.1]	13.3 [4.5]	13.8 [4.8]	13.6 [4.7][c]
	Falls-related injury (follow-up) n = 3,996															
	45-64 years								*65 years and older*							
	Females				*Males*				*Females*				*Males*			
	Lower ST		*Higher ST*		*Lower ST*		*Higher ST*		*Lower ST*		*Higher ST*		*Lower ST*		*Higher ST*	
Sample size[a]	n=913		n=443		n=957		n=466		n=328		n=259		n=356		n=274	
Occurrence of falls-related injury	*Injured*	*Not Injured*	*Injured*	*Not Injured*	*Injured*	*Not Injured*	*Injured*	*Not Injured*	*Injured*	*Not Injured*	*Injured*	*Not Injured*	*Injured*	*Not Injured*	*Injured*	*Not Injured*
Sample size[a]	n=343 (37.5%)	n=570 (62.4%)	n=173 (39.0%)	n=270 (60.9%)	n=223 (23.3%)	n=734 (76.6)	n=117 (25.1%)	n=349 (74.8%)	n=180 (54.8%)	n=148 (45.1%)	n=146 (56.3%)	n=113 (43.6%)	n=154 (43.2%)	n=202 (56.7%)	n=121 (44.1%)	n=153 (55.8%)
Age[b] (yr)	55.4 (5.2)	54.1 (5.2)	55.6 (5.3)	55.9 (5.3)[c]	55.0 (5.4)	54.5 (5.3)	56.3 (5.4)	55.7 (5.5)	73.1 (5.5)	72.0 (5.3)	73.0 (5.7)	71.7 (5.8)	74.1 (5.9)	70.6 (4.9)	73.8 (5.8)	71.7 (5.4)[c]
Timed Up and Go Time[d] (sec)	8.6 [1.9]	8.5 [1.7]	8.8 [1.8]	8.7 [1.7][c]	8.8 [1.8]	8.8 [1.8]	9.4 [2.2]	8.9 [1.8][c]	9.8 [2.8]	9.5 [2.1]	10.2 [2.5]	9.3 [2.1][c]	9.8 [2.2]	9.3 [2.4]	10.3 [2.7]	9.6 [2.1][c]
Grip Strength[d] (kg)	28.8 [7.3]	29.3 [7.6]	27.5 [8.2]	28.5 [7.5][c]	46.9 [12.6]	48.7 [12.1]	46.5 [13.2]	47.9 [11.5][c]	23.5 [6.6]	23.5 [7.3]	23.2 [7.1]	24.2 [6.2]	38.8 [12.7]	41.6 [10.7]	37.4 [10.2]	39.7 [9.7][c]
Chair Rise Time[d] (sec)	12.0 [4.1]	11.8 [4.0]	12.5 [4.2]	12.6 [4.5][c]	12.2 [4.2]	11.8 [3.8]	11.9 [5.3]	11.7 [3.8]	14.0 [5.1]	13.1 [5.1]	14.5 [5.0]	14.2 [4.7][c]	13.5 [4.4]	12.5 [4.8]	14.2 [5.4]	12.8 [4.6][c]

[a]Sample only includes those with complete data; prevalence estimates are not weighted.
[b]Age is reported as mean ± SD.
[c] $p<.05$ for the difference between event and no-event in each ST group.
[d]Physical function tests values reported with median and iqr.
ST = sedentary time; Lower ST = ≤ 1080 min; Higher ST = > 1,080 min.

TABLE 3.
Associations between falls-related outcomes and sedentary groups in middle-aged and older females and males

	Falls in the Last 12 Months (at Baseline)	*Falls-Related Injury (Follow-Up)*
Sedentary Time Groups		
Lower ST(crude)	Referent	Referent
Higher ST(crude)	1.27(1.16-1.38)[b]	1.16(1.01-1.32)[b]
Lower ST(adjusted)	Referent	Referent
Higher ST (adjusted)	1.22(1.11-1.33)[b]	1.01(0.88-1.17)
Physical Function Tests		
Timed Up and Go time	1.03(1.00-1.05)[b]	1.11(1.06-1.16)[b]
Grip Strength	0.99(0.98-0.99)[b]	0.97(0.97-0.98)[b]
Chair Rise time	1.00(0.99-1.02)	1.01(0.98-1.03)
Age Groups[a]		
45–64 years	Referent	Referent
65+ years	0.98(0.88-1.08)	1.68(1.43-1.97)[b]
Sex[a]		
Female	Referent	Referent
Male	0.85(0.74-0.98)[b]	0.77(0.63-0.96)[b]
Education[a]		
Less than secondary school graduation	Referent	Referent
Secondary school graduation	0.90(0.70-1.17)	0.86(0.57-1.31)
Some post-secondary education	1.03(0.79-1.35)	0.87(0.57-1.34)
Post-secondary degree/diploma	1.10(0.89-1.37)	0.81(0.56-1.15)
Household Income[a]		
Less than $20,000	Referent	Referent
$20,000 or more, but less than $50,000	0.80(0.65-0.98)[b]	1.28(0.89-1.84)
$50,000 or more, but less than $100,000	0.77(0.63-0.95)[b]	1.17(0.83-1.67)
$100,000 or more, but less than $150,000	0.80(0.64-0.99)[b]	1.33(0.92-1.92)
$150,000 or more	0.73(0.58-0.91)[b]	1.09(0.75-1.58)

[a]All covariates (age, sex, income, education) are from the adjusted model; only those with complete data for all covariates were included; models are weighted (CLSA weights).
[b]$p<.05$.
Lower ST = ≤ 1080 min; Higher ST = > 1,080 min.

when comparing the prevalence of falls and falls-related outcomes, although significantly different in some cases, were small in magnitude. In other words, sedentary time may be an important indicator of falls and falls-related injury risk because functional fitness scores do not vary in such homogenous populations of community-dwelling older adults. Thus, there may be clinical value in targeting sedentary time in those who are at risk for falls. It has been suggested that starting with an emphasis on reducing sedentary time may be a more feasible target for behaviour change among those who are inactive.[30] This approach may lead to greater long-term adherence, and thus decrease the burden of falls on individuals and the health-care system.[31] Research using randomized controlled designs is needed to determine the effect of such an approach.

As mentioned above, our measure of leisure sedentary time is a limitation of the present study. Although a valid and reliable tool was used, self-reported leisure sedentary time underestimates total sedentary time.[13] Thus, it is possible that more robust and stronger associations would be observed with device-measured data. It should also be noted that a formal definition of falls was not offered to participants; this may have increased the potential for misclassification bias. Selection bias may have impacted results based on loss to follow-up or missing data. Nevertheless, the present analysis used a large, representative sample of the Canadian population and incorporated a longitudinal design.

In conclusion, older adults who report higher volumes of sedentary time have higher odds of self-reporting a fall in the past 12 months. Sedentary time should be investigated as an indicator of falls and falls-related injury risk in community-dwelling older adults. Future interventional research using device-measured total sedentary time and breaks in sedentary time are needed to determine the effectiveness of sedentary time reduction on falls among a rapidly aging global population.

ACKNOWLEDGEMENTS

This research was made possible using the data/biospecimens collected by the Canadian Longitudinal Study on Aging

(CLSA). Funding for the Canadian Longitudinal Study on Aging (CLSA) is provided by the Government of Canada through the Canadian Institutes of Health Research (CIHR) under grant reference: LSA 94473, and the Canada Foundation for Innovation, as well as the following provinces: Newfoundland, Nova Scotia, Quebec, Ontario, Manitoba, Alberta, and British Columbia. This research has been conducted using the CLSA dataset [Dataset version 5.0 and Follow-up 1 Comprehensive Dataset version 3.0], under Application 2006006. The CLSA is led by Drs. Parminder Raina, Christina Wolfson, and Susan Kirkland. We would like to thank John Cullen (Memorial University) for his support with the data analysis for this manuscript.

CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal*'s policy on conflicts of interest disclosure and declare that we have none.

FUNDING

This work did not receive external funding

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