Preventive Medicine Reports 2 (2015) 90–95

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: http://ees.elsevier.com/pmedr

Objectively measured and self-reported sedentary time in older Canadians

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ARTICLE INFO

Available online 24 January 2015

Keywords:
Sitting
Physical activity
Health
Aging
Retirement

ABSTRACT

Objective. The aim of this study was to examine objectively measured total and self-reported leisure sedentary time among older Canadians by work status.

Methods. The analysis was based on 1729 older adults (60–79 years) from the 2007/09 and 2010/11 Canadian Health Measures Survey. Work status, functional limitations, smoking, and perceived health were assessed by self-report and waist circumference (WC) was measured. Total sedentary time (ST) and physical activity (PA) were objectively measured by accelerometer and leisure sedentary activities were assessed by questionnaire.

Results. 93.6% of individuals were sedentary for 8 or more hours per day. Measured ST did not differ by work status, while self-reported leisure ST was higher in those not working compared to those working (239 vs. 207 minutes/day, $p < 0.05$). Correlates of measured ST were fair/poor perceived health (β: 28.76, $p < 0.01$), smoking (β: 17.12, $p < 0.05$), high-risk WC (β: 13.14, $p < 0.05$), and not meeting PA guidelines (β: 35.67, $p < 0.001$). For self-reported leisure ST, working status (β: 33.80, $p < 0.001$) and functional limitations (β: 16.31, $p < 0.05$) were significant correlates.

Conclusions. Older adults accumulate substantial ST regardless of their working status and ST is correlated with indicators of health risk. Older adults are an important target population for interventions to reduce ST.

It is well known that physical activity (PA) reduces the risk of morbidity, mortality and loss of independence as we age (Paterson and Warburton, 2010). Recently, sedentary behaviour has emerged as an independent risk factor for chronic disease (Owen et al., 2009; Lord et al., 2011) and although current guidelines for sedentary behaviour focus on children and youth, the potential health consequences of prolonged sedentary time (ST) for older adults are significant. Gardiner et al. (2011b) found a positive association between overall self-reported ST and metabolic syndrome and a recent systematic review concluded there is a relationship between ST and mortality among older adults (de Rezende et al., 2014). These findings are particularly important in light of evidence that the amount of time spent sedentary increases with age (Colley et al., 2011; Dogra and Stathokostas, 2014; Godfrey et al., 2014). Despite this, there are few studies examining the correlates of objectively measured ST among older adults.

The workplace is a key setting for prolonged bouts of ST (Thorp et al., 2012) and although the relationship between work and leisure behaviours is complex (Wu and Porell, 2000), McCrady and Levine (2009) used objective measures to demonstrate that work days are associated with more sitting and less walking compared to leisure days. Mabry et al. (2012) also found that women who were employed reported 49% more sitting time compared to those who were not. In light of these findings, it seems reasonable to assume that retirement might provide an opportunity for both increased leisure-time PA and reduced ST among older adults. However, previous studies addressing the effect of retirement on PA and health have produced conflicting results (Chung et al., 2009; Henkens et al., 2008) and there are far fewer studies of older adults that have examined the relationship between sedentary behaviour and working status. This may be particularly important since an increasing life expectancy combined with a decline in the working age population means that more Canadians will continue working into their 60s and 70s (Payne and Doyal, 2010). Recently, Dogra and Stathokostas (2014) reported that retired men were 1.36 times more likely to report sitting for 4 or more hours/day than those who were not retired. In contrast, Godfrey et al. (2014) used objective measurements to show that individuals who were retired spent a lower percentage of their time sedentary compared to those who were still employed. These markedly different findings warrant further examination. Thus, the purpose of this study was to use a large nationally representative dataset to examine sociodemographic, anthropometric, and behavioural correlates of both objectively measured total ST and self-reported leisure ST among working and not-working older Canadians.

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http://dx.doi.org/10.1016/j.pmedr.2015.01.003

Methods

The present study used data from cycles 1 and 2 of the Canadian Health Measures Survey (CHMS). Approximately 96% of the Canadian population is represented in the CHMS: residents of Indian Reserves or Crown lands, institutions, certain remote regions, and full-time members of the Canadian Forces were excluded. Data were collected from March 2007 to February 2009 (cycle 1) and from August 2009 to November 2011 (cycle 2). Data collection consisted of a questionnaire on socio-demographic characteristics and health behaviours administered at the respondent's home, followed by anthropometric and fitness tests at a subsequent visit to a mobile examination centre. Of the households selected across both cycles of the survey, 72.7% provided the sex and date of birth of all household members and one or two members were then selected to participate. Of those selected, 89.3% completed the questionnaire, and 83.3% of those participated in the visit to the mobile clinic. The final response rate after adjusting for the sampling strategy was 53.5% (Statistics Canada, 2013). The final sample size for the combined cycles 1 and 2 was 11,398 respondents aged 6 to 79. The target sample for the present analysis was older adults aged 60 to 79 years ($n = 2194$). Of those, 447 had incomplete accelerometry data, and an additional 18 had incomplete working status information. Therefore, the present analysis is based on 1729 older adults aged 60 to 79 years. Ethics approval for the CHMS was obtained from Health Canada's and the Public Health Agency of Canada's Research Ethics Board and informed, written consent was obtained from all participants (Day et al., 2007).

Working status

Respondents were classified as "working" if they answered yes to the question "Last week, did you work at a job or business?" or to the question "Last week, did you have a job or business from which you were absent?" Respondents were classified as "not working" if they indicated they were retired, or if they answered no to the questions above. All respondents aged 76 to 79 were assumed to be "not working" since they were not asked any questions related to employment during the household interview.

Sedentary time

All ambulatory respondents were provided with an Actical accelerometer to wear over the right hip during all waking hours for 7 days (Statistics Canada, 2010, 2012). The Actical accelerometer measures the acceleration of movement in all directions (omnidirectional); movement is captured and recorded as a digitized value that is summed over 1 minute intervals resulting in 10,080 activity counts per minute (cpm) values in a week. Accelerometer data reduction followed published guidelines to identify and remove invalid data (Colley et al., 2010). Total daily accelerometer wear time was determined by identifying non-wear time which was defined as periods of at least 60 consecutive minutes of zero counts, with an allowance for 1 or 2 min of counts between 0 and 100 cpm. A valid day was defined as having at least 10 h of wear-time and only participants with at least four valid days of data were included in this analysis (Colley et al., 2010). Sedentary time was defined as ≤100 cpm and total ST (in minutes) per day was determined. Respondents were also grouped as ≥8 or <8 hour daily ST.

Leisure ST was determined using information collected in the questionnaire. Participants were asked how many hours per week they typically spent doing the following 4 activities outside of work: watching TV, playing video games, using computers, or reading. In cycle 1, answers were collected in categories (e.g. none, less than 1 h, 1 to 2 h, etc.) but were collected as continuous responses (e.g. number of hours entered as a numeric value) in cycle 2. For purposes of consistency between cycles, the number of hours reported for the various activities in cycle 2 was calculated as a grouped variable using the same categories presented in cycle 1. This grouped variable was used to calculate the total number of minutes of leisure ST per day.

Health indicators

Detailed descriptions of the measurement procedures for each of the CHMS physical measurement components are available elsewhere (Statistics Canada, 2010, 2012). In cycle 1, WC was measured as per the World Health Organization (WHO) protocol and in cycle 2, WC was measured as per the National Institutes of Health (NIH) protocol. In order to compare between cycles, a prediction equation developed by Patry-Patrisien et al. (2012)) was used to calculate a predicted NIH-WC value based on the WHO-WC measurements collected in cycle 1. Ardern et al. (2004) identified threshold waist circumference values within different BMI categories that identify individuals with increased health risk. These values were used in the present analysis and each respondent was categorized as either "below" or "above" the BMI-specific threshold value for increased risk. For men, the thresholds are 90, 100, 110, and 125 cm for normal weight, overweight, obese class I, and obese class II and III, respectively. For women, the thresholds are 80, 90, 105, 115 and 125 cm for normal weight, overweight, obese class I, obese class II, and obese class III, respectively (Ardern et al., 2004).

PA was determined based on data collected from the accelerometer with a cut-point of ≥1535 cpm used to identify minutes of moderate-to-vigorous PA (MVPA) during wear-time, which were summed for each valid day. Based on the weekly total, respondents were categorized as either "meeting the guidelines" (≥150 minute MVPA per week) or "not meeting the guidelines" (<150 minute MVPA per week).

Finally, all respondents were asked to report their perceived health status as either poor, fair, good, very good, or excellent. For the purpose of this analysis, poor and fair were grouped together.

Covariates

Other covariates considered were age, gender, education (post-secondary graduate, yes/no), smoking status (smoker/non-smoker), and an indicator of functional limitations (yes/no) based on the Health Utility Index function codes for mobility trouble and activities prevented by pain. Respondents were considered to have a functional limitation if they indicated having any mobility problem or pain that prevents any activity.

Statistical analysis

Conventional descriptive statistics were used to describe the sample distribution and to summarize measured total ST, prolonged ST, and self-reported leisure ST, by age group, gender, and working status. Differences in ST by gender or by working status were evaluated using *t*-tests, using a *p*-value of <0.05 to indicate significance. Separate linear regression models were used to evaluate the associations between ST and working status, WC risk, self-perceived health, and PA level. The models were adjusted for age, gender, education, smoking status and functional limitations, and results are presented in minutes per day. A multivariate linear regression model was used to evaluate the association between measured total ST and leisure ST, adjusted for age, gender, education, smoking status, and functional limitations. All models where measured ST was the outcome of interest were also adjusted for accelerometer wear-time (hours), to account for differences in total wear-time throughout the week. When self-reported leisure ST was the outcome of interest, the models were also adjusted for sleep time (hours). Sleep was not adjusted for in the objectively measured ST models as the accelerometer wear-time acts as a proxy for sleep since respondents are asked to wear the device for all waking hours.

All analyses were completed using SAS v9.2 and SUDAAN v10. All results were weighted using the activity monitor sub-sample weights