

Correlates of General and Domain-Specific Sitting Time Among Older Adults

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Objective: To examine correlates of sitting time among a population-based sample of older adults. **Methods:** Adults ≥ 55 years of age ($N = 1,296$; $N = 515$ employed; $N = 781$ unemployed) completed self-report measures of demographic and health-related variables, and a measure of sitting time (ie, SIT-Q).

Results: Employed total sitting time (min/day) was positively associated with home internet access ($B = 71.2$, 95% CI, 8.9 to 133.4, $p = .025$), body mass index (BMI) (kg/m^2 ; $B = 7.0$, 95% CI, 2.1 – 11.9, $p = .005$), and negatively associated with physical health ($B = -2.3$; 95% CI, -4.9 to 0.3, $p = .013$). Unemployed total sitting time was negatively associated with age (B per year = -3.0 , 95% CI, -4.9 to -1.1, $p = .002$), and male sex ($B = -54.0$, 95% CI, -86.7 to -21.3, $p = .001$). Unemployed total sitting time was positively associated with internet access ($B = 54.1$, 95% CI, 17.7 to 90.4, $p = .004$) and BMI ($B = 4.1$, 95% CI, .94 to 7.3, $p = .011$). **Conclusions:** Older adults reported low levels of sitting time. Different correlates emerged for the employed and unemployed samples across sitting domains.

Keywords: Older adults; sedentary; employment

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INTRODUCTION

Sedentary behaviors have been conceptualized as sitting or reclining, and in the energy-expenditure range of 1.0 to 1.5 metabolic equivalents (METs).¹ Spending large amounts of time sitting is increasingly acknowledged as a distinct risk factor for premature mortality and chronic disease.^{2,3} A recent systematic review and meta-analysis of 47 studies found significant hazard ratio associations of sedentary time with all-cause mortality, cardiovascular disease mortality and incidence, cancer mortality and incidence, and type 2 diabetes incidence.⁴ The health impacts of sedentary time extend into older age with high levels of sedentary time in this population associated with an increased risk of all-cause mortality and the metabolic syndrome, waist circumference, and overweightness/obesity.⁵

Adults above 50 years of age have the highest levels of sedentary time⁶ and emerging evidence suggests older adults spend the overwhelming majority of their day in sedentary pursuits.^{7,8} One recent systematic review suggested older adults spend on average 9.4 hours per day sedentary, as determined by objective measures, whereas estimates derived from self-report measures were considerably lower (5.4 hours per day).⁹

Given the high levels of sedentary time in older adults and the impact of this time on health in this population, this behavior is increasingly recognised as a health behavior change target. In order to enable the targeting and tailoring of interventions for the most sedentary it is important to investigate the demographic and health-related correlates of sedentary time among older adults. Compared to overall total sitting time, evidence suggests that different sedentary

behaviors contexts [eg, television (TV) viewing] show differential associations with metabolic syndrome.¹⁰ Therefore, it may be of importance to investigate correlates of different sedentary contexts in addition to overall sitting time. Common sedentary behaviors that have shown deleterious associations with health outcomes include sitting at work,¹¹ TV and computer use,¹² and transport related sitting.^{13,14} To date there are no studies that have identified investigated correlates of multiple individual behaviors or individual behaviors and total sedentary time.

We recently completed the Alberta Older Adult Health Behavior (ALERT) study; a population-based study designed to examine various health behaviors and associated health outcomes among older adults.¹⁵ The purpose of the present study was to examine the correlates of sitting time among a population-based sample of older adults.

METHODS

The ALERT Study¹⁵ was a cross-sectional study that was conducted using random digit dialing and computer assisted telephone interviewing. Random digit dialing ensured that households in each of the 5 provincial health zones had an equal chance to be contacted whether or not their household was listed in a telephone directory. All participant recruitment and data collection were conducted through a centralized research unit - the Population Research Laboratory at the University of Alberta (Edmonton, Alberta, Canada). Older adults across the province of Alberta were eligible to participate if they were at least 55 years of age, were able to walk unassisted (without the aid of a wheelchair or walking aid), community dwelling (not living in an aged care setting) and were able to complete a computer-assisted telephone survey in English. Overall, a population-based and representative sample of 1,296 older adults participated in the study. The ALERT Study was approved by the University of Alberta's Health Research Ethics Board as well as the Athabasca University Research Ethics Board.

Measures

Demographic and health information were self-reported, and included sex, age, income, education, height and weight [for body mass index (BMI)], home internet access, cultural background, and smoking status.

Employment was assessed by asking participants ‘What is your employment status?’ Response options included full-time (30 hours or more), part-time (less than 30 hours), unemployed (looking for work), not in labour force (not looking for work), retired, homemaker, on disability/medical leave, and seasonal work.

Sitting time was assessed using items from the SIT-Q, a measure designed to assess past year habitual sitting behaviors among adults, across work, transportation, leisure-time and household domains.¹⁶ Due to interview length restrictions, we utilised the work and transportation sections of the SIT-Q, and we combined items from the leisure-time domains that assessed computer/smartphone use (not while at work) and television viewing to generate a leisure screen time domain. Each item asked participants to estimate how much time, on average, they usually spent per day in each type of sitting. Participants were asked to best estimate their usual pattern over the past 12 months. A total sitting time variable was created by summing across the domains. The SIT-Q has demonstrated suitable reliability and validity.¹⁶

Physical activity was assessed using the leisure score index (LSI) of the Godin Leisure-Time Exercise Questionnaire (GLTEQ).¹⁷ The GLTEQ contains 3 questions that assess the frequency of mild, moderate, and strenuous physical activity during free time in an average week over the past month. For each of the 3 intensity categories, examples of activities are given that are appropriate for each category. An independent evaluation of the GLTEQ found its reliability

to compare favorably to 9 other self-report measures of exercise based on various criteria, including test-retest scores, objective activity monitors, and fitness indices.¹⁸

Health-related quality of life was measured using the 4-week version of the RAND-12 Health Status Inventory (RAND-12).¹⁹ Six items are used to construct the Physical Health Score (PHS) and 6 for the Mental Health Score (MHS); higher scores indicate better quality of life. Scores range from 0 to 100 and lower scores on the MHC and the PHC indicate greater disability (>50 = no disability; 40-50 = mild disability; 30-40 = moderate disability). A PHC score <42 suggests that perceived physical health problems are impeding life functioning, while a MHC score <38 likely indicates that an individual is experiencing psychological symptoms that might be impeding life functioning.¹⁹

Health literacy was assessed using 3 health literacy screening questions developed and validated by Chew and colleagues.²⁰ We measured HL by using 3 brief screening questions (difficulty in understanding written information, confidence in completing medical forms, needing help in reading medical information) that have been previously used and validated in older adults.²⁰ Each question was scored from 1 to 5 with higher scores indicating lower HL, and a cut-off point of 9.0 or higher for the weighted summative score (range = 3–15) indicating inadequate HL.

Chronic health conditions were assessed by asking participants to indicate (yes, no, or don't know) whether they had been told by a health professional that they have had: diabetes (and diabetes type), cancer (cancer type, and date of diagnosis), stroke, kidney dysfunction, fibromyalgia, rheumatoid arthritis, mood disorder, high blood pressure, or high blood cholesterol.

Statistical Analysis

All analyses were conducted with Stata MP 14, StatCorp, Copyright 1984–2009 (College Station, Texas, USA). Total sitting time amongst employed adults makes a sizable contribution to occupational sitting. Given our sample of adults (55 years of age and older) is close to the age, many individuals retire, we stratified our analyses according to employment status. ‘Employed adults’ (N = 515, 39.7%) were either working full or part-time. ‘Unemployed adults’ (N = 781, 60.3%) were either unemployed (looking or not looking), retired, homemaker, or on disability. For the unemployed sample, total sitting time consisted of only the leisure screen time variables and transport domain (there was no sitting time reported within the occupational domain). Separate linear regression models were fitted for those employed and unemployed to assess the associations between predictors and our outcomes of interest (total sitting time and domains). In addition to univariate analysis, multivariate models where all predictor variables were forced into each regression model to determine their independent associations with total sitting time and domain-specific sitting time were completed. All models were adjusted for age, BMI, waist circumference, physical health composite score, mental health composite score, total moderate-to-vigorous physical activity (MVPA) minutes, sex, married, income, home internet access, education, cultural background, other health preventive behaviors (ie, cancer screening, osteoporosis screening, multivitamin use, aspirin use, flu shot), health literacy, smoking, and comorbidities.

RESULTS

Details of study flow have been presented elsewhere.¹⁵ In summary, the Population Research Lab made 102,977 dialings on 36,000 unique telephone numbers to obtain 1,296

completed interviews for the study (yield 3.6% per unique telephone number). Of eligible households, the response rate was 18.5%.

Participant characteristics

Table 1 presents information for the overall sample, as well as the employed and unemployed samples. Among 1,296 participants, the average age was 66.4 years ($SD = 8.2$), 555 (43%) were male, and 1,221 (94%) were Caucasian. The majority of participants were married (65%), had some level of advanced education (college or university; 62%), reported an annual income over \$60,000 per year (55%), and had home internet access (86%). Most participants were not employed (eg, retired, looking for work) (60.3%, $N = 781$) with the remainder employed (ie, full, part-time) (39.7%, $N = 515$). Of the 781 participants who were not employed, 86.8% ($N = 678$) were retired.

Sitting time

Employed older adults in this study engaged in 385 minutes ($SD = 189$), or 6.4 hours, of total sitting time in a typical day over the past year. These participants reported 61 minutes ($SD = 59$) of sitting during transport, 198 minutes ($SD = 122$) of leisure screen time, and 127 minutes ($SD = 133$) while working (Table 1). Unemployed older adults engaged in 296 minutes ($SD = 186$), or 4.9 hours, of total sitting time. These participants reported 59 minutes ($SD = 94$) of sitting during transport, and 237 minutes ($SD = 158$) of leisure screen time (Table 1).

Correlates of total sitting time

Tables 2 and 3 present linear regression models for employed and unemployed adults, respectively.

Employed total sitting time was positively associated with home internet access ($B = 71.2$, 95% CI, 8.9 to 133.4, $p = .025$; ie, those with internet access engaged in more sitting time)

and BMI (kg/m^2 ; $B = 7.0$, 95% CI, 2.1 – 11.9, $p = .005$; ie each additional kg/m^2 associated with 7 minutes extra sitting time), and negatively associated with physical health ($B = -2.3$; 95% CI, -4.9 to -0.3, $p = .013$, ie, better physical health was associated with less sitting time) (Table 2).

Unemployed total sitting time was negatively associated with age ($B = -3.0$, 95% CI, -4.9 to -1.1, $p = .002$; ie each additional year of age was associated with 3 minutes less sitting time) and sex ($B = -54.0$, 95% CI, -86.7 to -21.3, $p = .001$; ie, females engaged in more sitting time than men), and positively associated with home internet access ($B = 54.1$, 95% CI, 17.7 to 90.4, $p = .004$; ie, those with internet access engaged in more sitting time) and BMI ($B = 4.1$, 95% CI, .94 to 7.3, $p = .011$; ie, each additional kg/m^2 associated with 4 minutes extra sitting time) (Table 3).

Employed leisure screen time was negatively associated with income \$60k to <100k ($B = -34.4$, 95% CI, -67.8 to -0.9, $p = .044$) and mental health ($B = -1.5$; 95% CI, -3.0 to .02, $p < .05$, ie, better mental health was associated with less leisure screen time), and positively associated with home internet access ($B = 60.5$, 95% CI, 20.5 to 100.6, $p = .003$), BMI ($B = 4.1$, 95% CI, 1.0 to 7.3, $p = .01$), and smoking ($B = 30.1$, 95% CI, -1.1 to 61.4, $p = .059$; ie, smokers engaged in more leisure screen time) (Table 2).

Unemployed leisure screen time was negatively associated with age ($B = -2.2$, 95% CI, -3.7 to -0.6, $p = .007$), sex ($B = -34.8$, 95% CI, -62 to -7.5, $p = .012$; females engaged in more sitting time than men), marital status ($B = -31.8$, 95% CI, -55.7 to -7.8, $p = .009$; married/common-law participants engaged in less sitting time than single/widowed/divorced participants) and mental health ($B = -2.5$, 95% CI, -3.9 to -1.1, $p < .001$, ie, better mental health was associated with less leisure screen time), and positively associated with home internet access

($B = 44.5$, 95% CI, 14.2 to 74.8, $p = .004$), BMI ($B = 4.0$; 95% CI, 1.3 to 6.6, $p = .003$), , and smoking ($B = 38.2$, 95% CI, 1.7 to 74.7, $p = .04$) (Table 3).

Employed transport sitting time was positively associated with age ($B = 1.84$, 95% CI, 0.8 to 2.9, $p = .001$), income \$60k to <100k ($B = 15.6$, 95% CI, -0.2 to 31.5, $p = .053$), home internet access ($B = 21.2$, 95% CI, 2.3 to 40.2, $p = .028$), high school diploma (highest level attained) ($B = 19.5$, 95% CI, 3.6 to 35.5, $p = .017$), and total MVPA minutes ($B = .04$, 95% CI, .02 to .06, $p < .001$, ie, increasing MVPA was associated with an increase in transport sitting time) (Table 2).

Unemployed transport sitting time was only negatively associated with sex ($B = -19.3$, 95% CI, -36.7 to -1.9, $p = .03$; females engaged in more sitting time than men) (Table 3).

Employed work/job sitting time was negatively associated with age ($B = -2.3$, 95% CI, -4.7 - .18, $p = .069$) and total MVPA minutes ($B = -.05$, 95% CI, -.09 to -.003, $p = .036$, ie, decreasing MVPA was associated with an increase work/volunteer sitting time) (Table 2).

DISCUSSION

The purpose of this study was to examine correlates of sitting time (total and domain-specific) among a population-based sample of older adults. To our knowledge, this is the first study to examine correlates of total sitting time and domain specific behaviors. Given that a substantial proportion of our participants were still employed (likely due to the lower age cutoff of 55 years), and the SIT-Q does measure occupational sitting time, we distinguished between individuals still in employment and individuals not in employment as they have different opportunities to engage in specific sedentary behaviors. The present study found different demographic and health-related correlates of total and domain specific sitting time emerged between the employed and unemployed participants.

A recent review of 22 studies and over 349,000 individuals⁹ concluded older adults spent an average of 9.4 and 5.3 hours per day sedentary, based on objective and self-report measurement of sedentary behavior, respectively. These estimates of self-report sitting time were similar for the unemployed participants (4.9 hours per day) but lower for the employed participants (6.4 hours per day) than reported in the review. Summary measures provide lower estimates of sedentary time than single items measures²¹ and it may be that we have missed some important behaviors (eg, reading, eating) identified in other studies.^{22,23} For the employed participants approximately half of sitting time was spent in leisure screen time (ie, TV, computer, smartphone) and a third in “work” sedentary time, while approximately 80% of sitting time in the unemployed participants was leisure screen time. A systematic review of adult sedentary behavior found several studies reported that sedentary time was associated with television viewing among individuals not in employment (retirement).²⁴

Since the 2012 review by Rhodes et al, other studies examining correlates of sedentary behavior among older adults have been conducted. In an Australian sample of 992 non-working older adults, the only correlate of high sedentary time (>10 hours per day) was disability or presence of a long-term health condition.²⁵ Findings from the present study differed; we did not find that chronic conditions were associated with total sitting time, or any sitting time domains. This may likely be due to the rather healthy sample of older adults that were recruited into the ALERT study, as opposed to the Espinel study that included 71% of participants who reported a disability or long-term health condition. Further, differences may also be due to the older sample in the Espinel study (all over 65 years of age, with 48% over 75 years of age). In a larger sample of 3,296 older adults in Brazil, Meneguci et al. reported several significant correlates of high sitting time that concurred with the present findings (including female sex, age over 70 years,

less education and low physical activity). However, other additional correlates from that study did not emerge in the present study including chronic disease, medication use, poor self-rated health, and dependence in activities of daily living.²⁶ Van Cauwenberg and colleagues examined diurnal patterns and correlates of sedentary behavior among 508 Belgian older adults and reported no significant associations between sociodemographic factors and total sitting time.²⁷ Varying assessment methods of the outcome variable (sitting) and the potential correlates may have also contributed to the conflicting results.

Perhaps most similar to the ALERT sample, a recent population-based study of Canadian older adults found high sitting time was positively associated with age, retirement status, dwelling type, chronic disease, perceived health, BMI, and mood disorder.²⁸ However, this study utilized objective (accelerometer) assessments of sedentary time, and did not examine correlates across sitting domains, nor did they consider employment status. Results from the present study found total sitting time was significantly associated with home internet access and BMI across both employment status samples. Across both samples, total sitting time increased by 4-to-7 minutes for every 1-point increase in BMI. In the employed sample, physical health (as measured by the RAND-12) also emerged as a significant correlate. That is, sitting time was reduced by over 2 minutes for every 1-point increase (favorable) in Physical Health Composite Score (range 0-100).

The present study also examined domain-specific sitting time. For leisure screen time, home internet use, BMI, mental health, and smoking emerged as significant correlates across both samples. However, younger age, female sex, and marital status (being unmarried) only emerged as significant correlates of higher leisure screen time in the unemployed sample. Previously published studies have reported on correlates of television viewing among older

adults. For example, in a sample of 1,665 community dwelling older adults, Kikuchi et al. found prolonged television viewing was associated with lower educational attainment, not in full time employment, and low physical activity (less than 200 minutes per week), all correlates that did not emerge as significant correlates.²⁹ Data from the ALERT study appear to suggest HRQoL (ie, mental and physical health) are significant correlates of leisure screen time. Higher transport sitting time was seen among employed participants with older age, higher income, home internet access, high school education, and more MVPA only, whereas only female sex was associated with more transport sitting in the unemployed sample. Among the employed sample, higher levels of work-related sitting time were associated with younger age and lower MVPA. We are unaware of any published studies that have examined differences in transport sitting time across employment status. We are aware of 1 study that has examined differences in transport sitting time across employment status. Using the Sydney Greater Metropolitan Area Household Travel Survey, Sugiyama and colleagues found higher prevalence rates of prolonged sitting time in cars in full-time workers (compared to 'part time' or 'other').³⁰

The present study adds to the literature base by examining a wide range of correlates across several different sitting contexts that have not been examined before in a large sample of men and women. A particular novelty was to examine correlates of sitting time across employment status, although it should be noted that the average age of those who were employed was almost 7.5 years lower than those who were not employed. Future research should continue to examine these sitting domains and factors that may be potentially relevant to older adults (such as employment status and income), to further our understanding of sitting time among older adults. Given older adults spend a substantial portion of their day sitting, there is a need to examine approaches to reduce sitting time. Given different correlates emerged for each sitting

domain across employed and unemployed older adults, interventions to reduce sitting time among older adults may need to consider, and recognize the employment status of the individual.

Feasibility studies testing such approaches in the older adult population are now starting to emerge and are showing promise. In the first intervention targeted toward older adults, Gardiner et al. reported 1 face-to-face goal-setting session with 1 individually tailored mailing providing feedback (based on Social Cognitive Theory and Behavioral Choice Theories) resulted in a statistically significant 3.2% decrease in sedentary time among older adults who were not employed.³¹ More recently, Rosenberg et al. examined an 8-week theory-based intervention targeting reduced total sitting time and increased sit-to-stand transition in obese older adults resulted in a 27-minute per day decrease in inclinometer-measured sitting time.³² Overall, general interventions can consider correlates that emerged for both employed and unemployed older adults, including home internet access, greater BMI, and poorer mental health, and being a smoker. For sitting time spent in transport, different correlates emerged between the employed and unemployed samples. Therefore, interventions designed to reduce transport-related sitting time among older adults who are employed or unemployed, may need to consider those relevant correlates.

Strengths and Limitations

Strengths of the present study include the large population-based sample of older men and women, random digit dialing procedures, as well as the use of a domain-specific measure of sitting time (and not general sedentary time which does not consider posture). Using the SIT-Q, we were able to measure sitting across transport, work, and leisure screen time, and examine correlates across these domains. Limitations of this study include the cross-sectional design and the low response rate, although common in telephone-based surveys.¹⁵ Further, selection bias

may have occurred, where only those individuals who were interested in health and health behaviors may have participated in the study. There are also limitations with eliciting an individual's usual pattern of sitting over the past 12 months. For example, factors such as seasonal differences, illness, and variable work routines are limitations of the past 12-month recall.¹⁶ These factors could possibly lead to misclassification and/or biased measurement of sitting behavior. Time since retirement and employment type (eg, construction, office job) may be two important factors to consider when interpreting the results from this study, however this data was not collected from participants. Finally, the ALERT sample was a relatively active, healthy, and highly educated sample of older adults and may thus not be representative of the older adult population in Alberta, Canada. However, we previously reported the ALERT sample was representative of the provincial population with respect to education and employment status based on Statistic Canada Census data.¹⁵

Sitting time was assessed via a self-report measure. While there are advantages to using self-report measures of sitting (eg, ease of administration with large sample sizes), there are limitations that should be mentioned. Evidence suggests self-reported sedentary time is an underestimate of true sedentary time as measured by accelerometer.³³ Self-report estimates of these behaviors are prone to measurement error that may lead to incorrect inferences about sitting time (and associated outcomes) and may bias study results.³⁴ Given these considerations, our results should be interpreted with caution.

In studies examining sitting time among older adults, employment status has not been given due attention. In conclusion, this study found different demographic and health-related correlates of sitting time emerged between the employed and unemployed samples. From a practical perspective, interventions should consider targeting different demographic and health-

related correlates. Sedentary behavior may require different intervention given differing correlates.²⁴ The present paper provides evidence that researchers should consider the employment status of their intended population, particularly if their population includes individuals who are still employed, and individuals who are retired (as in the ALERT sample). Given a substantial portion of an individual's sitting time may occur during employment, it is reasonable to suggest that interventions to reduce sitting time target the occupational context [among other domains (eg, leisure screen time, transport)]. It is reasonable to suggest a loss of intervention fidelity (and participant engagement) if an intervention to reducing sitting time included occupational sitting, but the intervention sample included individuals not in the workforce.

Human Subjects Statement

The study complied with the Declaration of Helsinki and protocols were approved by the National Center for Health Statistics Ethics Review Board. Written informed consent was obtained from participants.

Conflict of Interest

The authors declare that there are no financial or any other kind of personal conflicts with this work.

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References

1. Owen N. Sedentary behavior: understanding and influencing adults' prolonged sitting time. *Prev Med.* 2012;55(6):535-539.
2. Dunstan DW, Howard BV, Healy GN, Owen N. Too much sitting: a health hazard. *Diab Res Clin Pract.* 2012;97(3):368-376.
3. Owen N, Sparling PB, Healy GN, Matthews CE. Sedentary Behavior: Emerging Evidence for a New Health Risk. *Mayo Clin Proc.* 2010;85(12):1138-1141.
4. Biswas A, Oh PI, Faulkner GE, et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: a systematic review and meta-analysis. *Ann Intern Med.* 2015;162(2):123-132.
5. de Rezende LF, Rey-Lopez JP, Matsudo VK, do Carmo Luiz O. Sedentary behavior and health outcomes among older adults: a systematic review. *BMC Pub Health.* 2014;14:333.
6. Matthews CE, Chen KY, Freedson PS, et al. Amount of time spent in sedentary behaviors in the United States, 2003-2004. *Am J Epidemiol.* 2008;167(7):875-881.
7. Jefferis BJ, Sartini C, Shiroma E, Whincup PH, Wannamethee SG, Lee IM. Duration and breaks in sedentary behaviour: accelerometer data from 1566 community-dwelling older men (British Regional Heart Study). *Brit J Sports Med.* 2015;49(24):1591-1594.
8. Marshall S, Kerr J, Carlson J, et al. Patterns of weekday and weekend sedentary behavior Among Older Adults. *J Aging Phys Act.* 2014;23(4):534-541
9. Harvey JA, Chastin SF, Skelton DA. How sedentary are older people? A systematic review of the amount of sedentary behavior. *J Aging Phys Act.* 2015;23(3):471-487.

10. Gardiner PA, Healy GN, Eakin EG, et al. Associations between television viewing time and overall sitting time with the metabolic syndrome in older men and women: the Australian Diabetes, Obesity and Lifestyle study. *J Am Geriatr Soc.* 2011;59(5):788-796.
11. van Uffelen JG, Wong J, Chau JY, et al. Occupational sitting and health risks: a systematic review. *Am J Prev Med.* 2010;39(4):379-388.
12. Thorp AA, Healy GN, Owen N, et al. Deleterious associations of sitting time and television viewing time with cardiometabolic risk biomarkers: Australian Diabetes, Obesity and Lifestyle (AusDiab) study 2004-2005. *Diab Care.* 2010;33(2):327-334.
13. McCormack GR, Virk J. Driving towards obesity: A systematized literature review on the association between motor vehicle travel time and distance and weight status in adults. *Prev Med.* 2014;66:49-55.
14. Ding D, Gebel K, Phongsavan P, Bauman AE, Merom D. Driving: A road to unhealthy lifestyles and poor health outcomes. *PLoS One.* 2014;9(6).
15. Vallance JK, Eurich DT, Gardiner PA, Taylor LM, Stevens G, Johnson ST. Utility of telephone survey methods in population-based health studies of older adults: an example from the Alberta Older Adult Health Behavior (ALERT) study. *BMC Pub Health.* 2014;14:486.
16. Lynch BM, Friedenreich CM, Khandwala F, Liu A, Nicholas J, Csizmadi I. Development and testing of a past year measure of sedentary behavior: the SIT-Q. *BMC Pub Health.* 2014;14:899.
17. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci.* 1985;10(3):141-146.

18. Jacobs DR, Jr., Ainsworth BE, Hartman TJ, Leon AS. A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Med Sci Sports Exerc.* 1993;25(1):81-91.
19. Ware J, Jr., Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care.* 1996;34(3):220-233.
20. Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med.* 2004;36(8):588-594.
21. Healy GN, Clark BK, Winkler EA, Gardiner PA, Brown WJ, Matthews CE. Measurement of adults' sedentary time in population-based studies. *Amer J Prev Med.* 2011;41(2):216-227.
22. Gardiner PA, Clark BK, Healy GN, Eakin EG, Winkler EA, Owen N. Measuring older adults' sedentary time: reliability, validity, and responsiveness. *Med Sci Sports Exerc.* 2011;43(11):2127-2133.
23. Van Cauwenberg J, Van Holle V, De Bourdeaudhuij I, Owen N, Deforche B. Older adults' reporting of specific sedentary behaviors: validity and reliability. *BMC Pub Health.* 2014;14:734.
24. Rhodes RE, Mark RS, Temmel CP. Adult sedentary behavior: a systematic review. *Am J Prev Med.* 2012;42(3):e3-28.
25. Espinel PT, Chau JY, van der Ploeg HP, Merom D. Older adults' time in sedentary, light and moderate intensity activities and correlates: application of Australian Time Use Survey. *J Sci Med Sport.* 2015;18(2):161-166.

26. Meneguci J, Sasaki JE, da Silva Santos A, Scatena LM, Damiao R. Socio-demographic, clinical and health behavior correlates of sitting time in older adults. *BMC Pub health*. 2015;15:65.
27. Van Cauwenberg J, De Donder L, Clarys P, et al. Relationships of individual, social, and physical environmental factors with older adults' television viewing time. *J Aging Phys Act*. 2014;22(4):508-517.
28. Dogra S, Stathokostas L. Correlates of extended sitting time in older adults: An exploratory cross-sectional analysis of the Canadian Community Health Survey Healthy Aging Cycle. *Int J Public Health*. 2014;59(6):983-991.
29. Kikuchi H, Inoue S, Sugiyama T, Owen N, Oka K, Shimomitsu T. Correlates of prolonged television viewing time in older Japanese men and women. *BMC Pub Health*. 2013;13:213.
30. Sugiyama T, Merom D, van der Ploeg HP, Corpuz G, Bauman A, Owen N. Prolonged sitting in cars: prevalence, socio-demographic variations, and trends. *Prev Med*. 2012;55(4):315-318.
31. Gardiner PA, Eakin EG, Healy GN, Owen N. Feasibility of reducing older adults' sedentary time. *AmJ Prev Med*. 2011;41(2):174-177.
32. Rosenberg DE, Gell NM, Jones SM, et al. The Feasibility of Reducing Sitting Time in Overweight and Obese Older Adults. *Health Educ Behav*. 2015.
33. Stamatakis E, Hamer M, Tilling K, Lawlor DA. Sedentary time in relation to cardio-metabolic risk factors: Differential associations for self-report vs accelerometry in working age adults. *Int J Epidemiol*. 2012;41(5):1328-1337.

34. Ainsworth BE, Caspersen CJ, Matthews CE, Masse LC, Baranowski T, Zhu W.
Recommendations to improve the accuracy of estimates of physical activity derived from self report. *J Phys Act Health*. 2012;9 Suppl 1:S76-84.

Table 1
Demographic Details of ALERT Study Participants across Employment Status (N = 1296)

Variable, mean (SD)	Overall	Employed ^a	Unemployed ^a
Age	66.4 (8.2)	61.2 (5.3)	69.8 (7.9)
Female (N, %)	741 (57.2)	267 (51.8)	474 (60.7)
BMI kg/m ²	27.2 (5.1)	27.3 (5.0)	27.1 (5.1)
Waist circumference, inches	35.9 (5.3)	35.8 (5.4)	35.9 (5.3)
Married (N, %)	846 (65.3)	361 (7.10)	485 (62.1)
Education (N, %)			
Some college or university	796 (61.4)	343 (66.6)	453 (58)
High school	289 (22.3)	98 (19)	191 (24.5)
Other	211 (16.2)	74 (14.4)	137 (17.5)
Income (N, %)			
<\$60k	78 (37)	108 (20.9)	370 (47.4)
\$60k to <\$100k	283 (22)	151 (29.3)	132 (16.9)
≥\$100k	293 (23)	194 (37.7)	99 (12.7)
Missing	242 (19)	62 (12)	180 (23.1)
Racial background (N, %)			
Caucasian	1224 (94)	473 (84.9)	751 (96.2)
Aboriginal	16 (1)	10 (1.9)	6 (0.8)

Other	56 (4)	32 (6.2)	24 (3.1)
Comorbidities (N, %)			
None	137 (21)	142 (27.6)	136 (17.4)
1	172 (27)	152 (29.5)	191 (24.5)
2 or more	339 (52)	221 (42.9)	454 (58.1)
Health behaviors			
Cancer screening (N, %)	587 (45)	256 (49.7)	331 (42.4)
Osteoporosis screening (N, %)	784 (60)	270 (52.4)	514 (65.8)
Multivitamin use (N, %)	858 (66)	320 (62.1)	538 (68.9)
Aspirin use (N, %)	386 (30)	106 (20.6)	280 (35.9)
Pneumococcal vaccine (N, %)	391 (30)	78 (15.2)	313 (40.1)
Influenza vaccine (N, %)	738 (57)	241 (46.8)	497 (63.6)
Current smoker (N, %)	160 (12)	76 (14.8)	84 (10.8)
Total physical activity (MVPA) minutes (GLTEQ)	181 (256)	181 (260)	181 (254)
Adequate health literacy	998 (77)	415 (80.6)	583 (74.7)
Quality of life (RAND-12)			
Physical health score	51 (8.9)	52 (7.7)	51 (9.7)
Mental health score	51 (8.7)	52 (7.8)	51 (9.2)
Internet access (yes) (N, %)	1118 (86)	469 (91.1)	649 (83.1)
Total sitting minutes (SIT-Q)	343 (201)	385 (189)	296 (186.3)

Transport	60 (82)	61 (58.9)	59 (93.6)
Leisure screen	222 (146)	198 (122)	238 (158.2)
Employment	127 (133)	127 (133)	N/A

Note.

Numbers may not equal 1296 due to missing data. For the purposes of this study, missing data were defined as any data point where the participant indicated either (1) no response, or (2) don't know/not sure. All demographic (eg, age, education), health behavior (eg, physical activity, sedentary behavior), and health measures (eg, HRQoL) had <1% missing data, with the exception of income (18.7%).¹⁵

Data are presented as the mean (SD) for continuous variables (eg, age, body mass index) and frequency (%) for categorical variables.

a - Employed adults (N = 515) were working full-time, part-time, or self-employed.

Unemployed adults (N = 781) were unemployed (looking or not looking), retired, a homemaker, or on disability.

BMI - Body mass index

MVPA - Moderate-to-vigorous intensity physical activity

Table 2

Associations between Total Sitting Time (min/day), Domain-specific Sitting Time (min/day) and Correlates among *Employed* Older Adults (N = 515)

	F	df	R²	p	B	CI	P
Total sitting time	1.9	26, 488	0.09	.005			
Home Internet access (yes vs no)					71.2	8.9 to 133.4	.025
Body mass index (kg/m ²)					7.0	2.1 to 11.9	.005
Physical health (score range 1-100)					-2.3	-4.9 to -0.3	.013
Leisure screen time	2.16	26, 488	0.10	<.001			
Income (\$60k to <100k) vs <60k					-21.3	-42.8 to .21	.052
Home Internet access (yes vs no)					60.5	20.5 to 100.6	.003
Body mass index (kg/m ²)					4.1	1.0 to 7.3	.01
Mental health					-1.5	3.0 to 0.2	.044
Smoking (yes vs no)					30.1	-1.1 to 61.4	.059
Transport	2.94	26, 488	0.14	<.001			
Age / year					1.8	0.8 to 2.9	.001
Income (\$60k to <100k) vs <60k					15.6	-0.2 to 31.5	.053
Home Internet access (yes vs no)					21.2	2.3 to 40.2	.028
Education (high school diploma vs less)					19.5	3.6 to 35.5	.017
Total MVPA (minutes)					0.04	0.02 to 0.06	<.001
Work/volunteer	1.56	26, 488	0.08	.04			

Age / year					-2.3	-4.7 to 0.18	.069
Total MVPA (minutes)					-0.05	-0.9 to -.00	.036

Table 3**Associations between Sitting Time, Domain-Specific Sitting Time and Correlates among *Unemployed* Older Adults (N = 781)**

	F	df	R²	p	B	CI	p
Total sitting time	4.54	26, 754	0.14	<.001			
Age / year					-3.0	-4.9 to -1.1	.002
Sex (female vs male)					-54.0	-86.7 to -21.3	.001
Home Internet access (yes vs no)					54.1	17.7 to 90.4	.004
Body mass index (kg/m ²)					4.1	.94 to 7.3	.011
Leisure screen time	5.9	26, 754	0.17	<.001			
Age / year					-2.2	-3.7 to -0.6	.007
Sex (female vs male)					-34.8	-62 to -7.5	.012
Married (married/common-law vs single/widowed/divorced)					-31.8	-55.7 to -7.8	.009
Home Internet access (yes vs no)					44.5	14.2 to 74.8	.004
Body mass index (kg/m ²)					4.0	1.3 to 6.6	.003
Mental health					-2.5	-3.9 to -1.1	<.001
Smoking (yes vs no)					38.2	1.7 to 74.7	.04
Transport	0.89	26, 754	0.03	.624			
Sex (female vs male)					-19.3	-36.7 to -1.9	.03