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Single versus multi-item self-assessment of sedentary behaviour: A comparison with objectively measured sedentary time in nurses

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ABSTRACT

Objectives: To compare sedentary time (ST) measured by self-report using a single question from the short-form International Physical Activity Questionnaire (SF-IPAQ), 18-items from the Sedentary Behaviour Questionnaire (SBQ) and objectively using an accelerometer among a large sample of nurses.
Design: Cross-sectional.
Methods: Participants wore an ActiGraph GT3X accelerometer (≥4 days, ≥10 h/day) and self-reported usual day sitting using the IPAQ and sitting in different modes using the SBQ. Measures were compared using correlations, a Friedman test with Wilcoxon signed-ranks tests for pairwise comparisons, linear regression and Bland–Altman plots.
Results: A total of 313 nurses (95% female; mean ± SD: age = 43 ± 12 years) from 14 hospitals participated. Participants self-reported sitting for a median of 240 min/day using the SF-IPAQ and 328 min/day using the SBQ. Median ST measured by the ActiGraph was 434 min/day. All measures were weakly correlated with each other (ρ = 0.31–40, ps < 0.001). Limits of agreement were wide between all measures. Significant proportional bias between the ActiGraph and the SF-IPAQ and SBQ existed, suggesting that with greater amounts of ST, there is greater disagreement between the self-report and objective measures.
Conclusions: In a sample of nurses, self-reported ST using the SF-IPAQ and SBQ was significantly lower than that measured by accelerometer. A single-item tool performed more poorly than a multi-item questionnaire. Future studies should consider including both objective and self-report measures of ST, and where possible use a tool that quantifies ST across multiple domains, define a 'usual day' and are meaningful for those with daily schedule variations such as among shift-worker populations.

1. Introduction

Sedentary behaviours (SBs) refer to activities undertaken in a sitting, reclining or lying posture and are characterized by a very low energy expenditure (≤1.5 METS).[1] SBs include activities such as watching television (TV), sitting in a car and using a computer and can occur across multiple domains (e.g., at work, school, and home; transportation; and, in leisure time).[2] Adults in developed countries spend the majority of their time being sedentary (e.g., Canada: 69%, USA: 55% of waking hours).[3,4] Greater amounts of sedentary time (ST) are significantly associated with markers of cardiometabolic health including lower high-density lipoprotein (HDL),[5–7] higher triglycerides,[5,6] lower cardiorespiratory fitness,[5] greater body mass index (BMI),[5,7] and greater waist circumference[5–7] and poor health outcomes including cardiovascular disease, diabetes and cancer, and mortality.[8,9]

Historically, the majority of research on the relationship between ST and health has relied on self-reported measures. Accurate measurement of ST is needed to: quantify the association between SBs and health outcomes; track ST over time; and, evaluate the effectiveness of sedentary and physical activity interventions.[10,11] The International Physical Activity Questionnaire (IPAQ) is one of the most widely used self-report measures of ST.[12] The IPAQ sitting question is popular owing to its short length (single question) and its inclusion as part of a larger physical activity survey with international validity and reliability testing.[12] The majority of the validation work for the IPAQ has evaluated physical activity outcomes rather than ST. Recently, evidence suggests that a single ST question (such as the IPAQ) has poorer validity for measuring ST than questionnaires with multiple items (i.e. Marshall

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Sitting Time Questionnaire, Activity Questionnaire for Adults and Adolescents),[13] and which assesses a variety of modes of SBs, across different domains, and separately for weekday and weekend ST.[11] Questionnaires that address multiple SBs and domains provide a more composite measure of ST across the day, and are therefore, more likely to provide a better estimation of total ST. This domain-specific information is also important to provide specific outcomes for targeted interventions.

Given that ST is recognized as an independent risk factor for poor health outcomes,[8] it has become increasingly important to assess the SB habits of various populations. Nurses are the single largest segment of the healthcare workforce, with nursing regarded as a busy job with high mental and physical demands, yet little is known about the ST of nurses. Some evidence suggests a link between ST and work-related outcomes such as presenteeism and work vitality,[14] making it an important health behaviour to consider measuring in a workforce such as nurses. While self-report measures (particularly single-item tools) are more likely feasible and cost-effective to administer in a busy profession such as nursing, it is unknown if they provide a valid measure of ST. Further, it has been shown that factors in the social and built environments (such as workplace environment, social norms) associate differently with objective versus self-report SB[2] and that differences in the association with health outcomes exist between self-report and accelerometer-measured ST.[15,16] It is, therefore, important to identify whether self-report measures are able to accurately capture ST.

The objective of this study was to compare ST measured by self-report using a single sitting question from the short-form IPAQ (SF-IPAQ), 18-items from the Sedentary Behaviour Questionnaire (SBQ) and objectively using an ActiGraph accelerometer among a large sample of nurses. We hypothesized that ST would be lower when self-reported, compared to objectively-measured, using accelerometers.

2. Methods

This study used data from a multi-site (N = 14 hospitals) cross-sectional study of nurses in the Champlain Region of Ontario, Canada. A full description of the Champlain Nurses' Study and associated methodology is provided elsewhere.[17] The study was led by the University of Ottawa Heart Institute (UOHI) and received ethical approval from the Ottawa Health Sciences Network Research Ethics Board (Protocol #: 20140670-01H), Children's Hospital of Eastern Ontario Research Ethics Board (Protocol #: 15/22X), Hôpital Montfort (Protocol #: JR-21-01-15), Royal Ottawa Mental Health Centre (protocol #: 2015008), Queensway Carleton Hospital (protocol #: 15-04), Pembroke Regional Hospital (protocol #: 2014-003), Renfrew Victoria Hospital (protocol #: 20140670-01H), St. Francis Memorial Hospital (no protocol #), Winchester District Memorial Hospital (protocol #: 2014-1011), Kemptville District Hospital (protocol #: 20140670-01H), and the Cornwall Community Hospital (no protocol #). All participants provided written, informed consent prior to participation.

Briefly, participants reported demographic and occupational characteristics including: age; sex; ethnicity; marital status; level of education; annual income; shift length; type of shifts (days, nights, evenings, or a combination thereof); work status (full-time, part-time, or casual); and, area in which they worked ≥50% of their time. Research assistants objectively measured height (cm), body mass (kg), waist circumference (cm), and resting blood pressure (mmHg). Body mass index (BMI) was computed (kg/m^2).

Participants were asked to self-report their ST using the SF-IPAQ[12] and the SBQ.[18] A single sitting time question from the IPAQSF asked participants to estimate the average amount of time (in hours and minutes) they spent sitting during a weekday in the past 7 days including time spent at work, at home, at school and during leisure time including behaviours such as sitting at a desk, socializing, reading, or watching TV.[12] Participants were also asked to complete the nine-item SBQ for workdays and weekend days separately (18 items total). The SBQ asked participants to estimate how much time on a typical work day and a typical weekday (separately) they spend sitting while: watching TV; playing video or computer games; listening to music; talking on the phone; doing paperwork/office work; reading; playing an instrument; doing artwork; and, sitting for travel. Response options include: none; ≤15 min; 30 min; 1 h; 2 h; 3 h; 4 h; 5 h; or, ≥6 h.[18] The SBQ was scored to provide average minutes per day of sitting time using the following formula: ((workday sitting × 5 + weekend sitting × 2)/7).

Objectively measured ST was derived from the ActiGraph GT3X accelerometer (ActiGraph, Pensacola, FL). Participants were asked to wear an ActiGraph GT3X on their right hip during waking hours for nine days; removing the monitor for sleep and water related activities (e.g., swimming, bathing). The vector magnitude — a composite measure of movement in the x-, y- and z-axes — was used to quantify movement. A 15-second sampling epoch was used and converted into counts-per-minute (cpm). A valid day was defined as ≥10 h of wear time, and participants were required to have ≥4 valid days to be retained in the analyses. For participants with more than seven valid days, the first day and day 9 were removed (to minimize reactivity) and the subsequent seven days used for the daily average. Wear time was calculated by subtracting non-wear time from 24 h. Non-wear time was defined as at least 60 min of consecutive zeros for counts, with an allowance of up to two minutes of counts between zero and 150. A weekly average was calculated by multiplying the daily average (minutes/day) by seven. A previously validated cut-point of ≤150 cpm was used to define ST.[19] The ActiGraph also provided objectively determined steps per day. In general, the self-report responses were obtained in the last 1–2 days of the objective measures so that the SF-IPAQ recall of the past 7-days was reflective of the ActiGraph wear time.

Data were tested for normality visually using plots and Shapiro-Wilks test of normality; all measures of ST were not normally distributed. Descriptive data are reported using means ± standard deviations (SD), medians and interquartile ranges (IQR) or frequencies and percentages. To determine whether the self-report measures of ST (SF-IPAQ and SBQ) and the accelerometer measures were different, a Friedman test was used (to compare all three) and then Wilcoxon signed-ranks tests were performed for pairwise comparisons. Spearman correlation coefficients between each ST measure were calculated. Linear regression and standard and modified Bland–Altman plots were used to examine agreement between the self-report and accelerometer measures of ST and identify whether systematic errors exist in the measurements.[20–22] An acceptable level of agreement was identified as 60 min of ST; this interval of time has been associated with an increased risk of cardiovascular disease and all-cause mortality.[23] All analyses were conducted using SPSS v24 software (IBM Corp, Armonk, NY, USA) and Microsoft Excel.

3. Results

A total of 313 nurses had complete ST data measured by the SF-IPAQ, SBQ and ActiGraph. Characteristics of the nurses included in this sample are shown in Table 1. In general, the majority of the participants were female and of white ethnicity, had a higher income, were considered overweight and normotensive, accrued approximately 8200 steps/day, and were more likely to work 8 h shifts, days-only and in urban hospitals.

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