Journal of Science and Medicine in Sport 18 (2015) 662–666

Contents lists available at ScienceDirect

Journal of Science and Medicine in Sport

journal homepage: www.elsevier.com/locate/jsams

Original research

Validity of self-report methods for measuring sedentary behaviour in older adults

Nicolás Aguilar-Farías[a,b,*], Wendy J. Brown[a], Timothy S. Olds[c], G.M.E.E. (Geeske) Peeters[a,d]

[a] The University of Queensland, School of Human Movement Studies, Australia
[b] Universidad de La Frontera, Departamento de Educación Física Deportes y Recreación, Chile
[c] The University of South Australia, Health and Use of Time (HUT) Group, Australia
[d] The University of Queensland, School of Population Health, Australia

ARTICLE INFO

Article history:
Received 22 February 2014
Received in revised form 27 June 2014
Accepted 8 August 2014
Available online 15 August 2014

Keywords:
MARCA
Questionnaires
Time use
ActivPAL

ABSTRACT

Objective: Sedentary behaviour (SB) is associated with a range of negative health outcomes, but little is known about the validity of self-report methods for measuring SB in older adults. Thus, the aim was to assess the reliability and validity of two instruments for measuring SB in older adults.
Design: Cross-sectional study.
Methods: 41 community-dwelling older adults (14/27 male/female, 74.5 ± 7.6 years) wore an ActivPAL^{3TM} (AP) for 7 consecutive days, then completed (1) a single question (SQ) to assess sitting time on a usual weekday, weekend day and yesterday (i.e. the last day of monitoring), and (2) a computer-delivered 24-h recall (MARCA) for the last two days. Intraclass correlation (ICC) and standard error of measurement (SEM) were used to assess test–retest reliability; validity was examined using Spearman's correlation, mean bias and limits of agreement, and kappa for classifying tertiles of time in SB, with AP as the reference standard.
Results: For the SQ, the ICC ranged from 0.64 to 0.79, with SEM 1.03–1.42 h/day. ICC for the MARCA ranged from 0.72 to 0.96, with SEM 0.47–1.18 h/day. The SQ showed modest correlation with AP (r = 0.13–0.33), with mean biases of about −3.5 h/day. The MARCA showed moderate correlation with AP (r = 0.49–0.67), with mean biases of about 1.4 h/day. When categorised into tertiles, agreement was significant but fair for the SQ, and moderate for the MARCA.
Conclusion: Both measures have acceptable reliability, but the MARCA provides more valid estimates of SB than the SQ, which underestimates SB in this group of older adults.

1. Introduction

Recent studies have shown that time spent in sedentary behaviour (SB) (defined as activities during waking hours with energy expenditure <1.5 METs while sitting or lying down[1]) is associated with a range of negative health outcomes, even if individuals meet the physical activity (PA) guidelines.[2–4] Although many working-age adults spend at least 50% of their daily time sitting or lying down,[5] little is known about the distribution, types and context of SB in older adults.

Although objective measures (such as accelerometry) provide more reliable and valid estimates of both PA and SB, self-report measures are more practical and provide different insights, especially for large-scale studies.[6] For example, they may provide contextual information about use of time,[6] which is useful for informing the development of intervention strategies. Questionnaires are the most commonly used tools for assessing PA in large-scale population studies, and the measurement properties of several 'past day' and 'last-week' recall methods have been reported.[7–9] However, little is known about the validity and reliability of self-report methods for assessing SB, especially in older adults.

Two methods were considered for this study. The first was a single question about sitting time on week and weekend days The question is similar in terms of structure and intrinsic properties to the sitting time question used in the International Physical

* Corresponding author.
E-mail addresses: nicolas.aguilar@ufrontera.cl, nicolasaguilarfarias@gmail.com (N. Aguilar-Farías).

http://dx.doi.org/10.1016/j.jsams.2014.08.004
1440-2440/

Activity Questionnaire (IPAQ),[10,11] which has shown good reliability (Spearman's correlation of 0.77 and 0.85 for weekday and weekend-day sitting time, respectively) and moderate validity against ActiGraph (CSA model 7164; Pensacola, FL) (Spearman's correlation = 0.38) for total sitting time in adults.[12] In another adult sample, a single-item question for estimating total time spent in SB per day showed moderate reliability and correlation when compared with accelerometry (ActiGraph Model GT1M; Pensacola, FL).[13] However, a qualitative study has shown that older adults have difficulty answering these types of questions, and validation of this sitting question in an older population is needed.[14]

The second instrument was the Adult version of the Multimedia Activity Recall for Children and Adolescents (MARCA).[15] This instrument was initially designed to measure the timing, duration, intensity and type of activities throughout the day in children and adolescents[7,16] and later adapted for use in adults.[15] Compared with generic questionnaires, the MARCA collects higher resolution data on time of day, patterns and contexts of activities, and provides accurate estimates of total daily energy expenditure.[15] A recent study reported very high reliability (ICCs > 0.99) for moderate to vigorous physical activity (MVPA) and PA level and moderate validity compared with accelerometry (ActiGraph Model AM7164, Pensacola, FL) in octogenarians.[17] The measurement properties of the MARCA have not yet been tested for determining total time spent in SB in older adults.

The aim was to compare the reliability and validity of two self-report instruments, a single question and a 24-h recall instrument, for determining time spent in SB in older adults. Time spent in SB as measured by ActivPAL^{3TM} (AP) was used as the reference standard.

2. Methods

Participants in 'The Time of Your Life' study were community-dwelling older adults living in Brisbane, Australia. Participants were recruited using flyers displayed at organisations with large numbers of older adult members, including bridge clubs, senior centres, and exercise centres. Eligibility criteria included being 65 years or older, able to walk (with or without assistive devices but not requiring assistance from another person), ability to sign informed consent, and living in the greater Brisbane area, Australia. All participants gave written informed consent. The study protocol was approved by the Behavioural & Social Sciences Ethical Review Committee of the University of Queensland, Australia.

Participants were visited twice. The first visit included a brief interviewer-administered questionnaire asking about demographic information and health status. Each participant was fitted with an ActivPAL^{3TM} (AP) and was given oral and written instructions on how to wear it, but information about the type of behaviour (i.e. sedentary behaviour) we were trying to record was not provided. They were also asked to complete a logbook for the following 7 days with details of waking/sleeping hours and the times and reasons for every occasion the AP was removed from the indicated position. Participants were asked to continue with their normal activities during the 7-day measurement period. After three days, participants were contacted by phone to check monitor wear and address any related issues.

The ActivPAL^{3TM} (AP; Pal Technologies Ltd., Glasgow, UK) differentiates between static and dynamic activities, with an accuracy of 98%[18] and mean percentage bias of 0.19% for time spent in SB, compared with direct observation.[19] The AP was worn on the middle-anterior line of the right thigh. The device was sealed with a nitrile finger cot and attached to the skin with a transparent film (Tegaderm^{TM} Roll, 3M^{TM}) in order to provide a waterproof barrier. This allowed it to be worn continuously for 24 h a day for 7 days, without having to remove it for water-based activities or sleeping.

On the eighth day after the first visit, a second home visit took place, during which the AP and logbook were collected. A second questionnaire was completed which included the single question (SQ): How many hours each day do you typically spend sitting down while doing things like visiting friends, driving, reading, watching television, or working at a desk or computer on (a) an usual weekday, (b) usual weekend day, and (c) yesterday?

For the MARCA, participants first described their activities for 'yesterday' and then for 'the-day-before-yesterday'. The adult MARCA allows the respondents to recall activities in blocks of 5 min, guided by a list of more than 500 activities in a menu of different domains (inactivity, transport, sport/recreation, occupation, self-care, home activities, and other). Data were entered directly into the software. Approximately 0.5–1 h after the first assessment, the SQ and the MARCA were repeated to examine test–retest reliability. Between the first assessment and retest, participants completed a series of performance tests and questions about Locus of Control (data not reported here).

Sample characteristics were derived from the questionnaire which included questions about date of birth, type of residence, living situation, and self-rated health (categorised as presented in Table 1). Height and weight were measured and used to calculate body mass index (BMI = kg/m^2).

The APs were initialised and data were downloaded using ActivPal^{TM} Professional Software, v6.1.2 Research Edition (Pal Technologies Ltd., 2010). Data were included in the analyses if participants had at least 10 h of wear time on any 5 days of the week. Estimates of time spent in SB were derived from the event file, which includes time intervals per day in seconds, and defined as all waking hours spent in sitting/lying postures. A semi-automated filter was used to ensure that merged data from the log-books and AP only included waking hours and wear time.

Total estimates in hours from the SQ were extracted directly from forms for weekday, weekend day and yesterday. Total time spent in SB for an average day was calculated as: (5*weekday time + 2*weekend day time)/7.[10] SB estimates from SQ were compared with AP using matched days.

For MARCA, sedentary activities were identified based on the software's postural description and the energy cost derived for each activity. Total time in minutes was extracted individually for each day, and mean time in SB over the last two monitored days was calculated. Comparisons between the MARCA and AP were made using matched days.

To describe the study sample, means and standard deviations are presented for continuous variables, and percentages for categorical variables. To assess test–retest reliability of the SQ and MARCA, intraclass correlation (ICC) and standard error of measurement (SEM) were calculated. Concurrent validity of the two methods was examined with Spearman's correlation, mean bias and 95% limits of agreement (LoA), with AP as the reference standard. Participants were categorised into tertiles based on their time spent in SB. Percent agreement and the Kappa statistic were used to determine the agreement between the categorised self-report instruments and AP. The level of significance was set at $p < 0.05$. Data cleaning and statistical analyses were completed using Stata, version 11.1 (StataCorp. College Station, TX, USA).

3. Results

The average age of the 41 participants was 74.5 years (SD = 7.6, range 65–93 years); two thirds were female and half lived alone (Table 1). Only 19.5% rated their health as poor or fair, and 14.6% had difficulties managing on their income all or some of the time. Thirty-seven participants had valid AP data (i.e. they wore the monitor at least 10 h on any 5 days of the week). Reasons for exclusion ($n = 4$)