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Original research

Validating two self-report physical activity measures in middle-aged adults completing a group exercise or home-based physical activity program

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ABSTRACT

Objectives: To compare self-reported physical activity recorded in physical activity diaries or the Active Australia Survey with objectively measured physical activity using accelerometry in sedentary middle-aged adults completing two physical activity interventions.
Design: Cross-sectional study.
Methods: Sedentary 50–65 year olds were recruited to a non-randomized 6-month community group exercise program (G) or a physiotherapist-led home-based physical activity program (HB). Over 7-days, 76 participants (HB 39, G 37) wore an ActiGraph GT1M accelerometer (5 s epochs), completed the Active Australia Survey (AAS) and a daily physical activity diary. Data were analysed using descriptive statistics and Spearman rank-order correlations.
Results: The two interventions had similar demographic and physical activity characteristics except that home-based participants were younger ($p < 0.01$), more likely to be employed full time ($p \leq 0.001$) and reported less moderate-to-vigorous physical activity in the physical activity diaries compared to group exercise participants (HB 29 ± 21 min d^{-1} vs. G 57 ± 35 min d^{-1}, $p \leq 0.001$). Home-based participants had fair-to-good agreement between the physical activity diaries and AAS or ActiGraph data ($r = 0.39$–0.68, $p < 0.05$). Group exercise physical activity diary data did not correlate significantly with either the AAS or ActiGraph data. In contrast, group exercise AAS data had good correlations with ActiGraph data ($r = 0.49$–0.64, $p \leq 0.001$).
Conclusions: Physical activity diaries should be interpreted cautiously unless intervention participants have an adequate understanding of physical activity intensity. The AAS is the preferred self-report measure in middle-aged adults independent of intervention.

1. Introduction

To test the effectiveness of physical activity interventions, physical activity (PA) levels need to be accurately evaluated. Subjective measures, such as PA diaries and questionnaires, are commonly employed as outcome measures due to their low cost and ease of use in the clinical setting.[1] However, these measures do have some limitations[2,3] and their value within an intervention study or in the clinical setting needs to be determined.

PA diaries have been shown to be reliable and valid[4] although numerous studies indicate issues with over-reporting.[5] The detail obtained from PA diaries is high but they are labour intensive for participants.[3] In a long-term study in the USA, King[6] used PA diaries to determine PA adherence to sessions prescribed, comparing group and home-based programs of varying intensities. The findings from this study rated highly in a Cochrane review[7] comparing centre and home-based PA programs, concluding that there was some evidence that home-based programs provide better long-term adherence to PA. Therefore the accuracy of PA diaries is important, guiding future PA program implementation.

Similarly, PA questionnaires (PAQs) have been found to be reliable, valid and practical to use.[8] Although PAQs provide a lower level of detail and are subject to recall bias,[5] they are considered a less cumbersome self-report measure of PA, for both participants and researchers/clinicians, than PA diaries.[9] The use of accelerometers to objectively measure PA are in turn

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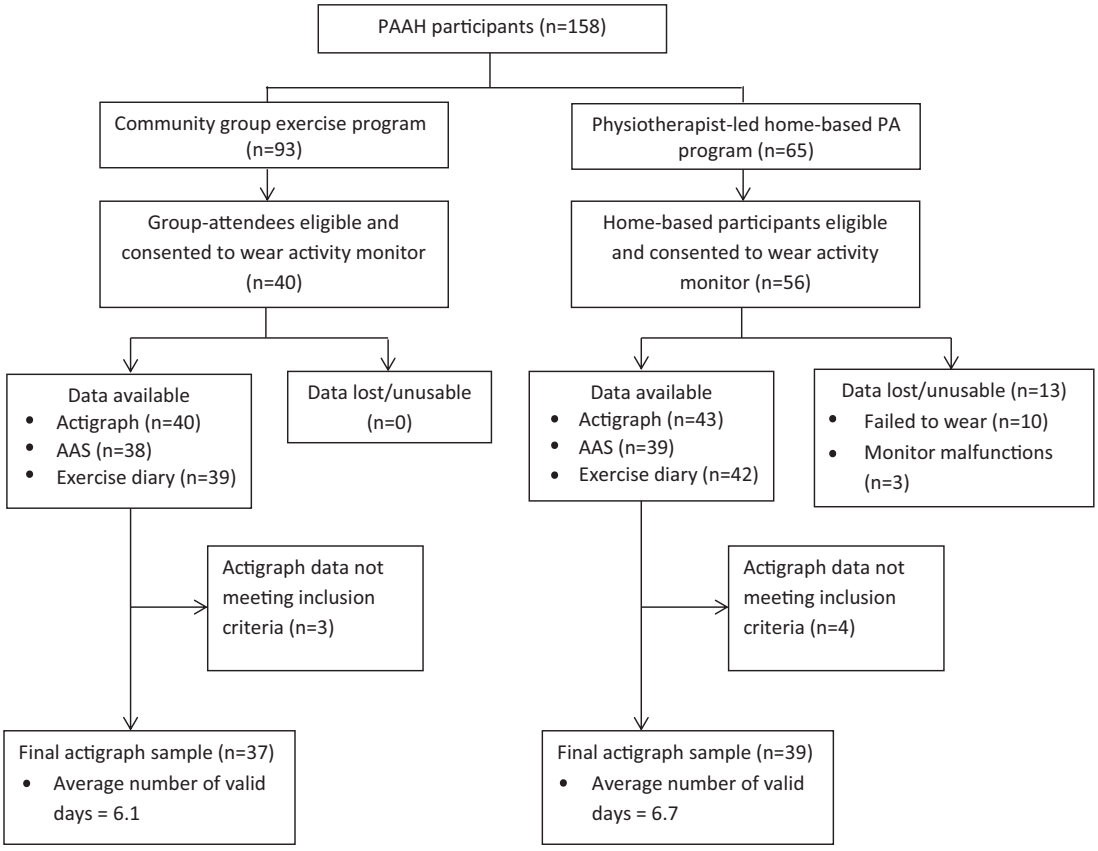

Fig. 1. Flow of physical activity measures. Active Australia Survey (AAS), physical activity (PA), physical activity at home study (PAAH).

considered a more accurate reflection of PA levels than subjective measures, eliminating issues such as over-reporting and recall bias[9–11] and having a stronger association with physiological and anthropometric biomarkers.[12] Accelerometers too, are not without their limitations. They provide no information on the type of activity performed,[11,13] do not adequately measure some activities,[11] such as cycling, and variations continue between study protocols, such as site placement,[11,14,15] epoch length,[11,14,15] cut-point thresholds,[2,11,14] make and model differences,[14,15] making it difficult to compare results. Numerous studies have compared PAQs and accelerometer outputs with fair-to-good correlations being reported.[1,2,10] Few studies have compared PA diaries or logs to accelerometer data though,[1,16,17] particularly in middle-aged adults, and there are no known studies where these measures have been compared when evaluating different physical activity interventions.

The main purpose of this study was to determine whether self-reported duration of perceived moderate and vigorous intensity PA via PA diaries matched potentially more accurate measures of PA, the Active Australia Survey and accelerometer data, for two PA interventions.

2. Methods

Community-dwelling 50–65 year olds were recruited to a non-randomised 6-month community group exercise program (G) or a physiotherapist-led home-based PA program (HB).[18] Two mail outs were conducted in the Australian Capital Territory (ACT) using the Australian Electoral Commission (AEC) federal electoral roll. The first letter ($n = 2105$) asked for expressions of interest in joining a group exercise program at a local YMCA. The second letter ($n = 1680$) was sent to those not interested in the group exercise program, inviting them to participate in the physiotherapist-led home-based physical activity program. All individuals who responded to the mail outs were contacted by telephone by the principal researcher to determine their eligibility. Participants were sedentary, had no serious medical conditions that could limit participation in moderate physical activity, and no severe functional impairments due to multiple medical or psychiatric conditions. Medical clearance screening was undertaken using the Sports Medicine Australia (SMA) Pre-Exercise Screening System.[19]

The physiotherapist-led home-based physical activity program targeted those not interested in, or unable to attend, a group exercise program. The home-based program consisted of an initial physiotherapy home visit. This was followed by approximately six phone calls using motivational interviewing[20] to offer advice and support over the 6-month intervention period. Fitness instructors conducted the group exercise program at the local YMCA, once a week, for 60 min, for 6-months. All participants, both group and home-based, were encouraged to increase their physical activity levels during the interventions, aiming to achieve public health PA guidelines, that is, 30 min of moderate intensity physical activity on most days.[18,21] A convenience sample of group-attendees and home-based participants were invited to take part in the validation study, with forty group-attendees and fifty-six home-based participants providing consent (Fig. 1).

Accelerometers were distributed to group-attendees within an exercise session at the YMCA. Instructions and demonstration of the accelerometer placement were provided during the exercise session by the principal researcher. Accelerometer instructions for home-based participants were provided by phone. The accelerometers and the self-report measures were then delivered to the participants' homes by the principal researcher. All participants were instructed to wear the accelerometer for 7-consecutive days within the next 10-day period, completing the PA diary during the 7-days and the self-administered Active Australia Survey (AAS) at