Bond University
Research Repository

Are Active Australia physical activity questions valid for older adults?

Heesch, Kristiann C.; Hill, Robert L.; van Uffelen, Jannique G.Z.; Brown, Wendy J.

Published in:
Journal of Science and Medicine in Sport

DOI:
10.1016/j.jsams.2010.11.004

Licence:
CC BY-NC-ND

Link to output in Bond University research repository.

Recommended citation(APA):
Heesch, K. C., Hill, R. L., van Uffelen, J. G. Z., & Brown, W. J. (2011). Are Active Australia physical activity questions valid for older adults? *Journal of Science and Medicine in Sport*, *14*(3), 233-237. https://doi.org/10.1016/j.jsams.2010.11.004

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

For more information, or if you believe that this document breaches copyright, please contact the Bond University research repository coordinator.

Download date: 16 May 2025

Are Active Australia physical activity questions valid for older adults?

Running Head: Are questions valid?

ABSTRACT

Objective The Active Australia Survey (AAS) is used for physical activity (PA) surveillance in the general Australian adult population, but its validity in older adults has not been evaluated. Our aim was to examine the convergent validity of the AAS questions in older adults.

Design The AAS was validated against pedometer step counts as an objective measure of PA, self-reported physical function, and a step-test to assess cardiorespiratory fitness.

Method Participants were community-dwelling adults, aged 65-89 y, with the ability to walk 100 m. They completed a self-administered AAS and the step-test in one interview. One week earlier, they completed the Short Form-36 physical function subscale. Between these two interviews, they each wore a YAMAX Digiwalker SW200 pedometer and recorded daily steps. Using the AAS data, daily walking minutes and total PA minutes (walking, moderate-intensity PA and vigorous-intensity PA) were compared with the validity measures using Spearman rank-order correlations. Fifty-three adults completed the study.

Results Median daily walking minutes were 34.2 (interquartile range [IQR] 17.1, 60.0), and median daily total PA minutes were 68.6 (IQR 31.4, 113.6). Walking and total PA minutes were both moderately correlated with pedometer steps (Spearman correlation $r=0.42$, $p=0.003$, for each) but not with step-test seconds to completion ($r=-0.11$, $p=0.44$; $r=-0.25$, $p=0.08$, respectively). Total PA minutes were significantly correlated with physical function scores ($r=0.39$, $p=0.004$), but walking minutes were not ($r=0.15$, $p=0.29$).

Conclusions This initial examination of the psychometric properties of the AAS for older adults suggests that this surveillance tool has acceptable convergent validity for ambulatory, community-dwelling older adults.

Keywords: Aged; Independent living; Population surveillance; Questionnaire; Reliability and validity

1. Introduction

There is strong support for the health benefits of regular participation in physical activity (PA). These include the delay or control of cardiovascular disease, diabetes, stroke, and mental illness and a decreased risk of all-cause mortality.[1] The burden of disease attributable to physical inactivity increases with age, with the greatest burden found in the oldest populations.[2] Additional benefits of PA participation for older adults include a decreased risk of having a fall.[3] PA has also been shown to decrease the risk of cognitive impairment[4] and to improve cognition in older adults with memory impairment.[5,6] Despite these benefits, over half of people aged 65+ y are not sufficiently active[7,8] according to Australian guidelines for moderate-intensity PA.[9]

Knowledge accumulated over the last 60 y about the beneficial effects of PA is largely based on epidemiologic studies. To date, questionnaires have been the preferred method for assessing PA levels in these studies.[10,11] While these self-report measures may not be suitable for intervention research, they may provide a reasonable snapshot of population levels of PA.[10]

In Australia, the Active Australia Survey (AAS) has been used widely in national and state-wide studies to measure PA. After being used in three national surveys, in numerous state surveys, and in large cohort studies, as well as starting to be used internationally, the AAS is recommended for continued use.[12] Although the AAS is primarily used for PA surveillance in Australia, researchers in different continents compare data about PA prevalence and proportions of the population meeting PA guidelines. Examining and reporting on the validity of the most frequently-used PA surveillance measure in Australia is therefore of interest for a wider research audience.

Like many PA surveillance surveys for the general adult population the AAS was developed for use with adults aged 18-65 y. With both the number and proportion of people aged 65+ y increasing in Australia,[13] it is important to examine whether the AAS is valid to assess PA levels in adults in this age group because the ability to use the same PA measure for surveillance in all Australian adults, regardless of age, is critical for determining population-wide PA patterns and trends. The aim of this study was to examine convergent validity of the AAS in older Australian adults. That is, we examined whether PA, as measured with the AAS, was associated with other measures theoretically expected to be associated with PA.[14]

2. Methods

Participants were community-dwelling residents of Brisbane, Australia, who were participating in a larger study of PA in older adults, which has been described elsewhere.[15] Residents aged ≥65 y who reported the ability to walk >100 m without aid, could speak and understand English fluently and were cognitively able to follow the study protocol were eligible for the current study. Nursing home residents were ineligible. As described previously,[15] participants were recruited via flyers displayed at voluntary organisations with large numbers of older adult members, via emails and e-newsletters, and word-of-mouth. The study protocol was approved by the University of Queensland Medical Research Ethics Committee.

Participants completed the self-administered version of the Active Australia PA Survey (AAS). Participants reported minutes spent in the last week (in ≥10-min sessions) walking briskly ('for recreation or exercise or to get to and from places'), in moderate-intensity leisure-time PA ('like gentle swimming, social tennis, golf'), and in vigorous-intensity leisure-time PA ('that makes you breathe harder or puff and pant, like jogging, cycling, aerobics, competitive tennis'). A walking minutes score and a moderate- to vigorous-intensity PA score (sum of minutes in these two activities) were used in these analysis, as well as a total score, which was computed by summing the minutes in each of the three activity types. This AAS version is used in large cohort studies, such as the Australian Longitudinal Study on Women's Health, which includes women aged 70-75 y, [16] and AUSDIAB, which includes a representative sample of adults aged 65+ y. [17] In a sample of mid-age women in Brisbane, [18] the self-administered AAS had acceptable test-retest reliability (total minutes/week: Spearman's rho=0.64). Total PA scores were moderately correlated with pedometer steps (r=0.43), and total PA (≥3 Metabolic equivalents [METS]) with accelerometer counts (r=0.52). In a convenience sample of adults aged 18+ y in Melbourne, total PA scores had low but acceptable correlations with accelerometer scores (PA≥3 METS: Spearman's rho=0.25-0.29).[19] Test-retest for classification as active was acceptable in that sample (>90.0%) as was classification as active, insufficiently active or sedentary in a representative sample of adults in Queensland (66.1%), 31% of whom were aged 60-75 y.[20]

In this study, three validation measures were used. Step counts were measured with the YAMAX SW-200 pedometer (YAMAX Corp, Tokyo), which has good convergent validity with other objective measures of PA.[21] Participants were instructed to wear the pedometer during all waking hours for 7 full days and were given a log for recording daily steps. They also received verbal and written instructions on wearing the pedometer and completing the log. Physical function was assessed with the self-report Short Form -36 (SF-36) physical function subscale, a widely used and well-validated measure. [22] The scale consists of 10 activities of daily living, ranging from 'bathing or dressing yourself' to 'vigorous activities'. Participants rated to what extent their health limited them in doing these activities: limited a lot (score=1), limited a little (score=2) or not limited (score=3). Scores on the questions were summed, and the total score was transformed to a 0-100 standardized scale, with higher score indicating better functional status.[22] Cardiorespiratory fitness was assessed with a self-paced step test that has been validated in older adults, using a maximum exercise treadmill test with measurement of expired gases.[23] The test requires participants to step up and down two 20-cm steps. To familiarize participants with the protocol, they stepped up and down 10 times at a pace that they considered 'low'. After a 5-min rest, they stepped 20 times at a pace they considered 'normal'. Minutes to completion were recorded as a measure of fitness.

Participants attended two interviews with study staff. The interviews were conducted in participants' homes or at other convenient locations, in accordance with participants' wishes. Before the first interview, participants were mailed a questionnaire addressing socio-demographic characteristics, the SF-36 physical function scale, and an informed consent form, which they completed and submitted at the first interview. At the first interview, they received a pedometer, a step log and instructions for their use. They each received a $20 gift voucher at the end of the interview. At the second interview, participants returned the pedometer and step log and completed the AAS. After it was determined that participants were not taking heart rate-altering medications (i.e., beta blockers), they did the self-paced step test. Participants received $20 cash for completing the second interview.

All data were entered into SPSS version 16.0 for analysis. Using the AAS data, median daily walking minutes, moderate- to vigorous-intensity PA [MVPA] minutes, and total PA minutes (walking and MVPA) were computed. Median total PA minutes were then used to dichotomize participants as the least physically active (< the sample median) or the most physically active (≥ the median). A mean daily step count was calculated for each participant. Days for which <10 hr of wear were reported were excluded (6 days; 5 participants). Pedometer data from participants recording <4 days of step counts (n=1) were also excluded.

Because the AAS data were not normally distributed, Spearman's Rank Order Coefficient was used to examine the relationship between each AAS variable with each validation measure. Independent sample t-tests were used to examine whether the least physically active participants, based on the AAS data, differed from the most physically active ones, on each validity measure. Statistical significance was set at $p = 0.05$.

3. Results

Data from 53 participants were available for analysis. Participants ranged in age from 65-89 y (mean=72.6 y, SD=5.9). Half were men (50.9%). Most participants were born in Australia (60.4%), were retired or not employed (90.6%), and were married or in a common-law marriage (64.2%). Although most participants had a university degree (54.7%), older adults with no tertiary education (11.3%) or with a certificate or trade education (34.0%) were represented. Most participants reported that managing on their income was easy (39.6%) or 'not too 'bad' (45.3%), although 15.1% said it was difficult to do so. Based on body mass index (BMI), calculated from objectively-measured height and weight as kg/m^2, 37.7% were a healthy weight (BMI: 18.5 to <25); 49.1% were overweight (BMI: 25 to <30); and 13.2% were obese (BMI: ≤30).

Using the AAS, participants reported a median of 68.6 min (IQR 31.4, 113.6) of PA/day. Most of this activity was walking (median walking min = 34.2, IQR=17.1, 60.0) with the remainder being MVPA (median=25.7, IQR 0.0, 61.1).

All AAS variables were fair to moderately correlated with pedometer steps, with walking minutes and total PA minutes showing the same, moderate relationship (Table 1). MVPA minutes and total PA minutes were similarly and significantly correlated with physical function scores, but walking minutes were not. Only MVPA minutes were fair to moderately correlated with step test time, meaning that participants who engaged in more minutes of MVPA needed less time to finish the step test than did those who engaged in fewer minutes of MVPA. As shown in Table 2, the most physically active participants (≥69 min of total PA/day) recorded significantly more daily pedometer steps and reported better physical functioning than the least physically active participants (<69 min of total PA/day); however, these two groups did not differ significantly on step test time.

4. Discussion

This study examined convergent validity of the AAS in adults aged 65 y or older. The main findings were that total PA minutes, as assessed by the AAS, were moderately correlated with pedometer steps and physical functioning and that the AAS could differentiate between the most and least physically active participants based on pedometer steps and self-reported physical functioning. The magnitude of the correlations was similar to that reported for other self-report PA measures in other age groups[24] and in older adults.[25]

The overall findings suggest that the AAS has acceptable convergent validity in older adults, at least as acceptable as that found in other studies assessing the validity of self-report PA measures developed for the general adult population.[18,21,24,26] Our findings that walking, MVPA, and total PA were moderately correlated with pedometer steps (*r*=0. 31-0.42) support those from a study of mid-age Australian women (mean age = 55, SD=1), for whom both AAS walking and AAS total PA were also moderately correlated with pedometer steps (0.29 and 0.43, respectively).[18] Our findings also follow from earlier studies that examined associations between other self-report PA and pedometer steps. In a review of the validity of pedometers for adults, including older adults,[21] the correlation between pedometer step counts and self-report measures was moderate (r=0.33) although correlates varied widely among studies (range=0.02-0.94).

To the best of our knowledge, an examination of the association between AAS scores and either SF-36 physical function scores or a measure of cardiorespiratory fitness has not been reported in the scientific literature. Our findings of moderate associations between both MVPA and total PA with SF-36 physical function are similar to previous findings showing moderate associations between both moderate-intensity PA and total PA with SF-36 physical function scores in older adults (r=0.39-0.41), using three self-report measures of PA developed for use in older people.[25]

In the present study, only MVPA was associated with cardiorespiratory fitness, and we were unable to differentiate between the least and most physically active participants based on cardiorespiratory fitness, although the difference between these groups in the time needed to complete the step test showed a trend in significance (p=0.06). It should be noted that cardiorespiratory fitness is correlated with total PA, but fitness is influenced by other factors, such as age and gender.[11] Thus, high correlates between PA and fitness were not expected for this study. The most common PA was walking, which, if not at a moderate pace, may not have impacted upon cardiorespiratory fitness. However, previous validation studies with older adults have been able to detect associations between other measures of cardiorespiratory fitness (e.g., 6-min walk test; sub-maximal cycle ergometer test) and total PA using other self-report PA measures.[25,27] Differences between the current study and these previous studies could reflect more valid measures of fitness, or more valid measures of PA for older adults.

It should be noted that summary PA measures in this study did not account for the intensity of the PA. Typically with AAS data,[28] PA scores are computed by multiplying the minutes in each PA by an assigned MET value to account for differences in intensity among the three PA types (walking*3.0 METs, moderate-intensity PA*4.0 METs, vigorous-intensity PA*7.5 METs). In the current study, this was not done for several reasons. First, MET values were developed for adults aged 18-64 y, and they are not recommended for use with older adults.[29] Second, pedometer steps do not account for PA intensity, and thus for comparisons with pedometer steps, minutes of PA are appropriate. However, to examine the sensitivity of our findings to our method of summarizing the PA data, we re-ran all correlations after adjusting PA by MET values. For all analysis, the correlations were almost identical to those reported here, suggesting that using PA minutes unadjusted for MET values was appropriate for this study.

Major strengths of this study were the recruitment of older adults that included young-old (32% aged 65-69 y), mid-old (36% aged 70-74 y) and old-old (32% aged ≥75 y) adults, the high level of compliance with the study protocol, and the representation of participants across categories of sociodemographic characteristics. The major limitation was that participants were healthy adults who were required to be able to walk at least 100 meters to be eligible for the larger study within which this study was nested. The high PA levels reported in the present study indicated that participants were more physically active than most Australian older adults.[7] Older adulthood (age 65+ y) spans a large range, and those in this range can be experiencing varying levels of disability. Overlooking the heterogeneity among older adults may foster misconceptions about age-related deterioration,[30] and thus studies to examine differences in the validity of the AAS among subgroups of older adults are warranted. Also of note is the possibility of recall bias. Participants completed the AAS immediately after engaging in daily recording of step counts over the previous week. This self-monitoring was likely to have improved awareness and retrospective recall of PA for the same reporting period and thereby inflated the validity estimates relative to what might be expected by using the AAS with older adults in national and state surveillance.

5. Conclusion

Our findings indicate that the measurement properties of the AAS for healthy, community-dwelling older adults are acceptable. Correlations between the AAS and pedometer steps indicate that the measurement properties are comparable to those for younger adults. Testing of the validity of AAS in large samples, in less physically active communities of older adults, and in subgroups of older adults with varying levels of disability is warranted, however, to determine the generalisability of the findings to a broader segment of the older adult population.

Practical Implications

- The Active Australia Survey is a practical tool for assessing physical activity levels in ambulatory, community-dwelling older adults.
- The Active Australia Survey is acceptably valid for assessing physical activity levels in ambulatory, community-dwelling older adults.
- Acknowledging that our results should be replicated, ambulatory, community-dwelling older adults could be included in national or state physical activity surveillance that uses the Active Australia Survey to assess physical activity levels.

Acknowledgements

Special thank you to the participants who generously provided the data used in this study. Drs. Heesch and van Uffelen were supported by a NHMRC program grant in physical activity and health (ID#301200) at The University of Queensland, School of Human Movement Studies.

References

1. Bauman AE. Updating the evidence that physical activity is good for health: an epidemiological review 2000-2003**.** *J Sci Med Sport* 2004;**7**(1 Suppl):6-19.
2. Begg S, Vos T, Barker B, et al. *The burden of disease and injury in Australia 2003. Cat. no. PHE 82.* Canberra, Australia: The Australian Institute of Health and Welfare; 2007.
3. Heesch KC, Byles JE, Brown WJ. Prospective association between physical activity and falls in community-dwelling older women**.** *J Epidemiol Community Health* 2008; **62**(5):421-6.
4. Etgen T, Sander D, Huntgeburth U, et al. Physical activity and incident cognitive impairment in elderly persons: the INVADE Study**.** *Arch Intern Med* 2010; **170**(2):186-93.
5. Lautenschlager NT, Cox KL, Flicker L, et al. Effect of physical activity on cognitive function in older adults at risk for Alzheimer disease: a randomized trial**.** *JAMA* 2008; **300**(9):1027-37.
6. van Uffelen JG, Chin A Paw, Hopman-Rock M, et al. The effects of exercise on cognition in older adults with and without cognitive decline: a systematic review**.** *Clin J Sport Med* 2008; **18**(6):486-500.
7. Bauman A, Ford I, Armstrong T. *Trends in Population Levels of Reported Physical Activity in Australia, 1997, 1999 and 2000.* Canberra, Australia: Australian Sports Commission; 2001.
8. Sims J, Hill K, Davidson S, et al. A snapshot of the prevalence of physical activity amongst older, community dwelling people in Victoria, Australia: patterns across the 'young-old' and 'old-old'**.** *BMC Geriatr* 2007; **7**4.
9. Australian Government Department of Health and Ageing. *Recommendations on physical activity for health for older Australians*. Available at: http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-physical-rec-older-guidelines. Accessed 7 June 2010.

10. Bauman A, Phongsavan P, Schoeppe S, et al. Physical activity measurement--a primer for health promotion**.** *Promot Educ* 2006; **13**(2):92-103.

11. Lagerros YT, Lagiou P. Assessment of physical activity and energy expenditure in epidemiological research of chronic diseases**.** *Eur J Epidemiol* 2007; **22**(6):353-62.

12. Australian Institute of Health and Welfare. *The Active Australia Survey: A Guide and Manual for Implementation, Analysis and Reporting.* Canberra, Australia: 2003.

13. Australian Institute of Health and Welfare. *The Health of Older People, Australia, 2001. AIHW cat. No. 4827.0.55.001.* Canberra, Australia: 2004.

14. DeVon HA, Block ME, Moyle-Wright P, et al. A psychometric toolbox for testing validity and reliability**.** *J Nurs Scholarsh* 2007; **39**(2):155-64.

15. Heesch KC, van Uffelen JG, Hill RL, et al. What do IPAQ questions mean to older adults? Lessons from cognitive interviews**.** *Int J Behav Nutr Phys Act* 2010; **7**(1):35.

16. Women's Health Australia, Research Centre of Gender, Health & Ageing, The University of Newcastle. *Women's Health Australia: the Australian Longitudinal Study of Women's Health.* Available at: http://www.alswh.org.au. Accessed 7 June 2010.

17. International Diabetes Institute. *AusDiab: Australian Diabetes, Obesity, & Lifestyle Study*. Available at: http://www.diabetes.com.au/research.php?regionID=181&page=ausdiab_home. Accessed 7 June 2010.

18. Brown WJ, Burton NW, Marshall AL, et al. Reliability and validity of a modified self-administered version of the Active Australia physical activity survey in a sample of mid-age women**.** *Aust N Z J Public Health* 2008; **32**(6):535-41.

19. Timperio A, Salmon J, Crawford D. Validity and reliability of a physical activity recall instrument among overweight and non-overweight men and women**.** *J Sci Med Sport* 2003; **6**(4):477-91.

20. Brown WJ, Trost SG, Bauman A, et al. Test-retest reliability of four physical activity measures used in population surveys**.** *J Sci Med Sport* 2004; **7**(2):205-15.

21. Tudor-Locke C, Williams JE, Reis JP, et al. Utility of pedometers for assessing physical activity: convergent validity**.** *Sports Med* 2002; **32**(12):795-808.

22. Ware JE Jr, Kosinski M, Keller SD. *SF 36 Physical and Mental Health Summary Scales: A User's Manual.* Boston, MA, United States: The Health Institute, New England Medical Center; 1994.

23. Petrella RJ, Koval JJ, Cunningham DA, et al. A self-paced step test to predict aerobic fitness in older adults in the primary care clinic**.** *J Am Geriatr Soc* 2001; **49**(5):632-8.

24. Prince SA, Adamo KB, Hamel ME, et al. A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review**.** *Int J Behav Nutr Phys Act* 2008; **5**(1):56.

25. Harada ND, Chiu V, King AC, et al. An evaluation of three self-report physical activity instruments for older adults**.** *Med Sci Sports Exerc* 2001; **33**(6):962-70.

26. Hagstromer M, Oja P, Sjostrom M. The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity**.** *Public Health Nutr* 2006; **9**(6):755-62.

27. Young DR, Jee SH, Appel LJ. A comparison of the Yale Physical Activity Survey with other physical activity measures**.** *Med Sci Sports Exerc* 2001; **33**(6):955-61.

28. Brown WJ, Bauman AE. Comparison of estimates of population levels of physical activity using two measures**.** *Aust N Z J Public Health* 2000; **24**(5):520-5.

29. Haskell WL, Lee IM, Pate RR, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association**.** *Circulation* 2007; **116**(9):1081-93.

30. Young A. Ageing and physiological functions**.** *Philos Trans R Soc Lond B Biol Sci* 1997; **352**(1363):1837-4.

Table 1

Correlations between minutes of physical activity, as recorded with the Active Australia Survey, and scores on validation measures (N=53).

Validation measures	Mean (SD)	Active Australia Survey, daily minutes		
		Walking Rho (p-value)	Moderate- to vigorous-intensity physical activity Rho (p-value)	Total physical activity Rho (p-value)
Daily pedometer counts[a]	7789 (3678)	0.42 (0.003)	0.31 (0.03)	0.42 (0.003)
SF-36 physical function	84.4 (14.6)	0.15 (0.29)	0.44 (0.001)	0.39 (0.004)
ST_{Time} (seconds)	91.7 (31.2)	-0.11 (0.44)	-0.29 (0.04)	-0.25 (0.08)

[a] N=50 (below median PA level n=24; above median PA level n = 26) due to faulty pedometer for two people and missing pedometer data for another person.

SD=standard deviation; ST=step test

Table 2

Associations between physical activity level, as recorded with the Active Australia Survey, and scores on validation measures (N=53).

Measures	Below median physical activity level n=25 Mean (SD)	Above median physical activity level n=28 Mean (SD)	Mean difference (SE)	p
Daily pedometer counts[a]	6180 (2835)	9273 (3786)	-3092.8 (952.3)	0.002
SF-36 physical function	78.8 (17.2)	89.5 (9.8)	-10.7 (3.9)	0.009
ST_{Time} (seconds)	101.1 (40.0)	83.6 (18.0)	17.5 (8.9)	0.06

[a] N=50 (below median PA level n=24; above median PA level n = 26) due to faulty pedometer for two people and missing pedometer data for another person.

SD=standard deviation; SE=standard error; ST=step test