

# Reporting physical activity in minutes not bouts: findings from a survey in Australia

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Traditionally, physical activity (PA) recommendations concentrated on continuous, moderate to vigorous forms of PA. Beginning in the mid-1980s, evidence found PA completed in shorter, 10-minute blocks also provided health benefits.<sup>1</sup> As such, many self-reported questionnaires used to obtain PA data for population surveillance measure PA performed in 10-minute bouts. For example, the validated Active Australia Survey (AAS)<sup>2</sup> measures the frequency (number of sessions) and duration (minutes per week) of sessions of walking and leisure PA completed in 10-minute bouts over the past seven days.

Incidental PA, such as walking from place to place, is a part of an individual's daily activity<sup>3</sup> but is not necessarily completed in 10-minute bouts. Current evidence suggests the total volume of PA, regardless of session duration, is associated with favourable health outcomes including all-cause mortality.<sup>4</sup>

Given this knowledge, neither the current Australian PA guidelines<sup>5</sup> nor the new World Health Organization guidelines<sup>6</sup> specifies PA should be completed in 10-minute bouts.<sup>5</sup>

To reflect the health benefits of walking trips of less than 10 minutes,<sup>4</sup> measuring the total minutes of activity is more useful than recording 10-minute bouts. Currently there is a gap in the literature evaluating how PA levels might compare when reported using bouts or unbouted measures. This study compares the differences in self-reported total time spent walking in a week to time spent walking in 10-minute bouts over the same seven-day period.

## Abstract

**Objective:** Physical activity has been commonly measured as time spent in bouts of at least 10 minutes, however, each minute of physical activity achieved in a day is now regarded as beneficial. This study aims to compare differences in total time spent walking in a week to time spent walking in 10-minute bouts over the same seven-day period.

**Methods:** Two self-reported measures of time spent walking were compared: one using time-constrained bouts and the other using total minutes. The first measure comes from the validated Active Australia Survey and reports walking in bouts of 10min or more, the second measure reports total estimated time spent walking.

**Results:** Data from 4,582 university participants in a census-styled survey were analysed. When comparing the reported minutes of walking in either 10-minute bouts or total minutes, more walking occurs in short bursts with a difference of 117min/week ( $p < 0.001$ ).

**Conclusions:** This result shows more walking is reported across a week in short bursts of less than 10 minutes.

**Implications for public health:** To monitor trends and evaluate physical activity interventions, reliable and valid measures of physical activity are necessary. Our result questions the usefulness of reporting bouted-walking as a measure which accurately captures population behaviour.

**Key words:** exercise; walking; self-report; Universities; Australia; survey and questionnaires

## Method

### Research Design

This cross-sectional study used an online survey to collect PA and travel behaviour data from staff and students from the University of Sydney, Australia. Full details have been described elsewhere.<sup>7</sup> Briefly, the survey used a single day 'census'-style approach to determine how staff and students travelled to the university. The census was open for voluntary participation on 19 September 2017 for approximately 24 hours. Participants answered two questions from the Active Australia Survey<sup>2</sup> to measure walking bouts: "In the last week, how many times have you

walked continuously, for at least 10 minutes, for recreation, exercise or to get to or from places?" and "What do you estimate was the total time that you spent walking in this way in the last week?". To measure total time spent walking, participants were also asked a modified AAS question, "In the last week, what do you estimate was the total time that you spent walking?"

Demographic information including sex, age, education level and role at the university was also collected.

The research was approved by the Human Research Ethics Committee, The University of Sydney (Protocol No. 2017/623).

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## Statistical analysis

We conducted paired t-tests to determine differences between the mean time participants reported to engage in walking bouts and total walking time. A difference-in-difference analysis of socio-demographic characteristics was based on known contributing factors for PA, including age and gender, as well as education and role (staff or student). Statistics were analysed using R version 4.0.3<sup>8</sup> and car (version 3.0-10)<sup>9</sup> package.

## Results

### Participants

In 2017, the university population was 75,986 persons; of these, 6,344 (8.4%) attempted the survey with 4,582 (62%) completing the PA-related questions. Participants comprised staff (36%) and students (63%).

### Overall difference in self-reported PA

Participants reported engaging in an average weekly 352 minutes of total walking compared with 235 minutes of walking bouts. The overall difference between reported measures was 117min/week, and statistically significant ( $t_{4581}=54.5, p<0.001, 95\%CI: 113; 121$ ). This difference equates to an additional 16min/day of PA.

High variance among the self-reported minutes walked was observed for both reporting measures.

### Differences in self-reported PA by socio-demographic characteristics

The paired t-tests showed a significant difference in the reported minutes of total-walking and walking in 10-minute bouts for all demographic groups (Table 1). Demographic differences were not significant when analysed in a multivariate logistical regression model. However, staff reported more total walking (mean=375min/week) and walking bouts (250min/week) than undergraduate students (337min/week total, 216min/week walking bouts) and postgraduate students (341 min/week total, 241 min/week walking bouts). The role of the participant at the university remained significant ( $p<0.001$ ) after adjusting for sex, age and education.

## Discussion

This study investigated the difference in reported time spent walking in 10-minute bouts compared to reporting total walking time over the same period. We found that participants reported spending more time in PA when reporting total minutes walked.

This finding was consistent across age, sex and education groups. Differences were found between staff and student responses, which remained significant after adjusting for sociodemographic characteristics. This time spent walking is beneficial for health, even when completed in bouts of less than 10 minutes,<sup>4</sup> because it breaks up sitting time and adds to daily physical activity minutes. Breaks in sedentary time are favourably associated with metabolic risk variables.<sup>10</sup>

The differences in how participants responded to these survey measures are important for PA research. Whilst the use of bouted-physical activity questions, such as the AAS, provide valid comparisons of PA over time through repeat measures with consistent wording of questions,<sup>11</sup> it may be more pertinent to measure total activity accrued given the health implications.<sup>4</sup> As such the research question should determine which measure is used, both for single studies and longitudinal surveillance. This study has specifically focused on walking trips only, however, the findings will be relevant for reporting of higher intensity PA, such as high-intensity interval training, which has shown benefits to health in bouts of only a few minutes. Further examination of population effects is required.

The limitations of this study were as follows: participants in our university sample were

**Table 1: Overall and demographic breakdown of time spent walking in 10-min bouts compared to total walking time over the same seven-day period.**

	Freq N(%)	Total minutes walked over one week		Difference in self-reported minutes walked over one week (within group analysis)			Difference in self-reported minutes walked over one week (between group analysis)		
		Mean (SD) week in 10min bouts	Mean (SD) week	Mean (SD)	95%CI	Test statistic (df)	p	Test statistic (df)	p
Total sample	4,582	235 (187.8)	352 (225.3)	117 (145.4)	113; 121	t=54.5 (4,581)	<0.001		
<b>Gender</b>								F=0.20 (1)	0.66
Men	1,561 (36%)	238(190)	354(225)	117 (143)	110; 124	t=32.115(1,555)	<0.001		
Women	2,760 (64%)	223(183.5)	351(224)	118(147.3)	113; 124	t=42.163(2,746)	<0.001		
<b>Age</b>								F=0.83 (4)	0.50
24 years and under	2,107 (48%)	228(180.8)	344(222.1)	118(147.7)	111;124	t=36.481(2,099)	<0.001		
25-34 years	941 (22%)	238.2(118.6)	349(221.9)	110(131.2)	102;119	t=25.753(938)	<0.001		
35-44 years	568 (13%)	277(180.9)	344(218.6)	117 (143)	105;129	t=19.418(564)	<0.001		
45-54 years	397 (9%)	245.3(191.1)	376(232.4)	122(143.9)	108;136	t=16.841(395)	<0.001		
55+	335 (8%)	271 (212)	404 (242.5)	136 (174.6)	117;155	t=14.157(329)	<0.001		
<b>Education</b>								F=0.17 (1)	0.68
Qualification less than tertiary (completed year 12, less than year 12 or diploma)	1,554 (36%)	217 (173.4)	337 (220.0)	122 (146.4)	114; 129	t=32.708(1,548)	<0.001		
Tertiary qualification or higher	2,805 (64%)	245 (192.3)	360 (226.7)	115 (145.2)	110;121	t=41.986 (2,791)	<0.001		
<b>Role</b>								F=7.83 (2)	<0.001
Staff	1,548 (36%)	250(192.6)	375(231.3)	126 (147.8)	119;134	t=33.159(1,537)	<0.001		
Student Undergraduate	1,624 (37%)	216(174.5)	337(222.3)	122(148.3)	115;129	t=33.175(1,618)	<0.001		
Student Postgraduate	1,162 (27%)	241(192.1)	341(217)	101(138.3)	93;109	t=24.858(1,158)	<0.001		

Note:

$p<0.05$  was considered statistically significant.

more active than the general population. The 34 minutes/day of walking reported in 10-minute bouts was higher than the population average of 25 minutes/day reported in the national census.<sup>12</sup> For a generalisation of these findings, the discrepancy in walking time needs to be assessed.

Self-report questionnaires are useful for population surveillance and large cohort studies due to their low cost and ease of administration, but also have their weaknesses.<sup>13</sup> Self-reported data using questions from the AAS are prone to bias when compared to objective PA measures.<sup>14</sup> However, for population surveillance and large-scale studies such as this, it is often not feasible to use objective measures of physical activity. Future validation studies using both objective and self-report measures to compare the time spent walking in bouts and total walking could provide more definitive insights.

## Conclusion

Our finding provides evidence that significantly more walking is done across a week in short bursts of less than 10 minutes. Walking in this way contributed to an additional 16min/day of physical activity being recorded in a self-reported survey. Measuring total walking minutes rather than only bouts of at least 10 minutes may provide a more useful estimate to monitor trends and evaluate physical activity interventions in population health.

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