Published in final edited form as:

Am J Health Behav. 2012 March ; 36(2): 168–178. doi:10.5993/AJHB.36.2.3.

Differential Accuracy of Physical Activity Self-Report by Weight Status

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Abstract

Objectives—To examine whether agreement between self-reported and accelerometer measured physical activity varies by BMI category in a low-income black sample.

Methods—Participants completed a questionnaire and wore an accelerometer for 4–6 days. Using one- and ten-minute bouts, accelerometers measured light, moderate, and vigorous physical activity time.

Results—Correlations varied by obesity (non-obese: one-minute $r = 0.41$; ten-minute $r = 0.47$; obese: one-minute $r = 0.21$; ten-minute $r = 0.14$). Agreement was highest among non-obese persons (one-minute kappa = 0.48, ten-minute kappa = 0.023; obese: one-minute kappa = -0.024 , ten-minute kappa = -0.020).

Conclusions—We found compromised questionnaire performance among obese participants.

Keywords

physical activity; obesity; IPAQ-S; accelerometer; self-report

Introduction

Engaging in regular physical activity is associated with a reduced risk of premature mortality and a myriad of negative chronic health conditions such as obesity, type 2 diabetes, hypertension, coronary heart disease, stroke, and certain forms of cancer [1–4]. For many practical reasons, physical activity is commonly assessed via self-reported questionnaire in descriptive and analytical research, despite the accumulated evidence challenging the validity of self-reported physical activity measures [4,4–9].

Accurate assessments of self-reported physical activity are important for surveillance and for analytical investigations in which physical activity is a key variable. The International Physical Activity Questionnaire Short Form (IPAQ-S), developed in 1997, is a commonly used self-reported physical activity measure that facilitates internationally comparable

physical activity estimates. IPAQ-S is comprised of seven items measuring physical activity within three intensity levels, walking, moderate, and vigorous [10]. Previous research, albeit limited, has demonstrated that the accuracy of physical activity reporting differs by socio-demographic characteristics, especially gender. A recent study, for example, showed that the IPAQ-S had significantly lower correlations with accelerometer measured physical activity among women compared to men [11].

Importantly, the IPAQ-S authors and others recommended further research be conducted examining possible population differences in its validity [10,12] and some evidence suggests that the IPAQ-S may be less accurate among obese persons [13–16]. Differences in accuracy could arise because the IPAQ scoring protocol uses of MET values derived from predominantly non-obese populations [17,18]. The resting metabolic rate (RMR) of 3.5ml/kg/min used in the Compendium of Physical Activities' MET calculations is appropriate for non-obese persons, but is too high for obese persons [19–21]. Because of this problem with the RMR, the accuracy of MET-minute computations in the IPAQ-S in obese populations is questionable. For example, the weighted score for walking activities in the IPAQ-S is multiplied by 3.3 METs, but because of their lower RMR, this value would actually be higher than 3.3 METs for an obese population. Thus, the IPAQ-S could systematically underestimate MET-mins for the obese, especially for MVPA types of activities due to differences in RMR between obese and non-obese participants.

Differences in reporting accuracy could lead to inaccurate physical activity prevalence rates in certain body mass index (BMI) categories and distorted associations in analytic models. This may be particularly problematic among U.S. racial/ethnic minority populations, particularly non-Hispanic Blacks, who have a disproportionate prevalence of overweight and obesity [22,23]. Additionally, Non-Hispanic Blacks consistently report lower amounts of leisure-time physical activity than non-Hispanic Whites, but might attain higher amounts of physical activity in other domains such as occupational and household activity [24–27]. These differences may lead to lower validity of self-report physical activity measures among some black groups [11].

The primary purpose of this study was to determine whether physical activity reporting using the IPAQ-S varied by BMI category according to objectively measured accelerometer physical activity data among a community-based sample of black men and women. A relatively unique characteristic of this study was that these analyses included the analysis of accelerometry-based activity data by two different minimum bout durations of one and ten minutes. The one-minute bout definition has been commonly used in the research literature and may actually correlate better with self-report physical activity from the IPAQ-S. However, the 10-minute bout definition is more consistent with both the public physical activity recommendations (i.e., activity bouts should be 10 minutes) and with how the IPAQ-S asks questions (i.e., activity bouts should be 10 minutes).

Methods

Sample

These data were collected from Black residents from two public housing developments in metropolitan Boston, Massachusetts. In collaboration with the housing developments and with institutional review board approval, participants were recruited through posted signs and distributed advertisements. Two hundred and fifteen subjects responded, provided written informed consent, and met eligibility criteria. Each respondent self-identified as Black or African-American, were 24–70 years of age, and self-reported no restrictions to usual physical activity.

Weight and Height Assessment

Body mass in kilograms and height in meters were measured by trained research staff using a standardized protocol [28] with a digital floor scale (Seca Model 770) and stadiometer (Seca Model 440 Portable Stadiometer), respectively. Individual heights and masses were used to calculate BMI using the formula: $BMI (kg/m^2) = (body\ mass / (body\ height)^2)$. Body mass index categories were defined as normal weight or underweight ($BMI < 25$), overweight ($25 < BMI < 30$), and obese ($BMI \geq 30$).

Physical Activity Assessment: Self-Reported

Self-reported physical activity data were collected using the IPAQ-S (questionnaire available at: <http://www.ipaq.ki.se>) which asks participants to report three types of physical activities performed during the last seven days that lasted ≥ 10 minutes in duration [10]. Specifically, the IPAQ-S questions ask participants to recall the amount of time spent performing moderate intensity activities (“*activities that make you breathe somewhat harder than normal*”), vigorous intensity activities (“*activities that make you breathe much harder than normal*”), as well as a separate question for all time spent walking. Total weekly physical activity was estimated by weighting time spent in each activity intensity level with an estimated metabolic equivalent (MET) energy expenditure (MET·mins/week) using the instrument’s scoring protocol (protocol available at: <http://www.ipaq.ki.se/scoring.pdf>). The IPAQ scoring protocol multiplies an average MET value to the number of self-reported minutes of moderate intensity activity (M), vigorous intensity activity (V), and minutes of walking activity (W) (3.3 METs, 4.0 METs, and 8.0 METs, respectively). A MET is the relative energy cost to perform a task divided by the general population estimate for resting metabolic rate (3.5 ml/kg/min) [29]. The total weekly physical activity for each participant was then expressed as two separate variables: 1) The sum of the computed MET·mins/week for all three types of activities (i.e., $M + V + W$); 2) The total number of minutes/week spent within the three types of activities. The former units (MET·mins/week) are commonly used for summarizing mixed moderate and vigorous intensity questionnaire-based activities, while the latter units (minutes/week) are the same as those used for reporting the physical activity guidelines of the American College of Sports Medicine and the American Heart Association (ACSM/AHA). Lastly, the protocol rules for outlier identification and data truncation were also followed.

Physical Activity Assessment: Objectively Measured

Objectively measured physical activity data were collected using omni-directional accelerometry-based activity monitors (Actical; Phillips/Respironics, Bend, OR USA). The functional characteristics of the accelerometers, as well as the sampling protocol, have been detailed elsewhere [11,30]. Briefly, a total of 40 accelerometers were randomly assigned to subjects and preprogrammed to record data over one-minute epochs. Prior to distribution, each accelerometer was examined using manufacturer-recommended hardware and software and calibrated before testing. Research staff explained the function of the accelerometer, demonstrated proper accelerometer placement, and securely fastened the device to a hip clip for attachment to the participant’s clothing. Participants were instructed to wear the accelerometers and to go about their normal activities. Six to eight days later, accelerometers were collected and data were immediately downloaded and archived. Accelerometers were then recalibrated and redistributed to other study participants.

Accelerometer Data Screening and Processing

The accelerometer data screening and processing procedures have been described elsewhere [11]. Importantly, the following criteria were used to determine accelerometer data quality and usability prior to subsequent analysis. The subject must have worn the monitor at least

four full days during the specified wearing period. A “full day of wearing” was defined as at least ten hours of continuous monitoring from the first to last bursts of activity data. The ten hour minimum could include only a single two hour period with no recorded movement of the accelerometer.

Each subject’s raw accelerometer data was converted to minute-by-minute activity energy expenditure (AEE, kcals/kg/min) and categorized as either light (<3.0 METs, or an AEE <0.0385 kcals/kg/min), moderate (3.0–7.9 METs, or an AEE 0.0385–0.1234 kcals/kg/min), or vigorous intensity (≥8.0 METs, or an AEE ≥0.1235 kcals/kg/min) [30]. Since the number of full monitoring days could vary between four and six days, the times within each activity intensity category were computed as an average minutes/day of activity and then extrapolated to an average minutes/week. This computational strategy allowed for the accelerometer outcome variable to be expressed in the same units as ACSM/AHA physical activity recommendations of minutes/week. The data processing algorithm described above was applied to the raw accelerometer data using minimum bout definitions of both one and ten minutes. A moderate intensity ten-minute bout, for example, means that the computed AEE values were ≥0.0385 kcals/kg/min for at least ten successive minutes. The duration of these bouts were summed over the course of each recording day and then averaged and extrapolated to minutes/week of activity as described above. A one-minute bout, in contrast, is the same as the recording interval (i.e., one-minute epochs), so individual one-minute values were simply summed over the course of each day regardless of whether bouts exceeded one-minute or not. The one and ten-minute bout definitions were used for summarizing these data because a one-minute bout is frequently used for processing accelerometer data in the research literature, whereas a ten-minute bout definition is consistent with the IPAQ-S questions and the ACSM/AHA physical activity recommendations.

Statistical Analyses

One-hundred thirty-five (62.8%) of the 215 participants had valid accelerometer data, self-reported data on physical activity, and BMI measurements. A total of 18 participants are not included in our analysis because they: dropped out for personal reasons (three people); did not complete the lost their accelerometer (six people); or their devices were unreadable (two people); reason not recorded (seven people). An additional 34 participants were excluded for lack of accumulation of at least four, ten-hour days of device wear. Another 13 are not included because they did not complete the IPAQ-S; 15 were identified as outliers through the IPAQ-S scoring protocol and excluded because they reported over 960 min/week of physical activity.

Socio-demographic characteristics such as income and educational attainment of obese and non-obese participants were compared using chi-square tests of association and two-sample t-tests. Medians and interquartile ranges by obesity status for physical activity data are presented. As the physical activity data were not normally distributed, non-parametric Spearman coefficients were used to assess correlations between IPAQ-S and accelerometer activity estimates. Partial spearman correlation coefficients were used to calculate estimates adjusted for age and gender. Both one- and ten-minute accelerometer bout lengths were assessed, without an allowance for bout interruptions. The proportion of participants classified as meeting physical activity recommendations (i.e., ≥150 min/week at moderate or higher intensity) [31] based on IPAQ-S (min/week) and accelerometer data (min/week) were compared and calculated using kappa measures of agreement. Our primary analyses compare non-obese participants to obese participants. This was done to maximize sample size and because preliminary analyses indicated that the relationship between reporting accuracy and weight status did not significantly vary between the underweight/normal and

overweight groups. All p -values were two-sided with an alpha level of 0.05. Data analysis was performed using SAS statistical software version 9.2.

Results

The majority of study subjects were obese ($n=74$, 54.8%) and female ($n=99$, 73.3%). Overall, participants had a mean age of 42.9 years, ranging from age 24 to 64 (Table 1). Most participants were unemployed ($n=81$, 60.0%) and low-income, with 35.5% earning less than \$10,000 per year. In spite of their low-income, over 40% of participants reported having attended college. Educational attainment varied by obesity status with half of obese participants reporting some college or above compared with only 29.5% of non-obese participants ($p=0.0089$). Overall, about half of the sample currently smoked, but this varied by obesity status, with only 33.3% of obese participants reporting current smoking versus 70.5% of non-obese participants ($p<0.0001$). Employment, household income, and mean age were similar among obese and non-obese participants.

Self-Reported Physical Activity

Participants reported a median (interquartile range) of 630 (1080), 120 (590) and 135(420) MET-min/week of walking, moderate and vigorous physical activity respectively on the IPAQ-S. Median min/week of each type of physical activity did not vary by weight status (Table 2).

Objectively Measured Physical Activity

Using a one-minute bout definition, participants recorded a median of 1400 min/wk of light intensity, 856 min/wk of moderate intensity and 0 min/wk of vigorous intensity physical activity (Table 2). Participants recorded 47.8 min/wk of light intensity, 101.8 min/wk of moderate intensity and 0 min/wk of vigorous intensity physical activity using the ten-minute bout definition. When we compared non-obese and obese participants, obese participants recorded lower levels of light and similar levels of moderate and vigorous activity in both one- and ten-minute bouts. Of note, both obese and non-obese participants reported over 100 min/wk of vigorous physical activity on the IPAQ-S, but neither group recorded any vigorous activity via accelerometer.

Correlation Coefficients

Correlations between IPAQ-S and accelerometer-determined activity estimates varied by obesity status using both a one- and ten-minute bout definition (Table 3). For a ten-minute bout, the correlation ($r=0.47$, $p=0.0002$) showed moderate agreement among non-obese participants and was higher than among obese participants ($r=0.15$, $p=0.20$). When correlations were adjusted for age and gender, the estimates showed little change. The difference between obese and non-obese participants was slightly smaller when a one-minute bout definition was used (Table 3). When we expanded the non-obese category and examined normal/underweight participants separately from overweight participants, correlations for the disaggregated groups were similar and remained higher than those of obese participants. Using a one-minute bout definition, Spearman correlation coefficients were $r=0.34$ ($p=0.060$) for normal/underweight and $r=0.44$ ($p=0.015$) for overweight participants respectively while they were $r=0.24$ ($p=0.041$) for obese participants. With adjustment for age and gender, correlations were somewhat attenuated for BMI groups. Spearman partial correlation coefficients were $r=0.28$ ($p=0.14$) for normal/underweight and $r=0.43$ ($p=0.022$) for overweight participants, while they were $r=0.21$ ($p=0.067$) for obese participants.

Activity Recommendations

When participants were classified by whether they met physical activity recommendations, agreement between the IPAQ-S and accelerometer was moderate ($k=0.48$, 95% CI: -0.13 , 1.00) among non-obese participants and there was no agreement among obese participants ($k=-0.024$, 95% CI: -0.064 , 0.017 ; Table 4). Among obese participants, 90.5% were classified as meeting recommendations by IPAQ-S compared to 98.6% using the accelerometer. In comparison, for non-obese participants those figures were 95.1% and 96.0% respectively. When a ten-minute bout length was used there was little agreement regardless of obesity status (Table 4).

Discussion

In our study, correlations between accelerometer measured and self-reported physical activity were consistently lower among obese participants than those with lower BMIs, particularly for longer accelerometer bout lengths. Our results show that obese persons misclassified the intensity of their physical activity, particularly vigorous physical activity to a greater extent than did non-obese participants. Additionally, kappa statistics showed no agreement between accelerometer measures and IPAQ-S self-report when classifying whether obese participants met activity recommendations. Our study contributes to the literature through the use of the both one- and ten-minute bout definitions to characterize accelerometer-derived estimates of physical activity. We also assessed the utility of the IPAQ-S for classifying individuals for meeting activity recommendations while most validation studies only examine validity with correlation coefficients.

Our results are consistent with much of the past work that examined BMI differentials in the validity of physical activity-self report, finding lower accuracy among obese persons [6,32–36]. For example, Ferrari et al. (2007) used the Past Year Total Physical Activity Questionnaire and found that accuracy of self-reported physical activity was lower for those with higher BMIs [35]. Several studies have found that overweight and obese individuals over-report their physical activity [32,33,37–41]. For example, Slootmaker et al. (2009) using the Activity Questionnaire for Adolescents & Adults found that overweight adults self-reported significantly higher vigorous physical activity than normal weight adults, which was not seen when assessed by accelerometers [32]. Additionally, prior research with the IPAQ-S suggests that abdominal obesity was one of the factors identified in IPAQ-S over-reporting [14], and both higher BMI and higher body fatness were factors in the overestimation of energy expenditure measured by physical activity records compared to doubly labeled water in other research [42]. Interestingly, Buchowski et al. (1999) found that subjects significantly over-estimated duration of more strenuous activities with increasing percent body fat, while underestimating moderate activities [34].

There are several potential reasons for the differences in physical activity reporting accuracy between obese and non-obese participants. First, the IPAQ-S asks participants to gauge their level of activity based on cardiorespiratory effects and physical efforts with such phrasing as “moderate physical effort” and “make you breathe somewhat harder than normal”. These manifestations of effort may occur at lower levels of activity for obese persons than among non-obese due to lower levels of cardiorespiratory fitness [43,44]. While a positive correlation between fitness and obesity is possible among some individuals, on a population level, it's more likely to an inverse correlation. This would lead to over-reporting of physical activity and misclassification of intensity. Ham et al. (2007) showed that many physical activity bouts classified as moderate-intensity were shown to be light or very-light intensity when mean heart rate was used as the criteria for cut-points instead of accelerometer cut-point equations [45].

The IPAQ-S could systematically underestimate MET-mins for the obese, especially for MVPA types of activities due to differences in in RMR between obese and non-obese participants [21]. In our analysis, this difference in MET-values is exacerbated by the fact that the AEE intensity cut-points we used for the accelerometer data were specifically derived to categorize the data with overweight/obese-specific intensity thresholds [30]. Thus, while our calculations of the accelerometry moderate to vigorous physical activity data was specific to overweight and obese persons, the IPAQ-S scoring system is not.

Additional misclassification could occur due to differences in how data is captured and classified on the IPAQ-S and the accelerometer. Walking is assigned its own category on the IPAQ-S, but walking may occur at different paces with slow walking assigned a MET value of 2.0, walking three miles per hour 3.3 METs and very brisk walking (4.5 mph) 6.3 METs [17,18]. Thus, some walking reported on the IPAQ-S would be captured as either light or moderate activity on the accelerometer. When we examine our data (Table 2) with this caveat in mind, the differences between self-reported MET-minutes of physical activity and accelerometer captured activity are similar for a one-minute bout, but not for a ten-minute bout. This finding highlights the importance of bout length in validation studies. The IPAQ-S asks respondents to only report physical activity which lasted for ten minutes or more. Thus, the ten-minute bout length data in our analysis would be expected to most closely align with self-reported physical activity. That it does not suggests that in this population physical activity is occurring, but in short bursts lasting less than 10 minutes, and this occurrence varies by weight status.

It is important to note that this study was conducted among a relatively small community-based sample of low-income, urban Black adults, and might only be generalizable to comparable populations. Past studies have suggested that physical activity questionnaires might be less valid among some lower-income urban [46] and black populations [47]. These population socio-demographics are important because few self-report measures, including the IPAQ-S, effectively capture physical activity accumulated through routine, non-leisure activities (e.g. domestic and occupational activities), which may account for a greater proportion of total physical activity among low income persons [48] and Blacks [49]. In recent work, 15.5% of non-Hispanic Blacks reported a physically active occupation and had lower levels of leisure-time physical activity than non-Hispanic Whites [50].

This issue of generalizability is an important one, not just in terms of our results, but in terms of the use of the IPAQ-S as well. Our study population is significant because of the high prevalence of obesity among U.S. Blacks, particularly black women, and the increasing number of initiatives on eliminating disparities in physical activity and health such as Healthy People 2010 [51]. Our results show that measures like the IPAQ-S have the potential to significantly misclassify physical activity in this population, which may lead to considerable biases when populations are compared. Thus, the issue is not just compromised performance of the IPAQ-S, but that it and similarly structured measures are potentially problematic for population comparisons. This measurement error could lead to distorted associations in regression models and attenuate risk estimates [35,52,53]. These implications should be taken in light of our earlier work using the IPAQ-S that demonstrated gender differentials in the accuracy of physical activity self-report [11].

Lastly, though accelerometer data was used in this analysis as a 'gold standard' we must point out that they do not capture all physical activities and thus might underestimate total physical activity levels for some individuals. For example, water-based activities (e.g., swimming) where the monitor may be taken off during activity, activities that do not require lots of moderate-to-vigorous intensity body movement (e.g., yoga, Ti Chi), as well as activities that do not require lots of large accelerations (e.g., bicycling), may be

underrepresented and/or missed entirely. Importantly though, qualitative data collected in our early interactions with members of this population indicated the prevalence of water-based physical activities was quite low. Furthermore, some bias may have resulted from non-response by participants refusing to partake in our study or forgetting to wear the accelerometer each day. However, participants in our study must have worn their accelerometer for at least four full days during the specified wearing period to meet our eligibility criteria, meeting minimum levels needed for reliable estimates of physical activity among adults [54].

Conclusions

In conclusion, we found compromised performance of the IPAQ-S among obese participants, whereby obese participants overestimated their vigorous physical activity levels and misclassified the intensity of physical activity. We advocate for a measurement error correction [5,35] to improve physical activity estimates among these populations. Moving forward, physical activity measures should be more routinely validated among populations being monitored for disparities reduction.

Acknowledgments

This research was supported by grants 5R01CA098864-02 and 3R01CA098864-02S1 from the National Cancer Institute and support to the Dana-Farber Cancer Institute by Liberty Mutual, National Grid, and the Patterson Fellowship Fund. GG Bennett is also supported by an award from the Dana-Farber/Harvard Cancer Center and by grant 3R01CA098864-02S1 from the National Cancer Institute. ET Warner was supported in part by a National Institute of General Medical Sciences training grant (grant # 5R25GM055353-12) and National Cancer Institute grant (grant # 5T32CA009001-36).

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Table 1

Participant characteristics

	TOTAL SAMPLE N=135 N (%)	NON- OBESE N=61 N (%)	OBESE N=74 N (%)	P-VALUE
CHARACTERISTIC				
Sex				
Male	36 (26.7)	19 (31.2)	17 (23.0)	0.29
Female	99 (73.3)	42 (68.9)	57 (77.0)	
Age (years)				
Mean $\pm$ SD	43.4 $\pm$ 11.6	43.9 $\pm$ 11.0	42.9 $\pm$ 12.1	0.46
BMI (kg/m²)				
Mean $\pm$ SD	30.9 $\pm$ 7.9	24.7 $\pm$ 3.5	36.1 $\pm$ 6.8	
Normal or underweight (<25)	31 (23.0)			
Overweight (25 and <30)	30 (22.2)			
Obese (≥ 30)	74 (54.8)			
Household Income				
Under \$10,000	44 (35.5)	23 (41.1)	21 (30.9)	0.35
\$10,000–19,999	27 (21.8)	9 (16.1)	18 (26.5)	
\$20,000–29,999	25 (20.2)	13 (23.2)	12 (17.7)	
\$30,000	28 (22.6)	11 (19.6)	17 (25.0)	
Educational Attainment				
Less than high school	26 (19.3)	10 (16.4)	16 (21.6)	0.0089
High school graduate	54 (40.0)	33 (54.1)	21 (28.4)	
Some college or above *	55 (40.7)	18 (29.5)	37 (50.0)	
Smoking				
Current Smoker	67 (50.4)	43 (70.5)	24 (33.3)	<0.0001
Non-Smoker	66 (49.6)	18 (29.5)	48 (66.7)	
Employment				
Employed	54 (40.0)	20 (32.8)	34 (46.0)	0.12
Not Employed	81 (60.0)	41 (67.2)	40 (54.0)	

* Anyone who attended college regardless of graduation status

Table 2

Median minutes/week of physical activity by type of activity for the IPAQ-S and by intensity category for the accelerometer for obese and non-obese participants

	TOTAL	NON-OBESE	OBESE	P-VALUES*
	Median (IQR)			
IPAQ-S				
Walking	630 (1080)	840 (1050)	420 (940)	0.23
Moderate	120 (590)	120 (600)	120 (520)	0.54
Vigorous	135 (420)	150 (420)	120 (420)	0.93
Accelerometer (1-min bout length)^a				
Light	1400 (456.3)	1522.2 (414.2)	1364 (452.7)	0.02
Moderate	856.3 (526.2)	858 (575.6)	855.2 (487.7)	0.91
Vigorous	0 (0)	0 (0)	0 (0)	0.80
Accelerometer (10-min bout length)^a				
Light	47.8 (56.2)	51.3 (62.0)	43.3 (59.0)	0.54
Moderate	101.8 (178.5)	101.8 (178.2)	100.2 (166.8)	0.55
Vigorous	0 (0)	0 (0)	0 (0)	0.32

Abbreviations: IRQ-interquartile range; IPAQ-S International Physical Activity Questionnaire Short Form

^aLight activity: <3.0 metabolic equivalents (METs); moderate: 3.0–7.9 METs; vigorous: 8.0 METs

* Two-sided Wilcoxon two-sample test

Table 3

Spearman correlation coefficients between the IPAQ-S (MET-mins/week) and accelerometer measured physical activity (minutes/week) by bout length and obesity

	Spearman r	p-value	Spearman r*	p-value
Accelerometer (1-min bout length)				
Non-obese	0.40	0.0013	0.41	0.0014
Obese	0.24	0.041	0.21	0.067
Accelerometer (10-min bout length)				
Non-obese	0.47	0.0002	0.47	0.0002
Obese	0.15	0.20	0.14	0.24
Accelerometer (1-min bout length)				
Underweight/Normal	0.34	0.060	0.28	0.14
Overweight	0.44	0.015	0.43	0.022
Obese	0.24	0.041	0.21	0.067
Accelerometer (10-min bout length)				
Underweight/Normal	0.43	0.034	0.36	0.055
Overweight	0.57	0.001	0.55	0.0026
Obese	0.15	0.20	0.14	0.24

* Spearman partial correlations with adjustment for age (in years) and gender (male or female).

Table 4

Agreement between IPAQ-S (mins/week) and accelerometer data (mins/week) at classifying participants as meeting physical activity recommendations by bout length

ONE-MINUTE BOUT	IPAQ-S		
Accelerometer	Did not meet recommendations	Met recommendations	Kappa Statistic (95% CI)
Obese			
Did not meet recommendations	0	1	−0.024 (−0.064, 0.017)
Met recommendations	6	67	
Non-Obese			
Did not meet recommendations	1	1	0.48 (−0.13, 1.00)
Met recommendations	1	58	
TEN-MINUTE BOUT			
	Did not meet recommendations	Met recommendations	Kappa Statistic (95% CI)
Obese			
Did not meet recommendations	4	52	−0.020 (−0.10, 0.063)
Met recommendations	2	16	
Non-Obese			
Did not meet recommendations	2	43	0.024 (−0.011, 0.058)
Met recommendations	0	16	