



Original article

Stand and Move at Work sedentary behavior questionnaire: validity and sensitivity to change



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ABSTRACT

Purpose: We evaluated the validity and sensitivity to change of a workplace questionnaire to assess sedentary behavior (SB) during and outside work.

Methods: Participants wore an activPAL and completed an SB questionnaire at two time points (baseline and 3-month follow-up). Ecological momentary assessments were used to assess workplace location (at desk vs. away from desk). Intraclass correlation coefficients, mean difference, root of mean square error, kappa agreement, and Bland-Altman plots assessed validity. Sensitivity to change after 3 months of intervention was assessed using the standardized effect size.

Results: Data from 546 participants (age = 45.1 ± 16.4 years, 24.9% males, 72.7% white) were analyzed. Intraclass correlation coefficients ranged from 0.08 to 0.23. SB was overestimated \bar{d} (95% CI) by 47.9 (39.2, 56.6) min during work hours but underestimated for both non-work hours and nonworkdays by -38.3 (-47.4, 29.1) and -106.7 (124.0, -89.5) min, respectively. Participants slightly underestimated SB by -3.4 (-12.6, 5.7)% when at their desk but overestimated SB by 2.8 (-2.4, 8.0)% when not at their desk. The questionnaire demonstrated similar standardized effect size (>0.6) to the activPAL for sedentary and standing time.

Conclusions: Agreement between the questionnaire and activPAL was on par with other self-report measures. The questionnaire yielded valid estimates of at/away from desk SB and was sensitive to change.

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Introduction

Excess sedentary behavior (SB), defined as any seated/lying positions with low energy expenditure, has deleterious effects on cardiometabolic and other key health parameters independent of time spent being physically active [1–5]. As office-based employees spend ~66% of their total work time being sedentary [6], the workplace has emerged as a logical setting for interventions targeting SB [7–9]. Although objective measures of SB exist, they are not always feasible in workplace epidemiologic and health behavior studies and do not provide the contextual information needed to inform public health guidelines [10]. Thus, self-report

remains an important method of measurement for physical activity and SB [11].

In contrast to physical activity that is structured and purposeful, SB is ubiquitous, habitual, and socially reinforced. These characteristics significantly increase the cognitive load associated with recall that ultimately leads to inaccurate self-reporting [12]. A number of self-report measurement tools have been developed to measure SB ranging from a single-item questionnaire to questionnaires. Two systematic reviews evaluated these tools in terms of their reliability (i.e., repeatability of measurement) and validity (i.e., accuracy in relation to a criterion measure) [12,13]. Results from these reviews indicated wide variability in the reliability of these questionnaires with overall reliability ranging from (intraclass correlation coefficient) 0.18 to 0.95 and domain-specific reliability ranging from 0.04 to 0.93. Furthermore, these questionnaires often have poor to moderate validity (spearman rho ranging from 0.02 to 0.83) with a significant amount of underestimation (-0.5 to -6 hours per day). In addition, very few questionnaires had been

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developed to assess the context of these behaviors in the workplace. For example, the Occupational Sitting and Physical Activity Questionnaire measures the total time spent sitting, standing, walking, or doing heavy labor at work [14] but does not assess the context of these activities (e.g., desk-based vs. non-desk based tasks). Furthermore, most of these questionnaires have been validated using accelerometry [15–17], which does not distinguish between sitting and standing activities [18], and none to our knowledge validate the context of SB in the workplace.

Another important metric in evaluating the usefulness of an instrument is its ability to measure change over time. The sensitivity to change index is valuable in providing researchers with an estimate of the minimum detectable change in the target behavior using the instrument. Unfortunately, few questionnaires have been evaluated in their ability to detect clinically important changes over time (sensitivity to change) [19]. This is important considering the proliferation of interventions that target SB in the workplace. A questionnaire that can measure context-specific SB that occurs in the workplace is valuable to help tailor interventions and better evaluate outcomes of these interventions.

This study aimed to evaluate the overall validity and sensitivity to change of a researcher-developed workplace SB questionnaire in assessing total SB during (1) work hours, (2) non-work hours on workdays, and (3) nonworkdays. Furthermore, we aimed to provide preliminary evidence to establish the validity of the tool in measuring context-specific SB (i.e., desk-based) in the workplace.

Methods

Study design and participants

Participants were drawn from an ongoing group randomized trial of 24 worksites in the greater Minneapolis/St. Paul and Phoenix metropolitan areas aimed at reducing SB and increasing light-intensity physical activity in the workplace. Participants were eligible if they meet all of the following criteria: (1) ≥ 18 years old, (2) able to safely reduce sitting and increase light physical activity (LPA), (3) working full time, (4) not currently pregnant, (5) predominant worksite occupation being seated office work, (6) not currently using a sit-stand workstation, (7) willing to have a sit-stand workstation, and (8) willing to be randomized to an intervention arm. The study design and protocol has been published elsewhere [20]. Worksites were randomized to one of two active behavioral interventions: (1) multicomponent intervention (e.g., support from worksite leaders and advocates, signage, and e-newsletters) to decrease sitting and increase standing and LPA at work or (2) multicomponent intervention to decrease sitting and increase standing and LPA at work along with the use of a sit-stand workstation. The intervention took place over 12 months, although only data from the baseline and 3-month time points (collected from January 2016 to January 2017) were included in these analyses. All study procedures were approved by the institutional review boards of the associated institutions and written consent was obtained from each participant before participation.

Criterion measure of sedentary and more active behaviors

Objective measures of sitting, standing, and moving time were derived from the activPAL microaccelerometer, which is a valid and reliable device [21–23]. The devices were waterproofed, and participants were instructed to wear it on the midline of their right thigh for seven consecutive days. Collected data were processed into events of sitting, standing, or moving (i.e., stepping) using the activPAL software (activPAL version 7.2.32, PAL Technologies Ltd, Scotland, UK). Sleep intervals, workday arrival and departure times,

and nonworkdays were self-reported using an electronic daily log. All wake time measured by the activPAL as lying/seated was considered sedentary. The remaining wake time periods were then classified as either standing or moving events by the activPAL device. All sitting, standing, and moving behaviors were summed to obtain total time spent in that respective activity and expressed in minutes per day (min/day). Times excluded from this wake-time analysis included (1) continuous sitting or standing behavior more than 6 hours as indicated by the activPAL (considered non-wear time); (2) all days with ≤ 10 hours of valid wear time; and (3) participants with only one valid day of activPAL wear.

Stand and Move at Work sedentary behavior questionnaire

Expert feedback on an existing SB questionnaire designed to measure total and domain-specific sitting time of working adults was obtained [16]. Recommended adaptations were incorporated into the new questionnaire, which required participants to (1) categorize sitting time into three time periods (i.e. work-hours during workdays, non-work hours during workdays, and non-workdays); (2) estimate the percentage of their time spent sitting, standing, or moving during work hours; (3) estimate the percentage of their day spent at, and away from, their desk; and (4) estimate time spent sitting in transportation, watching TV, using computer, internet, or electronic games, and sitting for other purposes during non-work hours on both workdays and nonworkdays (see [Appendix A](#) in the supplemental materials for full questionnaire).

Participants completed the questionnaire on the last (seventh) day of the baseline and 3-month assessment time points. Using the questionnaire, total sitting time was calculated for the three distinct periods: (1) work hours, (2) non-work hours on workdays, and (3) nonworkdays. Sitting, standing, and moving time during work hours was calculated by summing the time spent sitting (at their desk and away from their desk), during a typical workday, multiplied by the number of workdays in a typical week. To calculate sedentary time for both non-work hours on workdays and nonworkdays, respectively, all reported sitting time during transportation, watching TV, computer/internet/electronic games, and sitting for other purposes was summed, separately, for each of these two non-work periods. All data were expressed as average minutes spent on these behaviors in a typical day.

Ecological momentary assessment

Ecological momentary assessment (EMA) was used to estimate validity of the self-reported desk-based behaviors on a subsample of the study participants ($n = 45$). The EMA method had been shown to be a valid method in assessing sedentary and more active behaviors in adults [24–26]. The EMA questions (see [Appendix B](#)) were designed to derive participant workplace location (i.e., at desk vs. away from desk) and their momentary activity (i.e., sitting vs. standing vs. moving). Participants completed an EMA questionnaire at three random times per day (morning, midday, and end of the day) on seven random days during a 14-day period (includes the 7 days that they were wearing the activPAL device). The percentage of the time that participants reported as sitting, standing, or moving at or away from their desk was used as an estimate of time spent in each behavior.

Statistical analyses

Data were summarized using means, SDs, frequencies, and percentages. Time spent in each behavior was calculated from both activPAL and questionnaire data. Time was standardized to an 8-

hour day for work hours and non-work hours on workdays (totaling 16 hours on workdays), and a 16-hour day on non-work days. Analyses were performed using SAS (SAS 9.4, SAS Institute Inc., Cary, NC).

Validity was evaluated by comparing the reported sedentary and physical activity values to activPAL-measured sedentary time for work time, non-work time on workdays, and non-workdays. Agreement between the two measures was assessed through single-measure with absolute definition intraclass correlation coefficient using the two-way random effects model. Validity was considered poor, moderate, or strong when correlation coefficients were <0.4, 0.4–0.8, or >0.8, respectively [27]. Bias estimates including mean difference (\bar{d}) and root of mean

square error ($RMSE = \sqrt{\sum \frac{(\text{Questionnaire} - \text{activPAL})^2}{N}}$) were used to

quantify overall agreement. Kappa statistics was evaluated to assess the capability of the questionnaire to distinguish participants at different activity quartiles.

The Bland-Altman method was used to evaluate the agreement between the two measurement methods. Heteroscedasticity in the data was examined visually and confirmed through the methods outlined by Fernandez [28]. Modified Bland-Altman plots were created where the differences between measurement methods were expressed as the percentage of their mean.

To estimate sensitivity to change, the standardized effect size (SES) method [29,30] was used to determine whether observed changes in the behavior from baseline to follow-up were larger than the observed natural variability in baseline scores. A significant change in behavior measured by the activPAL device was defined as either a change of at least 30 minutes in standardized sitting and standing time during any of the three defined time periods or a change of at least 10 minutes of moving time during work hours only. Only those who significantly changed their behavior (as measured with activPAL) were included in this aspect of the analyses. A sensitivity analysis was also conducted to determine if there were systematic differences in reporting accuracy between those participants who significantly changed their behavior and those that did not. The ratio between the mean change from baseline to follow-up and the SD at baseline were calculated for each activity category and used to quantify sensitivity to change. The change score from the baseline to 3-month time point from the activPAL was plotted against the questionnaire change score.

Results

Data from 546 participants were included in the analysis after excluding those with missing questionnaires and invalid activPAL data. The demographics and SB variables (measured by activPAL) of these participants are presented in Table 1. Participants were predominately middle-aged, female, non-Hispanic white, and overweight. On an average work day, participants spent 331.9(77.9) mins/8-h day, 111.5 (74.9) mins/8-h day, and 36.9 (16.3) mins/8-h day on sedentary, standing, and moving behaviors.

Criterion validity

Table 2 shows the agreement between the questionnaire and activPAL data for sitting, standing, or moving during the three distinct time periods. During work hours, sedentary time was overestimated (47.9 [39.2, 56.6] mins), standing time was underestimated (–61.3 [–68.7, –53.9] mins), and time moving was overestimated (13.4 [9.5, 17.3] mins). During non-work hours on both workdays and nonworkdays, participants tended to

Table 1
Participant demographics (n = 546)

Demographic variable	Mean (SD)/percentage
Age (y)	45.1 ± 16.4
Gender*	
Male	24.9 (136/546)
Female	73.3 (400/546)
Race†	
Non-Hispanic white	72.7 (397/546)
Hispanic white	7.3 (40/546)
African-American	4.4 (24/546)
Asian	5.9 (32/546)
Others	4.8 (26/546)
BMI (kg·m ⁻²)	29.3 ± 7.3
Sedentary time	
Work hours (mins per 8 h)	331.9 ± 77.9
Non-work hours (mins per 8 h)	300.9 ± 55
Non-work days (mins per 16 h)	584.1 ± 121.6

BMI = body mass index.

* 10 participants did not report sex.

† 27 participants did not report race.

underestimate sedentary time (–38.3 [–47.4, 29.1] mins and –106.7 [–124.0, –89.5] mins, respectively). Further examination of the accuracy by sex revealed similar overall trend with males being slightly more accurate at reporting behaviors during work hours (see Supplemental Table 2). Kappa analysis between the two methods revealed poor agreement with kappas ranging from 0.05 to 0.16 (Supplemental Table 1).

Visual inspection of the Bland-Altman plots (Fig. 1) suggested significant heteroscedasticity and trends. For all activity categories, the no-difference line fell well within 2 SD limits of agreement with mean percent bias ranging from –84.6% to 13.4%. A slight, but significant, positive trend was observed for mean percentage bias of standing ($b = 0.29$, $\rho < 0.001$) and moving time ($b = 2.06$, $\rho < 0.001$) during work hours, sedentary time during non-work hours ($b = 0.40$, $\rho < 0.001$), and sedentary time during nonworkdays ($b = 0.17$, $\rho < 0.001$).

To approximate the overall accuracy of the EMA questionnaire, we compared the proportion of sitting, standing, and moving time reported on EMA to the activPAL. The results indicated minimal bias 13.1(6.3, 19.8)%, –5.0 (–11.5, 1.5)%, and –8.1 (–8.9, –7.2)% for sitting, standing, and moving behaviors during work hours. The questionnaire-reported percentage of time spent sedentary, standing, and moving at and away from the desk was then compared to the values reported in the EMA (Table 2). While at their desk, participants slightly underestimated both SB and standing with mean differences of –3.4 (–12.6, 5.7)%, RMSE = 30.4 and –2.5 (–7.0, 2.0)%, RMSE = 15.0, respectively, and slightly overestimated moving behavior by 4.3 (2.3, 6.3)%, RMSE = 7.8. When away from their desk, participants slightly overestimated SB by 2.8 (–2.4, 8.0)%, RMSE = 17.3, and moving by 6.3 (4.0, 8.7)%, RMSE = 10.1, while standing time was underestimated by –7.5 (–11.6, –3.6)%, RMSE = 15.5.

Sensitivity to change

Only 393 participants were included in this analysis based on their behavior change over time (see Table 3 and Fig. 2). Results from our sensitivity analysis revealed that there was no significant difference in the reporting accuracy between participants who changed their behavior and those who did not. The changes in sedentary and standing behavior during work hours from the activPAL were positively associated with the change in behavior from the questionnaire ($r = 0.50$, $P < .001$ and $r = 0.57$, $P < .001$, respectively; Fig. 2). This relationship was not observed for moving

Table 2Accuracy and bias estimate of the Stand and Move at Work sedentary behavior questionnaire ($n = 546$)

Behavior	Questionnaire ($\bar{X} \pm SD$)	Criterion ($\bar{X} \pm SD$) (activPAL or EMA)	Mean difference* (95% CI)	RMSE†
Work hours (mins per 8 h period)				
Sedentary	379.3 \pm 82.1	332.6 \pm 78.1	46.7 (38.1, 55.4)	114.7
Standing	50.2 \pm 54.7	110.6 \pm 74.8	-60.3 (-67.6, -53)	106.9
Moving	50.4 \pm 49.1	36.8 \pm 16.2	13.6 (9.8, 17.4)	48.0
At desk (%)‡				
Sedentary	67 \pm 22	70.5 \pm 22.8	-3.4 (-12.6, 5.7)	30.4
Standing	5.5 \pm 9.4	83.4 \pm 11.4	-2.5 (-7, 2)	15.0
Moving	4.3 \pm 6.5	0 \pm 0	4.3 (2.3, 6.3)	7.8
Not at desk (%)‡				
Sedentary	13.4 \pm 13.3	10.4 \pm 16	2.8 (-2.4, 8)	17.3
Standing	3.4 \pm 4.9	10.7 \pm 12.5	-7.5 (-11.6, -3.4)	15.5
Moving	6.3 \pm 7.9	0 \pm 0	6.3 (4, 8.7)	10.1
Non-work hours§ (mins per 8-h period)	263.4 \pm 104.8	301.1 \pm 54.6	-37.7 (-46.7, 28.6)	115.3
Nonworkdays§ (mins per 16-h period)	476.6 \pm 194.2	582 \pm 119.7	-105.6 (-122.7, -88.5)	224.8

EMA = Ecological momentary assessment; RMSE = root of mean square error.

* Mean difference (questionnaire–activPAL) of standardized values to an 8-hour period for work hours and non-work hours on workdays and a 16-hour period for nonworkdays.

† Root mean square error.

‡ Compared to reported percentage of time spent in each behavior using ecological momentary assessment.

§ Non-work hour and nonworkday values are time spent on sedentary behavior only.

behaviors during work hours or SB outside work. Self-reported mean changes in behaviors were consistently of greater magnitude compared with changes measured by the activPAL device (Table 3). However, the variability in baseline scores among participants was also consistently higher compared to the objective method, except for sitting and standing behaviors during work hours. The SES for sedentary and standing behaviors during work hours were higher (SES ranges from 1.06 to 1.95) for the questionnaire compared to activPAL. Poor SES (ranges from 0.01 to 0.06) were obtained from the activPAL and questionnaire for moving during work hours and SB on non-work hours during work days and nonworkdays. Similar directions of change in the summary score for the activPAL and questionnaire were observed for each

behavior and distinct time period, except for moving behaviors during work hours (mean difference was 1.4 min per day vs. -0.4 min per day for the questionnaire and activPAL, respectively).

Discussion

The purpose of this study was to determine the validity and sensitivity to change of a workplace questionnaire among sedentary working adults and provide initial evidence of its validity in measuring desk-based SB. Our analysis revealed similar validity with other self-report questionnaires [13,31,32]; however, this tool shows additional promise in terms of sensitivity to change and

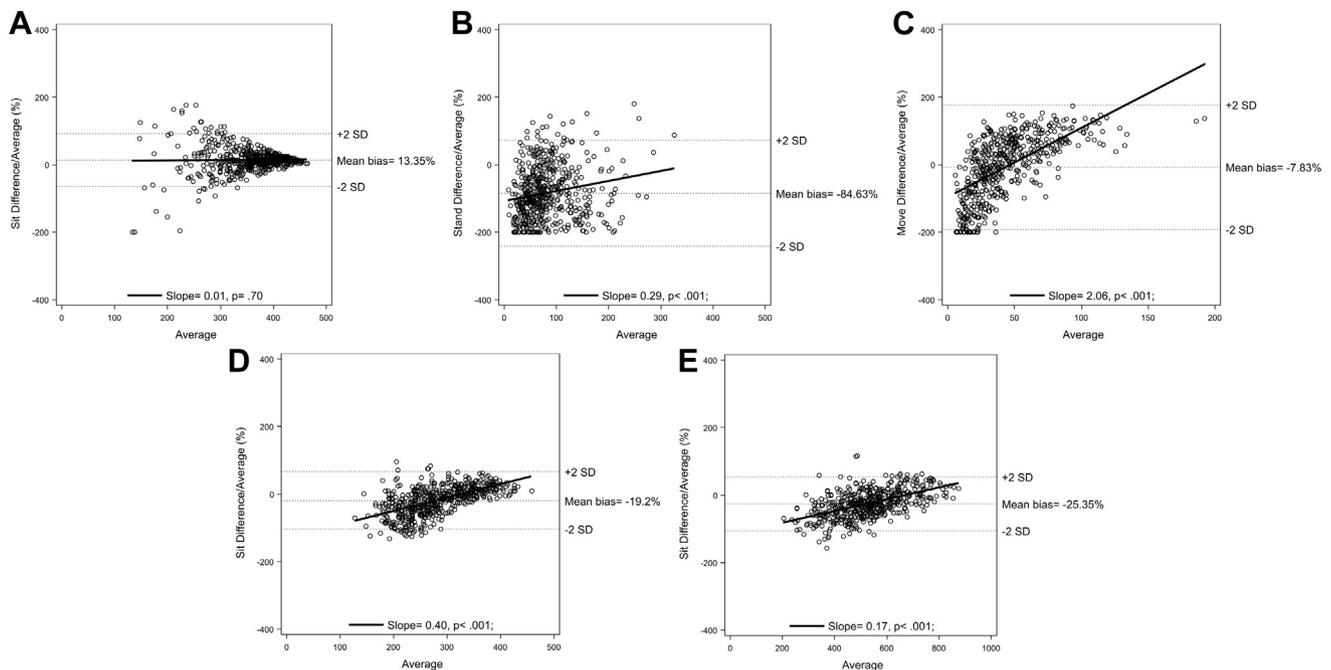


Fig. 1. Bland-Altman plots between the activPAL and the Stand and Move at Work sedentary behavior questionnaire. (A–C) Agreement in sedentary, standing, and moving time, respectively, during work hours. (D and E) Agreement in sedentary time during non-work hours on workdays and nonworkdays, respectively. The x-axis represents average between the two measures, and y-axis is the ratio between the difference and average expressed as percentage.

Table 3
Sensitivity to change of the Stand and Move at Work sedentary behavior questionnaire ($n = 393$)

Variable	% Substantial change*	Mean difference† (95% CI) (mins per 8 h or 16 h period)	SD‡	SES§
Work hours				
Sedentary	65.4%			
Questionnaire		−84.9 (−99.9, −69.8)	80.0	1.06
activPAL		−53.4 (−66.1, −40.8)	79.1	0.68
Standing	62.8%			
Questionnaire		83.9 (71.3, 96.5)	43.0	1.95
activPAL		57.0 (44.6, 69.4)	77.4	0.74
Moving	36.4%			
Questionnaire		1.4 (−9.2, 12.1)	59.0	0.02
activPAL		−0.4 (−4.3, 3.4)	19.8	0.02
Non-work hours	48.9%			
Sedentary				
Questionnaire		−13.5 (−33.4, 6.3)	103.4	0.13
activPAL		−3.6 (−13.3, 6.2)	55.5	0.06
Nonworkdays	84.0%			
Sedentary				
Questionnaire		2.6 (−23.6, 28.7)	193.4	0.01
activPAL		2.7 (−14.2, 19.5)	122.3	0.02

LPA = light physical activity; MVPA = moderate to vigorous physical activity; SES = standardized effect size.

* Percentage of participants who decreased by at least 30 min per day for sedentary activity, increased by at least 30 min per day of LPA or 10 min per day of MVPA based on activPAL.

† Mean change in score from baseline to follow-up.

‡ SD is a measure of variability in baseline participant scores.

§ Standardized effect size (SES) is calculated as (mean change/SD), with direction of change removed.

ability to assess context-specific form of workplace sitting (i.e., at desk vs. away from desk).

A review of newly developed self-report measures of physical activity and SB revealed a median validity coefficient (Spearman ρ) of 0.23 for SB and 0.30 for total activities [33]. However, these results were not unexpected considering that using self-report for absolute measurement of sedentary and more active behaviors have traditionally been difficult [12,34]. Despite this, the Bland-Altman plots suggest that this questionnaire has acceptable

validity compared with the activPAL device, as most of the points in the plot fall within the set limits of agreement. In addition, overall bias estimates for sedentary and more active behaviors are relatively modest with narrow confidence intervals during work hours, which suggest more accurate estimates of these biases. Although the kappa agreement between the two methods was poor, suggesting significant degree of misclassification between quartiles of behavior, most of the misclassifications occurred between the middle quartiles (quartiles 2 and 3). This finding suggests that the

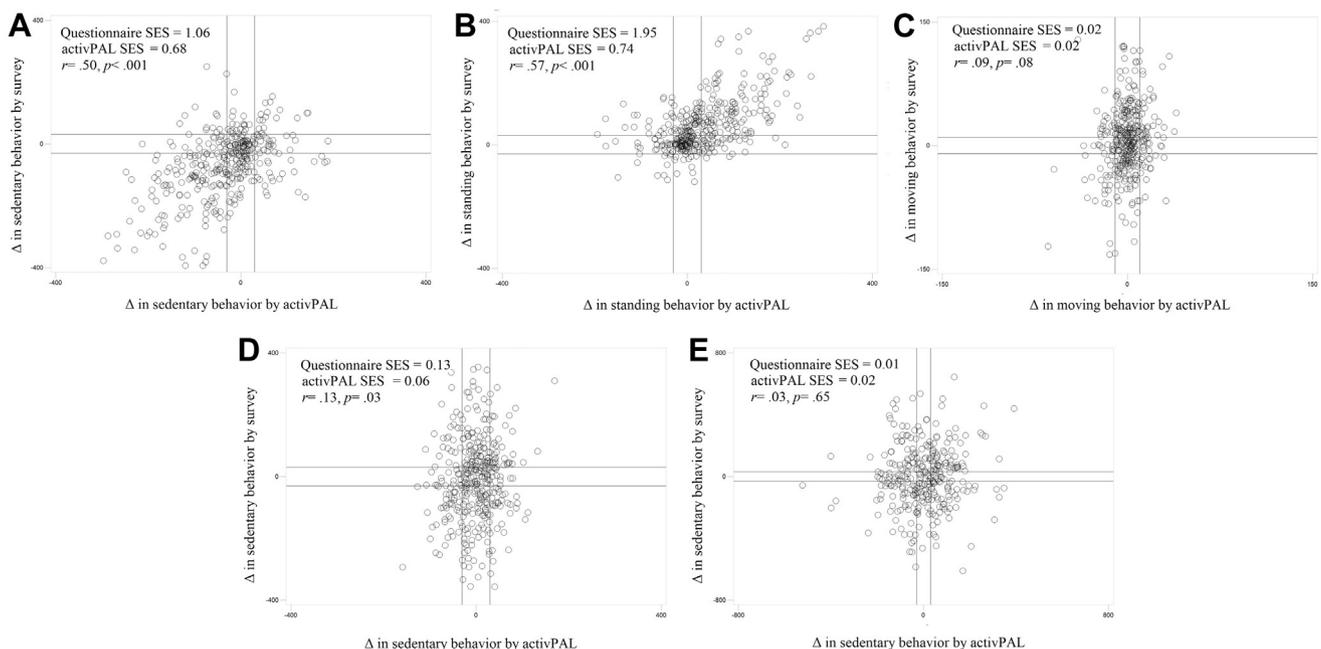


Fig. 2. Sensitivity to change of the Stand and Move at Work sedentary behavior questionnaire ($n = 393$). (A–C) The agreement in change from baseline to 3-mos follow-up in sedentary, standing, and moving time, respectively, during work hours. Agreement in change in sedentary time during non-work hours on workdays is displayed in (D) and nonworkdays in (E). The x-axis represents change as measured by the activPAL, and y-axis is change as measured by the survey. The gridlines represent ± 30 mins of change of sedentary and standing behaviors or ± 10 mins of change for moving behavior by the baseline SD. SES is the standardized effect size calculated by dividing the mean change from baseline to 3 mos by the baseline SD.

questionnaire can distinguish between the most and least sedentary participants.

In addition, our analysis of the context-specific workplace behaviors revealed only slight underestimation/overestimation for sedentary and more active behaviors that occur at and away from their desk. It should be noted that EMA is also a self-report measure and is subjected to certain degree of error. Future studies should evaluate this aspect of the questionnaire using objective tools (e.g., proximity sensors). Nevertheless, no other studies have evaluated the validity of self-report tools in assessing desk-based SB, which is valuable for evaluating large-scale workplace interventions. As such, this new questionnaire appears to have promising utility for large epidemiologic and intervention studies of SB.

The sensitivity to change results indicated consistently higher change score values and lower baseline variability than the activPAL device on sedentary and standing behaviors during work hours. As such, we observed higher SES scores between the two measurement methods for these behaviors during work hours. This may be partly due to the participants perceiving their work as being highly sedentary with less opportunity for standing or moving at work. The baseline scores from the questionnaire were more variable for moving behaviors during work hours and for sitting behaviors during both non-work hours on workdays and nonworkdays, which is reflected by the corresponding SES scores. Regardless, the mean change scores for both the activPAL and the questionnaire had similar trends in the standing and moving categories, suggesting that, at the very least, these measures agree on the overall direction of change for each of the behaviors. A limitation of this study is that our sensitivity to change estimates reflected the size of the reported change in behavior compared with the natural variability of baseline scores only in participants who substantially changed their behavior according to the activPAL device. This method allowed us to examine sensitivity in the context of change in group behavior. A different method of assessing sensitivity to change within individuals has been outlined in a past study and should be further evaluated [30].

One strength of this study is the large sample size. Participants were recruited from a total of 24 worksites across two distinct metropolitan areas (i.e. Phoenix and Minneapolis/St. Paul) from three different sectors (i.e. academic, government, and industry), allowing for a fairly representative sample of desk-based workers. In addition, the activPAL device was used as the criterion measure, which allowed for the comparison of the self-report measure to a valid measure of posture and light-intensity physical activity. The SES of both measures enabled us to determine the instrument's ability to detect changes in our target behavior over time, which is of principle use in any self-report measure of behavior [19].

Conclusion

Our results suggest that the Stand and Move at Work sedentary behavior questionnaire has similar validity to most self-report instruments. The questionnaire yielded valid estimates of at-desk versus away from desk SB and is sensitive to change in a manner similar to an objective measure of sitting. These results suggest the usefulness of the questionnaire in studies aimed at evaluating interventions targeted at changing these specific behaviors. In addition, this new instrument could be used as a tool to capture context-specific forms of SB.

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Supplementary data

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.annepidem.2019.01.002>.

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Appendix**Supplemental Table 1**

Accuracy and bias estimate of the Stand and Move at Work sedentary behavior questionnaire (n = 546).

Behavior	Kappa agreement (95% CI)
Work hours	
Sedentary	0.13 (0.08, 0.18)
Standing	0.14 (0.08, 0.19)
Moving	0.16 (0.11, 0.22)
Non-work hours (sedentary)	0.05 (0.01, 0.1)
Non-workdays (sedentary)	0.12 (0.06, 0.17)

Supplemental Table 2

Accuracy and bias estimate of the Stand and Move at Work sedentary behavior questionnaire (n = 546) by gender

Behavior	Female				Male			
	Questionnaire ($\bar{X} \pm SD$)	Criterion ($\bar{X} \pm SD$)	Mean difference* (95% CI)	RMSE†	Questionnaire ($\bar{X} \pm SD$)	Criterion ($\bar{X} \pm SD$)	Mean difference* (95% CI)	RMSE†
Work hours (mins per 8 h period)								
Sedentary	376.3 ± 86.6	327.1 ± 81.1	49.1 (38.2, 60.0)	123.3	385.2 ± 67.7	348.5 ± 68	37.2 (24.6, 49.9)	84.3
Standing	51.4 ± 57.7	116.3 ± 78.1	-64.6 (-73.8, -55.5)	115.1	48.4 ± 45.8	94.1 ± 63.1	-46.2 (-56.7, -35.7)	78.1
Moving	52.3 ± 51	36.7 ± 16.1	15.6 (10.9, 20.2)	50.3	46.5 ± 43.5	37.4 ± 16.7	9.0 (2.2, 15.8)	41.7
Non-work hours‡ (mins per 8 h period)	262.9 ± 106.6	299.2 ± 54.5	-36.2 (-47, -25.4)	118.0	262.8 ± 100.3	305.6 ± 55.6	-43.0 (-59.5, -26.4)	108.1
Nonworkdays§ (mins per 16 h period)	489.2 ± 195.6	580.6 ± 118	-91.6 (-112.1, -71.1)	222.7	437.3 ± 179.5	581.5 ± 124.8	-144.2 (-174.1, -114.2)	227.6

RMSE = root of mean square error.

* Mean difference (questionnaire-activPAL) of standardized values to an 8-hour period for work hours and non-work hours on workdays and a 16-hour period for nonworkdays.

† Root mean square error.

§ Non-work hour and nonworkday values are time spent on sedentary behavior only.