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Brief Original Report

Does the use of standing 'hot' desks change sedentary work time in an open plan office?

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ABSTRACT

Objective: This study assessed the use of standing 'hot' desks in an open plan office and their impact on sedentary work time.

Method: Australian employees (n = 11; 46.9 [9.8] years; BMI 25.9 [3.5 kg/m^2]) wore an armband accelerometer for two consecutive working weeks (November–December 2010). In the second week, employees were encouraged to use a pod of four standing 'hot' desks to stand and work as often as possible. Desk use was recorded using time logs. The percentages of daily work time spent in sedentary (<1.6 METs), light (1.6–3.0 METs) and moderate + (>3 METs) intensity categories were calculated for each week, relative to the total daily time at work. Paired sample t tests were used to compare weekly differences.

Results: Employees spent 8:09 ± 0:31 h/day at work and 'hot' desk use ranged from zero to 9:35 h for the week. There were no significant changes in mean time spent in sedentary (difference of −0.1%), light (difference of 0.8%) and moderate + (−0.7%) intensity categories. However, individual changes in sedentary work time ranged from −5.9 to 6.4%.

Conclusions: Volitional use of standing 'hot' desks varied and while individual changes were apparent, desk use did not alter overall sedentary work time in this sample.

Introduction

Office workers spend the majority of their working day sedentary (Miller and Brown, 2004). Research has linked sedentary occupations, or jobs that predominately involve sitting and low levels of energy expenditure, to increased risk of heart disease, type 2 diabetes and mortality (Freak-Poli et al., 2010; van Uffelen et al., 2010).

Standing desks have been identified as one potential strategy for reducing prolonged occupational sitting time (Gilson et al., 2011). However, studies have yet to quantify the impact of these desks on sedentary work time in real life office settings.

The aims of this novel study were to assess employee use of standing 'hot' desks and the impact of their use on sedentary work time in an open plan office. We purposely targeted shared desk use within a non-segregated work environment, in order to reflect the workplace realities of limited desk availability and contemporary office design.

Methods

All employees working in an Australian open plan office (n = 25), were given a brief presentation by a researcher describing study aims. This was followed by an email invitation requesting study volunteers. Eleven employees responded to the email and provided informed consent for participation. Study protocols were approved by the Human Research Ethics Committee of The University of Queensland, Australia.

Following recruitment, employees completed a demographic questionnaire and then wore an armband accelerometer (SenseWear™ Pro$_2$, Body Media Inc., Pittsburgh, USA) from waking-to-bedtime, for two consecutive working weeks (November–December 2010). Studies have reported the SenseWear armband to be a valid and accurate measure of total energy expenditure (Malavolti et al., 2005) and of energy expenditure at rest (Malavolti et al., 2007) and during low and moderate physical activity in free-living conditions (St-Onge et al., 2007).

In the first week (baseline), employees maintained their usual office routine. During the weekend between weeks one and two, a pod of four height adjustable desks (Linak Australia Pty Ltd) was fitted into the centre of the open-plan office space, with IT equipment for day-to-day tasks. Before work, at the beginning of the second week (intervention), employees were briefed on the benefits of reducing sitting time and encouraged to use any desk within the pod to stand and work as often as possible. Over the next 5 days, employees recorded the frequency, duration and type of use (i.e. standing or adjusted to sitting), using log books on each desk.

Post intervention, accelerometers were collected and data downloaded for analyses. Recognised thresholds (Norton et al., 2009) were used to calculate percentages of daily work time spent in sedentary (<1.6 METs), light (1.6–3.0 METs) and moderate + (>3 METs) intensity categories, relative to total daily time spent at work. Work times were

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Table 1
Employee demographics, mean time spent at work and mean percentage time within MET intensity categories at baseline and intervention (Australian open plan office, November–December 2010).

	n	Age (years)	BMI (kg/m^2)
Women	7	49.1 (6.7)	26.8 (3.9)
Men	4	43.0 (14.1)	24.5 (2.7)
Group	11	46.9 (9.8)	26.8 (3.9)

	Baseline	Intervention	Difference (intervention − baseline)	Range of change (minimum − maximum)
Work time (h:min)	7:56 (0:33)	8:20 (0:38)	0:24	
Sedentary (%) <1.6 METs	75.8 (10.3)	75.7 (8.4)	−0.1	−5.9 to 6.4
Light (%) 1.6–3.0 METs	15.0 (4.9)	15.8 (5.7)	0.8	−6.8 to 7.9
Moderate + (%) >3.0 METs	9.2 (6.8)	8.5 (7.2)	−0.7	−1.8 to 2.3

identified using office arrival/departure time stamps recorded by employees on their accelerometers. Only typical paired days (i.e. Monday in both baseline and intervention weeks) were included in analyses — atypical days were flagged in an accelerometer diary returned to researchers following the intervention week. Descriptive statistics for demographics and frequency/duration of desk use were generated and weekly differences in percentage time in each intensity category compared using paired sample t tests.

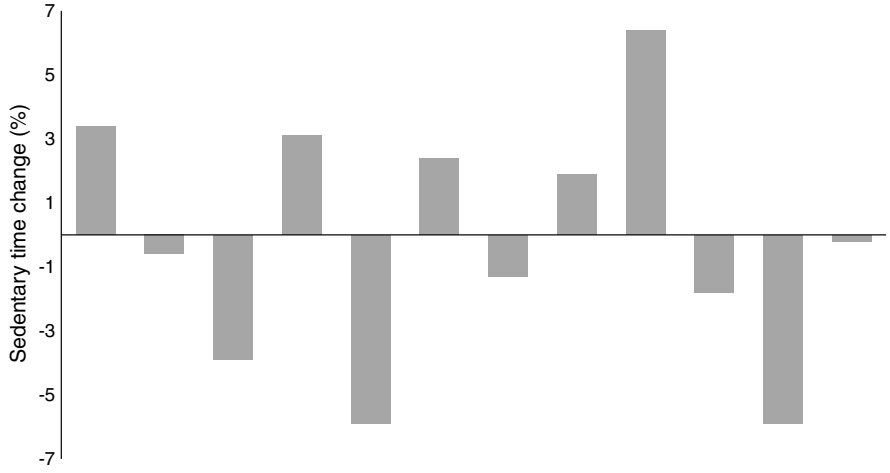
Results

Demographic and time data are shown in Table 1. A total of 82 from a possible 110 days were captured for analyses (8.0 [2.2] days/employee). Mean time at work was around 8 h/day with three quarters of this time classified as sedentary. Comparisons of baseline and intervention data showed no significant changes in mean percentage times in sedentary, light and moderate intensity categories.

Log book data indicated that desks were used solely in a standing position. Mean daily time spent at a desk was 1.02 ± 0.36 h, with times ranging from 0.20 to 3.05 h per session. One employee did not use the desks at all and three employees used the desks at least once a day. Duration of desk use and the percentage change in sedentary work time for each employee are shown in Fig. 1. Total time spent using desks ranged by 9:35 h, with the proportion of change in sedentary work time ranging from −5.9 to 6.4% (Table 1).

Discussion

Research into sedentary behaviour and office workstations has solely focused on walking desks and their impact on task performance (Ohlinger et al., 2011; Straker et al., 2009), energy expenditure (Levine and Miller, 2007) and step counts (Thompson et al., 2008). Standing or adjustable desks have typically been considered a reactionary strategy to treat musculoskeletal problems such as neck and back complaints (Husemann et al., 2009). This study explored their role from a primary prevention perspective and was the first to examine their use and impact on sedentary work time in a real life office setting.



Employee number	1	2	3	4	5	6	7	8	9	10	11	Group
Sedentary time change (%)	3.4	-0.6	-3.9	3.1	-5.9	2.4	-1.3	1.9	6.4	1.8	-5.9	-0.2±4.0
Total standing desk use (hrs:mins)	0	3:35	0:55	1:00	8:50	3:10	4:46	6:00	9:35	1:15	1:45	3:54±3:18

Fig. 1. Percentage changes in sedentary work time and total duration of a week's standing desk use for each intervention employee (Australian open plan office, November–December 2010).

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The findings provide two valuable insights. Firstly, desk use ranged from high, to infrequent, to not at all. Employees who used the desk infrequently or not at all may have found sharing difficult. However, the 'hot' desk concept fits well with employer financial constraints and the cost concerns of allocating height-adjustable desks to individuals. Future research should identify reasons that underpin the use of shared standing desks and develop strategies for overcoming barriers which limit their use by employees.

Secondly, while log books indicated that the introduction of height-adjustable 'hot' desks promoted increased standing in some employees, accelerometer data showed that desk use had no overall effect on the proportion of work time spent in sedentary behaviour. Further to this, desk use did not consistently reflect changes in sedentary time at the individual level. Reasons for this are contestable and might include weekly variations in occupational sitting or issues with the sensitivity of the SenseWear armband to detect small changes in energy expenditure at the sedentary/light intensity threshold. Others have postulated that standing desks may not raise employee energy expenditure levels above a sedentary threshold in a controlled setting (Speck and Schmitz, 2011). To an extent, our data supports this viewpoint in a field-based setting, although we would add the caveat that standing at desks might facilitate metabolic benefits, and that increases in energy expenditure may occur in employees who use standing desks as a platform to increase moving, as well as standing. New studies must now provide detailed and concurrent analyses of desk use and associated energy costs in free-living office environments.

Data collection within an office locale was the main strength of this study. This approach captured the ecological context of desk use and employee routines. The SenseWear armband, while recognised as a valid measure of free-living energy expenditure, did not provide information on posture, activity mode or sit–stand–move ratios. These were inferred through accelerometer and log book data. A small sample size and a relatively short measurement period were additional study limitations, highlighting the need for powered studies with heterogeneous samples over longer time periods. With regard to intervention duration, future studies that investigate issues around the sustained use of shared standing desks will be particularly valuable.

Conclusions

The key study finding was that use of standing 'hot' desks varied in this sample of Australian employees. The fact that reported desk use did not reflect objectively measured sedentary time was also noteworthy. Exploratory data raise important directions for future research on the determinants and measurement of shared desk use in open plan offices.

Conflict of interest statement

The authors declare there are no conflicts of interest.

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