Office workers objectively measured sedentary behaviour and physical activity during and outside working hours

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Running Title: Office workers sedentary behaviour and activity

Competing interests and funding

The authors declare that there are no conflicts of interest. No external funding supported the work outlined in the manuscript. The research was undertaken using existing funds and equipment within the School of Sport, Exercise and Health Sciences at Loughborough University.

Abstract (135 words)

Objective: To examine objectively-determined sedentary behaviour and physical activity (PA) during and outside working hours in full-time office workers.

Methods: 170 participants wore an ActiGraph GT1M accelerometer for 7-days. Time spent sedentary (<100 counts/minute), in light PA (100–1951 counts/minute), and moderate-vigorous PA (≥1952 counts/minute) were calculated for workdays (including working hours and non-working hours) and non-workdays.

Results: Participants accumulated significantly higher levels of sedentary behaviour (68% versus 60%) and lower levels of light activity (28% versus 36%) on workdays in comparison to non-workdays. 71% of working hours were spent sedentary. Individuals who were most sedentary at work were also more sedentary outside work.

Conclusions: Those who are most sedentary at work do not compensate by increasing their PA or reducing their sedentary time outside work. Occupational interventions should address workplace and leisure-time sedentary behaviour.

Keywords: sitting time, light intensity physical activity, workplace, occupational health, leisure-time

Introduction

Sedentary behaviour, defined as *"any waking behaviour characterised by an energy expenditure ≤1.5 METs while in a sitting or reclining posture*" (page 540),[1] is an independent risk factor for a number of adverse health outcomes. For example, greater sitting time (the terms sitting and sedentary behaviour are used interchangeably herein) has been associated with increased risk of overweight, obesity and weight gain,[2,3] cancer,[4,5] type 2 diabetes and the metabolic syndrome,[2,6] all-cause mortality and cardiovascular disease mortality,[7,8] independent of moderate-to-vigorous physical activity. There is a growing consensus that sedentary behaviour represents a unique aspect of human behaviour and that it should not be viewed as simply the absence of physical activity.[7,9]

Adults typically spend time sitting in three domains: the workplace, during leisure and for transport.[10] Economic advances and industrial innovation have resulted in large numbers of people employed within sedentary occupations, and data from Australian workers have shown that half of their total daily self-reported sitting time takes place at work.[11,12] Accelerometer data from Australian office workers has shown that between 66 and 82% of their working day is spent sedentary.[13-15] Of concern, it has been observed in some studies that those who are sedentary for a large proportion of their working day do not compensate by increasing their physical activity levels and/or reducing their sedentary behaviour during leisure time.[12,14,16,17]

Our understanding of the prevalence of sedentary behaviour in UK adults is currently limited, and has largely been restricted to the study of leisure time screen-based sedentary behaviours[18] or to specific occupational groups, such as postal workers.[17] It is important to measure sedentary behaviour and physical activity across a range of domains, particularly the workplace, if we are to truly understand patterns and determinants of these behaviours in adults, in order to inform behaviour change interventions.[19] To date, limited research has examined objectively measured sedentary time during and outside working hours.[13,14]

Increasing our understanding of the potential impact of sedentary behaviour during work, on sedentary behaviour and physical activity outside of work has been highlighted as a research priority.[13] The aim of the current study therefore was to examine objectively-determined sedentary behaviour and physical activity occurring during and outside working hours in a sample of full-time office workers from the UK. A secondary aim was to build on our understanding of the links between sedentary behaviour accumulated during and outside of working hours by investigating whether those who are sedentary for a large proportion of their working hours compensate by decreasing their sedentary behaviour, or increasing their physical activity, during non-working hours.

Methods

Participants

A convenience sample of 210 office workers were recruited from Loughborough University and local businesses within the East Midlands region of the UK. The study inclusion criteria ensured that all participants were aged between 18-65 years and in full-time office-based work. Responses on a health screen questionnaire completed at the outset confirmed that participants were all in good general health with no reported physical illnesses or disabilities that may affect their normal daily routine. The sample consisted of individuals employed within administrative roles, and all participants described themselves as having a predominately sedentary occupation. The standard working hours of the organisations involved were 9am to 5pm on Mondays to Fridays. The study received ethical approval from the Loughborough University Ethical Advisory Committee, and participants provided written informed consent.

Procedure

At the beginning of the study participants either attended a laboratory at Loughborough University or were visited by research staff at their place of work. During this meeting participant's body mass (kg) and height (cm) were directly measured without shoes using

electronic weighing scales (Tanita UK Ltd) and a wall-mounted stadiometer (Seca UK). BMI was calculated as kg/m^2, and general demographic information (age, gender, nature of employment, job title) recorded. Participants were issued with an ActiGraph accelerometer and shown the correct wearing position. Participants were instructed to begin wearing the device upon waking up the following day. During the seven day monitoring period, participants were requested to continue with their normal daily routine. Upon completion of the monitoring period participants met with a researcher to return the accelerometer. During this meeting they were asked to confirm if they had experienced a typical working week whilst wearing the device and any days in which participants reported missing work through either illness or leave days were recorded.

Sedentary behaviour and physical activity measurement and data processing

Participants wore an ActiGraph GT1M accelerometer (ActiGraph, Pensacola, FL) throughout waking hours for seven consecutive days, except during water based activities. The accelerometer was worn around the waist, above the midline of the thigh. The accelerometer was set to record at 1-minute epochs. Accelerometer data were downloaded using ActiLife version 5 and processed using KineSoft version 3.3.75. Accelerometer data were considered valid if there were more than 600 minutes of monitoring per day (excluding continuous strings of zero counts for 60 minutes or longer) recorded on at least three weekdays and one weekend day.[20] The widely used <100 counts/minute (cpm) cut-point was employed to estimate sedentary time (i.e. estimated time spent sitting),[21] whilst the Freedson cut-points were used to estimate time spent in light intensity (100 – 1951 cpm) (such as slow walking) and moderate to vigorous intensity (such as brisk walking or jogging/running) physical activity (MVPA) (≥ 1952 cpm).[22]

As preliminary analyses revealed that no significant differences occurred between the time spent in sedentary behaviour and physical activity across Monday to Friday (data not shown), time spent in sedentary behaviour, light intensity activity and MVPA were

summarised for workdays (Monday to Friday in the present sample) and non-workdays (Saturday and Sunday). On workdays, time spent in each behaviour were also summarised during working hours (9am to 4.59 pm) and during non-working hours (before 9am and after 5pm).

Statistical analyses

Statistical analyses were conducted using IBM SPSS Statistics for Windows version 21. Time spent in sedentary behaviour, light intensity activity and MVPA, along with the proportion of time spent in each behaviour (accounting for accelerometer wear time), on workdays, non-workdays, during working hours and non-working hours on workdays were checked for normality using the one-sample Kolmogorov-Smirnov test, which showed that all data were not normally distributed. Non-parametric analyses were therefore undertaken and the median and inter-quartile ranges (IQR) are presented as descriptors throughout. To account for differences in accelerometer wear time during and outside working hours, comparisons were undertaken using the proportion of wear time spent in each behaviour (sedentary, light activity, MVPA) as opposed to the absolute minute data. Specifically, the proportions of time spent in each behaviour were compared between workdays and non-workdays, and between working hours and non-working hours on workdays using Wilcoxon-signed ranks tests.

To address the secondary aim of this study, participants were grouped into tertiles based on the proportion of time spent sedentary during working hours. Tertile 1 (lowest working hours sedentary behaviour) consisted of individuals who spent less than 68% of their working hours sedentary (n = 55). Tertile 2 (medium working hours sedentary behaviour) consisted of individuals who spent between 68 and 74% of their working hours sedentary (n = 54), and tertile 3 (highest working hours sedentary behaviour) consisted of individuals who were sedentary during working hours for equal to or above 75% of the time (n = 61). The three groups were compared in terms of the proportion of accelerometer wear time spent in

sedentary behaviour, light activity and MVPA on non-workdays and during non-working hours on workdays using Kruskal-Wallis tests with Bonferroni-corrected post hoc comparisons. Age and BMI were also compared between the three groups using Kruskal-Wallis tests with Bonferroni-corrected post hoc comparisons. To further explore any links between sedentary behaviour accumulated during and outside of working hours, Spearman correlations examined whether there were any associations between sedentary behaviour measured during working hours and sedentary behaviour accumulated on non-workdays, and during non-working hours on workdays. Statistical significance was set at $p<0.05$ for all analyses unless otherwise stated.

To understand the pattern of sedentary behaviour and physical activity occurring throughout the day, line graphs were constructed depicting the mean minutes per hour spent in sedentary behaviour, light intensity activity and MVPA across the typical wear period (7am – 11.59pm) for workdays and non-workdays. The line graphs only contain data from valid days (>10 hours) and hours (all 60 minutes) in which the accelerometer was worn by each participant. Separate graphs were created for the three tertiles for working hours sedentary behaviour described above in order for any differences in patterns between the groups to be identified.

Results

Of the 210 participants who commenced the study, 170 (30% male, mean age 40.1±12.7 years; mean BMI 24.5±3.8 kg/m^2) provided valid data and were included in the analyses. There were no significant differences between those who provided valid data and those who did not in terms of age, BMI or gender proportion ($p>0.05$). Males and females did not differ significantly in terms of the proportion of wear time spent in sedentary behaviour and light intensity physical activity during working and non-working hours on workdays (all $p>0.05$). Overall on workdays, males spent a significantly greater proportion of time and minutes in MVPA in comparison to females (4±3% versus 3±3%, $p = 0.01$, [median±IQR]; 38 mins/day

versus 30 mins/day, p = 0.01). There were no significant differences in the proportion of time spent in sedentary behaviour, or in light intensity activity and MVPA between males and females on non-workdays (all p>0.05, data not shown). Given the limited differences in the proportion of time spent in each behaviour during and outside working hours between males and females, the analyses presented below focus on the sample as a whole.

Median accelerometer wear time was 874±103 mins/day on workdays and 767±113 mins/day on non-workdays days (p<0.001), the sample provided valid accelerometer data (wear time ≥10 hours/day) on 7 days/person (median value). Given the significant differences in wear time between the days (and between working hours and non-working hours on workdays, Table 1), the proportions of wear time spent in each behaviour (sedentary, light intensity activity and MVPA) were compared during and outside working hours as opposed to the absolute minutes. On workdays participants spent a significantly greater proportion of time in sedentary behaviours, and significantly less time in light intensity physical activity in comparison to non-workdays (Table 1). There were no significant differences between workdays and non-workdays in terms of the proportion of time spent in MVPA.

On workdays only, participants spent a greater proportion of time in sedentary behaviour during working hours, and less time in light intensity physical activity in comparison to non-working hours (Table 1). Overall, sedentary behaviour accumulated during working hours accounted for 57% of total daily sedentary time on workdays. There were no significant differences in the proportion of time spent in MVPA during working and non-working hours on workdays.

Insert Table 1 about here

When grouped into tertiles according to the proportion of working hours spent sedentary, significant differences in sedentary behaviour and light intensity physical activity were observed between the groups during non-working hours (Table 2). Participants in the lowest tertile for sedentary behaviour at work spent significantly less time in sedentary behaviour and more time in light intensity physical activity than those in the medium and high tertiles on non-work days (post hoc analyses, all $p<0.01$). The three groups did not differ significantly in terms of the proportion of time spent in MVPA on non-workdays (weekend days in the present sample). Similarly, during non-working hours on workdays, participants in the lowest tertile for sedentary behaviour at work spent significantly less time in sedentary behaviour and more time in light intensity physical activity than those in the medium and high tertiles (post hoc analyses, all $p<0.01$). Like non-work days, there were no significant differences between the groups in terms of the proportion of time spent in MVPA during non-working hours on workdays (Table 2). There were no significant differences in BMI between participants in the three tertiles ($p>0.05$). However, participants in the lowest tertile for sedentary behaviour at work were significantly older (46±13 years) than those in the medium (38±12 years) and high (36±11 years) tertiles ($p<0.01$).

For the sample as a whole, there were significant associations between the proportion of time spent sedentary during working hours and the proportion of time spent sedentary on non-workdays ($r = 0.25$, $p<0.001$), and during non-working hours on workdays ($r = 0.36$, $p<0.001$).

Insert Table 2 about here

An hour by hour breakdown of the time (in minutes) spent in sedentary behaviour, light intensity activity and MVPA on workdays and non-workdays are shown in Figures 1 and 2, respectively for participants grouped into tertiles according to the proportion of time spent sedentary during working hours. On workdays the three groups displayed a similar pattern

in terms of the accumulation of sedentary behaviour and light intensity physical activity across the day, however, as to be expected based on how the groups were defined (sedentary behaviour during working hours), the differences between sedentary behaviour and light activity over working hours becomes more pronounced across the groups. During working hours (9am to 4.59pm) sedentary behaviour was the most prominent behaviour across all groups. All groups exhibited a small dip in this behaviour around lunch time followed by another dip immediately after working hours which is then followed by a steady increase in sedentary behaviour as the evening progresses. It is evident from Figure 1 that on workdays, the pattern of light intensity activity displays a mirror image of the pattern of sedentary behaviour for all groups, suggesting that light intensity activities offset sedentary behaviours. For all groups, MVPA displays a distinct pattern, showing small increases prior to working hours (7 – 8.59am), around lunch time (1 – 1.59pm) and after work into the early evening (5 – 7.59pm).

The pattern of sedentary behaviour and physical activity accumulated hour by hour on non-workdays (Figure 2) differs to that seen for workdays (Figure 1) for all groups. Through until mid-afternoon (8am – 3.59pm), the proportion of sedentary behaviour and light intensity activity is relatively equal for participants in the lowest tertile for working hours sedentary behaviour. From 4pm onwards sedentary behaviour gradually increases throughout the evening as light intensity activity decreases. A similar pattern can be observed in the medium tertile group, however throughout the day sedentary behaviour is the predominant behaviour, with the steady increase in sedentary behaviour and the decline in light activities starting earlier in the day (1pm onwards). On non-workdays sedentary behaviour is the most prominent behaviour throughout the day for participants grouped in the highest tertile for working hours sedentary behaviour. The pattern of MVPA on non-workdays appears to be similar across the groups, with MVPA being higher during the day, and decreasing from 7pm onwards.

Insert Figures 1 and 2 about here

Discussion

The present study examined sedentary behaviour and physical activity accumulated during and outside working hours in a sample of full-time office workers from the UK. On both workdays and non-workdays sedentary behaviour was the most prevalent behaviour exhibited by the sample, accounting for 68% and 60% of accelerometer wear time respectively. On workdays, participants were highly sedentary during working hours, with 71% of working hours spent in sedentary behaviour. Overall, sedentary behaviour accumulated during working hours accounted for 57% of total daily sedentary time on workdays.

The present findings add to the growing evidence highlighting the workplace as an important setting for the accumulation of high volumes of sedentary behaviour.[13] The proportion of working hours spent sedentary in the current sample is similar to that observed in Australian office workers, using objective measures.[13-15] Given the workplace is the major contributor to total daily sedentary time on work days, worksite interventions designed to reduce, or break up, sedentary behaviour are urgently needed in UK office workers. Indeed, research in Australian and Swedish workers has started to investigate the effectiveness of sit-to-stand workstations for reducing sedentary time at work.[23,24] If successful, the incorporation of sit-to-stand workstations in offices of sedentary workers within the UK workforce could be an effective strategy for reducing sedentary behaviour during working hours.

It was observed in the present study that sedentary behaviour accumulated during working hours was positively associated with sedentary behaviour measured on non-workdays, and during non-working hours on workdays. Furthermore, when split into tertiles according to the proportion of working hours spent sedentary, participants in the highest tertile for working hours sedentary behaviour spent a significantly greater proportion of time in sedentary

behaviour during non-working hours on workdays and less time in light intensity activity in comparison to participants in the lowest tertile for working hours sedentary behaviour. The same finding was also observed on non-work days. The observation that those who were most sedentary during working hours were also the most sedentary out of working hours is similar to that reported in Dutch[16] and Australian[14] workers. In the present study, there were no significant differences between the groups in terms of the proportion of time spent in MVPA either during non-working hours on workdays, or on non-workdays. This suggests that, in the present sample, those who are sedentary for a large proportion of their working day do not compensate by increasing their physical activity levels outside of working hours. This finding is in contrast to that reported by Chau et al. [12] who observed in Australian workers that individuals with jobs which involve mostly sitting were more likely to report being physically active during their leisure-time than individuals in more active jobs. The differences in study findings may be attributable to differences in lifestyles between these Australian and British samples, further highlighting the importance of understanding these lifestyle behaviours in different populations. Whilst participants in the three tertiles for working hours sedentary behaviour did not differ in terms of job role, those in the lowest tertile were older than those in the medium and high tertiles, indicating that sedentary behaviour levels and patterns may vary across age groups. This warrants further study in larger samples.

The finding that those who were most sedentary during working hours, were also the most sedentary during non-working hours, coupled with the observation that there appears to be no compensatory increases in physical activity outside of work, is a major concern. The 'highest working hours sedentary behaviour' group spent over 10 hours per day in sedentary behaviour on workdays, suggesting that these individuals are at an increased risk of numerous chronic conditions associated with high volumes of sedentary behaviour.[8] In addition to an increased risk of chronic disease, evidence suggests that these individuals may also be at an increased risk of musculoskeletal disorders[25] and impaired work

performance.[15] Based on the present findings, and others,[14-16] it is suggested that worksite sedentary behaviour interventions also target sedentary behaviour outside of working hours.

The hour by hour breakdown of time spent in each behaviour for the three groups on workdays highlights working hours (9am – 4.59 pm) and the evening (8pm onwards) as critical periods during the day when sedentary behaviour is most prevalent. Whilst the overall pattern of behaviour is similar on workdays across the three groups, the difference between light intensity activity and sedentary behaviour becomes more pronounced between the groups. Participants in the lowest tertile for working hours sedentary behaviour exhibited less time in sedentary behaviour and a greater proportion of time in light intensity activity in the hours before work, in comparison to the remaining groups. This difference could be down to differences in commuting behaviour between the groups, however as participants did not report their mode of transport to or from work in the present study, this cannot be confirmed. For all groups on workdays (and non-workdays), the pattern of light intensity physical activity is the inverse to that of sedentary behaviour suggesting that light intensity activities offset sedentary behaviours. Given the apparent strong link between sedentary behaviour and light intensity physical activity, workplace interventions promoting increases in light intensity activity should be effective in reducing sedentary time. Given recent evidence suggesting that light intensity physical activity is beneficial to health,[26] future worksite interventions targeting sedentary behaviour should incorporate the promotion of light intensity physical activity where feasible, such as encouraging the use of pooled printers/copiers, centrally placed water coolers, restricting email and telephone contact for employees in the same building etc. Emerging experimental evidence has shown that breaking up sedentary behaviour every 20 minutes with 2 minutes of light walking significantly improves glucose and insulin regulation.[27] A strategy such as this could be implemented in future worksite interventions.

A small dip in sedentary behaviour and increases in light activity and MVPA were observed around the lunch period on workdays, suggesting that this period could be a suitable time for encouraging longer breaks in sedentary behaviour and increases in physical activity. Indeed, previous research has demonstrated the effectiveness of instructor-led lunchtime walking groups for promoting physical activity in sedentary workers.[28] In addition, recent research has shown that light intensity physical activity during lunch time was associated with reduced work performance impairment in office workers.[15]

This study provides novel information on how sedentary behaviour and physical activity is accumulated during and outside working hours in a sample of office workers from the UK. The objective measurement of sedentary behaviour and physical activity is a strength of the present study as it likely overcomes the limitations of bias and recall common with self-report measures. The study is not without its limitations however. Whilst the ActiGraph accelerometer has been widely used as an objective measure of sedentary behaviour, this waist-worn device is not capable of distinguishing between standing and sitting/lying postures. Therefore, some periods of standing still may have been misclassified as sedentary behaviour. Furthermore, in the present study we applied the commonly used <100 cpm cut-point to estimate sedentary behaviour. Despite its wide use, this cut-point was not empirically derived and recent contradictory evidence has questioned the validity of this particular cut-point.[29,30] For example, Kozey-Keadle[29] suggested a cut-point of 150 cpm may be more accurate at defining sedentary time, while Hart et al.[30] have reported that a cut-point of <50 cpm may be more appropriate. Further research would benefit from the use of an inclinometer, as used elsewhere,[17] which is capable of distinguishing between different postures. A further limitation of our study is participants did not record their start and finish work times in a daily diary, the working hours (9am – 5pm) assigned in the present study were based on our knowledge of the standard working hours applied in the organisations in which participants were based. It is possible therefore that some of our participants may have been at work for longer or shorter periods than these assigned hours on some days of

the study. However, participants were asked upon completion of the study to report whether they had had a typical week during the monitoring period, and any days where the participant had reported taking additional days off work through sickness or illness were removed ahead of the analyses. The study's cross-sectional design prevents us from making conclusions about causality, it is therefore not possible to determine whether being sedentary at work leads to an individual being more sedentary out of working hours. Further longitudinal research is required to understand the long term relationships between sedentary behaviour accumulated during and outside working hours. Limited demographic information was collected from participants in the present study; further research with larger samples should explore patterns of sedentary behaviour occurring across different age groups, educational groups and employment sectors for example, in order to enhance the development of tailored interventions for reducing sedentary time.

Conclusions

The present study extends our knowledge on the patterns of sedentary behaviour and physical activity on workdays and non-workdays in office workers living in the UK. The sample as a whole spent a large proportion of time in sedentary behaviour on both workdays and non-workdays. Of concern, it was observed in the present study that those who are sedentary for a large proportion of their working hours also accumulate a high proportion of time in sedentary behaviour during non-working hours. There was no evidence to suggest that those with high volumes of sedentary behaviour during working hours compensated for this by increasing their time in light intensity activity or MVPA out of working hours. Given the high volume of sedentary behaviour seen in the current study, and others, workplace interventions are urgently needed to reduce sedentary time in adults to reduce the risk of numerous chronic diseases associated with sedentary behaviour. Interventions should focus on reducing both workplace sedentary behaviour and leisure-time sedentary behaviour in sedentary office workers.

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Figure legends

Figure 1. Minutes spent in sedentary behaviour, light intensity physical activity and MVPA during each hour of the working day for participants grouped into tertiles based on the proportion of time spent sedentary during working hours.

Figure 2. Minutes spent in sedentary behaviour, light intensity physical activity and MVPA during each hour of the non-working day for participants grouped into tertiles based on the proportion of time spent sedentary during working hours.

Table 1. Sedentary behaviour and physical activity (PA) measured during and outside working hours in 170 office workers. Data represents the median and inter-quartile ranges (IQR).

	All days (median ± IQR)			Work days only (median ± IQR)		
	Work days	Non-work days	Differences * (p value)	During working hours	Non-working hours	Differences * (p value)
Number of valid days**	781	303		781	781	
Wear time (mins/day)	874 ± 103	767 ± 113	<0.001	477 ± 15	406 ± 79	<0.001
% of wear time spent sedentary	68 ± 9	60 ± 14	<0.001	71 ± 12	63 ± 12	<0.001
Time in sedentary behaviour (mins/day)	580 ± 101	460 ± 105		333 ± 61	254 ± 72	
% of wear time spent in light PA	28 ± 9	36 ± 14	<0.001	25 ± 11	33 ± 10	<0.001
Time in light PA (mins/day)	246 ± 90	278 ± 126		117 ± 55	130 ± 48	
% of wear time spent in MVPA	4 ± 3	4 ± 4	0.40	4 ± 4	3 ± 5	0.82
Time in MVPA (mins/day)	32 ± 26	28 ± 33		17 ± 17	13 ± 17	

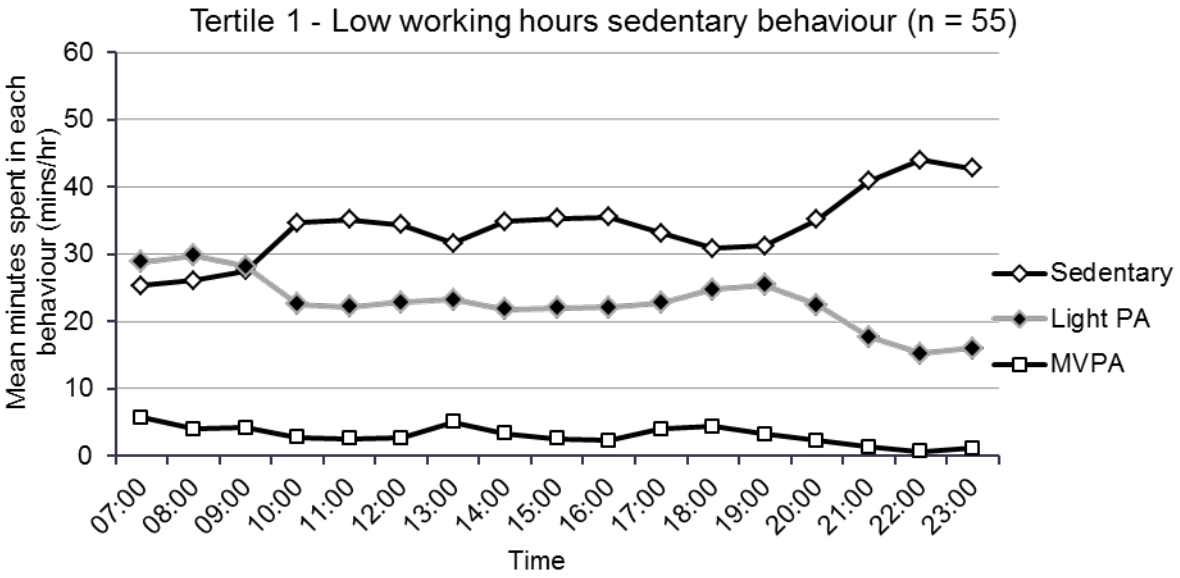
*Comparisons undertaken using Wilcoxon-signed ranks tests. As significant differences in accelerometer wear time were observed between workdays and non-workdays, and between working hours and non-working hours, comparisons were undertaken between the proportion of accelerometer wear time spent in each behaviour. Minutes spent in each behaviour are also included in the table for comparison purposes.

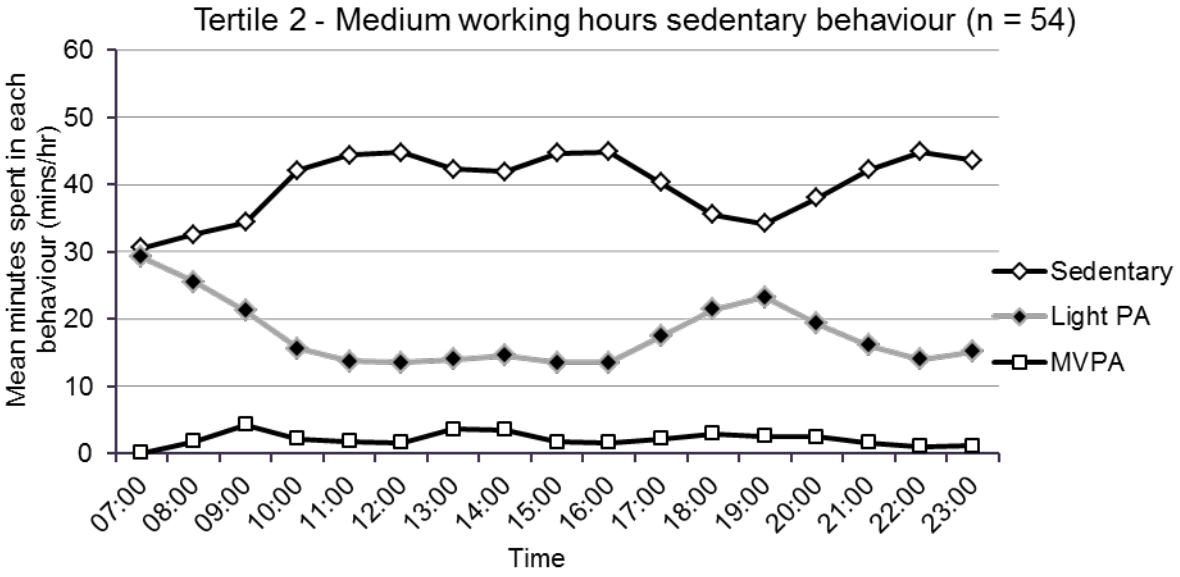
**The number of valid days (wear time ≥10 hours/day) included in the analyses.

510 **Table 2**. Sedentary behaviour and physical activity measured during and outside working hours in office workers grouped into tertiles according
511 to the proportion of working hours spent sedentary. Data represents the median and inter-quartile ranges (IQR).

	All days (median ± IQR)							
	Workdays				Non-workdays			
	Tertile 1 (n = 55)	Tertile 2 (n = 54)	Tertile 3 (n = 61)	Between group differences (p value)*	Tertile 1 (n = 55)	Tertile 2 (n = 54)	Tertile 3 (n = 61)	Between group differences (p value)*
Number of valid days**	260	251	270		97	95	111	
Wear time (mins/day)	888 ± 112	884 ± 87	850 ± 77	0.02	775 ± 120	764 ± 84	744 ± 135	0.16
% of wear time spent sedentary	59 ± 9	69 ± 5	72 ± 6	<0.001	54 ± 18	61 ± 11	64 ± 13	<0.001
Time in sedentary behaviour (mins/day)	508 ± 102	594 ± 79	609 ± 76		427 ± 149	479 ± 114	468 ± 79	
% of wear time spent in light PA	37 ± 8	28 ± 4	23 ± 7	<0.001	41 ± 15	36 ± 10	31 ± 12	<0.001
Time in light PA (mins/day)	325 ± 87	246 ± 41	198 ± 74		311 ± 106	274 ± 117	230 ± 104	
% of wear time spent in MVPA	4 ± 4	3 ± 2	3 ± 3	0.21	4 ± 4	3 ± 4	4 ± 5	0.53
Time in MVPA (mins/day)	35 ± 36	30 ± 18	31 ± 26		28 ± 32	26 ± 33	30 ± 33	
	Work days only (median ± IQR)							
	During working hours				Non-work hours			
	Tertile 1 (n = 55)	Tertile 2 (n = 54)	Tertile 3 (n = 61)	Between group differences (p value)*	Tertile 1 (n = 55)	Tertile 2 (n = 54)	Tertile 3 (n = 61)	Between group differences (p value)*
Number of valid days**	260	251	270		260	251	270	
Wear time (mins/day)	478 ± 13	478 ± 13	474 ± 17	0.26	420 ± 86	418 ± 55	387 ± 64	<0.01
% of wear time spent sedentary	60 ± 14	71 ± 3	78 ± 4	<0.001	60 ± 12	65 ± 10	66 ± 13	<0.001
Time in sedentary behaviour (mins/day)	286 ± 68	335 ± 17	365 ± 26		247 ± 80	263 ± 64	243 ± 63	
% of wear time spent in light PA	35 ± 12	25 ± 3	19 ± 5	<0.001	37 ± 10	32 ± 7	29 ± 10	<0.001
Time in light PA (mins/day)	163 ± 52	118 ± 19	88 ± 24		150 ± 56	128 ± 41	117 ± 53	
% of wear time spent in MVPA	4 ± 4	4 ± 3	3 ± 3	<0.001	4 ± 5	3 ± 3	4 ± 5	0.14
Time in MVPA (mins/day)	20 ± 19	17 ± 13	13 ± 13		13 ± 25	13 ± 14	16 ± 18	

512 *Between group comparisons undertaken using Kruskal-Wallis tests with Bonferroni-corrected post hoc comparisons. To account for differences
513 in accelerometer wear time between groups, comparisons were undertaken between the proportion of accelerometer wear time spent in each
514 behaviour. Minutes spent in each behaviour are also included in the table for comparison purposes.
515 **The number of valid days (wear time ≥10 hours/day) included in the analyses for each tertile group.


Tertile 1 - Low working hours sedentary behaviour (n = 55)
Mean minutes spent in each behaviour (mins/hr)
60
50
40
30
20
10
0
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time
Sedentary
Light PA
MVPA


Tertile 2 - Medium working hours sedentary behaviour (n = 54)
Mean minutes spent in each behaviour (mins/hr)
60
50
40
30
20
10
0
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
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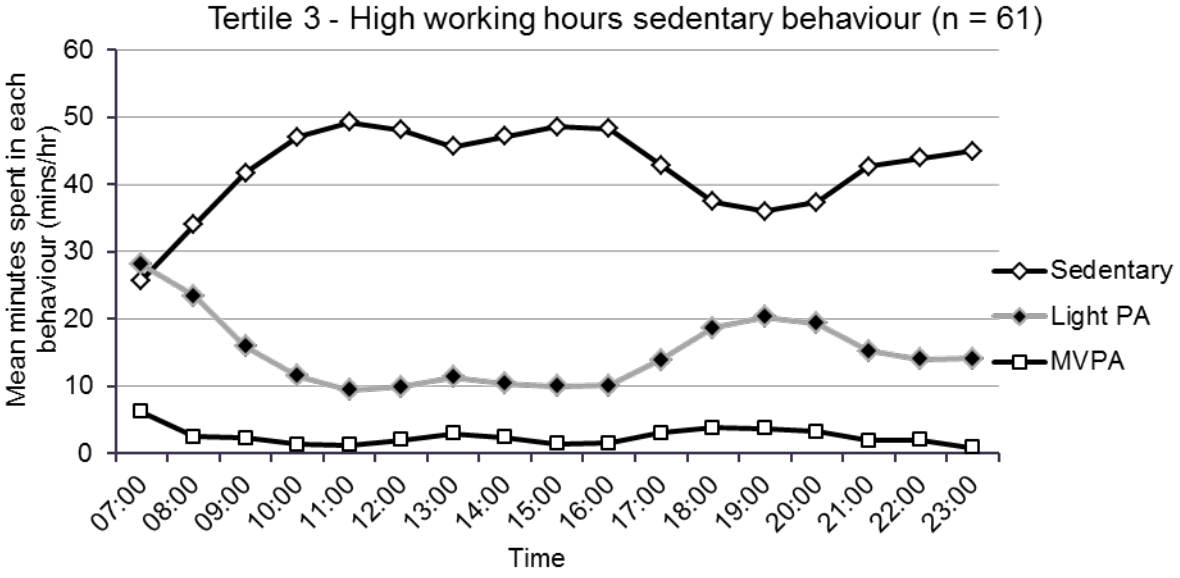
21:00
22:00
23:00
Time
Sedentary
Light PA
MVPA


Tertile 3 - High working hours sedentary behaviour (n = 61)
Mean minutes spent in each behaviour (mins/hr)
60
50
40
30
20
10
0
07:00
08:00
09:00
10:00
11:00
12:00
13:00
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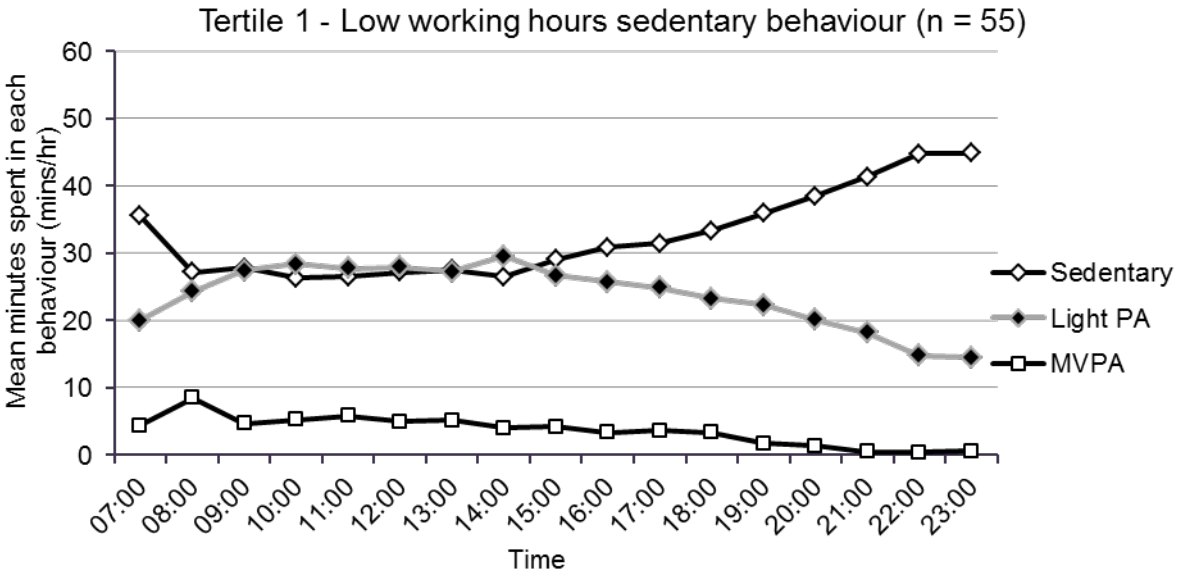
21:00
22:00
23:00
Time
Sedentary
Light PA
MVPA


Tertile 1 - Low working hours sedentary behaviour (n = 55)
Mean minutes spent in each behaviour (mins/hr)
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07:00
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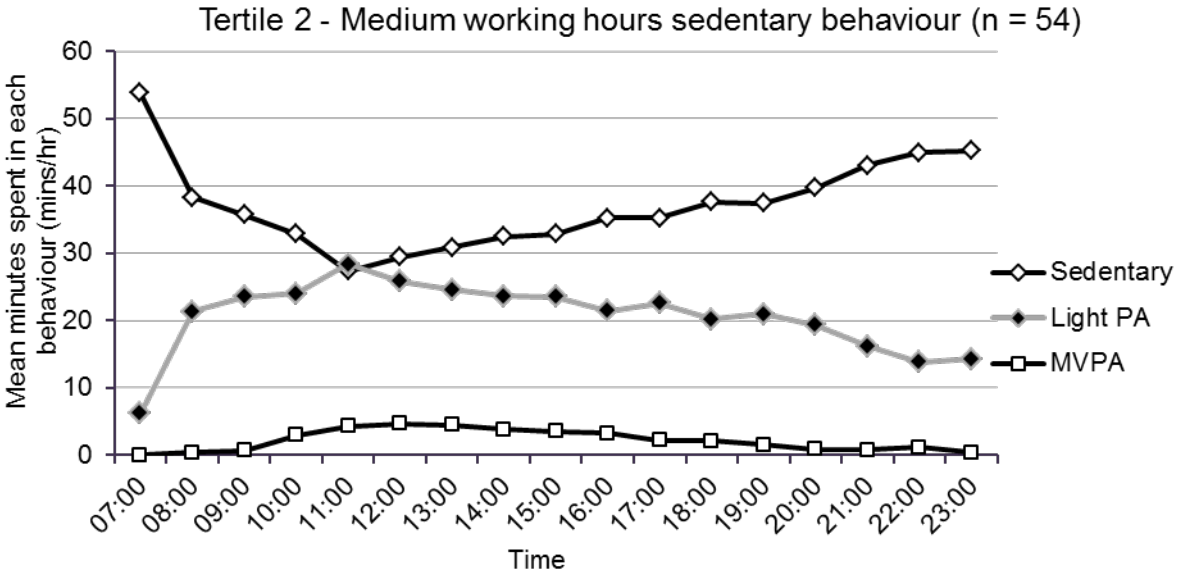
22:00
23:00
Time
Sedentary
Light PA
MVPA


Tertile 2 - Medium working hours sedentary behaviour (n = 54)
Mean minutes spent in each behaviour (mins/hr)
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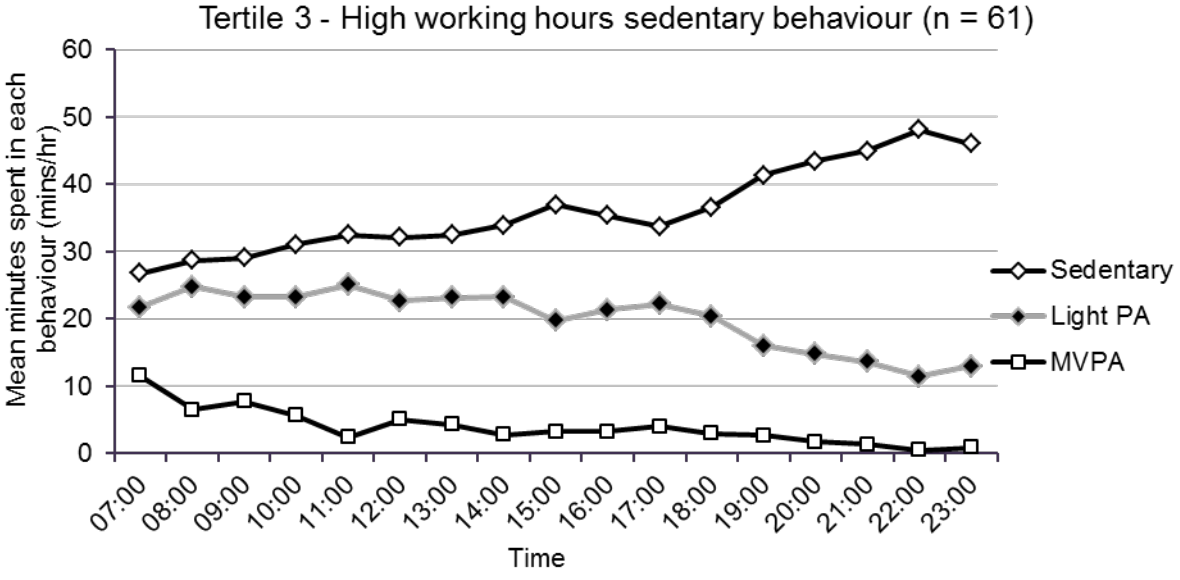
23:00
Time
Sedentary
Light PA
MVPA


Tertile 3 - High working hours sedentary behaviour (n = 61)
Mean minutes spent in each behaviour (mins/hr)
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07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time
Sedentary
Light PA
MVPA

518