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Exploration of sedentary behaviour among general practitioners: A cross-sectional study

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Keywords:

sedentary behaviour; physical activity

Abstract

Background:

Sedentary behaviour, which may have increased among GPs due to increasing use of telemedicine, is associated with many illnesses and increased all-cause mortality.

Aim:

To explore levels of sedentary behaviour among GPs and General Practice Specialty Trainees (GPSTs).

Design and Setting:

Sequential, cross-sectional design (initial online sedentary behaviour questionnaire, subsequent thigh-worn accelerometer sub-study) of GPs and GPSTs in Northern Ireland.

Method:

Self-reported questionnaire data were aggregated and compared with device-measured accelerometry data.

Results:

Data from 353 participants (17.7% of GPs and GPSTs in Northern Ireland) revealed doctors in general practice self-reported higher workday sedentary time (10.33 (SD=2.97) hours) than those in secondary care (7.9 (SD=3.43) hours) (MD 2.43 hours; p<0.001). An active workstation (eg. sit-stand desk), was used by 5.6% of participants in general practice, while 86.0% of those without one would consider using one in future. Active workstation users self-reported lower workday sedentary time (7.88 (SD=3.2) hours) than non-users (10.47 (SD=2.88) hours) (MD -2.58 hours, p=0.001). Accelerometer sub-study participants underestimated their workday sedentary time by 0.17 hours (95% CI -1.86, 2.20; p=0.865), and non-workday sedentary time by 2.67 hours (95% CI 0.99, 4.35; p=0.003). Most GPs (80.7%) reported increased workday sitting time compared to prior to the COVID-19 pandemic, while 87.0% would prefer less workday sitting time.

Conclusion:

GPs have high levels of workday sedentary time, which may be detrimental to their health. It is imperative to develop methods to address sedentary behaviour among GPs on workdays, both for their own health and the health of their patients.

Keywords:

sedentary behaviour; physical activity; primary care; general practice

How this fits in

Excessive sedentary behaviour is associated with many adverse health outcomes and increased all-cause mortality, yet little previous research has examined sedentary behaviour among GPs. This study shows that general practice is a highly sedentary occupation, particularly in light of the recent increased use of telemedicine, which may be detrimental to the health of GPs. Most GPs would prefer to spend less time sitting on workdays; in doing

so they could improve both their own health and, potentially, the health of their patients, due to their ability to effectively counsel patients on healthy lifestyle choices.

Introduction

Sedentary behaviour is defined as time spent sitting, lying or reclining, in a state of low energy expenditure, whilst awake [1]. Excessive sedentary behaviour is associated with adverse health outcomes, including type II diabetes mellitus, obesity, cardiovascular disease, metabolic syndrome, dementia, certain cancers, mental health issues [2-4] and increased all-cause mortality [4-10]. The World Health Organisation therefore advises individuals to minimise and break up periods of sedentary behaviour [11].

Primary care is "the cornerstone" of the UK NHS, providing over 300 million patient consultations per year [12]. By virtue of their position in the healthcare system, GPs can provide evidence-based lifestyle guidance to patients, which can play an important role in primary and secondary prevention of many illnesses. GPs who are more physically active are more likely to recommend physical activity to their patients [13-17]. Patients are more likely to make healthy lifestyle changes if they believe their doctor follows the guidance themselves [18-20]. Reducing sedentary behaviour and increasing physical activity among GPs could therefore lead to health benefits for GPs and their patients. This is particularly relevant now that GPs are performing more remote consultations [21, 22], traditionally performed while sitting down. Core opening hours for general practices are typically around ten hours every weekday, excluding bank holidays, which means many GPs are in work for most of the time they are awake on a typical workday. It is therefore important to investigate current levels of sedentary behaviour among GPs.

The specific objectives of this study were:

- To quantify total daily sedentary time among GPs and GPSTs during a typical workday and non-workday;
- To identify differences in the levels of sedentary behaviour depending on work environment, age and gender;
- To establish current uptake of "active workstations" such as standing desks;
- To ascertain if sedentary behaviour has been affected by changes due to the COVID-19 pandemic.

Method

Study design:

A cross-sectional study was conducted in accordance with STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidance [23], following a sequential design, incorporating an online questionnaire survey and subsequent accelerometer sub-study.

Stage 1: Online questionnaire study:

Design and distribution:

A questionnaire (supplementary file 1) was distributed to all GPs and GPSTs throughout Northern Ireland using email mailing lists (to in-hours and out-of-hours GPs and GPSTs, with the support of out of hours, training and continuing professional development providers), and social media. GPs and GPSTs in Northern Ireland have similar working conditions to their contemporaries throughout the rest of the UK. The International Sedentary Assessment Tool (ISAT) was used; a multi-item questionnaire developed following a systematic review of sedentary behaviour questionnaires [24]. Baseline details gathered included age, gender, job role and working environment. Additional questions explored access to and willingness to use an active workstation, and changes in sitting time since before the COVID-19 pandemic. At the end of the questionnaire, if participants indicated they were now spending more or less time sitting than prior to the COVID-19 pandemic, they were able to submit a free-text response explaining why. The questionnaire was accessed using a hyperlink to a Microsoft Forms webpage. Participants were recruited voluntarily, with no obligations or rewards for taking part. The Faculty of Medicine, Health and Life Sciences Research Ethics Committee of Queen's University Belfast approved the study (reference MHLS20_39). All participants provided informed consent. The questionnaire was live between 28 August and 24 September 2020.

Inclusion/Exclusion criteria:

Inclusion criteria were: being a GP partner, salaried GP, sessional/locum GP or GPST working in Northern Ireland at the time of the study. Exclusion criteria were: answering a question that contradicted the inclusion criteria.

Analysis:

Responses were reviewed to ensure there were no duplicates. Statistical analyses were conducted using SPSS (V.25.0). Baseline characteristics were described using mean (SD) for numerical data and counts (%) for categorical data. The distribution of numerical data was assessed visually using histograms and QQ plots. Data were analysed using independent t-tests and chi-square tests where appropriate. All tests were 2-sided with statistical significance set at $p<0.05$.

Stage 2: Accelerometer sub-study:

Recruitment and data collection:

Twenty questionnaire respondents were recruited to the accelerometer sub-study. No sample size calculation was performed, as the primary aim was to gather baseline data. Twenty accelerometers were available to the researchers for concurrent use. Purposive sampling was used to ensure maximum variation based on demographic criteria (age, gender, work pattern/environment) and self-reported sedentary time. During autumn 2020, participants were posted an Axivity AX3 accelerometer, adhesive waterproof dressings, and instructions. Axivity AX3 accelerometers are valid for accurately identifying sedentary time [25]. Participants were instructed to wear the accelerometer continuously, on the middle of the thigh, over a seven-day period while completing a contemporaneous sleep/work log. On completion, participants posted back the accelerometer and sleep/work log.

Inclusion/Exclusion criteria:

Inclusion criteria were: being a GP partner, salaried GP, sessional/locum GP or GPST working in general practice in Northern Ireland at the time of the study; having completed the online sedentary behaviour questionnaire; having consented to being approached for a subsequent accelerometer sub-study. Exclusion criteria were: not meeting the inclusion criteria; having a comorbidity that the participant felt would affect sedentary time; being on annual leave during the study; undertaking contact sports that could damage the accelerometer.

Analysis:

Accelerometers were programmed to capture triaxial accelerations at 50Hz with a dynamic range of +/- 8g. Details on accelerometer data processing and analysis can be found in a previous study [26]. For inclusion in the final analysis, accelerometers needed to be worn for a minimum of one valid workday and one valid non-workday. A valid day required a minimum of 600 minutes of wear-time whilst awake, as required for previous accelerometer studies [27]. A valid workday required the participant to work at least one clinical session. Accelerometer data was used to determine sedentary time, step count and time spent during light (LPA) and moderate-to-vigorous (MVPA) physical activity.

Results

Online questionnaire:

Sample Characteristics:

There were 1999 GPs and GPSTs working in Northern Ireland at the time of the study; 1633 GPs and 366 GPSTs. The online survey was accessed by 353 people, 17.7% of the eligible population. One person answered no questions and three answered no questions apart from number of sessions worked. They were excluded from the analysis.

Summary data of questionnaire participants is included in Table 1. Average age was 39.9 (SD=0.3) years, with 61.7% (n=204) female. GPs comprised 74.2% (n=251), with the rest GPSTs. GPs and GPSTs in general practice at the time of the study comprised 92.0% (n=312), with an average age of 40.7 (SD=10.2) years. The remainder, all GPSTs, with an average age of 32.5 (SD=7.7) years, were working in secondary care settings. GPs reported working an average of 6.09 (SD=1.75) clinical sessions per week in general practice, while 75.6% of GPSTs were working full time, with the remainder working part-time.

Self-reported sedentary time:

Overall, participants working in primary care reported more sedentary time on workdays (10.33, SD=2.97 hours) than non-workdays (4.78, SD=3.02 hours) (MD 5.55 hours; 95% CI 5.08, 6.02; p<0.001). Participants in general practice reported more workday sedentary time (10.33, SD=2.97 hours) than those in secondary care (7.9, SD=3.43 hours) (MD 2.43 hours; 95% CI 1.2, 3.37; p<0.001). However, participants in general practice reported less sedentary time on non-workdays (4.78, SD=3.02 hours), than those in secondary care settings (6.17, SD=3.67 hours) (MD 1.38 hours; 95% CI 0.17, 2.60; p=0.025).

Access to active workstations:

Summary questionnaire data regarding active workstations is found in Table 2. Among participants in general practice, 5.6% (n=18) reported having access to an active workstation, such as a standing desk, at work. They reported lower workday sedentary time (p<0.001) than those who did not have access to an active workstation (7.88 (SD=3.20) hours vs 10.47, (SD=2.88) hours). Participants in general practice with active workstations had similar levels of workday sedentary time to participants working in secondary care settings (MD 0.02 hours; 95% CI -2.10, 2.06; p=0.985).

Attitudes regarding active workstations:

Among participants in general practice without active workstations, 86.0% (n=253) would consider using one in future. Participants who would consider using an active workstation were younger (40.2, SD=9.7 years vs 45.3, SD=12.1 years; p=0.019) than those who would not.

Attitudes regarding sedentary behaviour:

Among participants in general practice, 87.0% (n=274) reported they would prefer less time sitting, 11.9% (n=38) would prefer the same time sitting and 1.1% (n=3) would prefer more time sitting on a typical workday. Those who would prefer less time sitting had more (p<0.001) workday sedentary time (10.68, SD=2.70 hours) than those who would prefer the same time sitting (7.93, SD=3.45 hours).

Changes in sedentary behaviour due to COVID-19 pandemic:

Among participants in general practice, 80.7% (n=255) reported spending more time sitting, 3.9% (n=44) the same time sitting and 5.4% (n=17) less time sitting at work than prior to the COVID-19 pandemic. Remote consulting was cited in the free-text responses of 94.5% (n=241) of the 255 participants who reported more time sitting.

Accelerometer sub-study:

Sample demographics:

Of the 353 participants who accessed the initial online questionnaire survey, 195 consented to being approached for the subsequent accelerometer sub-study. Forty-six survey participants were invited to participate in the accelerometer sub-study. The accelerometer sub-study invitation email received no response from 17 recipients. Of the 29 survey participants who responded to the invitation email, 20 agreed to participate. Nine did not meet the inclusion criteria: four were on annual leave; two declined; two participated in contact sports; one had a comorbidity. Table 1 compares accelerometer sub-study participants with questionnaire survey participants.

Data capture and analysis:

All accelerometers and sleep/work logs were returned to the investigators. Not all participants wore accelerometers during the study period: two forgot to wear the device; one was unable to affix the device to their thigh. Therefore, 17 participants provided usable accelerometer data to analyse.

Comparison of accelerometer and self-reported data:

Two participants who wore the accelerometer were excluded from the analysis. They did not work in general practice because of illness during the study. Objective, accelerometer data were compared with subjective, self-reported data for the remaining 15 participants, and summarised in Table 3. Average self-reported workday sedentary time was 9.83 (SD=3.45) hours. Their average accelerometry-measured workday sedentary time was 10.00 (SD=1.69) hours, showing they had slightly underestimated their overall workday sedentary time by 0.17 hours (p=0.865). Average non-workday self-reported sedentary time was 4.53 (SD 2.55) hours. Their average accelerometry-measured overall non-workday sedentary time was 7.20 (SD 1.88) hours, showing they had significantly underestimated their overall non-workday sedentary time by 2.67 hours (p=0.003).

Active workstations:

Accelerometery-measured data regarding active workstations is summarised in Table 4. Participants with active workstations (n=4) had less workday sedentary time (p<0.001) than those without active workstations (n=11) (7.57 (SD=0.56) vs 10.88 (SD=0.82) hours). They also had more (p<0.001) workday standing time (5.81 (SD 1.39) vs 2.88 (SD 0.79) hours). There was no significant difference in average workday LPA, MVPA and step counts between participants with and without active workstations.

Workdays vs Non-workdays:

Comparison of workdays and non-workdays is summarised in Table 5. Sedentary time was higher (10.00 (SD=1.69) vs 7.20 (SD=1.88) hours (p<0.001)) on workdays than non-workdays. LPA (3.36 (SD=0.86) vs (4.26 (SD=1.26) hours (p=0.030)), MVPA (0.36 (SD=0.29) vs (1.02 (SD=0.41) hours (p<0.001)) and step counts (5281.51 (SD=2690.17) vs 10890.89 (SD=4063.56) (p<0.001) were lower on workdays than non-workdays. There was no significant difference in standing time on workdays and non-workdays.

Discussion

Summary

This is the first study to specifically examine levels of sedentary behaviour among GPs. Participants had significantly more sedentary time on workdays compared to non-workdays. Those in general practice with active workstations had similar levels of workday sedentary time to those in secondary care. Participants in general practice without active workstations had significantly higher levels of workday sedentary time than those with active workstations, or those in secondary care. Participants with active workstations primarily replaced sedentary time with standing time. GPs now report having higher levels of workday sedentary time than prior to the COVID-19 pandemic. Most would prefer less sedentary time. Despite only a small minority of GPs currently having access to active workstations, a large majority, particularly those younger in age, would consider using one in future.

Strengths and limitations

Strengths:

An online survey was less onerous for participants than a paper-based, postal survey. Multi-item questionnaires with relatively short recall periods are more reliable than single item

questions and longer recall periods (26). Thigh-worn accelerometers are highly accurate for identifying sedentary behaviour (29). Using accelerometers with an accompanying sleep/work log among a smaller, purposive sample of participants allowed comparison between subjectively and objectively reported sedentary time and between workdays and non-workdays.

Limitations:

The questionnaire response rate of 17.7% is similar to previous online surveys among GPs [28-30]. Higher response rates have been obtained by postal surveys [30, 31], however this may have caused increased hassle for participants, particularly in light of concerns regarding higher workload during the COVID-19 pandemic [32]. COVID-19 restrictions prevented face-to-face recruitment, which may also have improved the overall response rate. Demographic data of participants appears to be comparable to published governmental data of GPs in Northern Ireland [33], however the relatively low response rate means that participants may not have been truly representative of all GPs and GPSTs in Northern Ireland at the time of the study. Thigh-worn accelerometers are unable to detect upper body movement, so if a participant was sitting or lying while performing exercise involving the trunk or arms, this may incorrectly have been recorded as sedentary behaviour. Participants in the accelerometer sub-study may have modified their behaviour while they were wearing the device, however the significance of this is uncertain and is shared with other studies using similar devices for objective measurements [34, 35].

Comparison with existing literature:

A recent systematic review, conducted by the authors, identified two previous studies reporting levels of sedentary behaviour among GPs [36]. Keohane et al. examined GP trainees and GP trainers in Ireland in 2018, when 60% reported spending in excess of seven hours, 24% between four and seven hours, and 16% less than or equal to four hours sitting each day [28]. Suija et al. examined female GPs in Estonia in 2009, reporting mean daily sitting time of six hours and 36 minutes, with 56% sitting for over six hours per day [29]. Both studies primarily examined physical activity using the International Physical Activity Questionnaire (IPAQ), [28, 29] where participants were asked how much time they usually spend sitting on an average weekday [37]. This may have underestimated sedentary behaviour, which includes when an individual is awake in a lying or reclining posture [1]. Both studies also took place prior to the COVID-19 pandemic, which has resulted in significant, potentially longstanding changes to general practice [38]. Our findings reflect the increased use of remote consultations brought about by the COVID-19 pandemic [22].

This study shows that most GPs currently have over ten hours of total sedentary time over the course of each workday, which is more than previously reported and similar to workers in the education, telecom and service industries [39]. This is a concerning finding given the established dose-response relationship between sedentary time and mortality [4-10]. Mortality risk has been shown to increase gradually between seven and nine hours of average daily sedentary time, with a further increase above nine hours [8]. For participants working in secondary care settings, or in general practice with active workstations, their average overall workday sedentary time of less than eight hours could potentially make them less likely to be affected by the adverse health outcomes associated with excessive sedentary behaviour. Active workstations allow the user to alternate between sitting and

standing, which has been shown to reduce postprandial glycaemia excursion, blood pressure, and back pain [40]. The greater disparity in self-estimated versus accelerometry-measured sedentary time on non-workdays, compared to workdays, aligns with previous studies finding self-reported sedentary time to be more accurate on a workday than on a non-workday [41-43]. This may be because workdays follow a more reliable, predictable structure and routine than non-workdays, which may be less structured and more variable.

Implications for research and practice:

This study demonstrates that doctors working in general practice typically have high levels of sedentary time on workdays, with much less on non-workdays. It is therefore important to consider ways of reducing workday sedentary time among GPs, given the negative health effects of excessive sedentariness and the role of GPs in counselling patients about healthy lifestyles. If GPs were able to find solutions to reduce their own workday sedentary behaviour, they could share these with patients when discussing how patients could reduce their sedentary behaviour both in and out of the workplace. One potential approach is the use of active workstations, which are already being used by a minority of GPs. Although active workstation users had less workday sedentary time than non-users, their sedentary time was primarily replaced by static standing time. Multi-component interventions to reduce workday sedentary behaviour and increase physical activity may be more successful. Future research should assess whether levels of sedentary time and physical activity among GPs changes with the easing of restrictions related to the COVID-19 pandemic and the adoption of new technologies. It would also be relevant to assess sedentary behaviour and physical activity throughout the primary care multidisciplinary team. Qualitative research focusing on the enablers and barriers to GPs reducing their workday sedentary time would shed more light on the acceptability and feasibility of future interventions in this area.

Additional Information

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Ethical approval:

Ethical approval was granted by the Faculty of Medicine, Health and Life Sciences Research Ethics Committee of Queen's University Belfast (Ref. MHLS 20_39 and MHLS 20_39 – Amendment 1).

Competing interests:

The authors have declared no competing interests.

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Tables

Table 1. Questionnaire survey and accelerometer sub-study participant comparisons

	Questionnaire survey (n=349)	Accelerometer sub-study (n=20)
Average age (years) *Mean (SD)*	39.9 (10.3)	39.1 (9.7)
Gender (Female / Male) *n (%)*	204 (61.6%) / 127 (38.3%)	12 (60%) / 8 (40%)
Job role (GP / GPST) *n (%)*	259 (74.2%) / 90 (25.8%)	16 (80%) / 4 (20%)
GP clinical sessions/week *Mean (SD)*	6.29 (SD 1.76)	6.65 (SD 1.53)
Access to active workstation (No / Yes) *n (%)*	302 (94.4%) / 18 (5.6%)	16 (80.0%) / 4 (20.0%)
Average self-reported workday sedentary time (hours) *Mean (SD)*	10.33 (SD 2.97)	9.80 (SD 3.19)
Average self-reported non-workday sedentary time (hours) *Mean (SD)*	4.78 (SD 3.02)	4.38 (SD 2.65)

Table 2. Summary questionnaire data for GPs and GPSTs working in general practice

	Do not have active workstation	Have active workstation	Significance
Total *n (%)*	302 (94.4%)	18 (5.6%)	
Gender (Female/Male) *n (%)*	173 (60.9%) / 111 (39.1%)	13 (72.2%) / 5 (27.8%)	χ^2 (1, n=302)=0.915, p=0.339
Age (years) *Mean (SD)*	40.8 (10.1)	39.0 (10.60)	MD 1.8, 95% CI -3.19, 6.87, p=0.472
Overall workday sedentary time (hours) *Mean (SD)*	10.47 (2.88)	7.88 (3.20)	MD 2.58, 95% CI 1.12, 4.07, p=0.001
Overall non-workday sedentary time (hours) *Mean (SD)*	4.88 (3.12)	4.36 (2.67)	MD 0.52, 95% CI -0.50, 1.11, p=0.304

Table 3. Comparison of accelerometry-measured and self-reported sedentary time

	Self-reported (n=15) *Mean (SD)*	Accelerometry-measured (n=15) *Mean (SD)*	Mean Difference
Workday sedentary time (hours)	9.83 (3.45)	10.00 (1.69)	0.17 hours, 95% CI -1.86, 2.20, p=0.865
Non-workday sedentary time (hours)	4.53 (2.55)	7.20 (1.88)	2.67 hours, 95% CI 0.99, 4.35, p=0.003

Table 4. Accelerometer sub-study comparison regarding active workstations

	No access to active workstation (n=11) *Mean (SD)*	Access to active workstation (n=4) *Mean (SD)*	Mean Difference
Workday sedentary time (hours)	10.88 (0.81)	7.57 (0.56)	3.31 (95% CI 2.36, 4.28, p<0.001)
Workday standing time (hours)	2.88 (0.79)	5.81 (1.39)	2.93 (95% CI 1.71, 4.14, p<0.001)
Workday light physical activity (LPA) (hours)	3.28 (0.79)	3.53 (1.23)	0.25 (95% CI -1.39, 0.91, p=0.659)
Workday moderate to vigorous physical activity (MVPA) (hours)	0.37 (0.34)	0.34 (0.20)	0.03 (95% CI -0.36, 0.43, p=0.852)
Workday step count (steps)	5331.09 (3096.62)	5145.19 (862.29)	MD 185.90 (95% CI -3651.33, 3279.53, p=0.910)

Table 5. Accelerometer sub-study comparison regarding workdays vs non-workdays

	Workday (n=15) *Mean (SD)*	Non-workday (n=15) *Mean (SD)*	Mean Difference
Overall sedentary time (hours)	10.00 (1.69)	7.20 (1.88)	2.80 (95% CI 1.46, 4.14, p<0.001)
Overall standing time (hours)	3.66 (1.58)	4.18 (1.32)	0.52 (95% CI -0.57, 1.61, p=0.336)
Light physical activity (LPA) (hours)	3.36 (0.86)	4.26 (1.26)	0.90 (95% CI 0.09, 1.71, p=0.030)
Moderate to vigorous physical activity (MVPA) (hours)	0.36 (0.29)	1.02 (0.41)	0.66 (95% CI 0.39, 0.93, p<0.001)
Step count (steps)	5281.51 (2690.17)	10890.89 (4063.56)	5609.38 (95% CI 3597.21, 7621.55, p<0.001)

Supplementary File 1

Sedentary behaviour questionnaire.