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Ten thousand steps: a pedometer study of junior dentists in a major British teaching hospital and a district general hospital

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Abstract

Sedentary behaviour is widely associated with deleterious health outcomes that in modern medicine have similar connotations to smoking tobacco and alcohol misuse. The integration of e-portfolio, e-logbook, British National Formulary (BNF) and encrypted emails has made smartphones a necessity for trainees. Smartphones also have the ability to record the amount of exercise taken, which allows activity at work to be monitored. The aim of this study to compare the activity of the same group of dental core trainees when they worked within a large multisite teaching hospital and a smaller district general hospital, to find out if supplementary activity was needed outside work. Data were collected from smartphones. To ensure continuity, data were collected only from those who had calibrated iPhones (n = 10). At the teaching hospital six of the trainees walked over 10 000 steps a day while working (mean (SD) 10 004 (639)). At the district hospital none of the trainees walked 10 000 steps. The mean (SD) number of steps completed by all trainees was 6265 (119). Walking at work provides the full quota of recommended daily exercise most of the time for those working in the teaching hospital, but additional exercise is occasionally required. While working at the district hospital they walk less, meaning that they should try to increase their activity outside work. Trainees working in the teaching hospital walk significantly more steps than in the district hospital.

Keywords: dental core trainee; pedometer; junior doctor; secondary care

Introduction

Recent research has confirmed folk wisdom that physical activity is a cornerstone of a healthy lifestyle.[1] Thresholds for what constitutes an effective exercise regimen have been described in terms of degree of exertion and overall time spent at exercise or total distance travelled. Walking is cheap, low impact, and can be incorporated into daily routine. It is recognised as being highly beneficial at both personal and population levels,[2] and has benefits in terms of body weight, body fat, and blood pressure, but also other indices such as depression.[3]

The "step goal" - a minimum number of steps taken/day – has been suggested as a practical means of setting exercise goals, and 10 000-steps/day has been acknowledged as being of considerable benefit in the NHS "Live Well" guidance.[4,5]

The British government has recently recognised the importance of physical health among employees in the NHS, both in terms of preventing illness and as a means of health promotion for users of services. Physically active, non-obese doctors are more likely to discuss exercise with patients, and dissuade them from sedentary behaviour.[6] It has also been shown that moderately and severely obese people are con-

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siderably less productive in the workplace.[7] We know of few studies on the amount of exercise taken by health-care professionals at work, and none on the amount of activity of dental trainees.[8]

The primary aim of this study was to compare the number of steps taken during normal working hours with the 10 000 steps aspired to. The secondary aim was to find out if a phone-based pedometer is a viable way to monitor workplace activity of trainees working at two separate hospitals.

Methods

The study was done with Oral and Maxillofacial Surgery (OMFS) dental core trainees at a teaching hospital NHS trust in the UK. As part of their 10-week rotation they spent two weeks working in a smaller district general hospital. At both sites they worked with junior doctors, being employed under the same contracts as their medical counterparts, and working a 48-hour week. At the teaching hospital they were responsible for providing cover in outpatient clinics, theatres, a 32-bed ward, paediatric emergency department, and a minor injuries unit across six sites, including an offsite major trauma centre. The Trust covers a total internal floor area of over 354 126 m^2. At the district hospital they covered outpatient clinics, an on-site emergency department, and had daily day-case theatre duties. The internal floor space of the district hospital is 76,545 m^2, so the teaching hospital is roughly four-and-a-half times its size.

Data collection involved reading the pedometer on the smartphones of 10 trainees, as they all carry one, and they all worked at the two sites between 2014-16. This convenience sample ensured easy, cost-effective collection of data.[9] All data was collected from the "Health" application of calibrated iPhones, model 5S or newer. Numerical step data can be taken from this application and studies have shown that a calibrated phone-based pedometer can give accurate results.[10]

Data can then be extrapolated to show only those steps taken between the times the trainee was scheduled to be at work. Night shifts across two days were recorded as the first of the two days. Only full days at work were assessed, with a week running from Monday to Sunday.

Technique of measurement

Before we give the results we must consider the validity of a phone-based pedometer as a method of measuring activity. All trainees within the study were identified as "able-bodied," meaning that any discrepancies caused by unnatural gait were avoided.[11] We have to acknowledge that the accelerometers used to measure activity in mobile phones vary in their accuracy of step counting when the user is walking at different speeds and also when the phone is held at different sites on the body.[12,13] In response to these potential issues, trainees often carry the phone in a trouser pocket throughout the day because they are obliged to wear work clothes or "scrubs" during working hours. This makes readings consistent among participants.

Most movements made by hospital juniors must be purposeful and direct because of the nature of their work.[14] Slower steps that may be taken during the morning ward round, for example, could potentially be recorded inaccurately. However, this is a small part of the trainees' day. In the teaching hospital the morning ward round lasts only 30 minutes to facilitate attendance at clinics and theatre lists. In the district hospital there is no ward round as there are no OMFS inpatients. We must also consider that even though all participants were using iPhones, different models of hardware and software may have variable accuracy and processing algorithms, which may lead to minor discrepancies in the step count - something that is unavoidable within such a study.[15]

There are, however, clear advantages to the use of the phone for recording steps. Accelerometers, which are responsible for recording steps on smartphones, have been used to track steps in other medical specialties such as anaesthetics.[16] Classic waistband pedometers have also been used to measure the movement of hospital doctors successfully, but the accuracy of these can also be disputed.[8,17] Successful studies with pedometers have also been made with healthcare professionals in hospitals outside the UK, including a study of 180 hospital workers in Nigeria.[18]

Findings from research about the validity of smartphone-based pedometers can therefore be defined as inconsistent, and the lack of a "gold-standard" pedometer app raises questions of accuracy.[19] However, recent studies have shown that newer smartphone accelerometers are more accurate.[20] The fact that the trainees were carrying relatively new iPhones means, therefore, that their use was acceptable for this study.

Results

Mean (1SD) activity by week and by trainee are shown in Figs. 1–4 .

Six of the 10 trainees walked over 10 000 steps a day at work, three between 9000 and 10000 steps, and the most sedentary 8656 steps during the rotation at the teaching hospital (Fig. 1). Trainees walked further when they were on call (four x 12 hour shifts). For example, the mean (SD) number of steps was 11010 (1623) (Fig. 2) during the week of on call day shifts. Conversely, weeks not on call were associated with less activity. In weeks during which trainees attended more outpatient clinics, nine of them failed to reach the "Live Well" target (Fig. 2). Over the eight-week teaching hospital rotation, the mean (SD) number of steps was 10 004 (639).

The only week with no on call commitment during which trainees exceeded their step goal while at work was the penultimate week of the teaching hospital rotation (CCDH4) when they took (10 160 (1027)) steps (Fig. 2). This could be attributed to the large amount of cover given to the trainee on call, which often involves review of any patients with