Sedentary time, physical activity and musculoskeletal symptoms of office workers – an exploration of exposure patterns and impacts from participatory workplace interventions

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1. Introduction

Both the overall amount of sedentary behaviour and pattern of exposure to sedentary behaviour are suggested as important risk factors to poor health (Dunstan & Owen, 2012; Hamilton, Healy, Dunstan, Zderic, & Owen, 2008). It is estimated that office workers are sedentary for between 66-82\% of working hours, (Parry & Straker, 2013; Toomingas, Forsman, Mathiassen, Heiden, & Nilsson, 2012) with prolong bouts of sedentary time (in excess of 30 minutes) accounting for 21-66\% of working hours (Parry & Straker, 2013; Toomingas et al., 2012). In addition, musculoskeletal pain is one of the most prevalent occupational health problems (Andersen, Haahr, & Frost, 2007; Janwantanakul, Pensri, Jiamjarasrangsri, & Sinsongsook, 2008) with a high prevalence of musculoskeletal complaints amongst office workers (Cho, Hwang, & Cherng, 2012).

However, very little is known about the relationship between the overall amount and the pattern of exposure of sedentary behaviour and the development or exacerbation of musculoskeletal symptoms.

A number of recent studies have found a reduction in occupational sedentary behaviour following the introduction of interventions to reduce sedentary behaviour, such as the use of sit-stand workstations or ‘Active Workstations’ (Healy et al., 2013; Neuhaus, Healy, Dunstan, Owen, & Eakin, 2014; Parry, Straker, Gilson, & Smith, 2013). However, very few studies have examined whether changes in occupational sedentary behaviour can impact on musculoskeletal symptoms experienced by office workers.

The aim of this secondary analysis was to explore the potential associations between sedentary time and musculoskeletal symptoms in two studies of office workers. In the first study (Study 1) the prevalence and distribution of musculoskeletal symptoms in office workers and their relationship with accelerometer determined sedentary time and physical activity were explored. In the second study (Study 2) the relationship between participatory workplace interventions to reduce the overall amount of sedentary time and sustained sedentary time (bouts in excess of 30 minutes), promote light intensity activity and moderate/vigorous physical activity (MVPA), and increase the frequency in breaks in sedentary time during work hours for office workers and self-reported musculoskeletal symptoms were explored.

2. Methods

Study 1 was an observational study conducted with 171 office workers who completed the Nordic Musculoskeletal Questionnaire and a subset of 48 participants who also wore an Actical accelerometer for 7 days. Correlations between sedentary time and activity levels and the presence of musculoskeletal pain in the different body regions were performed using Pearson’s correlations. Study 2 was a randomised controlled trial conducted using 62 office workers (clerical, call centre and data processing) from 3 large government organisations. Three groups developed interventions using a ‘participatory approach’: ‘Active office’ ($n = 19$) aimed to reduce occupational sedentary time by promotion of increasing office incidental activity with participants having access to an ‘Active Workstation’; ‘Traditional physical activity’ ($n = 14$) aimed to increase activity between productive work time with participants taking part in a pedometer challenge; and ‘Office ergonomics’ ($n = 29$) aimed to reduce sustained occupational sitting by encouraging ‘active sitting’. Participants wore an ActiGraph GT3X accelerometer for 7 days and completed the Nordic Musculoskeletal Questionnaire before the intervention period and again following the 12 week intervention. Accelerometer determined sedentary time, sustained sedentary time, breaks in sedentary time, light activity and MVPA during work hours was analysed using repeated measures t-tests to evaluate the overall effect of any intervention across all participants. Linear regression models (ANCOVA) were used to test effects between the organisations and between intervention groups. McNemar’s test was used to assess changes in musculoskeletal pain, following the intervention period.
3. Results

Study 1 found that neck pain (46% of participants), shoulder pain (44% of participants) and lower back pain (36% of participants) were most frequently reported, with 54% of participants reporting that work contributed to their musculoskeletal pain (Figure 1). There was no significant relationship between the total number of ‘desk-related’ body regions (neck, shoulder, elbow, wrist, hand, lower back, upper back) and the proportion of sedentary time ($r=0.08, p=0.61$), light activity ($r=0.009, p=0.563$) or MVPA ($r=0.01, p=0.954$) during work hours.

Study 2 found that following the 12 week participatory workplace intervention, when examining intervention effects for all participants, there was a small but significant reduction in sedentary time during work hours (2% wear time or 8 less sedentary minutes; $p = 0.006$) and a significant increase in light activity during work hours (2% wear time or 7 more light minutes; $p = 0.036$). In addition, there was a significant increase in the number of breaks/ sedentary hour during work hours (0.64 breaks/sedentary hour, $p = 0.005$). None of the three interventions (‘active office’, ‘traditional physical activity’ and ‘office ergonomics’) were clearly more effective at improving occupational sedentary behaviour. Further, following the intervention period, there was no significant difference in the proportion of participants (47 participants) reporting musculoskeletal pain in the different body regions (Figure 2) nor was there a significant difference in the reported number of body regions experiencing musculoskeletal pain.

4. Discussion

The high prevalence of musculoskeletal symptoms in office workers is consistent with other studies of office workers (Janwantanakul et al., 2008) and the evidence that work factors such as prolonged keyboard and mouse use, workplace posture, high workload and stress can all contribute to the development of musculoskeletal symptoms (Cho et al., 2012). Study 1 was not able to demonstrate a relationship between either sedentary time or physical activity and ‘desk-related’ body regions. These findings are consistent with the poor evidence of a causal relationship between sitting and musculoskeletal complaints in adults (Cho et al., 2012). Future longitudinal and prospective studies that incorporate comprehensive assessments of musculoskeletal symptoms and objective measures of sedentary time and physical activity are recommended to establish this activity-pain relationship.

In Study 2, whilst a reduction in occupational sedentary behaviour was identified across all participants, these changes were small, 1-2% of activity during work hours. Currently, it is not known whether a change of this magnitude will impact health outcomes.

The lack of a change in musculoskeletal symptoms across all participants is consistent with studies that have examined the impact of musculoskeletal symptoms following the introduction of sit-stand workstations (Healy et al., 2013; Neuhaus et al., 2014). There may be a potential trade-off between improving occupational sedentary behaviour and physical activity while balancing changes in musculoskeletal pain. As office workers report a high prevalence of musculoskeletal pain, future research should consider the impact of pre-existing musculoskeletal symptoms on the success of sedentary behaviour workplace interventions and the long term effects on musculoskeletal symptoms by modifying activity and sedentary behaviour.

Figure 1: Distribution of self-reported musculoskeletal pain and work contribution to pain by body region

Figure 2: Reported musculoskeletal pain in relation to number of body regions before and after the intervention period
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References


