



Work-related correlates of occupational sitting in a diverse sample of employees in Midwest metropolitan cities

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ABSTRACT

The worksite serves as an ideal setting to reduce sedentary time. Yet little research has focused on occupational sitting, and few have considered factors beyond the personal or socio-demographic level. The current study i) examined variation in occupational sitting across different occupations, ii) explored whether worksite level factors (e.g., employer size, worksite supports and policies) may be associated with occupational sitting.

Between 2012 and 2013, participants residing in four Missouri metropolitan areas were interviewed via telephone and provided information on socio-demographic characteristics, schedule flexibility, occupation, work related factors, and worksite supports and policies. Occupational sitting was self-reported (daily minutes spent sitting at work), and dichotomized. Occupation-stratified analyses were conducted to identify correlates of occupational sitting using multiple logistic regressions.

A total of 1668 participants provided completed data. Those employed in business and office/administrative support spent more daily occupational sitting time (median 330 min) compared to service and blue collar employees (median 30 min). Few worksite supports and policies were sitting specific, yet factors such as having a full-time job, larger employer size, schedule flexibility, and stair prompt signage were associated with occupational sitting. For example, larger employer size was associated with higher occupational sitting in health care, education/professional, and service occupations.

Work-related factors, worksite supports and policies are associated with occupational sitting. The pattern of association varies among different occupation groups. This exploratory work adds to the body of research on worksite level correlates of occupational sitting. This may provide information on priority venues for targeting highly sedentary occupation groups.

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1. Introduction

Sedentary behaviors are linked to adverse health outcomes such as chronic disease risk factors (Helmerhorst et al., 2009; Jakes et al., 2003; Sisson et al., 2009; Thorp et al., 2010; Wijndaele et al., 2009; Wijndaele et al., 2010b), the development of chronic diseases (Beunza et al., 2007; Hu et al., 2001; Hu et al., 2003), and mortality (Dunstan et al., 2010; Katzmarzyk et al., 2009; Wijndaele et al., 2010a), possibly

independent from levels of physical activity (Healy et al., 2008; Helmerhorst et al., 2009; Hu et al., 2003; Jakes et al., 2003; Katzmarzyk, 2010). Sedentary behavior is distinct from physical inactivity. For example, prolonged sitting (i.e., occupational sitting, watching TV) may exist among people who are physically active by engaging in sufficient recreational activity. Therefore, reducing prolonged sitting time and interrupting sitting time by active breaks is recommended even for adults who meet the recommended level of physical activity (Department of Health, 2011; Garber et al., 2011).

Historically, epidemiologic studies examined physical demands at work and leisure-time activity in relation to the rate of developing outcomes such as coronary heart disease and all-cause mortality (Fox and Skinner, 1964; Hartley and Llewellyn, 1939; Morris et al., 1973; Morris

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et al., 1953). Nevertheless, the majority of current studies on sedentary behavior have focused on sitting during leisure time, e.g., TV viewing, rather than occupational sitting (Dunstan et al., 2010; Hu et al., 2003; Jakes et al., 2003). Available evidence links sitting at work to obesity (Hu et al., 2003; Mummery et al., 2005) and diabetes (Hu et al., 2003). Workplaces may be an ideal setting to reduce sitting time through implementing worksite policies or improving the work environment infrastructure, given that working adults may spend 8 h or more per day at work during working days (Carnethon et al., 2009; van Uffelen et al., 2010). Along with industrialization and the development of modern technology, many adults are employed in occupations that mainly involve sitting, particularly in developed countries (Owen et al., 2010). In addition, the ecological model has identified environmental and policy approaches as the most promising strategies to influence physical activity behavior at the population level (Sallis et al., 1998; Sallis et al., 2006). Therefore, there is a need to investigate the potential to reduce sitting time through workplace environment and policy support.

A recent review (Smith et al., 2016), which included 41 studies, examined the correlates of occupational physical activity and sedentary behavior, in order to synthesize current evidence and inform intervention design specific to workplace-based settings. The review is timely because it reveals a critical research gap, which is the lack of studies focusing on occupational sedentary time, namely occupational sitting. More importantly, among six studies that included occupational sitting, only one investigated factors beyond the personal or socio-demographic level (Tissot et al., 2005). Further, the time of data collection of that study was 1998, which is almost 20 years ago, thus updated data and research on this topic are necessary.

Physical demands and sedentary needs and behaviors vary by occupation; however previous studies have often overlooked occupational differences in sitting time. Thus, in the current study, we aim to examine the variation in occupational sitting across different occupations, and further investigate work-related factors in relation to occupational sitting across different occupations. We also explore whether specific worksite supports and policies for active workplaces may influence occupational sitting in a large sample of adults in Missouri metropolitan areas.

2. Method

2.1. Study population and study design

The participants in this study were from the Supports at Home and Work for Maintaining Energy Balance (SHOW-ME) study, a cross-sectional study designed to understand the environmental, programmatic, and worksite policy influences on employees' obesity status. The study design has been described in detail elsewhere (Yang et al., 2014). In brief, between 2012 and 2013, 2015 participants employed and living in four Missouri metropolitan areas (St. Louis, Kansas City, City of Springfield, and City of Columbia) were recruited using list-assisted telephone random-digit-dialing methods. The first eligible adult who volunteered to participate was sampled in each household. The eligibility criteria included: aged 21–65 years; employed outside of the home at one primary location, employed for 20 or more hours per week at one site with at least 5 employees; not pregnant; and had no physical limitation that prevented walking or bicycling in the previous week. Recruited participants completed a survey over the phone which was developed for the SHOW-ME study and based on existing self-reported and environmental assessment instruments, and input from a Questionnaire Advisory Panel (QAP) comprised of experts in survey development, nutrition/food environment, physical activity, transportation, and worksite environmental intervention (Hoehner et al., 2013). The study design was approved by the institutional review boards of Washington University in St. Louis and University of Missouri-Columbia. All participants provided informed consent.

3. Measures

Participants self-reported their occupation, as well as job-related features, such as whether they supervised others or had a flexible work schedule. Research team members coded these occupations using the US Bureau of Labor Statistics' Standard Occupational Classification (SOC), and referencing the O*NET OnLine resource for detailed descriptions of each occupation. Based on the SOC codes, SOC *Job Families* (where categorization is based upon similar work performed as well as similar required education and skills), and team consensus, the research team combined occupation codes into six broad occupation categories: healthcare, business, education/professional, service, blue collar, office/administrative support.

4. Main outcome/dependent variable

4.1. Occupational sitting

The telephone survey incorporated questions adapted from the Australian Longitudinal Study on Women's Health (Marshall et al., 2010), which records the frequency and duration of sedentary activities at work, at home, and during travel to/from work. Time spent sitting at work was determined by the following question: "Please estimate how many hours you spent sitting each day while at work." Time spent sitting at work was recorded in hours and minutes, and then recoded to total minutes per day. Due to its non-linearity, data were tested via scatter plots, box plots, frequency tables, and a square root transformation procedure on the occupational sitting variable. In each occupation category, we dichotomized daily occupational sitting time to sitting less and sitting more approximating the median cut-off value to indicate the different levels of sedentary behavior involved at work for each participant. Median cut off score was used because it appears to be the appropriate measure of central tendency given the distribution of the outcomes variable. In the occupation group stratified analyses, we used median cut off scores of occupational sitting in each occupation group. By doing so, we attempted to account for the variation of occupational sitting due to different occupations. Due to the nature of different occupational categories, the median cut-off values vary from 30 min to 330 min per week to ensure a balanced sample size between the two binary responses for reliable estimation. The median cut-off value for the overall sample was 180 min per week.

5. Exposures/correlates/independent variables

5.1. Work related factors

Information on household income, employer size, and whether they were working full time was self-reported by participants. Household income was collapsed into three groups approximating tertiles, which were: less than \$39 k, between \$40 k and \$74 k, and more than \$75 k. Employer size categories were also collapsed into four groups approximating quartiles, which were: between five and 49 employees, between 50 and 200 employees, between 201 and 499 employees, and >500. Participants also reported their schedule flexibility at work which was dichotomized into yes and no. Work-related physical activity was assessed using selected questions from the International Physical Activity Questionnaire (IPAQ). IPAQ has been tested internationally for reliability (Spearman's $\rho \sim 0.8$) and validated with objective measures (median $\rho \sim 0.3$); these values are comparable to values found in other validation studies of self-reported data (Craig et al., 2003). Work-related physical activity refers to activities completed as part of paid or unpaid work, namely physical demands of work activities. We dichotomized weekly minutes spent in work-related physical activity into < 150 min per week (insufficiently active) or 150 or more minutes per week (sufficiently active), to determine whether participants were active at work, independent of sedentary time (CDC, 2011).

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