Total Worker Health Intervention Increases Activity of Sedentary Workers

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Introduction: Office employees are exposed to hazardous levels of sedentary work. Interventions that integrate health promotion and health protection elements are needed to advance the health of sedentary workers. This study tested an integrated intervention on occupational sedentary/physical activity behaviors, cardiometabolic disease biomarkers, musculoskeletal discomfort, and work productivity.

Design: Two-group, RCT. Data were collected between January and August 2014.

Setting/participants: Overweight/obese adults working in sedentary desk jobs were randomized to: (1) a health protection–only group (HPO, n=27); or (2) an integrated health protection/health promotion group (HP/HP, n=27).

Intervention: HPO participants received an ergonomic workstation optimization intervention and three e-mails/week promoting rest breaks and posture variation. HP/HP participants received the HPO intervention plus access to a seated activity permissive workstation.

Main outcome measures: Occupational sedentary and physical activity behaviors (primary outcomes), cardiometabolic health outcomes, musculoskeletal discomfort, and work productivity (secondary outcomes) were measured at baseline and post-intervention (16 weeks).

Results: The HP/HP group increased occupational light intensity physical activity over the HPO group and used the activity permissive workstations 50 minutes/work day. Significant associations were observed between activity permissive workstation adherence and improvements in several cardiometabolic biomarkers (weight, total fat mass, resting heart rate, body fat percentage) and work productivity outcomes (concentration at work, days missed because of health problems).

Conclusions: The HP/HP group increased occupational physical activity and greater activity permissive workstation adherence was associated with improved health and work productivity outcomes. These findings are important for employers interested in advancing the well-being of sedentary office workers.

Trial registration: This study is registered at www.clinicaltrials.gov NCT02071420.
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Introduction

The health of today's working population is influenced by the work environment, which has become increasingly sedentary with the rise of the desktop computer. Sedentary jobs have risen 83% since 1950 and currently account for 43% of all U.S. jobs.[1] This is an important public health issue, as the WHO estimates that 3.2 million people die annually because of physical inactivity, making it the fourth leading cause of mortality.[2] Excessive sedentary work (e.g., tasks characterized by an energy expenditure $\leq$1.5 METs while in a sitting or reclining posture)[3] places employees at increased risk for multiple chronic diseases,[4] obesity,[5] poorer cognitive function,[6,7] and mental distress.[8,9] Sedentary computer work has also been associated with upper body musculoskeletal symptoms and disorders.[10,11] Sedentary work tasks can therefore be

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categorized as a hazardous exposure that increases worker's risk to adverse health outcomes and premature mortality.

Conversely, evidence suggests interrupting prolonged periods of sedentary time with even light-intensity bouts of physical activity may result in improved cardiometabolic biomarkers[12,13] and reduced musculoskeletal discomfort.[14] Regular physical activity has also been related to reduced decrements in quality of performed work and overall job performance.[15]

In an effort to advance the health of sedentary workers, employers have implemented narrowly focused health promotion only (e.g., promoting lifestyle behaviors off the job that reduce worker's risk)[16] or health protection only (e.g., reducing worker's exposure to risk factors arising within the work environment) programs.[17] Health promotion programs focused on promoting physical activity have largely relied on behavioral approaches aimed at motivating employees to be more active outside of working hours. Such approaches have suffered from poor attendance and failed to instill long-term behavior changes.[16,18] Conversely, health protection programs targeting sedentary employees have used postural ergonomic interventions and workstation adjustments. These approaches have mixed effects.[19]

In an effort to advance the health and well-being of workers more effectively and efficiently, the National Institute of Occupational Safety and Health announced the Total Worker Health Initiative (TWH), which has called for comprehensive programs that integrate both health promotion and health protection elements.[20] However, it is currently unclear whether integrated interventions are more effective than non-integrated interventions.[21,22] Further, few TWH interventions have focused exclusively on the needs of sedentary workers.[21] Of the studies conducted to date, most have introduced "activity permissive workstations," including treadmill desks and sit–stand desks, to reduce work sitting time.[23]

The authors have conducted three studies testing seated activity permissive workstations that allow the user to engage in light-intensity physical activity while remaining in a normal working position. This work suggests that even slow pedaling (40 rpm) on a seated elliptical workstation results in light-intensity physical activity (1.7 METs).[24] These devices are highly accepted among sedentary employees,[24,25] do not impair the employee's ability to complete computer work tasks such as typing,[24] and reduce occupational sedentary time.[25,26] However, this health promotion approach has yet to be combined with a health protection approach. Therefore, the objective of this study was to test the effect of an integrated health promotion/health protection worksite intervention (HP/HP) against a health protection–only intervention (HPO) on occupational physical activity, cardiometabolic biomarkers, musculoskeletal discomfort, and work productivity among a sample of adults working in full-time sedentary occupations. The study's hypothesis was that the HP/HP intervention would result in increased occupational physical activity and improved cardiometabolic biomarkers when compared with the HPO group.

Methods

Subjects and Design

Healthy, but physically inactive, overweight/obese adults working in full-time sedentary jobs (self-reported sitting ≥75% of work day) were recruited. This group represents a highly prevalent proportion of today's workforce, which is also at increased risk for chronic diseases. Participants of all races and ethnic backgrounds working at a large private company (1,200 employees) in the Midwest were recruited via an electronic advertisement placed on the company's wellness website. The advertisement included a link to an online eligibility survey. Research staff contacted interested and eligible employees via telephone to schedule a baseline testing session. Exclusionary criteria were:

1. limitations with or contraindications to physical activity as indicated by the Physical Activity Readiness Questionnaire[27];
2. self-reported acute illness or injury;
3. any self-reported cognitive impairments, psychosis, or other diagnosed psychological illness (with the exception of depression and anxiety);
4. self-reported diagnosis of a chronic condition such as heart failure or cancer;
5. medications contraindicated with physical activity;
6. having a height-adjustable workstation;
7. BMI <25.0 kg/m^2; or
8. reporting sitting <75% of a typical work day. Participants were compensated $40 for completing both baseline and post-intervention testing sessions.

Experimental protocols were approved by the Human Subjects Office IRB and voluntary written informed consent was obtained from each participant.

A total of 145 people responded to the advertisements, of which 83 were excluded for not meeting eligibility criteria: having a height-adjustable workstation (n=33), excluded medication use (n=32), low BMI (n=17), or having a non-sedentary occupation (n=13) (Figure 1). Three eligible participants declined to participate. Participants were consented immediately upon arrival for their baseline evaluation session and were then randomized to one of two groups:

1. an HP/HP group (ergonomic workstation optimization intervention; three activity-promoting e-mails/week and access to a seated active workstation); or
2. an HPO group (ergonomic intervention and e-mails only).

A block randomization procedure with random-sized (2–5) blocks was used to assign participants to treatment arms. A 1:1 randomization scheme was generated by the principal investigator using an online random sequence generator.[28] On