

## Factors influencing workplace physical activity interventions: a short review

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### Abstract

**Introduction:** Many occupations are characterized by sedentary behavior (SB) and lack of physical activity (PA). There is growing evidence that prolonged sitting is associated with multiple health risks, including musculoskeletal disorders, biomarkers of increased cardiovascular diseases, some forms of cancer. There is an increasing interest in changing the work environment by implementing various interventions to reduce barriers and promote physical activity. The aim of this short review is to identify factors that affected workers' SB and/or PA to design appropriate interventions. **Methodology** The search was performed based on PRISMA statement methodology and was conducted in Scopus for articles and reviews published in scientific journals from 2010 until 2019 in English, using a set of root keywords as "sedentary work," "physical activity" and "effectiveness intervention". **Results and discussion** the review included 12 studies describing effective factors on PA in three categories: organizational factor, individual factor, and social factor. The main organizational factors found were: supportive workplace policies and resources, time for involvement in intervention, paying for activity, management support, work environment factors, and job type (passive jobs, and high-strain jobs). Interpersonal factors, knowledge include (educational level and information about physical activity guidelines) and some sociodemographic factors as individual factors associated with the physical work activity. Furthermore, social factors like social support and social norm have a significant effect on willing to do physical activity in workers. Some studies used "behavior change techniques" to find effective factors on physical activity for identifying the most appropriate interventions. **Conclusion:** Current evidence demonstrates that some individual, organizational and social factors influence work physical activity; therefore, they need to be considered in each population specifically, before choosing the intervention type. It can contribute to the increasing effectiveness of interventions intended to improve physical activity. Future research in this area should consider the association of various factors identified to enhance the effectiveness of interventions.

**Keywords:** Sedentary work, Effectiveness of the intervention, Sociodemographic factors.

### INTRODUCTION

People who spend most of their working hours in sedentary work are at higher risk for adverse health effects, even if they exercise the same amount as those with a less sedentary lifestyle (Bankoski et al., 2011; Finni, Haakana, Pesola, & Pullinen, 2014). Sedentary behavior is increasingly present in people's professional lives, because of the changing nature of jobs (e.g., shift from manufacturing to services, using technology). Nowadays, workers spend up to 70% to 90% of the workday in a static sitting posture (Smith, Ekelund, & Hamer, 2015) and they are exposed to ergonomic risk factors (Thorp et al., 2012). Increasing occupational sitting time has been associated with a decrease of 100 calories per day, which, in turn, resulted in a reduction of the energy expenditure by the workers (Cleland et al., 2013; Mullane et al., 2017). It can cause 80% of the average increase in body weight among workers during this period (Church et al., 2011) and increase of about 5% in the risk of obesity and 7% increase in the risk of diabetes. There is growing evidence that prolonged sitting is associated with multiple health risks, including musculoskeletal disorders, biomarkers of increased cardiovascular diseases, some forms of cancer (Gao, Nevala, Cronin, & Finni, 2016). Previous studies show that a wide variety of these outcomes can be treated or improved through increasing physical activity. Some different strategies like physical changes, policy changes, information, and counseling or multiple interventions (Neuhaus, Eakin, et al., 2014) are being designed over the years to promote physical activity at work. Depending on the characteristics of the tasks/workplace, different types of active workstations can be implemented such as walking on a treadmill in workstation (Levine & Miller, 2007; Tudor-Locke, Schuna Jr., Frensham, & Proenca, 2014) and

using sit-stand desk (Chau et al., 2016; E. F. Graves, C. Murphy, Shepherd, Cabot, & Hopkins, 2015; Gao et al., 2016). Also, different studies evaluated the effects of changes in chairs to enable more activity, such as balloon chairs (Beers, Roemmich, Epstein, & Horvath, 2008), using cycle workstation (Rovniak et al., 2014; Sabia & Anger Jr., 2016). Some other intervention, such as changing the layout of the workplace, to make possible perform more physical activity (Commissaris, Douwes, Schoenmaker, & de Korte, 2006). Interventions should ensure promising effects, to effectively change habits and arouse the interest of the employers and employees, therefore for choosing appropriate and practical intervention components, effective factors on changing physical activity habit should be considered (Buman et al., 2017). In this short review, various factors that affected workers' SB and/or PA and will be identified.

## METHODOLOGY

This short review of the literature was based on the PRISMA statement methodology. The research was performed in Scopus, science direct and other resources, and included all articles and review papers published in scientific journals from 2010 until 2019 April in English. The following criteria were used to include articles: (1) At least one of the following words must be present in Title, Abstract or Keywords: "descriptive epidemiology", "interventions", "effectiveness", "socioecological factor", "improve physical activity", "workplace", "epidemiology", and the roots "physical activity", "sedentary work"; (2) Any of the following words should be present neither Title nor Keywords: "daily life", "clinical", "elderly". The outcomes of different keyword combination and sources were merged, taking care to discard the duplicates, into a single list of documents, excluding all records, which were not full papers, open access or just protocol.

## RESULTS

The total number of papers, before exclusion was 389. Additionally, four records were identified through other sources. The total number of papers after eliminated duplicate were 380 and 12 papers were matched with the search criteria. Two systematic reviews were found on this topic. Most of the discarded papers focused on interventions and affection of them on organizational factors like productivity and job satisfaction or individual factors such as improving knowledge about sedentary behavior, or they were measure association between interventions and physical activity; other papers were eliminated because they focused on daily life and clinical scope or elderly people. Studies were quite large, including 23 to 654 participants (Batista Ferrer, Cooper, & Audrey, 2018). Two studies used "behavior change Techniques" to find effective factors for identifying the most appropriate interventions for improving physical activity (Munir et al., 2018; Perchoux et al., 2017). Other studies used various questionnaires to evaluate PA and SB at the workplace and also to collect individual and sociodemographic information, psychological parameters and job type. As a result, they characterized PA and individual and organizational factors (Batista Ferrer et al., 2018; Clemes et al., 2016; McNaughton, Crawford, Ball, & Salmon, 2012; Perchoux et al., 2017). Four studies used the accelerometer to collect data about physical activity instead of a questionnaire (Batista Ferrer et al., 2018; Brett & Pires-Yfantouda, 2017). All studies considered the effect of individual factors on physical activity, whereas six studies evaluated organizational factors and just three studies searched about social factors.

## DISCUSSION

Recent literature has begun to emphasize the importance and potential of using socio-ecologically based approaches to choose effectiveness intervention in the workplace, due to the decrease of physical activity in the workplace and the increase in the implementation of different interventions. Two studies used comprehensive ecological frameworks (i.e., the Ecological Model of Physical Activity; EMPA and (Plotnikoff, Prodaniuk, Fein, & Milton, 2005) method) for understanding PA and effective factors in the workplace (Plotnikoff, Pickering, Flaman, & Spence, 2010). In this framework, six environment levels in the workplace are identified that may influence on physical activity: (a) individual (i.e., demographic factors and individual employee characteristics related to PA behaviors such as skills, knowledge, confidence, age, and gender). (b) social (i.e., the influence of the corporate culture, social relationships, supervisor relationships related to PA behavior of employees). (c) organizational (i.e., infrastructure, leadership, and desire of the workplace to promote PA, how the organization is structured). (d) Community (i.e., how the workplace interacts effect on PA behavior of employees), (e) policy (i.e., the workplace's policies regarding employees' PA behavior), and (f) physical environment (i.e., the physical environment of the workplace including the buildings, workplace layout, and surrounding area related to PA behavior of employees). Although ecological models of PA suggest that environments may have a direct influence on physical activity behavior, these models also propose that environmental influences on PA may be influenced with psychological variables such as beliefs and other factors (Plotnikoff et al., 2010). Munir et al. (2018) described the systematic process to develop the intervention components to change sitting behavior specifically in the workplace. They used the Behavior Change Wheel (BCW) (Susan Michie, van Stralen, & West, 2011) and its functions to enhance the development of the intervention. The BCW is a comprehensive framework for designing interventions by integrating behaviour theory to understand and target mechanisms of action within the intervention (S Michie, Atkins, & West, 2015). The wheel has three layers; including Capability (physical and psychological), Opportunity (social and physical) and Motivation (automatic and reflective). The second layer of the BCW comprises nine intervention functions (Education, Persuasion, Incentivisation, Coercion, Training, Enablement, Modelling, Environmental Restructuring, and Restrictions) (Munir et al., 2018). They found that in their study, motivation to change behavior was low because of current working habits and the work culture of sitting. Their findings are also similar to those of Neuhaus et al. (Neuhaus, Healy, et al., 2014) but they recognized the importance of social opportunity and social influence in reducing sitting at work. They suggested that knowledge, social identity, intentions, beliefs about capabilities, and self-regulation of behavior were essential to address in their intervention. Also, they indicate that the BCW guide can be applied successfully in the context of designing a workplace intervention for increasing PA. Scotland's new Strategy for Physical Activity, "Let's make Scotland more active" (Executive, 2003), aimed at increasing and maintaining the proportion of physically active people in Scotland. This study suggests that three conditions are necessary to enable behavior change in physical activity: high self-efficacy, a firm intention and readiness to change, and a supportive social network and environment with no barriers. Caroline E. et al (2017) researched to examine the effectiveness of a pedometer-based intervention to increase walking behaviour amongst staff at a Scottish university. They realized that academic staff was more likely to report that work pressures – such as teaching, lunchtime meetings, or urgent deadlines for grant applications or journal articles – precluded regular daytime walking. Indeed, individual and organizational factors effect on the amount of physical activity (Brett & Pires-Yfantouda, 2017). Clemes et al. (2016) analysed the influence of

sociodemographic factors on sedentary behaviour to inform effective interventions. They examined domain-specific sitting times reported across socio-demographic groups of office workers. It was observed that sedentary behaviors were most prevalent amongst males, younger adults, obese individuals, individuals educated up to school level, those not meeting physical activity guidelines, single/divorced/widowed adults, full-time workers, and high work-time sitters. They suggested that these sociodemographic groups should be targeted for interventions designed to reduce sedentary behaviour.

## CONCLUSIONS

Previous studies show that a wide variety of adverse effect of sedentary work can be treated or improved through increasing physical activity. To identify the most appropriate and user friendly interventions for improving physical activity, effective factors on amount of physical activity need to be defined. This short review search about various factors that affected workers' SB and/or PA and their methods. It has shown that a few comprehensive studies have been conducted in this field, but results suggest that to maximize the effectiveness of interventions for increasing PA, researchers should evaluate effective factors on physical activity and recognize barriers to participation among different classification of employees; specific needs for each job type should also be considered. By considering individual, organizational and social factors, interventions will be more effectiveness and acceptable and participation in the plan for increasing physical activity will be optimal. Future research should consider the association of various factors with the amount of physical activity through the identified techniques in different population and organizations to enhance the effectiveness of interventions.

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