

LOST-TIME ILLNESS, INJURY AND DISABILITY AND ITS RELATIONSHIP WITH OBESITY IN THE WORKPLACE: A COMPREHENSIVE LITERATURE REVIEW

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Abstract

The objective of this study was to conduct a literature review examining predictors of lost-time injury, illness and disability (IID) in the workplace, with a focus on obesity as a predictor, and to evaluate the relationship between obesity and lost-time IID. The study objective was also to analyze workplace disability prevention and interventions aimed at encouraging a healthy lifestyle among employees and reducing obesity and IID, as well as to identify research gaps. The search was conducted in several major online databases. Articles included in the review were published in English in peer-reviewed journals between January 2003 and December 2014, and were found to be of good quality and of relevance to the topic. Each article was critically reviewed for inclusion in this study. Studies that focused on lost-time IID in the workplace were reviewed and summarized. Workers in overweight and obese categories are shown to be at a higher risk of workplace IID, are more likely to suffer from lost-time IID, and experience a slower recovery compared to workers with a healthy body mass index (BMI) score. Lost-time IID is costly to an employer and an employee; therefore, weight reduction may financially benefit both – workers and companies. It was found that some companies have focused on developing interventions that aid reduction of weight and the practice of active lifestyle among their employees. *Int J Occup Med Environ Health* 2016;29(5):749–766

Key words:

Obesity, Disability, Workplace, Injury, Illness, BMI

Received: June 30, 2015. Accepted: November 25, 2015.

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INTRODUCTION

A large global study has emphasized the spread of human obesity, presenting age-standardized obesity rates doubling between 1980 and 2008 [1]. More than 10% of the world's adult population (≥ 20 years of age) was considered obese in 2008, with more than 1.4 billion adults being in the overweight group, and 500 million of these adults being in the obese group [2]. The growing prevalence of workers who are overweight and obese in numerous countries [3–5] is related to the loss of productivity [6] and lost-time injury. Lost-time Injury, Illness and Disability (IID) can be defined as absence from work due to some form of sickness or workplace injury that is approved by an employer [7]. Such absence can range in severity and duration, resulting in short or long-term disabilities, and encumber social and financial hardship for employees as well as employers.

The increase of obesity in the workplace can lead to potential consequences for an employer and an employee. Between 1980 and 2008, body mass index (BMI) increased 0.4 kg/m^2 in men and 0.5 kg/m^2 in women, every 10 years [8]. There is also evidence that employees have higher rates of presenteeism [9–11] and as a result of increased absenteeism and presenteeism cost the U.S. employers additional 11.7 billion dollars per year compared with normal weight workers [12].

Globalization has had positive effects on the economic development of many nations [13]. However, evidence suggests that globalization creates a labour environment that causes additional stress on employees, leading to changes in work demands (physical to mental tasks) and habits that favor a positive energy balance, which may be responsible for an increase in obesity levels [13]. Modernization and globalization impose lifestyle changes that may affect prevention of work disability and increase the amount of lost-time Illness, Injury and Disability (IID) in the workforce [13,14]. Furthermore, globalization of agricultural practices and food industry have had negative implications

for population health and obesity epidemic [13]. Globalization and modernization have environmentally contributed to the stress and obesity levels in the workplace and in our society as a whole.

Evidence suggests that obese workers more frequently encounter lost-time IID than workers with normal weight [15]. Consequently, obesity results in negative health and economic outcomes. Employees with a BMI score of ≥ 30 may be at an increased risk of experiencing workplace IID for numerous reasons including: compromised mobility, fatigue due to sleep apnea or the use of medications that cause sedation to treat diseases, not being able to tolerate hazardous energy exposure, and difficulty engaging in physically demanding job obligations [16]. From an economic standpoint, the cost of obesity among U.S. full-time employees is estimated at 73.1 billion dollars [17]. This is equivalent to the cost of hiring 1.8 million workers per year at 42 000 dollars each.

Several reviews have examined the cost and effects of obesity, on disability management, both in the community, as well as in the workplace [17–20]. Although these studies draw links between obesity, sick leave and the non-medical costs of obesity in the workplace, none of these studies have assessed intervention or prevention strategies. The singular exception appears to be that offered by Neovius, who has examined 4 studies of the effect of surgical weight loss interventions on morbidly obese employees [18].

Efforts to reduce the prevalence of obesity in the workplace could result in savings for an employer and health benefits for an employee. It is, therefore, important not only to study the impact obesity has in the workplace, but also possible prevention strategies or interventions, which may mitigate the effects and lessen the burden of illness and injury associated with obesity for both employees and an employer. For employers, this may represent a workforce that is more productive, has lower rates of work absenteeism and decreased operating costs [6].

Disability management

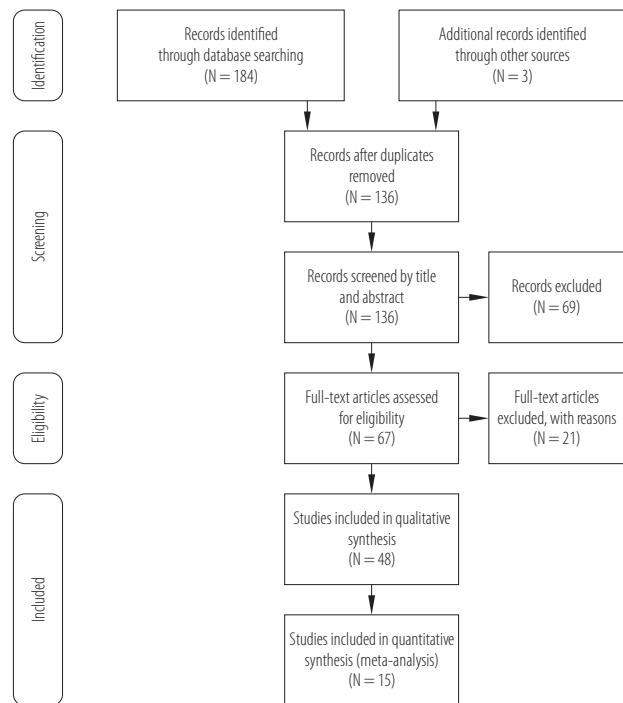
Williams and Westmorland [21] have defined disability management as an employer-based approach to prevent and limit disability, provide an early intervention for risk factors, and promote a safe and early return to work. Disability management includes education and involvement of employees working together as a team, the use of prevention strategies, and many more factors. Crucial factors involved in facilitating return to work include an employer participation, a supportive work environment, and co-operation between laborers and management [21]. Our main interest in this study is the prevention component of disability.

Aims

The objective of this study was to conduct a literature review examining predictors of lost-time IID in the workplace, focusing on obesity as a predictor, and to evaluate the relationship between obesity and lost-time IID. This study also analyzed strategies and interventions aimed at encouraging a healthy lifestyle among employees and reducing IID, as well as identified gaps in the research on this topic.

MATERIAL AND METHODS

The information was collected using PubMed, CINAHL, PsycINFO, Social Science Abstracts and Embase/Cochrane databases. The search was completed between June and December 2014. Studies dated from January 2003 to December 2014 were included in this review. Keywords used in the search included: “lost time,” “injury” or “injuries,” “illness,” “disease,” “disability,” “absence,” “prevalence,” “workplace,” “worker,” “occupational,” “obesity,” “BMI,” “workers compensation,” “predictors,” “prevention,” and “intervention.” The snowballing technique was also used in the data collection, which involved using the reference lists of articles found through the keywords mentioned above to identify additional related articles.



Based on: Moher D, Liberati A, Tetzlaff J, Altman D. The PRISMA Group [54].

Fig. 1. PRISMA flow diagram

We completed an initial title screen, followed by an abstract screen and a full-text review of the selected articles (Figure 1).

Inclusion criteria comprised of the information whether the article explicitly addressed lost-time illness, injury and disability, and its relationship with obesity in the workplace. This review includes both quantitative and qualitative research as well as theoretical articles, including program evaluations. Letters, conference proceeding, abstracts and unpublished manuscripts were excluded. The articles that were included in the review were published in English, in peer-reviewed journals between January 2003 and December 2014, and were found to be of good quality and of relevance to the topic. All members of the research team reviewed decisions regarding the inclusion and exclusion of articles. Articles were excluded if they did not meet the above criteria. Each article was

critically reviewed for inclusion in this study using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Figure 1).

Data analysis

The Institute of Medicine and the National Research Council Model illustrates the complicated relationship among various factors in the development of disability management through the conceptual model [22]. This model has been acknowledged by both Costa-Black et al. [23] and Schultz et al. [24] in reviews of various conceptual models in the field of disability management. Similarly to Loisel's Work Disability Prevention framework [25], this model was created to portray various factors that may influence development of musculoskeletal disorders in the workplace.

RESULTS

In order to discuss findings on the lost time IID and BMI more effectively, the results were organized into 2 broad categories: the worker and the workplace. These categories are also used by the Institute of Medicine and National Research Council. Findings from the literature regarding disability prevention and various interventions are also listed below. A summary of findings, arranged by outcome variables, can be found in Tables 1–3.

Obesity and work demands

Few studies have linked physical work demands and lost-time IID, though psycho-social factors in the workplace have been associated with lost-time IID in workers. High work pace, workload and relationship strains with co-workers predicted greater lost-time IID [26–32]. These studies have focused on the workplace and its association with lost-time IID (Table 1). An emphasis has been placed on observing suitability of the workplace environment and work demands for employees in obese BMI categories. The studies suggest making the workplace safer

and employees happier through interventions targeted at the entire organization.

Obesity and interventions

Implementation of obesity prevention or weight management intervention programs and strategies in the workplace, in a form of health promotion or worker wellness programs aimed at weight, nutrition, stress, and physical activity, taking into consideration the obesity rates of today, may be important for employers to consider [33–40] (Table 2 and 3).

In a 2009 meta-analysis by Conn et al. of the health and physical activity behavior outcomes from various workplace wellness intervention studies published between 1969 and 2007, it was found that some interventions were successful at improving employee health. However, effects were variable for most outcomes and further research should be done to compare interventions to confirm any causal relationships [41]. A second meta-analysis by Verweij et al. published in 2010 identified moderate quality evidence supporting workplace physical activity and dietary behavior interventions, especially those containing an environmental component, as significantly reducing body weight, body fat percentage and BMI [42].

In a recent literature review of the effectiveness of workplace health interventions by Schröder et al., beneficial health effects have been found in interventions aimed at workplace nutrition and multi-component physical activity, both of which, when combined, showed a greater effect on weight loss over solely one or the other; however, this review have not found any evidence of increased efficacy associated with any specific intervention reviewed [43].

In another recent literature review published by Fernandez et al. in 2014 of both group-randomized and non-randomized trials testing environmental interventions for obesity in the workplace, only 4 studies were identified, which met their criteria of performing formative research

Table 1. Studies based on obesity and absenteeism

Country of study, reference	Purpose	Study design	Participants	Interventions	Findings	Limitations
USA – Arena et al., 2006 [28]	to assess the relationship between BMI and STD by examining the frequency and duration of short-term disability events	a retrospective study of a cross-sectional survey; data collected from employee completed health risk appraisals, company STD records	white-collar office employees of a large financial services company (N = 17 622)	no interventions	employees in the overweight and obese categories were more likely to have STD than employees in the normal or underweight categories; workers in the underweight category had the longest mean STD duration, followed by workers in the obese category; the number of STD events was not statistically significant between BMI categories	self-reported height and weight, which may have differed from weight/height at the time of STD
USA – Brown and Thomas, 2003 [29]	to examine the relationship between work related injury (WRI) and specific variables or risk factors	an exploratory study with a retrospective review of employee medical charts	employees of a medical center with first time WRIs between 1998–2000 (N = 233)	no interventions	most injured employees were of older age, female gender, worked long hours, had increased BMI, had history of back and upper extremity injuries, and had no health and wellness activity attendance, and experienced lost-time IID	non-experimental study with small sample size, skewed sample distribution; study relied on secondary data (medical records)
Finland – Kyröläinen et al., 2008 [55]	to measure physical fitness and BMI, and to assess the relationship with sickness absence in male soldiers	a cross-sectional study; data on BMI, fitness was collected from soldiers and combined with sickness/absence administration records from 2004	male Finnish military personnel (N = 7 179)	no interventions	BMI was higher in the group with the long sickness absence; the poorest fitness tests were found in those with the long sickness absence; high BMI, poor muscle fitness and poor aerobic endurance are associated with increased sickness absence	no data available for reason of sickness/absence, study did not assess contributions of other factors (smoking, chronic disease, etc.)

Table 1. Studies based on obesity and absenteeism – cont.

Country of study, reference	Purpose	Study design	Participants	Interventions	Findings	Limitations
USA – Poston et al., 2011 [31]	to examine the association between BMI and lost-time IID among firefighters	a cross-sectional study; data collected from an ongoing longitudinal cohort study of injury risk factors in firefighters	male firefighters of the U.S. Fire Service (N = 478)	no interventions	there was no association between BMI and firefighters reporting an IID or any missed workdays due to IID; BMI showed to be an independent and significant predictor of the number of workdays missed due to IID; obesity categories were associated with much greater weight-related attributable costs to employers, even though the rates and types of injuries were similar among BMI groups	concerns regarding BMI as method of categorizing overweight/obese due to high muscle mass in the population, small sample size limited to one region
USA – Tsai et al., 2008 [32]	to examine employee lost-time IID and the economic impact of overweight and obesity in an industrial workplace	a 10-year follow up (1994–2003) study; data was collected from Shell Health Surveillance system, including data from periodic physical exams	Shell Oil company employees (N = 4 153)	no interventions	employees in the obese category were 80% more likely to be absent from work and had 3.7 more absent days per year compared to employees in the normal weight category; average number of workdays lost and absence frequency rates both increased across BMI categories and with an increasing number of risk factors	only info on a primary diagnosis was used, no data was collected on the use of drugs, alcohol, etc., results not distinguished between genders

BMI – body mass index; STD – short-term disability; IID – injury, illness and disability.

Table 2. Studies based on workplace injury rates/claim rates

Country of study, reference	Purpose	Study design	Participants	Interventions	Findings	Limitations
The United Kingdom – Blake et al., 2013 [33]	to deliver and evaluate a 5-year employee wellness program aimed at improving the health and well-being of employees in a large UK NHS workplace	a multi-level ecological workplace wellness intervention was delivered; questionnaires were used to collect baseline data and 5 years after implementation to measure physical activity, BMI, etc.	UK NHS employees at baseline (N = 1 452) participants at 5 years (N = 1 134)	health campaigns, provisions of facilities, health-promotion activities	after 5 years, more employees engaged in active transportation to work and were more active at work; there was also lower sickness absence and greater job satisfaction; there were no significant differences in BMI between the baseline and follow-up	findings relied on self-reported data, which may be subject to recall bias; weight and height were also self-reported and should be interpreted with caution; participants were self-selected (volunteered) out of a larger group, and tended to be more physically active than the general population at the baseline point; study design limits ability to determine causality
USA – Conn et al., 2009 [41]	to summarize health and physical activity behavior outcomes from worksite health promotion programs	a meta-analysis	standardized mean difference (d) effect sizes were summarized across approx. 38 231 participants	n.a.	the study reported significantly positive effects for physical activity behavior (0.21), fitness (0.57), lipids (0.13), anthropometric measures (0.08), work attendance (0.19), and job stress (0.33), the significant effect size for diabetes risk (0.98) is less robust given small sample sizes; the mean effect size for fitness relates to a change between treatment minus control subjects' means on maximal oxygen uptake (VO_{2max}) of 3.5 ml/kg/min; for lipids, -0.2 on the ratio of total cholesterol to high-density lipoprotein; and for diabetes risk, -12.6 mg/dl on fasting glucose	the study was limited by the paucity of data from studies to calculate effect sizes and substantial heterogeneity among studies; as well, the physical activity interventions and methods used to evaluate them varied widely

Table 2. Studies based on workplace injury rates/claim rates – cont.

Country of study, reference	Purpose	Study design	Participants	Interventions	Findings	Limitations
USA – Finkelstein et al., 2009 [34]	to quantify the extent to which successful weight loss among overweight/obese employees results in savings in medical expenditures and absenteeism	intervention study data was collected from medical claims and absenteeism records	workers from 17 community colleges in North Carolina with BMI > 25 at beginning of the study (N = 422) completed both phases (N = 279)	environmental change to increase healthy foods around campus; environmental change plus self-directed web-based weight loss program; environmental change, self-directed web-based weight loss program and cash motivation based on weight loss	there was a statistically significant increase in days missed for those who did not lose 5% weight, but no s.s. difference for the group that did lose 5%; the subsequent 2 years is not s.s. suggesting that no significant impact on absenteeism existed during the study period for those who lost $\geq 5\%$ of their baseline weight; there is no evidence that the weight loss leads to reduced medical expenditures	study is based on highly select sample of overweight/obese who agreed to participate in weight loss study, small sample size, weight was not tracked beyond intervention period, did not include factors other than medical claims and absenteeism
USA – Giese and Cook, 2014 [35]	to evaluate the effectiveness of the Diabetes Prevention Programs as an obesity intervention in the workplace	a pretest-posttest cohort study of participants of a diabetes prevention program; changes in weight/BMI were evaluated	overweight of obese (BMI > 25) employees of a New Mexico manufacturing plant who attended at least 4 sessions of the program (N = 35)	participation in a 16-week diabetes prevention program conducted by a nurse	participants achieved statistically significant changes in body weight and BMI; 27 participants lost weight; 8 participants gained weight; program attendance was moderately correlated with a decrease in body weight	small sample size; self-reported weekly progressed appeared to be inflated and therefore, were not analyzed for trends; short program duration

USA – Meenan et al., 2010 [36]	to evaluate the economic cost vs. benefit of a workplace wellness program delivered through Hawaii hotel work-sites	a 2-year randomized trial of a weight loss program (3W) delivered to hotel staff; intervention and control groups were matched on size, union involvement and luxury status, and assigned either level 1 or level 2 interventions	employees of 31 hotels across Oahu, Hawaii (N = 11 559)	level 1: raise employee awareness of weight and health habits, and provide feedback level 2: two years of on-site weight management groups and other initiatives as well as level 1 interventions	after 2 years, program benefits were found to be: reduced medical costs, fewer absences and higher productivity, though the clinical outcomes did not immediately translate in to cost savings for the hotels; staff in level 2 intervention hotels reduced both BMI and waist/height ratio after 2 years	the study focused on economic impact; no follow up was done after the 2 years mark; changes produced by the interventions were too limited in size and too short to meaningfully influence hotels' medical expenditures; there was a significant loss in participants as study went on
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UK NHS – United Kingdom National Health Services; BMI – body mass index; n.a. – non applicable; s.s. – statistically significant.

Table 3. Studies that examined the impact of interventions on general health

Country of study, reference	Purpose	Study design	Participants	Interventions	Findings	Limitations
Australia – Morgan et al., 2012 [37]	to evaluate the impact of a workplace-based weight loss program for male shift workers	a randomized trial study of 2 groups, one involved in a workplace based weight loss program (Work- place POWER – Preventing Obesity Without Eating like a Rabbit), the other on a 14 week wait list; men were assessed at baseline and at 14 week point for weight, quality of life, etc. using surveys	overweight/obese male employees of an aluminum manufacturer in Australia (N = 110) program participants (N = 65) wait-list control group in 2009 (N = 45)	face-to-face information session; use of study website to report daily eating and exercise diaries and weight loss; provision of resources, including a pedometer; financial incentives for highest losses	significant intervention effects were seen for weight, quality of life, presenteeism, absenteeism and injuries	certain factors were self-reported (ex/presenteeism); study only includes a 14-week follow-up period; only one employer was captured, so generalizability of findings may be limited

Table 3. Studies that examined the impact of interventions on general health – cont.

Country of study, reference	Purpose	Study design	Participants	Interventions	Findings	Limitations
USA – Ovbiosa-Akinbosoye and Long, 2011 [38]	to examine factors associated with long-term weight loss and maintenance for participants of a comprehensive workplace wellness program after a 1-year period	a 1-year follow up study Health Risk Assessments completed by overweight/obese persons between 2005–2010 who participated in a workplace wellness program (Onelife) before and after the participation	participants between 2005–2010 across 16 employers from different industries, including construction, education, finance, etc. 54.5% were obese and 45.5% were overweight (N = 89 746)	wellness program areas included weight management, blood pressure management, cholesterol management, physical activity, nutrition, stress management; programs included phone or internet consultations with coaches; monetary and non-monetary incentives	men, those of older age, those with reduced stress, improved nutrition and increased exercise were shown to have increased odds and amount of weight loss after 1 year; average weight loss after 1 year was 8%	results varied across industries; no control group; free of charge and the provision of incentives may affect generalizability of the findings; data on weight was self-reported
USA – Poston et al., 2013 [39]	to evaluate the health of firefighters from departments with well-developed health promotion programs, compared to those without	purposive sampling; evaluations were conducted of fire departments with and without wellness programs as part of a national longitudinal cohort study; participants' body composition, health behavior and fitness were assessed	male firefighters from career fire departments; fire departments varied in size and mission (N = 1 002) respondents with wellness approach programs (10 stations) (N = 522) male firefighters without wellness programs (10 stations) (N = 480)	departments were considered to have well-developed wellness programs if they showed a commitment to health and fitness, and included: requiring annual medical physical examinations of all service personnel; having a designated health/fitness coordinator having peer fitness trainers; providing time for physical training while on duty	firefighters in departments with wellness programs were healthier than their counterparts in departments without wellness programs in place; they were less likely to be obese, were more likely to have better levels of fitness, were less likely to smoke, be diagnosed with anxiety disorders, but were also somewhat more likely to report workers compensation (WC) injury	the selection process used to identify departments with wellness programs does not allow for causal attributions to be made about associations

<p>USA – Siegel et al., 2010 [40]</p>	<p>to develop an obesity intervention appropriate for elementary school personnel</p>	<p>a randomized controlled trial of 16 elementary school work sites in California between 2005 and 2007; self-reported health data (BMI, waist-hip ratio, etc.) was collected at baseline and 2 years later</p>	<p>school personnel from 8 schools in the intervention group (N = 145) school personnel from 8 schools in the control group (N = 288)</p>	<p>development of a workplace wellness committee to develop and implement health promotion activities</p>	<p>employees in intervention groups dropped their BMI by an average of 0.4 kg/m², compared with the control group who showed BMI increased by an average of 0.37 kg/m²; no significant changes were shown in any other categories of evaluation</p>	<p>small sample size; only 66 personnel form the intervention group and 124 from the control group completed both baseline and post-intervention evaluations; exposures to interventions may have varied</p>
<p>Netherlands – Verweij et al., 2011 [42]</p>	<p>the meta-analytic review examined effectiveness of workplace interventions geared towards physical activity, dietary behavior or both on weight outcomes</p>	<p>a meta-analysis</p>	<p>22 RCTs were included and provided sufficient information to be included in the meta-analyses</p>	<p>n.a.</p>	<p>there was a moderate quality of evidence that workplace physical activity and dietary behavior interventions significantly reduce body weight (nine studies, MD = -1.19 kg (95% CI: -1.64(-0.74)), BMI (11 studies, MD = -0.34 kg×m⁻² (95% CI: -0.46(-0.22)) and body fat percentage calculated from sum of skin-folds (three studies, MD = -1.12% (95% CI: -1.86(-0.38))</p>	<p>the aim of the meta-analysis differed from the RCTs included in the analyzes, therefore, the results may be underestimated; moreover, only half the studies included provided sufficient information for pooling and does present a publication bias</p>

BMI – body mass index; RCT – randomized controlled trials; MD – mean difference; CI – confidence intervals.

before an development of an intervention or program. None of these studies were able to demonstrate an effect on the main outcome of interest [44]. Fernandez et al., as well as Zinn and Schofield, acknowledge importance of formative data in successful workplace weight interventions, ensuring personalized data is collected and utilized in the development and implementation of the intervention in order to properly match the wants and needs of the target population [44,45].

It is recognized that there is a great variance in the quality of published studies examining various interventions and prevention programs. Certainly, additional quality research is needed to evaluate programs effectiveness, demonstrate the benefits to policy makers and employers, and to ensure a proper balance between the cost and success of such programs [46]. A literature review examining effectiveness of pedometers as a workplace wellness intervention for increasing physical activity and improving health has been found to be limited, to present low quality data and have not provided enough evidence to properly assess effectiveness of the intervention [47]. Another review by Chau et al. of the effectiveness of workplace interventions to reduce sitting and increase active time has shown the lack of evidence on the success of these programs as well [48].

Barriers for success often identified by participants include lack of willpower and cost of healthy food. However, barriers to the implementation of health promotion activities and programs in the workplace can also include misalignment of interests between employers, insurers, service institutes and government [49]. A study by Trogon et al., which attempted to simulate the return-on-investment of 2 workplace obesity intervention programs, has suggested that opting for lower-cost policy or environmental interventions in worksites may be more likely to result in cost-savings for the employer, rather than high cost interventions, which look to cause behavioral change, as substantial weight loss would need to be experienced in order to see a return [50].

In a 2004 telephone survey conducted by the Research Triangle Institute for Obesity regarding workplace policy strategies for treating and preventing adult obesity, it was found that a vast majority of respondents (85%) were in favor of policy change, which would offer their employers tax breaks should they provide exercise facilities in the workplace. Other supported policies included offering employees beneficiary discounts, either by an employer or the healthcare companies, to motivate them to move towards a healthier lifestyle or pursue weight loss [51].

There are obviously many pieces and parties, which come in to play when considering workplace prevention or intervention strategies aimed at health and weight. Though multiple studies exist examining outcomes of specific workplace interventions on obesity, as highlighted in Table 2 and 3, there is an obvious lack of quality, readily available, evidence based data to assist in the development, formation and implementation of such programs. Further research is necessary to ensure appropriate frameworks are available to employers, healthcare providers or other participating bodies in order to enable them to provide effective, meaningful prevention and intervention programs. Also, solid data on the effectiveness, both health and cost related, is important to secure the buy in from employees, employers and policy makers necessary for their success.

DISCUSSION

The aim of this paper was to review and evaluate the relationship between obesity and lost-time IID in the workplace and to examine prevention and recovery intervention strategies in the workplace. In agreement with the literature, our review underlined that workers in overweight and obese categories appear to be at a higher risk of workplace IID and are more likely to suffer from lost-time IID. Since lost-time IID is costly to an employer and an employee, weight reduction may financially benefit workers and companies. To do so, lost-time IID prevention

strategies need to involve consideration and collaboration of various stakeholders, including a worker, workplace, healthcare system, and compensation systems [25].

Concept of weight-loss has received tremendous attention from scientific community over the past few decades and is associated with numerous physical, physiological and psychological health improvements. However, since obesity is a multifactorial and complex condition, employers and their employees need to collaborate in order to optimize their chances of success.

To start with, employees need to be educated about the possible health consequences associated with being overweight and its financial impact on the workplace IID. To do so, employers should consider offering educational workshops and conferences promoting healthy lifestyle behaviors to help employees make informed decisions. Moreover, in order to encourage employees to seek the expertise needed, employers need to facilitate access to healthcare professionals by providing sufficient annual health coverage and/or offering on-site work consultations.

Professionals will then be able to help employees target specific causes that might lead to weight gain and increased lost-time IID, and to put appropriate solutions in place. Along those lines, an employer can promote active lifestyle behaviors by providing access to on-site physical activity installations or if this is not possible, to compensate employees subscribing to organized exercise classes or physical activity centers. Moreover, in order to favor healthy eating, employers need to make sure they offer an affordable and healthy alternative menu at the cafeteria.

It is now better known that successful long-term weight management includes strategies that consider a broad range of behaviors including sedentary ones, nutritional and physical activity habits, stress management, etc. Along those lines, our review suggests that clinicians investigating a patient's medical, social and psychological history

could benefit from adding occupational history to this list. Indeed, an average worker spends approximately 8 h per day in his/her workplace. Thus, clinicians should be encouraged to investigate a patient's work environment including factors related to the workplace and the person.

Researchers have worked with companies to develop interventions that are aimed at workplace IID prevention, though further research must be directed at studying IID recovery interventions. These recovery strategies should be specified by occupation because every job involves its own specific demands. For example, a construction worker must lift heavy objects, while a white-collared employee may spend majority of his or her working hours at a desk. Considering the amount of time and money obesity in the workplace has cost, companies have targeted their focus on developing interventions that are tailored to different occupational settings [33,35,37,39,40].

In turn, employees often know what makes a workplace vibrant. Their recommendations for improvement push far beyond health promotion programs into issues such as economic rewards, hours, and schedules, relationships with co-workers and more input, and job resources. Moreover, among those employees whose work interfered with their personal life, reduced workload was also a sought-after change, followed closely by more flexible work accommodations [52].

Employers who are motivated by the imperatives of productivity, competitiveness, flexibility and efficiency need to be made aware of the growing evidence that work quality (e.g., skill, discretion, autonomy, consultation and a healthy work environment) all contribute directly to the achievement of their goals [53]. Employers must work together with their employees to achieve their goals. Overcoming organizational barriers to change is challenging, and many employers are trapped in old ways of thinking about people issues in the workplace. For instance, heavy workload and time scarcity are major change barriers in nursing.

These obstacles invariability are identified as holding managers back from doing more to promote a healthy organization [52]. Furthermore, overworked employees won't espouse a new change initiative, even one aimed at improving their work environment [52]. The best way for managers to become facilitators of healthy change is to directly involve them in improving the drivers of health and increasing quality of work life in the work setting for their employees.

Finally, governments could also promote partnerships with employers, works and unions, educational and training institutions, and other labour-market stakeholders. In Europe, employers, workers, unions and governments tend to see one another as partners. Within many organizations, workers are consulted on issues affecting and pertaining to them. Works Councils, in which such discussions take place, are becoming more and more common across Europe.

Critics argue that this more worker friendly approach comes at the expense of less flexibility, overstaffing and generous social security benefits that have crippled European industries and states. However, these opponents neglect the way organization of work in Europe is changing: bureaucratic restrictions are being eased and new technologies introduced, there is greater work flexibility in work assignment, job responsibilities are expanding, training and education opportunities are improving. The mindset is that work should encompass more than paid employment and consider social, political and economic aspects as well. This approach is vital in shaping public policy and guiding occupational health strategies in improving the quality of work life of workers.

Limitations

This review contains a number of limitations. First, only articles written in English were included in our search. Second, BMI values determining which weight category employees are placed into were not consistent throughout

the articles reviewed. Several researchers grouped underweight and ideal weight employees together, while others separated them, and a few of the articles classified larger BMI scores into 3 obese subcategories. Furthermore, BMI scoring is not an overall plausible classification for obesity, as muscle is not taken into consideration.

Body fat percentage may be a superior form of measurement; however, this technique is costly and can be unreliable. Studies were not consistent with the process of obtaining weight and height data from the studies populations, as some were self-reported and others were acquired through physical examinations. This may have an effect on the accuracy of the overall results. Study populations varied greatly in size, where smaller groups could have an adverse effect on the results, as the study may be overrepresented. A distinct set of BMI ranges and categories must be put to use in all future studies in order to make reliable comparisons. Lastly, researchers should formulate outcome measurements related to the success of work disability prevention interventions in order to distinguish which strategies are most productive and effective. Researchers should consider performing more thorough follow-ups on these interventions for significant results to be found after long durations.

CONCLUSIONS

Workers with a high BMI are more likely to suffer from lost-time IID and experience a slower recovery compared to workers with a healthy BMI score. Obesity in the workplace increases absenteeism and presenteeism, which financially impacts employees and their employer. In order to benefit both the health of employees and the productivity of a company, thorough IID prevention strategies and weight reduction interventions should be implemented.

As extensive research has been put into analyzing lost-time IID in the workplace, some studies have evaluated more confounding variables and risk factors in comparison to others. Gaps exist in research focused on IID and

disability prevention because many of these studies fail to be thorough in the explanations of their prevention strategies. Experts in the field of workplace IID and workplace disability should establish specific guidelines stating steps and strategies to prevent IID in workplace environments. Further studies revolving around IID prevention and intervention should be conducted on various job types and settings, where researchers are clear on how they aim to prevent the most common and severe injuries found in specific work fields, or how they have implemented intervention strategies where existing issues have been identified.

There also should be clear measurements of progress for returns to the workplace. Additional studies focused on employees returning to work should be conducted and analyzed for specific job types and work injuries. This will result in developing the most efficient and cost-beneficial approaches to return workers back to their workplace.

Increase in obesity levels over the last decade, and the increase that is hypothesized for the future, is dangerous to employees' health and contributes to the workplace lost-time IID. Employers with a high obesity rate in their workplace should be encouraged to offer their workers weight reduction programs, which is another area where additional research would be greatly beneficial.

Employers should take the initiative to review daily practices of their workers. This will allow employers to become aware of the physical and cognitive demands they are requesting from their employees. Employers may then acknowledge alterations that should be made in order to reduce stress levels among their employees. This, in turn, could result in a decrease in obesity levels in the workplace. Future research regarding IID prevention, intervention, return to work and weight reduction programs should be practiced for a significant amount of time and followed-up years later. Longitudinal and follow-up studies could help determine if the interventions or strategies were significantly beneficial.

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