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The effectiveness of workplace health promotion on low and middle-income countries.

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ABSTRACT

Although many literature reviews synthesize literature regarding workplace health promotion (WHP) interventions, systematic reviews on the effectiveness of and factors influencing the operation of WHP activities in low- and middle-income countries (LMIC) are scarce. Therefore, we systematically reviewed evaluation studies to examine the effectiveness and factors related to the implementation of WHP programs in LMIC. Twenty-six peer-reviewed and grey evaluation studies, published before November 2017, were included from electronic databases (PubMed, The Cochrane Library, PsycINFO, EMBASE, and Web of Science) and manual searching. The results revealed that WHP intervention in LMIC was effective in reducing health risks in a wide range of industries and settings, including in resource-poor contexts such as small enterprises and the manufacturing industry. The main factors positively influencing the effectiveness of the intervention are long intervention time period, and needs-based and active intervention strategies. In addition, commitment from workplace leaders, the involvement of workers, and support from authorities and professionals are factors contributing to a successful WHP program. However, the evidence regarding the effectiveness of WHP in LMIC regarding the health outcomes and business productivity is inconclusive due to the several remaining methodological limitations. Future developments of more rigorous methods of evaluating the effectiveness of WHP activities should be addressed in order to produce higher-quality evidence that would inform future practice.

Keywords: Workplace health promotion, evaluation, low- and middle-income countries, systematic review

INTRODUCTION

In the context of globalization, workers in low- and middle-income countries (LMIC) face growing health and safety risks that are driven by industrialization and migration (International Labour Organization, 2014). In response to the challenges, all nations, as well as enterprises in LMIC, need to employ appropriate interventions to protect and promote workers' health. The workplace is considered to be an optimal setting for providing health services for adults of working age because of the presence of natural social networks, the possibility of reaching a large population, and the amount of time workers spend at their worksite (World Health Organization, 2010).

However, current understanding regarding how to effectively implement WHP interventions is mostly generated based on evaluation studies of interventions conducted in long-industrialized countries (Cahalin *et al.*, 2015; McCoy *et al.*, 2014). Consequently, LMIC often lack evidence of effective health promotion, even when knowledge and interventions for developing healthy workplaces exist. Little is known about how effective WHP interventions are and what factors influence the effectiveness when WHP programs are implemented in LMIC, representing a significant gap in the health promotion literature. This literature review aims to fill the gap by examining the effectiveness of WHP interventions that were implemented in LMIC and the key issues concerning the implementation of workplace health promotion (WHP) programs in LMIC.

METHOD

Literature search

A literature search was conducted using both electronic searching and hand searching methods to find peer-reviewed and grey literature up to November 2017 on interventions aimed at promoting workers' health. In the electronic search, we searched the online databases PubMed, The Cochrane Library, PsycINFO, EMBASE, and Web of Science. Regarding the hand searching, we searched evaluations published on websites of regulatory agencies, such as World Health Organization (WHO) and International Labour Organization (ILO), and checked the reference lists of all included studies and relevant systematic reviews. Keywords were used in combination of three components that were developed from three concepts: workplace, health promotion intervention, and low- and middle-income countries. The detail of key concepts and related keywords and phrases were presented in the Supplementary file, Table 1.

Study selection criteria and procedures

We included studies evaluating the effectiveness of and factors influencing the implementation of WHP intervention programs in LMIC. An intervention for WHP is defined as a planned program aiming to protect and promote workers' health that "combines efforts of employers, employees, and society" (European Network Workplace Health Promotion, 1997). Intervention evaluation research is defined as "the systematic application of social research procedures in assessing the conceptualization, design, implementation, and effectiveness of social intervention programs" (Rossi and Freeman, 1993).

We included only studies conducted with workers in the formal sector and who were healthy adults. No limitation of the publication date was set. The review only included original research papers and original reports which had full text in English. The review also only included the studies conducted in LMIC, as classified by the World Bank (2017). We excluded intervention for workers who had an underlying health condition. Because the current authors were aware of the lack of evaluation studies in WHP in LMIC, all evaluation methods were considered.

The selection process is documented in Figure 1 following PRISMA (the Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram.

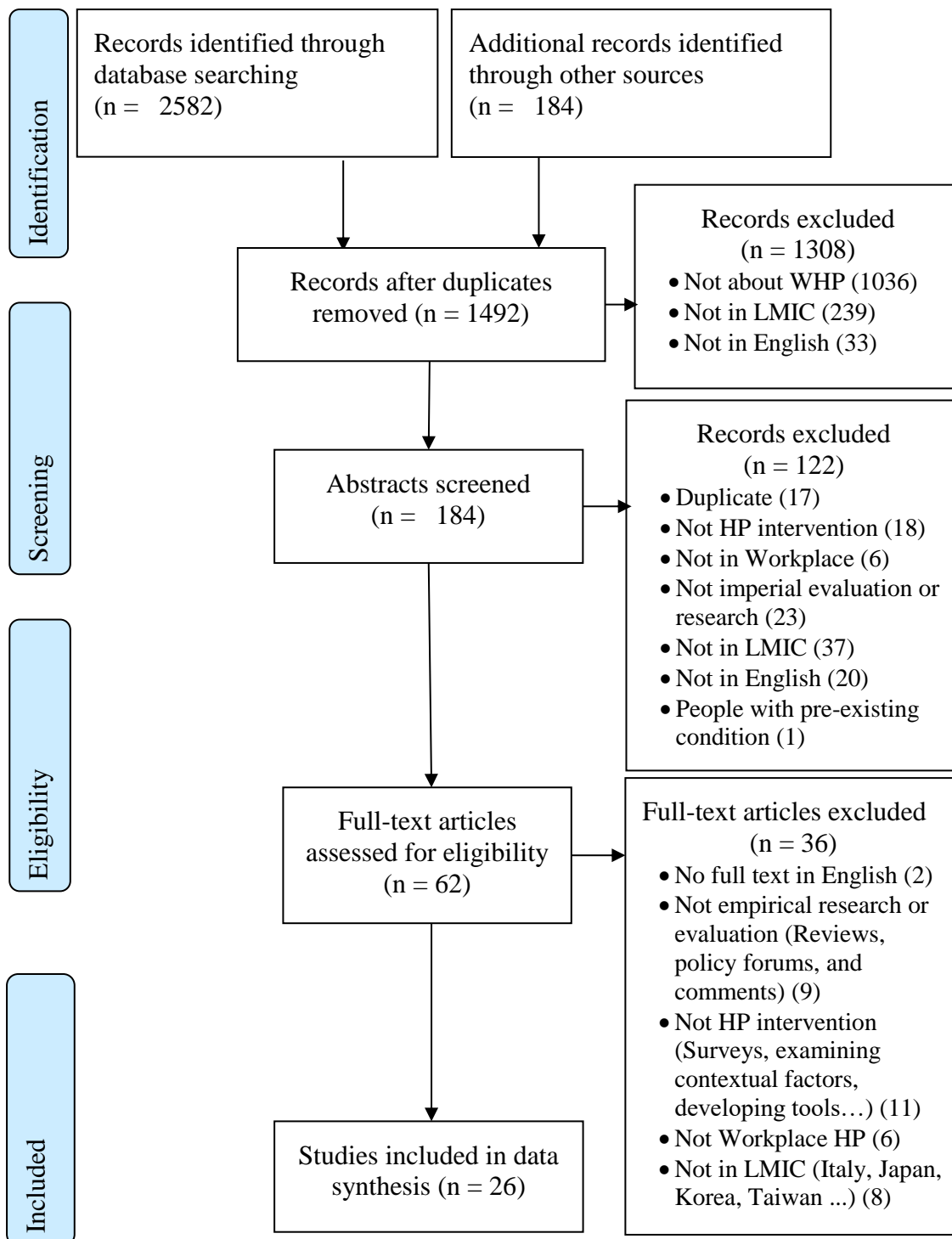


Figure 1. PRISMA flow diagram of article selection.

We conducted the selection of eligible studies in three stages. First, the initial screening of titles for the relevant research paper was carried out. In the second stage, one reviewer conducted a comprehensive review of the abstracts of all the relevant studies we found with our systematic search aimed at identifying studies for inclusion. We purposely selected broadly and

inclusively so that the review was less likely to exclude studies that potentially fitted the selection criteria. At the final stage, the full paper was retrieved and reviewed. We included only references that fulfilled all of our inclusion criteria.

We also accessed the methodological quality appraisal of the included studies. Due to the wide variety of study designs that were included in this review, we assessed the quality of studies following guidelines. Regarding quantitative studies, we used the Quality Assessment Tool for Quantitative Studies that was developed by Effective Public Health Practice Project (EPHPP) and was adjusted for use in systematic reviews of effectiveness by Deeks *et al.* (Deeks *et al.*, 2003). For qualitative studies, we employed the Evaluation Tool for Qualitative Studies (Long and Godfrey, 2004). We used both of the checklists to assess studies that employed mixed-methods. Studies with very low rigour, which indicated very serious flaws in the study design, were excluded.

Data extraction and analysis

Using a data extraction form, data were extracted from each study using a data collection form that included evaluation objectives; setting (intervention location and industry); study design (conceptual foundation of the study, evaluation method; target and control group; sampling; data collection methods, outcome measures); the intervention (health promotion model, WHP activities, intervention period); effectiveness of intervention; influencing factors; and issues related to study limitation and funding. The reviewers highlighted relevant contents in the full texts according to the form and then entered data into the form.

The extracted data were analyzed using thematic analysis that aimed to identify patterns and codes. The codes then were summarized, paraphrased, and synthesized. A system of theme and subtheme describing the effectiveness of and factors influencing the implementation of WHP intervention in LMIC was generated and then reviewed and revised. The final step of data analysis was defining and naming the themes and subthemes.

Two reviewers independently reviewed the full texts according to the selection criteria and performed the data extraction and analysis. Any disagreement between the two reviewers was resolved through discussion between reviewers, and if consensus was not reached, discussions were held with the third reviewer.

RESULTS

Characteristics of the literature included in the review

In total, 26 papers met the selection criteria and were selected into the reviewing process. The summary of all the papers is included in this review in the Supplementary file, Table 2. Most of the interventions (73.1%) were located in the LMIC of Asia. Only two papers described interventions conducted in African countries (Hope, 2003; Richter *et al.*, 2012). Two papers evaluated the WHP interventions conducted in multiple countries (Anthony *et al.*, 2015; Richter, *et al.*, 2012). A large proportion of studies took place in multiple workplace settings (n=15).

Less than half of the studies employed an experimental design (n=12) that included controlled and clustered randomized trials, and quasi-experiment studies with the moderate- to high-quality appraisal. Four evaluations employed pre- and post-study without a control group. Ten studies employed cross-sectional study methods for monitoring the implementation of WHP programs and assessing the outputs of the interventions. Among them, one study employed the qualitative study method (Liau *et al.*, 2014) and seven others employed mixed-method studies (Abdullah, 2003; Daud, 2003; Hope, 2003; Manothum and Rukijkanpanich, 2010; WPRO, 2001; Yusoff, 2003; Zainuddin, 2003), which provided more insights about the factors related to the effectiveness of WHP intervention.

The review shows that WHP interventions were implemented in a wide variety of industries, including resource-poor sectors, such as the manufacturing sectors or construction. Ten interventions were conducted on workers in the manufacturing industry. Among them, seven interventions were conducted on workers in small- and medium-sized enterprises in the manufacturing sectors. One intervention was conducted on female rural-urban migrants in the manufacturing industry (Decat *et al.*, 2012). More details of the characteristics of the papers included in this review are presented in Supplementary file, Table 3.

Evidence of effectiveness of WHP interventions in LMIC

The effectiveness of the WHP interventions was evaluated in a wide range of outcomes. Studies in this review reported positive effects of interventions in reducing health risks, specifically, among persons who received the WHP interventions which reflected the designs of interventions evaluated in those studies. Types of positive outcomes of health risk reduction intervention included positive behaviour changes (Decat, *et al.*, 2012; Franco *et al.*, 2013;

Hope, 2003; Sorensen *et al.*, 2017), improved working conditions (Krungkrai Wong *et al.*, 2006; Manothum and Rukijkanpanich, 2010; Nguyen and Ton-That, 2014; Takeyama *et al.*, 2006; WPRO, 2001), weight loss (Abdi *et al.*, 2015), reduction of waist circumference and blood pressure (Chen *et al.*, 2008; Lara *et al.*, 2008), and reduction of cholesterol levels (Moy *et al.*, 2006). This evidence was mostly from eight evaluation studies (Abdi, *et al.*, 2015; Abdullah *et al.*, 2013; Anthony, *et al.*, 2015; Bandoni *et al.*, 2011; Decat, *et al.*, 2012; Nguyen and Ton-That, 2014; Sertel *et al.*, 2016; Zavanela *et al.*, 2012) that employed randomized control trials with high research quality rigour and from four quasi-experiment studies with moderate quality rigour.

Besides, some negative effects of WHP interventions aimed at reducing health risks were mentioned. In an intervention aimed to improve workplace conditions in Vietnam, Nguyen and Ton-That (Nguyen and Ton-That, 2014) reported that the measures of post-intervention working conditions were worse for personal dust, static dust, and noise. In another workplace intervention conducted in China, India, and Mexico, despite interventions designed to reduce salt added at the table and reduce tobacco use, salt intake and tobacco use slightly increased in both control and intervention areas (Anthony, *et al.*, 2015). The authors of the two papers were not able to provide explanations for the apparent deterioration in the intervention outcomes (Anthony, *et al.*, 2015; Nguyen and Ton-That, 2014). One other evaluation in sub-Saharan Africa that used peer education in HIV prevention showed that the participants in the intervention were more likely to report that they had engaged in risky sexual behaviour in the past 12 months (Richter, *et al.*, 2012). Authors of the study suggested that the reason was the more open atmosphere among workers after the peer education, where respondents trusted those in their peer group and were able to discuss and report their risky sexual behaviour (Richter, *et al.*, 2012). Furthermore, Liao, *et al.* (Liao, *et al.*, 2014) reported unexpected side effects of intervention in a 6-month “Love Your Heart” programme, which aimed to reduce five cardiovascular risk factors. Some participants in this health promotion program had experienced mental stress when they learned their blood test results or weight, and this did not improve despite their best efforts (Liao, *et al.*, 2014).

Some studies looking at longer interventions showed that the health promotion activities resulted in reducing health-related outcomes such as stroke mortality and morbidity rate (Chen, *et al.*, 2008) and injury rate (Krungkrai Wong, *et al.*, 2006; Nguyen and Ton-That, 2014; Takeyama, *et al.*, 2006; WPRO, 2001). However, all the evaluation studies assessing the health-related outcomes employed quasi-experimental study methods (Chen, *et al.*, 2008) and

cross-sectional study methods (Krungkraiwong, *et al.*, 2006; Takeyama, *et al.*, 2006; WPRO, 2001) with moderate to low methodological quality appraisal. Therefore, the evidence of the positive effects of intervention in reducing ill-health and injuries was less conclusive

Several studies also demonstrated the benefit of WHP interventions on business productivity (Nguyen and Ton-That, 2014; Takeyama, *et al.*, 2006; WPRO, 2001; Zavanela, *et al.*, 2012). A study conducted in small manufacturing factories in The Philippines showed that improving workplace conditions using WISE (Work Improvement for Protection of Environment) methodology could increase the productivity of most enterprises (Takeyama, *et al.*, 2006). Another intervention study in a major bus company showed a reduction in worker absenteeism rate in the group of workers involved in 24 weeks of physical activity training (Zavanela, *et al.*, 2012). Similarly, interventions, following the comprehensive approach recommended by the Western Pacific regional guideline for WHP, had increased worker productivity and reduced absenteeism for health reasons among household businesses in Vietnam (WPRO, 2001). Likewise, improving working conditions had led to productivity enhancement and improved worker-employer relationships among small enterprises in Vietnam (Nguyen and Ton-That, 2014). Again, due to the low quality of evaluation studies, we could only conclude that there is only moderate evidence of the effect of WHP activities on business productivity.

Factors influencing implementation of WHP interventions in LMIC

The review discovered factors that influence the implementation and the effectiveness of WHP intervention in LMIC. Two overarching themes and 7 categories were synthesized from the evaluation studies and are summarized in table 1.

Table 1. Factors influencing implementation of WHP interventions in LMIC

Theme	Categories
Factors related to intervention design	Intervention time and intervention outcomes
	Interventions that meet workers' needs provide more positive outcomes
	Active education strategies are more effective
Factors related to implementation of intervention	Commitment from workplace leaders
	Involvement of workers
	Importance of help from outside to sustaining the intervention

Factors related to intervention design

Intervention time and intervention outcomes

Most obviously, interventions that used longer intervention time periods showed more significant benefits to workers' health. The majority of the publications evaluated interventions (n=19) that were conducted for around 1 year or less. Most of the evaluation studies into this type of interventions could only evaluate the outcome of intervention activities, not able to show the impact of the intervention on workers' health. Although achieving positive immediate behaviour and health indicator outputs, the short-term interventions did not allow enough time for more significant health effects to develop and be evaluated. Abdi, *et al.* (Abdi, *et al.*, 2015) illustrated this point in a lifestyle program, where a significant reduction in weight loss was observed after 6 months' intervention, but there was no significant change in the participants' blood pressure and waist measurements. Liao, *et al.* (Liao, *et al.*, 2014) also suggested that six months' duration of intervention is not enough to promote and sustain behavioural change. Similarly, Zainuddin (Zainuddin, 2003) suggested that the effectiveness of intervention should be evaluated using indicators such as absenteeism rate, lost time injury rate and accident rate, while other indirect indicators were increased workers' morale, productivity, and lower health care and insurance costs, which could only be reviewed after 5 years. Furthermore, the evaluation of short-duration intervention could potentially produce false-positive results. For example, an evaluation into a quit smoking intervention in Mumbai, India, showed that the quit rate between intervention and control was different for 30-day quit rates but not for 6-month sustained cessation (Sorensen, *et al.*, 2017).

Meanwhile, among 26 papers in the review, four papers (Anthony, *et al.*, 2015; Krungkraiwong, *et al.*, 2006; Moy, *et al.*, 2006; Prabhakaran *et al.*, 2009) evaluated interventions conducted for two to five years, and two papers (Chen, *et al.*, 2008; Hope, 2003) evaluated interventions conducted for more than eight years. Longer intervention times allowed those studies to produce findings about the health effects of WHP interventions, such as reduction of waist circumference and diastolic blood pressure (Lara, *et al.*, 2008), cholesterol levels (Moy, *et al.*, 2006), and stroke mortality and morbidity change (Moy, *et al.*, 2006).

Interventions that meet workers' needs provided more positive outcomes

Only five studies among the 26 intervention evaluations, four in Malaysia (Abdullah, 2003; Daud, 2003; Yusoff, 2003; Zainuddin, 2003) and one from Vietnam (WPRO, 2001), reported interventions that were implemented in response to the explicit needs assessments that involved stakeholders and partnerships. Based on the identified needs, these interventions developed comprehensive health promotion strategies addressing multiple determinants of workers' health. Unfortunately, the quality of evaluation studies into these interventions was not sufficiently rigorous to make a strong case for the effectiveness of the comprehensive approach. Other programs targeted individual health topics that were identified by the intervention groups: non-communicable diseases (NCD) risks such as smoking, lack of fruit and vegetable consumption, and physical inactivity; HIV/AIDS prevention; reproductive health; and work environment hazard reduction.

Nonetheless, few interventions that were more specific to their needs based on consultation with workers showed more positive outcomes (Abdullah, 2003; Daud, 2003; Franco, *et al.*, 2013; Manothum and Rukijkanpanich, 2010; WPRO, 2001; Yusoff, 2003; Zainuddin, 2003; Zavanela, *et al.*, 2012). For example, based on the focus group among workers, an intervention concentrating on increasing consumption of fruit and vegetables in workplace canteens in Brazil suggested changing the cook of the workplace canteen (Franco, *et al.*, 2013). The evaluation of the intervention showed a greater proportion of workers reported trusting the cleanliness of the raw food (Franco, *et al.*, 2013). A simple assessment of workers needs could suggest an intervention that is more specific and that produces positive outcomes. The review also showed an example of ineffective intervention due to a lack of understanding of workers' needs. The evaluation study of a WHP programme on dietary changes among employees in a city in Malaysia reported no improvement in the outcome measure on BMI among participants because participants believed that losing weight reflected ill-health and that overweight was a sign of prosperity (Moy, *et al.*, 2006).

Active education strategies are more effective

Regarding health education strategies, activities that actively communicate the message to participants were shown to be more effective. Overweight government employees who were assisted to control their weight via telephone lost more weight than participants in the web-assisted group (Abdi, *et al.*, 2015). Similarly, Liao, *et al.* (Liao, *et al.*, 2014) reported that direct one-to-one counselling sessions were more effective than simply distributing the booklet.

Factors related to implementation of intervention

The commitment of workplace leaders

Many of the evaluation papers highlighted the role of management commitment in achieving promising practices (Abdullah, 2003; Nguyen and Ton-That, 2014; Sertel, *et al.*, 2016). Abdullah (Abdullah, 2003) argued that the commitment of company leaders in the needs assessment process significantly contributed to establishing a healthy workplace based on WHO guidelines. A similar conclusion was also suggested in an evaluation of a Participatory Action-oriented Training program used in small enterprises in Vietnam (Nguyen and Ton-That, 2014). Another aspect of the commitment from the worksite authorities was the allocation of a necessary resource for intervention. Sertel, *et al.* (Sertel, *et al.*, 2016) suggested that ensuring the availability of sporting facilities and equipment during all working hours may improve adherence to worksite exercises.

Involvement of workers

The review showed that the involvement of workers in the planning and implementing process was vital for a successful WHP program. For instance, Bandoni, *et al.* (Bandoni, *et al.*, 2011) advised that the involvement of workers in the planning and management of meals directly improved the availability and consumption of fruits and vegetables. Other authors pointed out the benefits of worker involvement in WHP interventions. Worker involvement in identifying workplace health issues and needs assessment could significantly improve the process because workers have a better understanding than other stakeholders of working conditions and problems that they face (Manothum and Rukijkanpanich, 2010; Yusoff, 2003). The participation of workers in planning and implementing health promotion activities helped the workers to see examples of the best practice and to increase their knowledge and improve their attitudes (Manothum and Rukijkanpanich, 2010). Moreover, by involving them in the intervention, workers take pride and ownership of the improvements they have made, which increases the participation rate (Nguyen and Ton-That, 2014).

Importance of help from outside to sustaining the intervention

Many authors called for support from government authorities to sustain the efforts of employees and employers in WHP interventions in LMIC (Nguyen and Ton-That, 2014; Yusoff, 2003; Zainuddin, 2003). Others asked for technical support and commitment from WHP professionals in conducting the needs assessment (WPRO, 2001; Zainuddin, 2003) and

implementing the program (Sorensen, *et al.*, 2017; Yusoff, 2003). Further, Yusoff (Yusoff, 2003) and Hope (Hope, 2003) pointed out the turnover of WHP officers negatively affected the implementation of the WHP intervention.

Barriers caused by the difficulty of business operations

Several studies suggested that difficulties encountered by businesses could obstruct the implementation of WHP interventions (Manothum and Rukijkanpanich, 2010; Sertel, *et al.*, 2016; WPRO, 2001). Interventions that aimed to improve the working condition of small worksites in Vietnam faced difficulties due to decreases in production and because of flooding, which led to a decrease in the number of workers by 24.9% (WPRO, 2001). Another study reported that the lack of ability to provide any systematic occupational health and safety mechanisms in the workplace had hindered the implementation of workplace health activities (Manothum and Rukijkanpanich, 2010). Additionally, Sertel, *et al.* (Sertel, *et al.*, 2016) reported that the major barriers to physical exercise intervention were shift changes and increased working hours among participants.

DISCUSSION

This review is the first to examine the evidence of effects of WHP activities in LMIC and the factors related to the effectiveness of and barriers to implementation of those interventions. This review is also unique because it considered a wide range of intervention outcomes and included studies using various evaluation methods. The review suggests the positive effects of WHP intervention on reducing the health risk factors among employees. In addition, there is moderate evidence of the effect of WHP interventions on workers' health outcomes and business productivity.

The finding of this review differs to the results of previous literature reviews (Cairns *et al.*, 2015; Malik *et al.*, 2014; Pereira *et al.*, 2015), which mostly looked at the evidence from WHP intervention in high-income countries and suggested inconsistent evidence of the effects of behaviour change as the consequence of interventions. One review, which only looked at controlled trials or randomized controlled trials, showed that the impact of workplace physical activity interventions on worker productivity was ineffective in higher-quality studies (Pereira, *et al.*, 2015). Similarly, a review that focused only on studies conducted in the US showed that the impact of WHP interventions on increasing physical activity was inconclusive (Malik, *et*

al., 2014). Cairns, *et al.* (Cairns, *et al.*, 2015) also concluded a similar finding in their review on socio-economic inequalities in obesity.

The studies included in this review employed a wide range of evaluation methods. However, this review highlights several methodological weaknesses in the current evidence. Regarding studies evaluating the effectiveness of risk reduction intervention, a number of studies (eight studies) measured the outcomes using self-reported data collection tools such as a questionnaire on behaviour change (Abdullah, *et al.*, 2013; Anthony, *et al.*, 2015; Decat, *et al.*, 2012; He *et al.*, 2012; Hope, 2003; Prabhakaran, *et al.*, 2009; Richter, *et al.*, 2012; Sorensen, *et al.*, 2017). Findings from these evaluation studies were subjected to reliability issues, such as response bias, honesty, or understanding of the questions. These issues reduced the strength of evidence regarding the effectiveness of risk reduction intervention in LMIC workplaces. Further, many other studies providing evidence of the effects of health risks reduction intervention employed pre- and post-study methods. The absence of control groups in the pre– post-evaluation studies made the evidence from these studies less convincing because it is difficult to control the confounding and the effects without intervention. Concerning studies evaluating health outcomes, apart from one quasi-experimental study, other studies employed a cross-sectional study method. The evidence from the cross-sectional program evaluation was weak because the findings from path analyses do not delineate cause-effect relationships.

Methodologically, it is noteworthy that there was no cost-effective analysis of WHP interventions in this current review. Workplace-based interventions might not always provide the most cost-effective delivery of expected health benefits because to provide WHP programs, an organization must consider the cost of implementation and ongoing support (Zavanela, *et al.*, 2012). Information about the balance of the cost, including financial, time, and human resources, as well as the effectiveness of an intervention, could provide valuable information for decision-makers (Pelletier, 2009). Moreover, in the current review, no published evaluation study reported or discussed in detail WHP interventions that did not produce positive outcomes in LMIC. Lessons from others' mistakes could significantly contribute to planning and implementing a successful WHP program and potentially save the time and resources of other health promotion interventions.

The lack of high-quality evaluation studies into WHP activities was also reported in other reviews (i.e. Malik, *et al.* (Malik, *et al.*, 2014) and McCoy, *et al.* (McCoy, *et al.*, 2014)). Another review, which considered a wide range of intervention models and health outcomes,

concluded that the majority of evaluations were not sufficiently rigorous to make a conclusive judgment on the effectiveness of WHP (Harden *et al.*, 1999). Tew *et al.* (Tew *et al.*, 2015) also called for evaluation studies with larger and more representative populations and that were conducted for longer to conclude the health effects of adjustable workstations.

An evaluation of WHP intervention faces a number of challenges. Methodologically, there is a gap between the knowledge and practices in WHP and the methods to evaluate the effectiveness of WHP intervention. Because the defined aim of health promotion intervention is “to enabling people to increase control over, and to improve their health” (World Health Organization, 1986), WHP interventions had developed a broader, more comprehensive, integrative approach to health and health determinants. However, the evaluation methodology is still heavily dependent on epidemiological study methods that are based on the assessment of cause-effect relationships of a low number of exposures and outcomes. The multiple determinants of workers’ health and the interactive nature of health determinants could create significant difficulties in evaluating intervention by epidemiological studies. Also, WHP interventions often produce multiple outcomes, which is also challenging for drawing a pooled conclusion of the effectiveness of an intervention.

In addition, there are also issues related to conceptualizing WHP program evaluations. First, because WHP interventions require the involvement of multiple stakeholders, the perspective of key stakeholders should be included in the evaluation process (Moore *et al.*, 2015). Inclusion could be a substantial challenge because standpoints of intervention effectiveness could greatly vary among stakeholders. Furthermore, other aspects of WHP intervention, such as the approach, model, or framework used in the intervention; the standards and criteria for evaluation; and the purpose of evaluation, could all significantly affect the design of the evaluation study (Moore, *et al.*, 2015).

The findings of this review also reflect discoveries of other reviews on the factors influencing the effectiveness of WHP interventions. Rojatz *et al.* (Rojatz *et al.*, 2017) listed a wide range of factors influencing WHP intervention, including management support, participation, social support, and business difficulties. Harden, *et al.* (Harden, *et al.*, 1999) showed that the low proportion of WHP interventions that were based on the needs of employees caused variation in the reported participation rates. Malik, *et al.* (Malik, *et al.*, 2014) also suggested that tailored interventions produced more effective outcomes. Concerning factors related to WHP in the resource-poor setting of small enterprises in high-income countries, McCoy, *et al.* (McCoy, *et*

al., 2014) reported that the main barriers to intervention adoption were management support, lack of employee interest, and lack of health promotion providers.

Finally, in interpreting the findings of this review, we need to acknowledge some limitations of the current study's research methodology. Because the review included studies that largely differ in design, type of intervention, and outcomes measures, it was not possible to provide a pooled analysis of the effects of WHP interventions. Further, the review did not include several articles published in other languages, such as articles in Chinese from China and articles in Spanish from Latin America, which could all provide high-quality evaluations of effective intervention. Researchers who are familiar with these languages should review, sum up, and disseminate the evidence of these articles in English so that the valuable evidence could be more accessible. Last, the review is potentially affected by publication bias, as in most reviews.

CONCLUSION

Despite methodological drawbacks in some included studies (such as using self-reported behaviour or not using control groups), the evaluations of WHP interventions in LMIC showed that a workplace intervention that aims to reduce the health risks of workers could be effective. However, the evidence of the effect on workers' health and productivity is weak due to the low quality of evaluation methods. The findings of this review suggest that a lengthy (two years or longer) intervention period and needs-based and active intervention strategies are more effective. Additionally, support from workplace managers, the participation of workers, and enrolment of stakeholders are conditions for a well-implemented WHP activity. Future programmes designed to promote workers' health in LMIC should be based on the needs of all stakeholders to produce a sustainable and effective intervention.

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