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WORK, INDUSTRIAL & ORGANISATIONAL PSYCHOLOGY | REVIEW ARTICLE

A systematic literature review of workplace physical activity programs: an exploration of barriers and enabling factors

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Abstract: Physical inactivity continues to be a global issue with many adolescents and adults failing to meet the recommendations for daily exercise. Efforts to reduce physical inactivity in adults include the incorporation of strategies such as workplace physical activity programs, especially for sedentary workers. In this systematic literature review we examined current literature about the efficacy of workplace physical activity programs, as well as the barriers and enablers to these programs. Six EBSCO databases were searched (Academic Search Complete, CINAHL Complete, MEDLINE, APA PsycInfo, APA PsycArticles and SPORTDiscus with full text) between a ten year period (2011 to 2021). The search terms used were "physical activity", "workplace" and "program" along with their variations. Following a systematic process, eighteen papers met the eligibility criteria. The authors analysed the findings using a narrative synthesis, in which four themes emerged from the data. These include Benefits to physical health, Benefits to mental health, Barriers to workplace physical activity and Workplace activity enablers. These findings provided several recommendations for organizations that endeavour to improve the health of workplace employees. Generalised workplace physical activity programs were viewed favourably by both employees and employers. Incorporating these practices into daily work structures may provide favourable outcomes such as increased work productivity and reduced physical inactivity.

Subjects: Sport Psychology; Work & Organizational Psychology; Work Motivation
Keywords: Workplace; physical activity; exercise; barriers; benefits; enablers; wellbeing

1. Introduction

The World Health Organization (WHO) defines physical activity as "any bodily movement produced by skeletal muscles that requires energy expenditure" (World Health Organization [WHO], 2018, p. 14). Physical inactivity is recognized as a key modifiable risk factor for increasing rates of non-communicable diseases, including coronary heart disease, stroke, type 2 diabetes and specific cancers (Lee et al., 2012). In 2013, the global cost of physical inactivity was estimated to be in the vicinity of $54 billion per year in healthcare costs, with an additional $14 billion lost due to decreased work productivity (Critical Appraisal Skills Programme, 2018). Physical inactivity continues to be prevalent on a global scale, with one in four adults and three in four adolescents aged between 11 to 17 years failing to meet the global recommendations for physical activity (Critical Appraisal Skills Programme, 2018). Current global guidelines recommend that adults engage in approximately 150 to 300 minutes of weekly moderate intensive physical activity or 75 to

150 minutes of vigorous exercise each week (WHO, 2020). As people age, robust efforts are promoting methods that integrate physical activity into daily life as a way to combat inert lifestyles and reduce chronic illness.

The *Global Action Plan on Physical Activity 2018–2030* (Critical Appraisal Skills Programme, 2018) encourages the incorporation of physical activity into multiple settings, particularly the work environment. Workplace group activities have demonstrated improved physical and mental health outcomes in employees, leading to increased work productivity (Commissaris et al., 2016; Jakobsen et al., 2015). Office workers spend approximately 89% of their working hours in a sitting position, placing them at increased risk of health consequences due to their sedentary behaviour (Gremaud et al., 2018). Employers have a responsibility to provide a healthy work environment for employees, which can lead to a reduction in overall absenteeism and improved productivity and performance (E. Taylor et al., 2017). The shared benefits between employees and employers indicate that physical activity programs may be advantageous to the work environment for all involved.

The evaluation of workplace exercise program efficacy can be complex due to influencing factors, such as program fidelity, mode of program delivery and the work population or program location (Lock et al., 2020). Evidence suggests that the use of wearable devices in conjunction with an activity goal or structured exercise sessions, were more effective when compared to sit to stand workstations (Lock et al., 2020). Previous studies have investigated workplace interventions to increase physical activity. A systematic review with a search range of 2000 to 2010 found that the use of pedometers, Internet based approaches and social and environmental interventions were more likely to report health improvements (To et al., 2013). This review also found that 7 out of 12 randomized controlled trials (RCTs) did not prove effective in any outcome. Another systematic review found that some workplace physical activity programs can be beneficial, however the overall results were inconclusive (Malik et al., 2014). Barriers and facilitators for implementing physical activity at work was explored through a scoping review in which 109 factors were identified via a Theoretical Domains Framework (GarneDalgaard et al., 2019). This review showed that the literature primarily describes employee perception.

The WHO recommends further research and evaluation into physical activity and sedentary behaviours to strengthen knowledge translation and policy implementation (Critical Appraisal Skills Programme, 2018). This systematic literature review aims to explore the contemporary literature pertaining to the overall efficacy of workplace physical activity programs with respect to overall physical, psychological; and social health outcomes. This line of questioning is relevant, given the low rates of global physical inactivity and health and work-related costs of physical inactivity. This review differs from other approaches in that it seeks to explore the barriers and enabling factors for both employees and organizations regarding these physical activity programs.

2. Aim

The research questions for this systematic literature review are:

(i) What is known in the current literature about the overall efficacy of workplace physical activity programs with respect to overall physical, psychological; and social health outcomes?

(ii) What are the barriers and enabling factors for workplace physical activity programs?

3. Method

3.1. Search strategy

This systematic literature review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). The search was conducted using the following six EBSCO databases: Academic Search Complete, CINAHL

Complete, MEDLINE, APA PsycInfo, APA PsycArticles and SPORTDiscus with full text. Databases were searched using MeSH terms and a Boolean search strategy, in which key concepts and their variations were entered into the databases (see Table 1). The search terms used were "physical activity", "workplace" and "program" along with their variations. The limiters applied to the search included peer-reviewed, full-text original articles and published in the English language within the last ten years (2011 to December 2021). The authors specifically selected this time period, as they were interested in reviewing current evidence in this field of study. The authors also conducted a search on Google Scholar and manually searched the reference lists of included papers. All citations from the database search were uploaded to Endnote. These records were transferred to Covidence, a software program that manages systematic reviews (Veritas Health Innovation, 2021).

3.2. Screening and eligibility

The authors collaboratively developed the inclusion and exclusion criteria. Studies were included if physical activity was the primary intervention, therefore studies were excluded if they consisted of environmental modifications such as sit to stand workstations to increase physical activity. Studies were also excluded if the primary intervention was technology-based such as the use of websites, mobile phone apps or health campaigns to promote general physical activity. Studies that incorporated pedometers were considered, as walking is the primary intervention in this context. The authors were specifically interested in physical activity programs conducted at the workplace during designated work hours. Studies were also excluded if they contained co-interventions such as dietary changes or stress-modification programs. All workplace settings were considered for inclusion, however studies that were geared towards specific diseases such as musculoskeletal conditions were excluded. The authors were specifically interested in generalised physical activity programs instead of specialised or tailored rehabilitation for known conditions. All types of study designs were considered for inclusion, however study protocols and non-original studies were excluded from this review.

After duplicated records were removed on Covidence two authors performed an independent title and abstract screen. A third author moderated the process in the event of uncertainty as required to achieve consensus. The records that passed the title and abstract screen were obtained in full text and further evaluated by the authors to determine if the study met the inclusion criteria. The approved full-text papers underwent quality appraisal before the final dataset was confirmed.

3.3. Quality assessment

The final papers underwent an independent quality assessment by two of the authors to critique the quality of the articles and assess the risk of bias. Qualitative studies were assessed using the Critical Appraisal Skills Program (CASP) Qualitative studies checklist (Critical Appraisal Skills Programme, 2018). Quantitative papers were assessed using the CASP checklist for randomised controlled trials (RCTs) and other study designs as applicable. The CASP checklists were applied to evaluate the methodology and validity of the research results, with papers scoring 80% or more included in this review. Mixed methods studies were appraised using the Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018). All authors approved the final dataset for this review.

3.4. Data extraction and analysis

Following the quality appraisal, the authors extracted the data verbatim from the final studies. The data extracted from these papers included: author, year and country, study design, aim of study, study population, data collection tools and analysis and key findings. Other variables that were extracted included the type of physical activity intervention and program length/duration. These results are presented in two tables, in which two authors independently verified the data.

Data analysis consisted of a narrative approach, in which the authors summarised general key characteristics of the studies and physical activity interventions. Given the heterogeneity of the studies, the authors opted to use an inductive narrative synthesis in which common themes

emerged from the extracted data. The authors agreed that the final themes are an accurate representation of the review findings.

4. Findings

The initial search produced 1624 papers and an additional three records from other sources. After de-duplication (*n* = 485), a total of 1139 records were screened based on title and abstract relevance. The authors assessed 123 full-text papers for their eligibility. Following this process 105 studies were excluded for various reasons: irrelevance to research aims (*n* = 42), physical activity was not the primary intervention (*n* = 28), wrong study design such as study protocols (*n* = 20), wrong population (*n* = 9), intervention was not at the workplace (n = 5), the study data is outside of our review date range (*n* = 1), non-English article (*n* = 1) and not an original article (*n* = 1). The final data set of this systematic literature review consisted of 18 peer-reviewed articles that met the eligibility criteria. A summary of the systematic search process is detailed in Figure 1.

4.1. Article characteristics

A data summary Table 1s shown in Table 2, which details the article characteristics of each study. The 18 articles in this review included quantitative studies (*n* = 12), mixed method studies (*n* = 3) and qualitative studies (*n* = 3). The 12 quantitative studies consisted of RCTs (*n* = 5), quasi-experimental (*n* = 1), cohort (n = 1), quasi-experimental (*n* = 1), an egocentric network analysis (*n* = 1), cross-sectional (*n* = 1), intervention studies (*n* = 2) and a longitudinal observational study (*n* = 1). The study locations occurred in the United Kingdom (n = 4), USA (n = 4), Australia (*n* = 3), Sweden (*n* = 2), as well as Denmark, USA, China, Greece, Spain and Iceland.

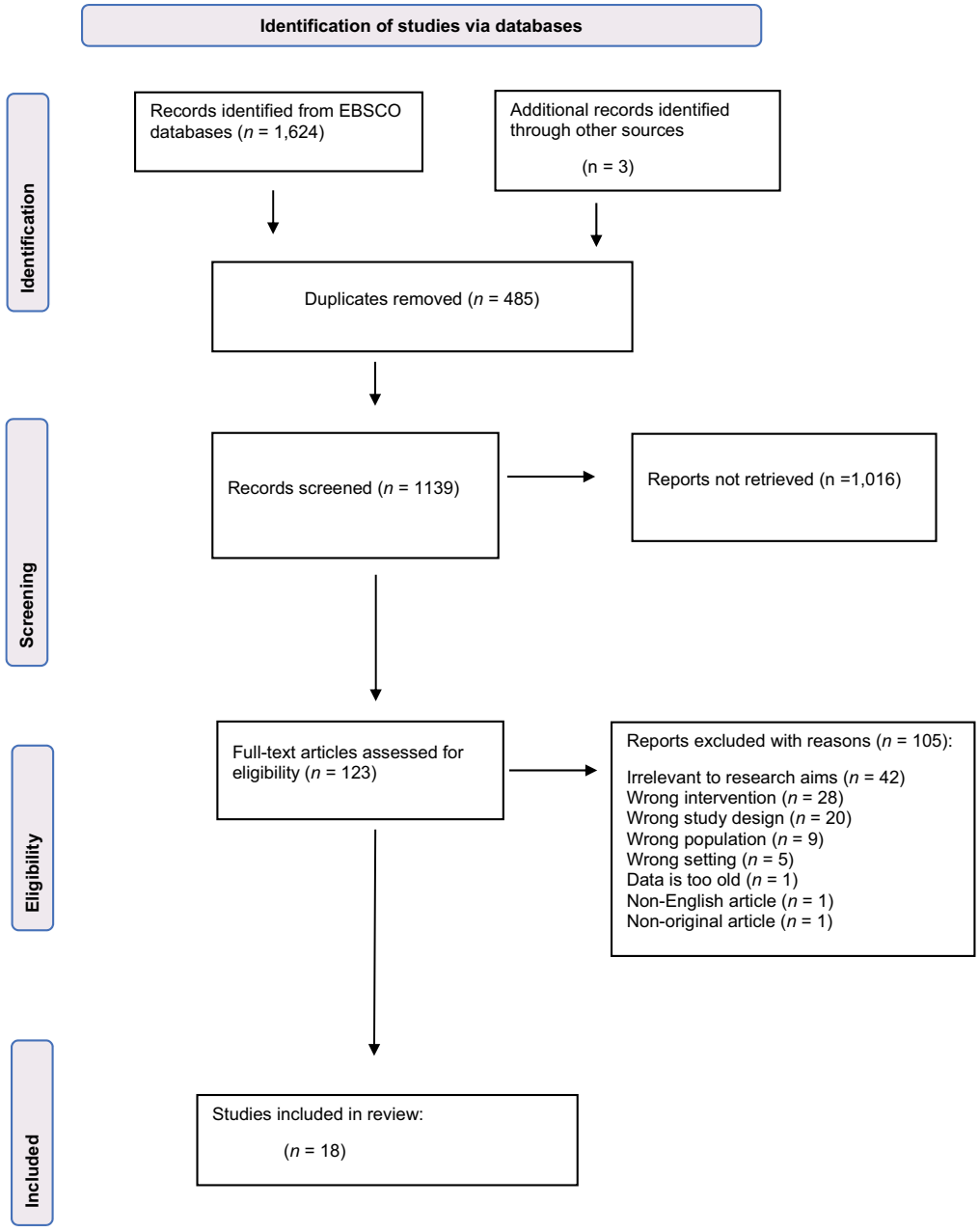
The number of participants in this review ranged from 35 (W. C. Taylor et al., 2013) to 2206 participants (Mason et al., 2018). Participants were predominantly from office-based employment or sedentary duties. One study investigated intervention fidelity between various organizations (Lawton et al., 2015) and another consisted of warehouse workers (Hertting et al., 2020). Most workplace physical activity programs were designed to increase physical activity in employees, therefore it was unlikely that employment of a strenuous nature would require additional workplace physical activity incentives.

4.2. Physical Activity Intervention

Table 3 depicts the physical activity interventions and program details from each study. Walking was the most popular intervention (Gu et al., 2020; Hallam et al., 2018; Harding et al., 2013; Mason et al., 2018; Parry et al., 2013; Puig-Ribera et al., 2017) with one study incorporating treadmill workstations to increase physical activity at work (Bergman et al., 2020). Some studies preferred participants to choose the type of physical activity (Edmunds et al., 2013; Lawton et al., 2015; McEachan et al., 2011; Patterson et al., 2020), whilst one study assessed the impact of "Wellness Champions" on an eight week physical activity program for university employees (Ellis et al., 2021). Hertting et al. (2020) analysed the effect of ping pong on the health and wellbeing of warehouse workers, focusing on the social or enjoyment aspect of physical activity. Other studies focused on circuit training (Saavedra et al., 2021), computer-guided sprint interval exercise cycling (Metcalfe et al., 2020), a concurrent training program (Karatrantou et al., 2020), Booster Breaks (W. C. Taylor et al., 2013) and intelligent physical exercise training (one hour of intense activity; Dalager et al., 2017). The programs ranged in duration from six weeks (Metcalfe et al., 2020) to one year (Dalager et al., 2017).

Four themes were produced using Braun and Clark's (2006) six-step process for thematic analysis: from the findings: Benefits to physical health, Benefits to mental health, Barriers to workplace physical activity and Workplace activity enablers. The remainder of the findings will be discussed under these themes.

Figure 1. PRISMA flowchart of search strategy (Page et al., 2021).



4.3. Benefits to physical health

Most studies identified in this review reported significant improvements to overall physical health in their participants. Findings included increased musculoskeletal strength in the treatment group (Dalager et al., 2017), increased aerobic capacity (Metcalfe et al., 2020) and increases in vigorous

Table 1. Search terms

Search strategy
S1) Physical activity OR (MH "Exercise") OR (MH "Physical Fitness") OR physical exercise
S2) (MH "Workplace") OR (MH "Employment") OR (MH "Work Environment") OR (MH "Work")
S3) Program OR intervention OR service OR initiative

Table 2. Summary of key findings

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Bergman et al. (2020) & Sweden	Qualitative interview investigation	To explore the experiences of office workers who had access to treadmill workstations for 13 months, which were installed in their offices.	Healthy office workers (n = 20) Mean age: 53.2 years (range: 40 to 62 years)	Semi-structured interviews Modified form of grounded theory	• The coding process revealed four ideal types or strategies that could be related to various behavioural models or theories: the Convinced, the Competitive, the Responsible and the Vacillating. • Participants had a high motivational level and pre-existing knowledge about the health benefits of increasing physical activity at work, they had different capacities for benefiting from the intervention, hence the four ideal types.
Dalager et al. (2017) & Denmark	Randomized single-blinded parallel controlled trial	To assess effects of 1-year Intelligent Physical Exercise Training (IPET) on musculoskeletal health	Office workers who worked ≥ 25 hours per week within an office environment (n = 387, 74% females) Mean age: 44 ± 10 years	Nordic Musculoskeletal Questionnaire, Muscle strength Descriptive & inferential statistics	• Office workers in the intervention group had significantly increased muscle strength after one year of the workplace program. • Surprisingly, significant reductions of generalised musculoskeletal pain occurred in both the treatment and the control group. • Participants who adhered to the intervention >70% had a significant between-group effects on neck pain in the past three months of the program.

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Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Edmunds et al. (2013) & United Kingdom	Mixed-methods evaluation design	To explore the impact of an intervention which trained existing employees to promote physical activity (PA) to their colleagues.	89 low-active employees from 17 small and medium sized organizations	Psychological wellbeing scales and perceived stress, physical activity, physical health and business indicators & descriptive & inferential statistics. Focus group interviews & framework analysis	• The intervention was associated with increased PA and was significantly higher at 6 months compared to baseline • Program completers had significantly higher social support from family compared to participants that discontinued. • Participants had autonomy over the type and frequency of PA. • Ripple effect to colleagues which resulted in embedding PA in the workplace culture • Five main themes emerged from the focus groups: awareness of PA, sustaining PA behaviour change, improved health and wellbeing, enhanced social networks in the workplace and embedding PA in the workplace culture
Ellis et al. (2021) & USA	Cross-sectional study	To evaluate the impact of Desire2Move (D2M) implementation fidelity by Wellness Champions on program effectiveness	Participants included 422 employees, however, only 144 provided survey data (99 females, 42 males) Mean age: 39.3 ± 13.2 years	Electronic survey (5-point Likert scales) Descriptive statistics	• Wellness Champions positively impacted employee physical activity participation and program satisfaction. • This study differed from others in that the Wellness champions offered peer support and were responsible for delivering key program information.

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Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Gu et al. (2020) & China	Prospective self-controlled study	To evaluate the effect of a group-based worksite intervention on PA and health-related outcomes by using pedometers and to examine the associations between the change in vigorous physical activity (VPA)/moderate physical activity (MPA)/walking and health related outcomes.	*n* = 262 participants (68% adherence) 146 males, 116 females.	Short International Physical Activity Questionnaire, Karasek's Job Content Questionnaire and various health-related outcomes Descriptive & inferential statistics	• Results indicate a significant improvement in PA and health-related outcomes in the intervention group compared to the control group. • The role of the group was highlighted by intra-group supervision and support, inter-group competition and group incentives. • Limitations to this study included low adherence rates, lack of information on dietary habits and reliance on self-reported data regarding PA compliance.
Hallam et al. (2018) & Australia	Uncontrolled intervention study	This study investigated the impact of a 100-day, 10,000 step program on signs of depression, anxiety and stress as well as general wellbeing	1963 participants made up the final sample size from various countries (1458 males, 505 females) Mean age: 36.6 ± 8.9 years (range: 16 to 74 years)	Standardised psychological scales Descriptive & Inferential statistics	• A daily work-based 10,000 step challenge may significantly improve mental health and wellbeing. • The small, but positive effects in participants occurred regardless of the average number of steps achieved by the person over the 100 days. • This simple and inexpensive activity could be easily replicated in other workplaces.

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Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Harding et al. (2013) & Australia	Prospective longitudinal observational study	To evaluate whether participation in a pedometer-based PA program in the workplace was associated with changes in health-related quality of life (HRQoL).	*n* = 487 (59% female) from primarily sedentary occupations Mean age 41 ± 10 years	Biomedical and physical measurements, self-reported questionnaires, self-reported HRQoL measures Descriptive & Inferential statistics	• There was a small increase in the mental component of the HRQoL measure, however there was no change in the physical component. • A limitation to this study is possible selection bias, in which participants had already met the PA guidelines at baseline. • The authors recommend a broad perspective of health to be used to implement and evaluate workplace PA programs.
Hertting et al. (2020) & Sweden	Qualitative	The aim of the paper is to explore the participant's experiences of the intervention and how health and well-being were affected.	13 participants from the warehouse of a company within the retail sector	One initial workshop baseline, a sport-based intervention, three group interviews, and a final workshop Hermeneutic phenomenology analysis	• Three themes emerged: expressing positive individual effects, expressing improved work environment and the meaning of the workplace as a lived space. • The workplace as a lived space offers a valuable opportunity for sport-based interventions that improve health and well-being through physical activity, social relations and learning. • A possible disadvantage was an increase in workloads for other colleagues, whilst colleagues were participating in the intervention.

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Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Karatrantou et al. (2020) & Greece	RCT	To examine the effectiveness of a 6-month workplace training program on health indices, musculoskeletal pains, functional capacity and physical fitness in office workers.	36 office workers from four workplaces (21 females, 15 males) Mean age: 43.39 ± 5.90 years	Health indices, musculoskeletal pain, functional capacity and physical fitness and enjoyment scales Descriptive & Inferential statistics	• Over 120 supervised sessions in a six-month timeframe, improvements were reported in lean body mass, respiratory function, cervical, hand grip, back and leg strength, functional capacity, decreased body fat, blood pressure, heart rate and reported levels of musculoskeletal pain in office workers. • The authors report the strength of this study was the concurrent program of flexibility, balance, strength and aerobic exercise rather than single training programs.
Lawton et al. (2015) & United Kingdom	Fidelity analysis: Matched pairs cluster RCT supplemented with qualitative data	To test whether the effectiveness of a worksite physical activity intervention delivered in five work organizations varied as a function of intervention fidelity.	1260 individuals from 44 worksites	Self-reported PA and fidelity measures. Telephone interviews with facilitators and focus groups with employees. Descriptive statistics & deductive content analysis.	• The local council was the only organization to show good intervention fidelity compared to the bus company and university (poor fidelity) and the hospital and government organization (moderate fidelity). • Ideal conditions for the workplace intervention include facilitator commitment, support from management, employee receptiveness and engagement and the delivery of the intervention to a team within a physical space.

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Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Mason et al. (2018) & USA	Retrospective cohort study	To determine the efficacy of an incentivized workplace PA intervention	*n* = 2206 university employees Ages unknown	PA monitor of participant choice Descriptive statistics	• This workplace wellness PA intervention increased daily steps in participants with low levels of PA and remained above pre-intervention levels in the post-intervention period. • The average cost of implementing this PA promotion was $65.52 USD per employee.
McEachan et al. (2011) & United Kingdom	Matched pairs cluster RCT	To explore the impact and cost-effectiveness of a workplace PA intervention designed to increase PA levels.	*n* = 1260 from five organizations Intervention (*n* = 662), 296 males Mean age: 43.13 ± 10.41 years	PA levels, health and fitness, demographic measures, cost effectiveness analysis	• There was a positive effect of the intervention on self-reported moderate/vigorous PA although it was non-significant. • PA levels varied with social classes in that lower social classes reported higher levels of PA. • There were significant benefits to systolic blood pressure and resting heart rate • The economic evaluation did not indicate that the intervention was effective.

(*Continued*)

Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Metcalfe et al. (2020) & United Kingdom	Mixed methods—RCT & exploratory qualitative	To investigate the acceptability and effectiveness of reduced-exertion high-intensity interval training when applied in an unsupervised workplace setting.	*n* = 25 office-based employees from two workplaces Mean age: 47 ± 9 years	VO2max measurement and quantitative psychological questionnaires and individualised interviews (*n* = 8) Descriptive statistics & thematic analysis	• There was a significant increase in aerobic capacity in the exercise group compared to the control group. • Shorter bouts of high interval exercise (10 secs) were tolerated better than longer bouts of 20 secs. • Reduced-exertion high-intensity interval training could be implemented as a feasible, effective, and acceptable exercise intervention in a workplace setting. • There were no changes to perceived stress in both groups after six weeks.
Parry et al. (2013) & Australia	RCT	To determine if participatory workplace interventions could reduce total sedentary time, increase the frequency of breaks and promote light to moderate/vigorous intensity activity during work hours.	*n* = 62 call centre workers across 3 large government organisations (81% female, 19% male) Mean age: 43.5 ± 6.4 years) (range: 25 to 59 years)	Baseline body measurements and accelerometer data. Descriptive & inferential statistics.	• The interventions resulted in a significant reduction in sedentary time (1–2%) and a subsequent increase in light intensity activity time during work hours. • It is not known whether these changes are sufficient to change health risk in sedentary employees. • This intervention involved consultation with employees, managers and team leaders to tailor the workplace interventions.

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Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Patterson et al. (2020) & USA	Egocentric network analysis	To examine whether mental and social health factors were related to increased exercise among employees participating in a worksite group exercise program.	*n* = 57 university employees (44 females, 10 males) Mean age: 41.75 ± 12.54 years (range: 24 to 69 years)	Depression, anxiety, stress, physical activity, overall wellbeing and demographic measures Egocentric network analysis	• Participants engaged in strenuous exercise on an average of 2.29 times per week. • Group exercise programs in the workplace may decrease feelings of depression, leading to better work outcomes and productivity. • Healthy behaviours are reinforced through personal networks. Exercising in a social setting may increase a person's PA levels, thus the social aspect should be considered.
Puig-Ribera et al. (2017) & Spain	RCT	To assess the short and mid-term impacts of and patterns of change within a 19-week workplace web-based intervention.	*n* = 264 employees from 6 Spanish university campuses (171 females) Mean age: 42 years	PA levels, sedentary time, work productivity measures and mental wellbeing measures Descriptive & inferential statistics.	• Effects were sustained two months after program completion. • The percentage of losses in health-related productivity was less compared to the comparison group at follow-up. • There were no reported effects to employees' mental wellbeing from participating in the program.

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Table 2. (*Continued*)

Author, Year & Country	Study Design	Aim of Study	Study Population	Data Collection Tools & Analysis	Key Findings
Saavedra et al. (2021) & Iceland	Quasi experimental	To determine the effects of two physical exercise programs carried out during working hours in an office environment on health-related parameters of employees	47 office worker volunteers (27% males) Mean age: 45 ± 11.95 years	Anthropometric and body composition, fitness, lipid profile and mental health. Descriptive & inferential statistics.	• Both programs improved cardiorespiratory fitness in participants and their reported mental health. • Neither program had an effect on lipid profile or blood pressure. • The circuit training intervention led to reductions in waist to hip ratio and body fat mass. • Small sample sizes in each of the three groups. Randomization occurred for the two interventions, in contrast to the control group.
W. C. Taylor et al. (2013) & USA	Qualitative	To examine participants' acceptance of and satisfaction with physical activity Booster Breaks in traditional work environments and to identify benefits and barriers.	35 participants across five worksites (29 women, 6 men) Mean age: 45.2 years (range, 24–68 years)	Open-ended survey Content analysis	• Three themes expressed the benefits of the Booster Breaks: reduced stress and promoted enjoyment, increased health awareness and facilitated behaviour change and enhanced workplace social interactions. • Two themes described the barriers or areas for improvement to this program: a need for greater variety in the routine and for greater management support.

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Table 3. Physical Activity Interventions and Program Details

Author	Exercise Intervention	Program Length/Duration
Bergman et al. (2020)	Treadmill workstations	13 month study, unspecified amount of walking
Dalager et al. (2017)	Intelligent Physical Exercise Training	One hour of high intensity training every week during working hours for one year
Edmunds et al. (2013)	Workplace Activator Programme—participant choice of exercise	Six month program, varied amount of physical activity
Ellis et al. (2021)	Varied—participant choice of exercise using Wellness Champions	Eight-week program, varied amount of physical activity
Gu et al. (2020)	Walking—self-monitoring using a pedometer	100-day period, varied amount of walking
Hallam et al. (2018)	10,000 step program	100-day period
Harding et al. (2013)	10,000 step program using pedometer	4-month program
Hertting et al. (2020)	Table tennis	12-week intervention
Karatrantou et al. (2020)	Supervised concurrent training program (flexibility, strength, balance, aerobic)	6-month intervention, 2 workouts per day of 15–20 minutes
Lawton et al. (2015)	Participant choice	10 minute bouts with a view to achieve 30 minutes on at least 5 days of the week.
Mason et al. (2018)	Walking—self-monitoring using a PA monitor of participants' choice	6-week corporate wellness program
McEachan et al. (2011)	Participant choice	10 minute bouts with a view to achieve 30 minutes on at least 5 days of the week.
Metcalfe et al. (2020)	Computer-guided sprint interval exercise training in cycling	Two sessions/week of low intensity cycling with two "all-out" sprints increasing in duration from 10 to 20 seconds per sprint over six weeks
Parry et al. (2013)	Active workstations or traditional physical activity (walking)	12-week intervention, 30 minute daily access to active workstation and unspecified amount of walking
Patterson et al. (2020)	Group exercise—participant choice e.g., yoga, cycling	Not specified
Puig-Ribera et al. (2017)	Web-based intervention—short walks during work hours	19-week intervention, amount of walking varied between weeks
Saavedra et al. (2021)	Circuit training or brisk walk	12-week intervention of three 30-minute sessions in the middle of the workday
W. C. Taylor et al. (2013)	Booster Break—warm up, aerobic/ toning/ strengthening/stretching, cool-down	One 15 minute physical activity each workday over 6 months

intensity physical activity levels (Dalager et al., 2017; Edmunds et al., 2013; Gu et al., 2020; McEachan et al., 2011). Physiological outcomes and measurements such as improved systolic blood pressure, waist circumference, body fat percentage and body mass index (BMI) were also statistically significant in the intervention group (Gu et al., 2020). An intensive six-month concurrent training program by Karatrantou et al. (2020) found improvements in participants' lean body mass, respiratory function, cervical, handgrip, back and leg strength, functional capacity, decreased body fat, blood pressure, heart rate and reported levels of musculoskeletal pain in office workers. This program was implemented over 120 supervised sessions incorporating flexibility, balance, strength and aerobic exercise. In contrast, Harding et al. (2013) found no changes

in the physical component of the health related quality of life (HRQoL) measures. This finding may be explained by selection bias, in that most participants had already met the physical activity guidelines at baseline (Harding et al., 2013).

Significant improvements were found in reported neck pain in the treatment group, compared to the control group in Dalager et al. (2017). Nevertheless, the between-group effect for neck pain was only significant for participants who adhered to the intervention >70%. Interestingly, Dalager et al. (2017) found significant reductions in generalised musculoskeletal pain in both the treatment group and the control group. Although these results in the control group are surprising, they could perhaps be attributed to the increased awareness of physical activity and health promotion in the workplace.

Reduced sedentary time was noted to be a benefit in Parry et al. (2013) and in Edmunds et al. (2013) who reported that physical activity levels were significantly higher at six months compared to baseline. The sustainability of the intervention was also noted in Mason et al. (2018), which found that the increased daily steps in participants remained above pre-intervention levels, with an estimated average cost of $65.52 USD per employee at the time of the study.

4.4. Benefits to mental health

Several studies included various psychological outcomes to assess the efficacy of the intervention on mental health and wellbeing. There was a small increase in the mental component of the HRQoL measure in Harding et al. (2013) and with reported mental health (Saavedra et al., 2021). Another study reported that simple, inexpensive physical activity programs such as the 10,000 step challenge may significantly improve mental and health wellbeing (Hallam et al., 2018). This study reported improvements in stress levels by 8.9% for participants, depressive symptoms by 7.6%, anxiety by 5% and wellbeing by 2.1% over baseline (Hallam et al., 2018). In contrast, the participants in Metcalfe et al. (2020) reported no changes in perceived stress between the treatment group and the control group, as was the case in Puig-Ribera et al. (2017). Similar feelings were also elias cited in Hertting et al. (2020) in which participants found increased enjoyment in learning a new skill (ping pong), as well as increased social connectedness and improved generalised wellbeing. The heterogeneity and various intensities of the exercise interventions indicate that regardless of the nature of the workplace program, positive effects to mental wellbeing are likely to occur. Similarly, Patterson et al. (2020) reported that group exercise programs may decrease depressive symptoms, leading to better work outcomes and productivity.

4.5. Barriers to workplace physical activity

Although the workplace physical activity programs were supported by employers and organizations, several barriers were identified in various studies. Barriers such as time and busy lifestyles were noted by participants in Metcalfe et al. (2020), in which they reported that the short interval training was easier to incorporate into their daily work schedules. The lack of motivation was also identified as a barrier, however participants reported exercising with a work colleague helped to overcome this barrier (Metcalfe et al., 2020). Participants in W. C. Taylor et al. (2013) reported the need for greater variety in the 15-minute physical activity Booster Break and the need for greater management support.

In Bergman et al. (2020) researchers from outside the organization to implemented the physical activity intervention of 13 months of access to treadmill workstations. The study identified the varying characteristics and motivation of participants to the intervention such as the convinced, the competitive, the responsible and the vacillating (Bergman et al., 2020). The authors identified that the behavioural change might be more sustainable if it was introduced from within the organization, denoting the importance of organizational support when implementing these programs.

4.6. Workplace activity enablers

The concept of fidelity was explored in Ellis et al. (2021), in which the voluntary Wellness Champions recruited employees and implemented the intervention for their team acting as enablers to workplace activity. As described by the Centres for Disease Control and Prevention [CDC], a Wellness Champion "provides expert training, technical assistance, and support to employers" and promote workplace health programs (Centers for Disease Control and Prevention, 2021). Participants reported higher program satisfaction and increased physical activity compared to teams that perceived low physical activity implementation by their team captain (Ellis et al., 2021). These results suggest the potential influence that a Wellness Champion may provide for their colleagues. This study differs from others given that the Wellness Champions offered peer support, and designed the physical activity intervention (Ellis et al., 2021). Although these Wellness Champions received instructions, they were not provided with formal educational sessions. Gu et al. (2020) reported using group captains within their physical activity intervention, however the outcomes of the physical activity were not discussed as a part of the article. The above information indicates that a team captain or Wellness Champion may have an important role in the delivery and implementation of workplace health and wellbeing initiatives. The ability of employees to be given the time, resources and motivation to participate greatly improved their ability to engage with structured workplace activity programs leading to a reduction in sedentary working time.

One study discussed how the physical activity intervention had a "ripple effect" on workplace culture (Edmunds et al., 2013). Another study reported that the ideal conditions for their workplace intervention included facilitator commitment, support from management, employee receptiveness and engagement and the delivery of the intervention to a team within a physical space (Lawton et al., 2015). Family support was also identified as key to program fidelity (Edmunds et al., 2013).

5. Discussion

The first research question for this review pertains to the overall efficacy of workplace physical activity programs. In general, studies supported physical activity interventions for improving general physical, mental and social health. Workplace group activities have been demonstrated to improve both physical and mental health in employees, which can be attributed to increased work productivity (Commissaris et al., 2016; Jakobsen et al., 2015). Our findings of improvement to mental health are in contrast to another systematic review, which reported that workplace exercise interventions seem to have limited effects on mental health (Bordado Sköld et al., 2019). The social benefits of exercise must also be considered with some studies linking the indirect benefit of physical activity with improved workplace culture (Edmunds et al., 2013) and positive enhanced social interactions (W. C. Taylor et al., 2013). As demonstrated in this review, studies incorporated various types of physical activity interventions. This is comparable to another project, the Sport4Health Network (SPORT4H) which identified a moderate to strong link between non-traditional physical activity programs in the workplace and several indices of health-related physical fitness (Todorovic et al., 2021). Implementing non-traditional physical activity programs may be an important strategy to reduce sedentary behaviour (Todorovic et al., 2021). This also signifies the importance of tailoring workplace physical activity interventions in accordance with both employees, managers and organisation policies to encourage participation.

The second research question explored the barriers and enabling factors for workplace physical activity programs. The use of treadmill workstations or active workstations were found to be a useful tool to encourage increased activity. Similarly, many studies utilised pedometers as feedback to evaluate the number of steps per working day. This is comparable to previous studies, which found that enablers also included the availability and accessibility of exercise equipment, including wearable devices (Lock et al., 2020). A number of barriers to participating in workplace activity were identified such as workload, nature of the activity, time and availability of exercise equipment. Given the decreasing participant adherence rates of some programs, such as 56% (Dalager et al., 2017) and 67.9% (Gu et al., 2020), it would be relevant to investigate the

compliance rates in workplace physical activity programs and understand these influencing factors and barriers in order to improve the implementation of these programs. A fidelity analysis was conducted in Lawton et al. (2015) and investigated in Ellis et al. (2021), which highlighted the importance of a facilitator or champion to promote physical activity interventions and behavioural change. It is also essential to gain internal management support to promote physical activity interventions. A socio-ecological model such as the one proposed in Van Kasteren et al. (2020) could be a useful framework to incorporate broad changes to the workplace that address the various dynamic factors influencing behavioural change. It is essential that interventions are not solely reliant on individual motivation but address holistic elements to create opportunities for sustainable health change (Van Kasteren et al., 2020). Interestingly there were no studies included in this review which discussed the impact of COVID-19 on workplace physical activity. Future research could explore the influences of coronavirus on workplace behaviours regarding physical activity.

6. Implications for practice

In summarizing the outcomes and recommendations of this review:

- The provision of a workplace physical activity program may provide important physical, psychological and social health benefits for employees with an emphasis on movement, irrespective of the type of exercise.
- The provision of workplace physical activity programs significantly reduce sedentary behaviour, especially in office-type jobs.
- Increased work productivity was identified by participants as an advantage of the workplace physical activity programs.
- Consider the allocation of a Wellness Champion or a team captain to promote the physical activity intervention and to motivate their fellow colleagues.
- Barriers to workplace physical activity programs include time, workplace culture, nature of work tasks and daily structure, motivation and public perceptions.
- Internal support within organizations was also recommended to encourage regular physical activity participation for employees.

7. Limitations

There are limitations to this review, which may have influenced the findings. This review considered papers in the English language, which may have excluded significant studies. Another limitation to this review is the exclusion of studies in which the intervention focused on specific conditions that required specialised treatment or care planning. While the authors acknowledge the importance of such studies in the workplace, the focus of this review was on generalised workplace physical activity programs. Some of the studies identified their own limitations such as a lack of information on dietary habits and physical activity outside the workplace (Gu et al., 2020) and small samples sizes (Metcalfe et al., 2020; Saavedra et al., 2021). The authors of this review identified that many of the studies excluded participants that had pre-existing conditions such as cardiac, cerebrovascular disease, mental illness or physical disorders. The findings of this review may not be applicable to participants with such health conditions.

8. Conclusion

This review aimed to identify the literature pertaining to barriers, benefits and enablers of workplace physical activity programs. Overall, generalised workplace physical activity programs were viewed favourably by both employees and employers. Incorporating these practices into daily work structures may increase work productivity, as well as reducing physical inactivity. Given the low rates of physical inactivity and subsequent links to chronic disease, finding ways to incorporate regular activity into daily life is essential to improve physical and mental health of employees. The significant healthcare costs of chronic disease and cost of lost productivity denotes the importance

of a global effort in overcoming the modifiable risk factor that is physical inactivity. Workplace physical activity programs may be a valuable strategy to improve the physical activity statistics.

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