The effectiveness of physical activity interventions in improving wellbeing across office based workplace settings: **A Systematic Review**

Keywords: Physical activity, review, intervention, employee, workplace, worksite

Abstract

Objectives: Although the benefits of regular physical activity are widely accepted, most of the population fail to meet the recommended levels of activity. Public health bodies such as the World Health Organisation (WHO), emphasise promoting physical activity within workplaces as key intervention setting to reach the health and wellbeing of the working population. Given the importance of wellbeing in workplace settings, it seems worthwhile to explore the evidence of effectiveness in the literature. This systematic review aims to assess the effectiveness of physical activity (PA) interventions for improving wellbeing in working adults. It provides a review of current evidence, assesses the quality of the research into this topic area and identifies issues and recommendations for future research.

Study Design: A systematic review, guided by the Cochrane Handbook was conducted.

Methods: PsycINFO, PubMed, ScienceDirect, Web of Science, EMBASE, MEDLINE and Cochrane Library literature searches were conducted from 2007 to April 2017. Using the key words 'Physical Activity'; 'Exercise', 'Wellbeing'; 'Employee' and 'Workplace' 5 articles were obtained that fit for the inclusion criteria. Inclusion criteria were: - a workplace setting, an intervention including a physical activity intervention and an outcome measure including wellbeing. Extraction of articles and quality assessment of the papers were performed independently by two authors using the Cochrane's data extraction form and the Cochrane's risk of bias. Due to heterogeneity in population characteristics, intervention components, outcomes measures and the durations of interventions, a narrative synthesis was conducted.

Results: The review identified 5 workplace physical activity interventions in promoting wellbeing in 1326 participants. The included studies varied substantially in sample size characteristics, methodological quality, and duration of follow up, types of interventions and assessed outcomes. Three out of the five included studies were of high quality. The types of physical activity intervention included yoga, exercise and three studies focussing on walking interventions. The findings evidenced that exercise, yoga and walking interventions improve wellbeing as measured across workplace settings compared to no intervention. Some studies

did not include a placebo control group and therefore a form of PA intervention regardless of the type may be better than no intervention at all.

Conclusion: This review found mixed evidence that PA interventions can be effective in improving wellbeing across workplace settings. Although, the findings are promising, due to methodological failings there is no conclusive evidence. Current evidence indicates that employees can improve their wellbeing by participating in any form of physical activity interventions in the workplace.

Introduction

Workplaces have been established as one of the priority settings for health promotion in the 21st century[1]. They have been shown to directly influence the physical, mental, economic and social wellbeing of employees and as a result the health of their families. Regrettably the concept that the workplace is an important area for health campaigns of many kinds, as well as basic occupational health and safety programmes may not yet be widely accepted[2]. The concept of promoting health in the workplace is becoming increasingly relevant as more organisations recognise the importance of a healthy workforce to obtain success across their organisation. There are several benefits for employers in investing in the health of their employee such as reduced sickness absence, increased productivity and better staff retention[3].

Physical activity interventions have been shown to be cost effective across workplaces [4, 5, 6]. Numerous studies have conveyed the importance of physical activity in improving health and wellbeing [7,8,9,10]. According to the Department of Health[11], terminology around wellbeing is often used interchangeably and sometimes incorrectly. Wellbeing refers to an individual realising their own capabilities and able to feel good and function well with the normal stresses of life whilst working[12]. The World Health Organisation (WHO) recognises that wellbeing is an important marker of health and plays an important role in employee and employer relations as well as job satisfaction and productivity [13, 14].

It has been widely emphasised that workplace physical activity strategies to improve mental wellbeing and employee productivity should focus on reducing sitting time by increasing physical activity across workplaces [14]. However; a systematic review examined workplace health interventions for increasing physical activity and found the evidence to be inconclusive[1]. As evidence on workplace physical activity interventions is unclear, this

review aims to provide clarity on the effectiveness of physical activity interventions across workplaces.

Although the benefits of physical activity in promoting wellbeing are widely accepted, links between physical activity interventions and wellbeing across workplace settings remain unclear and often anecdotal. This is the first review to the authors' knowledge where the effectiveness of physical activity in improving wellbeing is synthesised. Given the importance of wellbeing in workplace settings, it seems worthwhile to explore this emerging area. This systematic review aims to assess the effectiveness of PA interventions for improving wellbeing in working adults. It provides a review of current evidence, assesses the quality of the research into this topic area and identifies issues and recommendations for future research.

Methods

This systematic review guided by the Cochrane Handbook was conducted to assess the effectiveness of physical activity (PA) interventions for improving psychological wellbeing in working adults in an office setting. This review was registered prospectively to the PROSPERO register. Registration number CRD42017068826.

Data sources

A systematic literature search was performed for English Language articles from 2007 to April 2017 in PsycINFO, PubMed, Science Direct, Web of Science, EMBASE, MEDLINE and the Cochrane library using the following search terms and keywords: 'Physical activity'; 'exercise'; 'wellbeing'; 'work'; 'workplace'; 'worksite'; 'employees' and 'employee'. Additional reference lists of included studies and related systematic reviews were manually checked for further relevant articles.

Study selection

The approach of this systematic review was based on the Cochrane handbook for systematic reviews of interventions [15] and PRISMA flow chart shown in figure 1. This approach ensured that this systematic review consisted of limited bias and the evidence provided in this review was of a reliable nature. The search of the databases and the exclusion and inclusion of relevant studies based on titles were done by the first author (SA). The full text of the remaining studies was reviewed by SA and a second reviewer (RW) considering the eligibility criteria. Any disagreements were resolved by discussion. Data was extracted by

two authors (SA and RW) and it was planned that the third author (JBD) would assess should there be no agreement in discussions between the two authors.

Types of studies

Study designs of all types were eligible if they met the criteria of inclusion. Studies were limited to published, peer reviewed articles written in English language.

Types of participant

Studies had to represent adults in a office-based workplace environment.

Types of intervention

Any studies focusing on face-to-face physical activity or exercise interventions were included. Non-behavioural interventions were excluded such as educational and counselling. All included studies measured the effects of the intervention on psychological wellbeing levels as a primary outcome. Psychological wellbeing was reported through various outcomes such as stress, life purpose, life satisfaction and subjective wellbeing. Some studies reported physical activity outcomes using step counts.

Quality assessment of included studies

The quality of the included studies was assessed using the Cochrane's risk of bias tool [15]. The tool covers six domains of bias: selection bias, performance bias, detection bias, attrition bias, reporting bias and other biases. The validated tool provided a conclusion of risk of bias using low risk, high risk and unclear risk for each study. A methodologically weak strong quality paper will have a low risk for each domain.[15] Each study was assessed independently by the first two authors to limit bias. The quality of the studies was used in combination with the evidence of effect throughout the synthesis.

Results

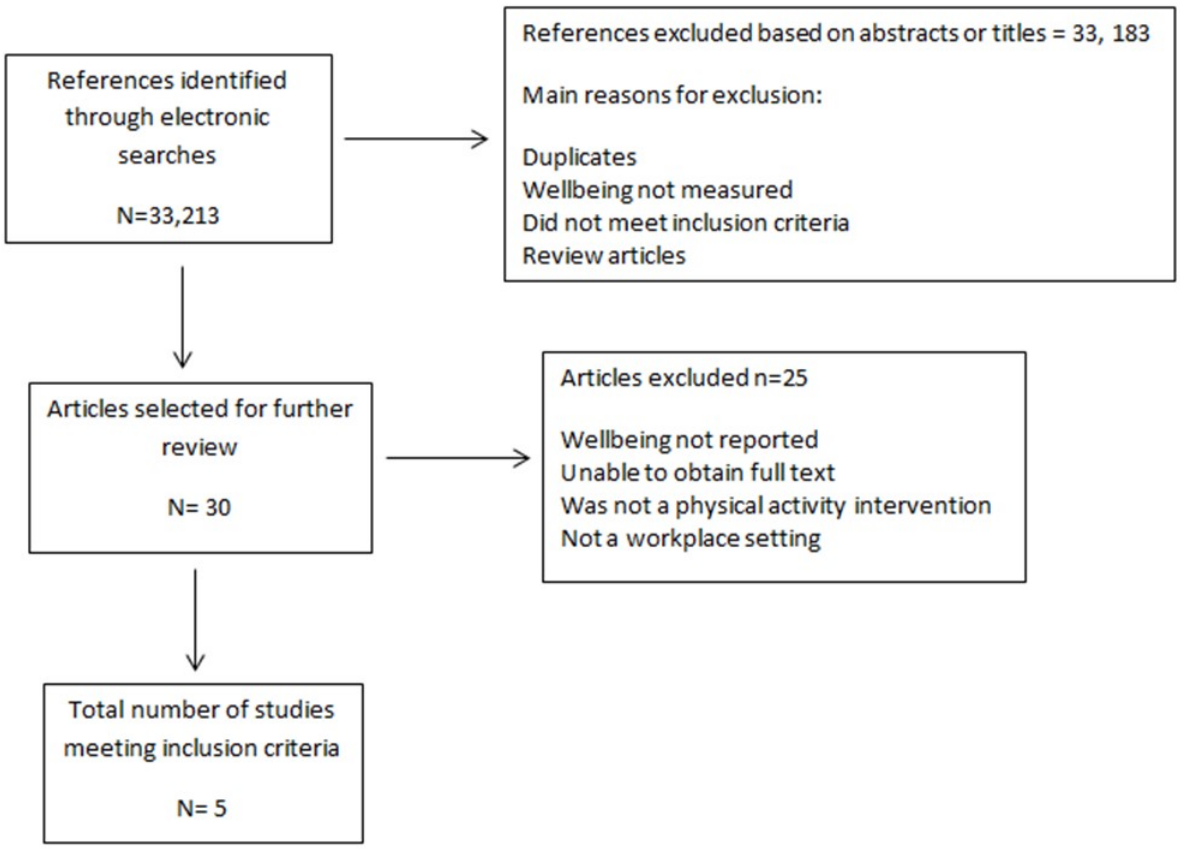

Figure 1 PRISMA Flowchart

Five studies with a total of 1326 participants met the inclusion criteria. Of these, three were randomised control trials [16, 17, 18], one was an experimental design[19] and one uncontrolled feasibility trial [20]. Due to heterogeneity in population characteristics, intervention components outcomes measures and the durations of interventions, a meta-analysis was not feasible [21]. A narrative synthesis was conducted for this review.

Interventions

The mode of physical activity interventions across the studies included one exercise study, one yoga study and five walking studies. The length of studies ranged from a minimum of 9 weeks [17] to two years[20]. All the included studies measured wellbeing differently using a range of questionnaires and scales. Two high quality studies [18, 20] did not report physical activity outcomes.

Three studies were conducted in University settings [17,18,20], one study was conducted amongst small to medium sized organisations[16] and one study did not report the type of workplace setting [19] however it was mentioned that 10 worksites were involved. Four studies were undertaken across Europe [16, 17,18, 20] and one was conducted in Australia[19]. Four studies were conducted at a single workplace, with one being conducted across ten Australian worksites[19].

According to the quality assessment, three studies [17, 18, 20] were of high quality. Two studies [16, 19] were of low quality. None of the included studies used a theoretical base in their interventions.

Evidence of effectiveness

Table 1 show the main outcomes of all included studies. The outcomes are described by grouping the included studies as type of interventions.

Yoga

Hartfiel, Havenhand, Khalsa, Clarke and Krayer [18] found good quality evidence that yoga was statistically significant in increasing wellbeing compared to controls. The yoga participants felt significantly less anxious ($p<0.0005$), less confused ($p<0.0005$), less depressed ($p<0.01$), tired ($p<0.002$) and less unsure ($p<0.010$). Moreover, yoga participants had a greater sense of life purpose and satisfaction ($p<0.0.009$) and were more confident during stressful situations ($p<0.001$). Although, participants in the yoga group reported feeling less hostile than the control group, this was not significantly evident ($p>0.189$). However, as there was no placebo control group high quality study can only conclude that a form of intervention is better than none.

Walking

Three walking interventions studies showed mixed evidence of statistically significant increases in improving wellbeing [17, 19, 20]. However, one of the studies [19] was of low quality and as a result the quality of the three studies compromises the strength of the findings that walking interventions are effective in improving workplace health.

Thogersen-Ntoumani et al [20] found significant improvement ($P<0.001$) in health perceptions, subjective vitality, work performance and fatigue. These changes were sustained at four months follow up. However, this high quality study highlighted that there were no changes identified for enthusiasm, nervousness and relaxation at work.

A low-quality study [19] found that after the four month intervention, subjective wellbeing improved significantly immediately ($p<0.001$) and was sustained eight months after completion of the programme ($p<0.001$). However, as there was no placebo control group high quality study can only conclude that a form of intervention is better than none.

Puig-Ribera, McKenna, Gilson & Brown[17] found good evidence that individuals who reported low activity at baseline, showed the greatest increase in step counts, improved quality of life and wellbeing and work productivity ($p<0.01$).However, the findings of this high quality study demonstrated no significant group differences in changes to work day step counts. Although, participants in the intervention groups maintained their step counts, control step counts decreased with the approach of winter. This study implies that this walking intervention works best with sedentary employees compared to a control group.

Exercise

Kettunen, Vuorimaa & Vasankari [16], conducted a 12 month exercise programme found low quality evidence that statistically significant decreases of stress symptoms and improved mental resources and cardiorespiratory fitness and these positive changes were retained after 1 year follow up compared to control group.

The findings evidence that exercise, yoga and walking interventions improve wellbeing as measured across workplace settings compared to no intervention. Some studies did not include a placebo control group and therefore a form of PA intervention regardless of the type may be better than no intervention at all. Two studies [17, 20] did not follow participants for a sufficient duration to allow definitive conclusions to be drawn.

Table 1 –physical activity Interventions to promote wellbeing across office employees

Study	Sample and Setting	Design and Intervention	Measures	Findings	Quality Assessment
Kettunen et al (2015) Finland Aim: To investigate the effect of an exercise-training programme with a moderate volume and low intensity on stress symptoms, mental resources and cardiorespiratory fitness of healthy working adults. Study Length:2 years	Sample: 371 employees from small and medium-sized companies. Intervention group: N = 338 , mean age 45± 8.8, Women = 212, Male – 126 Control Group: n=33, mean age = 41±6.9. Women= 17, Male = 16	RCT, 1 year intervention with 1 year follow up., data collections occurred at baseline, 4 month, 8 month, 12 month and 24 months. Intervention Group: 12 month exercise programme which contained 2 days training camps at a sport institute. Individuals were put into groups and each group had the same coach for the duration of the intervention. Every participant had an	Physical Activity The weekly leisure time physical activity (LTPA) questionnaire. Cardiorespiratory fitness Maximal oxygen uptake Wellbeing The Occupational stress questionnaire (OSQ) measured the characteristics and stress factors of work and stress reactions of employees. Mental resource index (MRI)	Stress symptoms of the exercise group decreased by 16% ($p<0.0001$)and mental resources, leisure time physical activity as well as cardiorespiratory fitness improved during the 12 month intervention and these positive changes remained after the follow up year.	Low Quality

		individualised exercise programme. Control group: received no supervised exercise or programme			
Hartfiel et al (2011) United Kingdom Aim: To examine the effectiveness of yoga in enhancing emotional wellbeing and resilience to stress amongst university employees. Study Length: 1 Year	Sample: 48 employees from a British University. Intervention Group : N = 20 N= 17 Female, Mean age: 40.6 Control Group: N=20, Women: n=19, Mean Age: 38.0	RCT Intervention Group: Attended at least 1 of 3 60 minute lunchtime classes per week for six weeks with a yoga instructor. Each participant received a Yoga CD which included a guided 35 minute home practice session.	Physical Activity: Wellbeing: Profile of Mood States Bipolar (POMS-Bi) Inventory of positive psychological attitudes (IPPA)	The yoga participants at the end of the program felt significantly less anxious ($p<0.0005$), confused, ($p<0.0005$), depressed ($P<0.01$), tired ($P<0.002$) and unsure ($P < 0.010$) and had a greater sense of life purpose and satisfaction ($P<0.009$) and were more confident during stressful situations ($p<0.001$).	High Quality

		Control Group: No intervention		Although the yoga group reported feeling less hostile than the control group, this difference was not statistically significant (p>0.189).	
Freak-Poli et al (2014) Australia Aim: To evaluate whether the participation in a four month, team based pedometer based workplace health program known to improve biomedical risk factors is associated with improved wellbeing. Study length: 4 Months	Sample: 762 adults from 10 Australian worksites.	Data was collected at baseline, four months, and eight months after completion of the programme. Intervention: The Global Corporate Challenge (GCC) consisted of a team-based, visible step count pedometer challenge. The target	Physical Activity: Reported as part of self-reported questionnaire incorporating demographic information and behavioural measures including meeting physical activity guidelines. Wellbeing: WHO-Five Wellbeing Index (WHO-5) to	Wellbeing improved immediately after the health program (P<0.001) and was sustained eight months later (P<0.001). Out of the 25% of individuals with poor wellbeing initially, 49.5% moved into positive wellbeing category immediately after program completion and sustained eight months later (P<0.001).	Low Quality

		is for teams to achieve 10,000 steps per day to virtually walk around a world map. Weekly encourage emails were sent. A website was used for logging daily steps, access to additional heath information such as the number of steps required to burn off food item were offered.	assess subjective wellbeing.		
Thogersen-ntoumani et al (2014) United Kingdom Aim: To examine well-being and work performance changes accompanying participation in a 16	Sample: 75 physically inactive non-academic employees from a large British university. 92% female, mean age= 47.68.	Uncontrolled feasibility trial. Intervention: first 10 weeks consisted of 3 groups led 30 minute lunchtime walks and 2 self-initiated week end walks per week. In the following 6 weeks, all walks were	Physical Activity: Wellbeing: MOS Health Survey Subjective Vitality Scale	Increases in perceptions of health, subjective vitality and work performance and decreases in fatigue at work were observed. Changes were sustained four months after the end of the	High Quality

weeks lunchtime walking intervention Study length: 4 months	All individuals had desk based jobs. Participants were eligible to take part in the intervention if they reported engaging in less than the recommended levels of physical activity and worked full time.	self-initiated. Participants were provided with unsealed pedometers.	The job Affect Scale (JAS) World Health Organisation Health and Work Performance Questionnaire (WHO HPQ) Positive and Negative Affect Scale (PANAS)	intervention. No changes were identified for enthusiasm, nervousness and relaxation at work.	
Puig-Ribera et al (2008) Spain Aim: To examine the impact of two walking interventions on quality of life and job performance of University employees. Study length: 9 Weeks	Sample: 70 university employees	RCT Intervention Group 1: n= 19 Walking Route Intervention Group 2:n= 25 Walking while working Control: n= 26	Physical Activity: Step Count Wellbeing: SF-12 Questionnaire Work limitations Questionnaire	Low active participants showed the greatest increase in step counts and improved quality of life and work productivity.	High Quality

Discussion

The five studies included in this review found mixed evidence that physical activity interventions can be effective in improving wellbeing in adults, with evidence of improvement being maintained for up to 2 years after intervention. Inconsistency of measures and outcomes meant it was not possible to pool the data of the included studies in to a meta-analysis. All intervention types were able to elicit some improvement in wellbeing versus control group with no active placebo, therefore the evidence can only conclude that something is better than nothing. One RCT found no significant group differences in quality of life and step counts [17]. However, when data from the two intervention groups were pooled, positive changes were found compared to controls. Therefore, suggesting that some form of physical activityis better at improving the wellbeing of individuals than partaking in no physical activity. . Although the findings demonstrated positive results, due to the differences in quality assessment of the included studies, the results should be taken with caution. Out of the 5 studies, three studies included a sample size of fewer than 100 participants [17, 18,20] . Furthermore, due to the heterogeneity of the difference in settings definitive conclusions cannot be drawn. All five studies varied in their outcome measures of wellbeing and physical activity, with two studies opting to not report physical activity in their studies.

Recommendations for future research and limitations

The evidence around the benefits of physical activity in promoting wellbeing are widely accepted however the link between PA interventions and wellbeing across workplace settings is poorly evidenced, highlighting a gap in the literature. Out of the five included studies, three high quality studies demonstrated promising results however due to the lack of placebo controls, the findings do not highlight a direct link to effectiveness.

Therefore, future studies should use rigorous designs and methods to provide conclusive evidence around workplace interventions and wellbeing.

Interventions should incorporate a theoretical framework and use behavioural change techniques[22] to implement interventions across the targeted workforce population. A recent systematic review[1] investigated a review of behaviour change techniques within workplace health promotion interventions for increasing PA. Although the studies included in the review demonstrated evidence that workplace physical activity interventions are somewhat effective, overall the results were inconclusive.

Moreover, the type of PA intervention in workplace settings may influence employee wellbeing. As yoga includes an element of mindfulness, this type of physical activity may influence wellbeing differently to traditional PA interventions such as exercise and walking. Regular exercise is intended to tone and strengthen body, whist yoga focuses on physical and mental fitness. Therefore future reviews such focus on one type of PA to conclude the effectiveness on employee wellbeing.

A key improvement issue evidence from this review indicates that further work is required to define and measure wellbeing. A limitation of this review is that the keywords used during the search strategy may not have yielded all published articles. However, the comprehensive search that was conducted explored the relationship between PA, wellbeing and workplace. It is recommended that more physical activity interventions in promoting wellbeing are conducted across workplaces using similar measures and consistent operationalisation of terms. This would enable reviews to examine the explanations for heterogeneity across different PA workplace interventions.

The review was limited to academic studies published in English Language, therefore may have missed some relevant studies published in other language or in grey literature sources. Furthermore, despite a comprehensive search of the literature across a wide range of databases, this review identified only five studies in improving wellbeing through PA interventions. The limited number of studies causes difficulty in establishing a link between the effectiveness of PA interventions in promoting wellbeing. Moreover, this review investigated all types of PA interventions in workplaces, with only one study focusing on yoga, one on exercise and three on walking. The differentiation across types of PA interventions make it difficult to reach a straightforward conclusion on the topic.

Two of the included studies were carried out in the United Kingdom, one in Spain, one study in Australia and the other in Finland. The vast difference amongst study settings raises the question of generalisability to other countries. The feasibility and the effectiveness of these interventions are potentially limited due to differences across the globe in infrastructure, workplace settings, policies and social norms.

Due to the nature of a systematic review, there remains a risk of publication bias as interventions yielding a negative or insignificant outcome are less likely to be published[23]. The heterogeneity within the studies identified makes it challenging to provide recommendations for policy makers and health professionals. Nonetheless, the evidence

gathered in this review offers promising individual studies highlighting that a form of PA intervention regardless of the type of physical activity may be better than no intervention at all.

Conclusions

This review found mixed evidence that PA interventions can be effective in improving wellbeing across workplace settings. The findings are promising however due to methodological failings there is no conclusive evidence. Current evidence indicates that employees can improve their wellbeing by participating in any form of physical activity interventions in the workplace. However, the evidence base on the most effective intervention type is inconclusive and lacks depth or theory around the range of behavioural underpinnings such as motivation and intentions. The current review has identified a need for better future research to investigate this topic further to draw well founded conclusions relating to this area of workplace health.

Author statement

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Approval

None Sought

Competing Interests

None declared

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