Impact of worksite wellness programs on health-related outcomes in white-collar workers. A narrative review

[1]Chiramal Stephiya Davis, [2]Sneha Mary Jacob, [3]Pruthviraj R, [4]Pavana Holla, [5]Sriraghunath S

[1]Lecturer, Department of Sports Physiotherapy, [2]Lecturer, Department of Community Rehabilitation, [3]Principal & Professor
[1] Department of Sports Physiotherapy,
[1]R V College of Physiotherapy, Bengaluru, India

***Abstract*— Worksite wellness programs are often implemented to increase work productivity and improve the health in employees, however, there is very little evidence on how effective these programs are. This review of literature aims to investigate the impact Worksite Wellness Programs have on the physiological and psychological health-related outcomes in white-collar workers. Electronic databases including PubMed, Web of Science, and CINAHL were screened. Publications between 2010 and 2020 were included. A total of nine studies were reviewed. Six out of nine studies showed positive improvements in physical health characteristics like BMI, fat mass, waist circumference, occupational sitting time, and step counts. Four out of nine studies showed significant differences in psychological outcomes like Quality of life, emotional exhaustion, ruminative depression, and other stress-related symptoms. No significant changes were found in job satisfaction, performance, and cognitive function. The study yielded mixed results regarding the impact of wellness programs on health outcomes. There exists strong evidence demonstrating the impact of Worksite wellness programs on major physiological outcomes such as BMI, step counts, waist circumference, sitting time, waist-to-hip ratio, and blood pressure. Significant reductions in major psychological outcomes such as anxiety and depression were reported.**

***Index Terms*— White collar workers, Health, Physical health, Mental health, Worksite wellness programs**

I. INTRODUCTION

Physical activity (PA) can be defined as "any bodily movement produced by skeletal muscles which results in energy expenditure, expressed as Metabolic Equivalents of the task (METs). Physical activity intensity is categorised as light (1.5-2.99 METs), moderate (3.5-2.99 METs) and vigorous (>6 METs) [1]. The current global recommendation on PA is 150 min of moderate-intensity physical activity or 75 min of vigorous-intensity physical activity per week to achieve substantial health benefits. Physical activity has a positive influence on both physical and mental health and is considered as an important factor in the prevention of CVD [2]. PA also lowers the risk of diabetes, breast cancer, and depression thereby eliminating 6% to 12% of major non-communicable illnesses [3].

Sedentary behavior (SB) is "any waking behavior characterized by an energy expenditure ≤ 1.5 METs during sitting or lying posture''. Common examples of SB are TV watching, computers, or other desk-based jobs. Out of all the activities, "sitting" dominates so it can be referred to as sitting time. SB and PA both have different determinants and hence should not be used interchangeably.[4]

Office-based workplaces are currently one of the largest occupational groups globally [5]. Desk-based office workers are subjected to numerous environmental cues that encourage prolonged periods in a seated static posture which is an economic hazard in the work environment. Research has shown that those in a sedentary occupation can accumulate highs of 11 hours/day of sitting time of a working day and can therefore be at risk of a 20% increased chance of premature mortality [6][7].

The poor health habits of many workers, growing rates of chronic diseases, and the rising cost of health benefits have created a new interest in workplace wellness programs. Workplace wellness is any workplace health promotion activity or an organizational policy created to support healthy behavior in the workplace and improve health outcomes. It often comprises activities like health education, medical screening, weight management, on-site fitness programs, etc. Workplace wellness programs can be categorized as primary, secondary, or tertiary prevention efforts [8].

1) Primary prevention programs include stress management, exercise, and healthy eating promotion.
2) Secondary prevention programs include smoking cessation programs and screening for high BP and other cardiovascular disease-related risk factors.
3) Tertiary prevention aims to help control or reduce the symptoms.

Over the past 20 years, WWP has seemingly taken off. These programs have moved from providing health information to counseling and fitness delivery to using monetary rewards to incentivize employers to stay well [9]. Employers have increasingly invested in workplace wellness programs to improve employee health and reduce healthcare costs, however, there is little evidence on how effective these programs are. This study is unique in reviewing the impact of Worksite Wellness Programs on health-related outcomes in White Collar Workers. Many studies related to Worksite Wellness Programs very often tend to focus more on physical health outcomes and neglect or give minimal importance to mental health outcomes. The objective of this study is to critically review the impact of Worksite Wellness Programs on physical and mental health outcomes in White Collar Workers.

II. Materials and Methods

Data sources and search strategy

A methodical search of the literature was performed to investigate the effectiveness of Worksite Wellness Programs on health-related outcomes in White-collar workers. Electronic databases including PubMed/Medline, Web of Science, and CINAHL were screened. Search strategy consisted of MeSH terms such as "White-collar workers", "Worksite wellness programs", "Mental health", "Sitting time", "Sedentary jobs'', "Health programs", as well as a combination of these terms. Papers published between 2010 and 2020 were included. Studies were required to be published in the English language and only human subjects were screened.

Study selection process

The primary researcher initially read through the titles and abstracts to identify the articles that met the inclusion criteria. After reviewing the abstracts, two authors independently scrutinized the full-text documents for relevance. Further, if any discrepancies existed, a discussion took place until reviewers were satisfied with the final inclusion.

Inclusion and Exclusion criteria

The study mostly included randomized controlled trials. Pre-posttest intervention studies, Quasi-experimental comparison studies, and cohort studies were also considered. The inclusion criteria for the studies were as follows: (a) Full-text available articles (b) studies published from 2010 to 2020 (c) included only adult working population over the age group of 18 years (d) White-collar workers of either gender which included managerial, professional, health care workers, technical, clerical and all other desk-based or sitting jobs (e) Only those studies which gave a detailed description of the type of intervention conducted, measures and results were included in the study.

Studies were excluded if they (a) did not involve the adult working population (b) included a population other than white-collar workers (e.g., blue collars/pink collars) (c) if the studies did not report the results adequately.

Data extraction

All information linked to study design, study population, sample characteristics, objectives, outcome measure, and key results were recorded on a data recording spreadsheet by principal authors.

Data Analysis

After considering the differences in the individual findings regarding the design outcomes and objectives.

III. Results

Table 1: Description of the included studies

AUTHOR, YEAR	STUDY DESIGN	PARTICIPANTS	METHODS AND OUTCOME MEASURES	RESULTS
Alexopoulos E C, 2014 [10]	RCT	**127 White collar workers** (61.4% Women) **Intervention group n=68**; Male =25, Female=43. **Control group n= 59;** Male= 24; Female =35 Median age = 40 years (33 -46) (employees were randomly assigned to groups using random numbers by online generator)	Both groups attended seminars and were given 1) Exercise brochure included benefits on mental and physical health 2) Proposed walking for at least 30minutes 4 times/week. 3) Self-rating questionnaires (beginning and end of program) Salivary cortisol samples were collected (beginning, every fifteen days, and at the end) **Intervention group** Self-set relaxation techniques- Diaphragmatic breathing in combination with muscle relaxation exercises twice a day for 20minutes for 8 weeks Stress reduction exercises (through CDs containing education on exercises) Perceived stress scale (PSS)	1)No statistically significant difference was observed between the CG and IG in the primary levels of cortisol (p v value=0.129) 2)The % of employees in the IG who listed of experiencing stress was lower at the end of the trial (80.3%) than the beginning (87.9) (p-value=0.025) 3)Stress associated symptoms were reported as reduced in the intervention group Dyspepsia (10.1%, p value=0.027); Palpitations (-10 %. p value=0.030); chest pain (-10 %. p value=0.030) 4)Psychological job demands score was reported to be remarkably lower at the end of the study(p-value=0.028) 5)In the control group, a notable increase was observed in the HLC2 and HLC3

			Job content questionnaire (JCQ) to measure mental and physical demands Health locus of control scale (HLC)	
Clemow LP,2018[14]	RCT	**92 Employees of medical Centre.** 18 to 70 years ago. Mean age -48 years **Intervention group n=46;** Systolic BP =149 ± 10.6mmHg Diastolic BP=91.3 ± 6.3mmHg **Control group n=46** Systolic BP=147 ± 10.2mmHg Diastolic BP=90.3 ± 8.7mmHg Participants were randomly assigned to either group by giving random envelopes.	BP measurements were taken thrice and questionnaires were given to assess stress and depression at the baseline for both groups. **Intervention groups** 10 weekly 1-hour session (8 to 10 participants' in each group) between 12 noon to 2 pm for 2 months. Sessions included a) William Lifestyle Workshop manual and video. b) Stress reduction c) Behavioral group intervention techniques Maslach Burnout Scale for Emotional exhaustion Ruminative Response Scale (RRS)	1) No significant differences were observed at the baseline between the IG and CG 2) systolic BP (SBP) in the IG decreased 7.5mmHg over controls between baseline and follow up from 149.1 to 140.0 mmHg (p-value =.001) A non-significant decline in DBP in the control group and a significant decline of 4.8mmHg (p=.001) in the intervention group 3)Greater decline in Emotional exhaustion (p=0.02) 4)Greater reductions in depressive ruminations (p=0.01)
Chae D, 2015[13]	Single group pre-posttest design	**N=70 White-collar employees** Age -38 years SD=8.14) Male n=34; Females n=35 Body mass index (BMI)= 23.26 ± 3.37Kg/m^2 Waist hip ratio=0.86 ± 0.06 Completers n=39 Male =19; Females = 20 (BMI)= 22.74 ± 2.66 kg/m2 Waist hip ratio=0.85 ± 0.05. Non-completers n =31 Male =16; Females =15 BMI=23.92 ± 4.05 Kg/m^2 Waist hip ratio=0.87 ± 0,06	single group pre-posttest design (8 weeks) to evaluate the **"3000 more steps''** program Pre-intervention Physical activity was measured by a pedometer Body composition analyzer to calculate fat mass, waist-hip ratio, and BMI. Perceived exercise Efficiency measured with Exercise self-efficiency scale pre-intervention.	1]) The daily no. of steps was 5,811 at pre-intervention which increased by 3,429 to 9,240 steps post 8 weeks in the IG (p = <0.001) 2) post-intervention, waist-hip ratio (t=4.729, p<0.001) and BMI (t=3.663; p=, 001) showed notable decreases. 3) Exercise self-efficiency was 41.62 pre-intervention rising to 42.80 post 8 weeks. 4)Only 39 participants completed the entire 8-week program
Michishita R, 2017[11]	RCT	**59 White collar workers** Male n = 40; Females n=19 Mean age: 40.9 ± 9.2 years	10-week active rest program for IG Participants performed 10 minutes lunch fitness	1)The time spent in moderate and vigorous-intensity increased in the IG (p<0.05) 2) A positive correlation was found between no.

		BMI =22.8 ± 2.9Kg/m^2 **Intervention Group (n=29)** Male =19; Females=10 Mean age- 40.8 ± 9.8 years BMI=23.01 ± 3.2Kg/m^2 Systolic BP 119.9 ± 16.3mmHg. Diastolic BP-76.1 ± 15.2mmHg **Control Group (n=30)** Male=21; Female=9 Mean age-41.1 ± 8.6 years BMI=22.5 ± 2.5Kg/m^2 SBP=124.7 ± 18.1mmHg DBP=77.7 ± 10.6mmHg	activity 3 times per week (a total of 29times) Program consisted 1)Warm-up 2)Cognitive Functional Training 3)Aerobic exercises 4)Bodyweight resistance training 5)Cool down Assessment of PA using an accelerometer and subjects were asked to wear an accelerometer on a belt except during sleep. Profile of Mood States (POMS2) to assess the mood states of participants Brief Job Stress Questionnaire (BJSQ) to evaluate job-related stress.	Of exercise participation and change in the item of vigor activity (r=0.467, p=0.011) 3)Post 10 weeks, the items of fatigue-inertia decreased and vigor-activity and friendliness in POMS 2 increased in the intervention group(p<0.05) 4) Interpersonal stress reduced and vigor, support from colleagues, and job satisfaction increased in the IG (p<0.05)
Eng J Y, 2016[16]	Cohort Study	**N=1365 White collar workers** Male=603; Females=762 Females=55.8% Mean age =46.2 ± 5.8 years Healthy subject n=342 Male=100; Females=242 -At-risk subjects n=774 Male=369; Females=405 -HTN subjects n=249 Male=134; Females=115 *Blood Pressure*: Systolic BP-128.6mmHg Diastolic BP-80.1mmHg Healthy BP=25% Risk of HTN=56.7% Hypertensive=18.3% -Body Mass Index (BMI) n=26.7±4.5Kg/m^2 Healthy group:24.7 ± 4.3Kg/m^2 At risk group-26.8 ± 4.5Kg/m^2 HTN group=28.8 ± 4.7Kg/m^2	Program aimed to promote employee's health& wellbeing (over 6 years) by screening and seminars Lifestyle counseling session every 6 months included a initial assessment of present eating habits and PA. (45-60 minutes). All activities were more focused on a healthy diet, quitting smoking and Stress management. Smoking Habits were assessed using a self-reported tobacco use questionnaire. Never smoked=76% (1050) Current smoker=11% (147) Former smoker=13% (170)	1) The SBP in the hypertensive group decreased 2.36mmHg per year (p<0.0001). 2) There was remarkable improvement in the SBP among participants who were at risk of HTN (p<0.001). The diastolic BP among the hypertensive and at-risk subgroups 1.76mmHg /year (p<0.001) and 0.56mmHg/year (p<0.001). 3) Compared to subjects who never smoked, a larger reduction of 4.79mmHg (p<0.001) in SBP was found in smokers. while there was no notable decline among former smokers (0.54mmHg, p>0.05) 4) For each increase in Body Mass Index, there was an increase of0.55mmHg (p<0.001).

Wattanapisit A 2020[12]	Pre-posttest Intervention study	N=103 White collar employees Male=64; Females=39 Mean age=37.82 ± 9.15 years -N=89 participants started the Virtual-run Intervention (53 Females and 36 males) Mean age=37.37 ± 9.22 years) -Only 47 participants completed the VRI. (males30 and Females 17)	Virtual –Run Intervention Program divided into phase 0, 1, and 2. for 6 months **Phase 0** **(Pre-Intervention)** 1st Exercise stages of change (ESC)- 5 stages (pre-contemplation, contemplation, preparation, action, and maintenance) Calculation of body compositions- body weight, fat mass, % of fat mass, and % of free fat mass) (Endomondo) application was used Group project - each group included of 1-2 group motivators and observers. **Phase 1** **(During Intervention**) (6 months) walking and running activities Participants recorded the activities through Endomondo 2nd measurement of body compositions (at 3 months intervention) **Phase 2** **(Post-Intervention**) 2nd ESC (participants remaining were 30) 3rd measurement of body compositions Collecting running and walking times Rewarding –running jersey for >600min participation in activities.	**1) Exercise stages of change (ESC**) - maintenance stage: no. Of participants (ESC) increased from 34.04% in phase 0(n=16) to 63.83% in phase p>0.05 **2) Bodyweight and BMI** -The median (IQR) of body weight was 63.00, 65.00, and 64.00 in phases 0, 1, and 2 respectively. The change in body weight was not significant p>0.05). **3) Fat mass and fat percentage** **-**showed no significant results -the median (IQR) of fat mass (in kg) was 17.00(8.00),17.00 (10.0) and 17.00(10.0) in phase 0, phase 1 and phase 2.
Song Z, 2019[16]	RCT	**N=32,974 Employees** from 160 worksites) **20 Treatment worksites=4,037 employees*.* Mean age=38.8 ± 0.7 years Male=2104(53.7%); Female=1933(46.3%). Blood pressure	**Control Worksites** Received no wellness programming. **Treatment group** The worksite wellness program was implemented for 18 months-comprised of 8 modules. 1)Nutrition	1)Treatment groups were reported to be engaging in regular exercise by8.3% points (95%CI,3,9-12.8; unadjusted<0.001), adjusted p=.03 2) Treatment group managed weight by 13.6% points (treatment group

		SBP-124.9mmHg DBP-80.3mmHg Body mass index=29.9 ± 11.0Kg/m^2 **20 Primary control worksites=4106 employees* Mean age=38.3 ± 0.5 years Male=2151(54.5) Females=1955(45.5) **120 Secondary control worksites=24,831 employees* Mean age=38.7 ± 0.2 years Male 15,597; Females=13,339 SBP=124.3mm Hg DBP=79.7mmHg (BMI)-29.7 ± 7.1Kg/m^2 Individuals were assigned to treatment or control sites based on their worksite at the time of randomization or initial employment	2)Physical activity 3)Stress reduction and prevention (each module lasted for 4 to 8 weeks) - *Self-reported health behaviors* 1) Exercise->3days/Wk of moderate exercise. 2)Diet-whole grain & reduced-fat foods,2 cups of fruits, and 2.5 cups of vegetables /day 3)Smoking 4)Alcohol use (no. of drinks per week) Clinical measures of health date were measured-BP, BMI, and cholesterol levels. Health care spending and utilization Employment outcomes were gathered for employment records and included absenteeism and tenure	69.2% vs Control grp 54%). 3)Treatment group-4.0 drinks and control group-4.5 drinks p=0.04 4)no significant effect on clinical measures of health (all P values>0.05) 5)No detectable effect of health care spending or utilization (P>0.05) 6) Workers were employed for a mean of 305.9 total days in the IG vs 308 in the CG. Thus, no effect of absenteeism or tenure (all P values>.05

	Quasi-experimental comparison group pre-posttest design	N=264 administrative staff Mean age=42 ± 10 years Females=171 Intervention group n=129; 87 Female (BMI)=25.5 v 4.1Kg/mm SBP=120 ± 16.7mmHg DBP=77.6 ± 11.9mmHg Sitting time = 446.6mins/day Step counts=8862per day Control group n=135; females 84 (BMI)=25.9 ± 4.7 SBP=122.4 ± 1.8 DBP=78.9(10.8) Sitting time=404.6 min/day Step counts=9920 per day	**Intervention group** 19 weeks Sit less and move more web-based program At the baseline, both CG and IG were given: Pedometers (to record step counts) Diary- to register daily sitting time Measurement of BP W@WS web program for the IG which consists of incidental walking and short walks. *Ramping phase (1 to 8weeks) *Maintenance phase (9 to 19 weeks) *Follow-up **Control group** asked to maintain habitual behavior	1) Occupational sitting reduced in the IG from baseline to follow up -414.2±129.minutes ($p<0.05$), whereas the CG group maintained sitting time in the ramping and maintenance stage but decreased at follow upstage. 2)No significant synergy were found between groups. Remarkable differences were found in both groups for changes in step counts (+1,432 steps/counts('$p<0.001$) in maintenance stage. - Follow up done at 2 months showed increases in the step counts (+1417 step/counts; $p<0.001$)
Edwardson C L, 2018[15]	RCT	**n=146 Desk-based workers** Mean age=41.2 ± 11.1 years BMI=26.2±5.9Kg/m **Intervention Group n=77** Age=41.7+_11.0 years Woman=56 men=21 BMI=24.8 ± 5.4Kg/m^2 **Control Group=69** Age=40.8 ± 11.3 years Woman=60; Men=9 BMI=26.7 ± 6.5Kg/m^2 ***AcitvPAL values (IG group)***	**The intervention group** received 12 months of SMArT work intervention for short(3months), medium (6 Months) and long term (12months). ****Organizational Strategies*:** Regular newsletters to all staff to encourage activities ****Environmental Strategies:*** *1)* Height adjustable work stations-to enable them to sit/stand at work *2*) Choices of desk-electric desk and platform desk 2)Goal setting booklets	1) A significant difference b/w groups (in favor of IG in occupational sitting at 12 months (-83.28min/day; 94% confidence interval-116.57 to -49.98, P=0.001). 2)At 3 months<0.001) and at 6 months (-64.40min/day<0.001) 3) no difference was found for MVPA at any point (P>0.05) 4) Difference in 6 and 12 months in favor of IG for performance and job

		1)Occupational sitting =357.9min/day 2)Prolonged sitting(>30min) =166.7min/day 3)Standing =92.7min/day *ACTi Graph values* 4) MVPA (Moderate to vigorous physical activity) =34.84min/day. ***Control group values*** 1)sitting time =354.1min/day 2)Prolonged sitting>30min =168.8min/day 3)Standing =104.2min/day 4)MVPA = 34.94min/day N=50 Health workers	***Individual and Group Strategies:*** 1) ActivPAL device to measure occupational sitting for 7 consecutive days which calculated daily sitting, prolonged standing. Standing and stepping time. 2) ActiGraphLink Accelerometer to measure moderate to vigorous physical activity (MVPA) 3)Job satisfaction, performance, and occupational fatigue 4) Mood and affective states-mood Affect Adjective checklist for Anxiety, depression, and hostility. **Control Group** Participants in CG were excluded from any lifestyle advice, guidance, or results from the ActivPAL device. IG continued with normal practice for 12 months Intervention group-6-week supervised concurrent chair-based exercise program (stretching, strength, balance exercises, aerobic dance; 5 days/week, 30–40 min/day, 2 workouts/day lasted 15–20 min) in the hospital.	fatigue but not in job satisfaction 5)Variations were found for anxiety and dysphoria at 6month in favor of IG

Description of Health – Related Outcomes

1. Lifestyle Characteristics

Six out of nine studies showed remarkable differences in the lifestyle characteristics of the participants. The daily number of steps was 5,811 before intervention which increased by 3,429 steps to 9,240 posts 8 weeks. There was a significant decrease in the BMI, Waist-hip ratio, and fat mass in the participants and a statistically substantial difference in the fat mass between program completers and non-completers was found. There was no significant difference in self-efficiency or perceived benefit of exercise. In another study, the time spent in MVPA increased in the intervention group whereas in the control group, the inactive time was reduced and the time spent in light intensity was found to be more. The usage of stairs during work was reported to increase in subjects who wore pedometers [11].

In one study, after 18 months, the rates of self-reported outcomes increased in the intervention group as compared to the control group for engaging in regular exercises (69.2% vs 61.9%) and for actively managing weight (69% Vs 54%) [17].

Anna-Puig et al reported a significant reduction in waist circumference by 2.2 cm from initial to follow up while in the Control group, there was a decline by 3.1cms during the same period [18]. In two studies, the daily occupational sitting time was found to be reduced in the intervention group [15][18]. No difference was found between MVPA and daily stepping in both groups.

No changes in body composition were found. Fat mass and % of fat mass, fat-free mass, and its percentage showed no significance in the intervention period. However, 51% of participants reported improvement in Exercise stages of change (ESC), and the Virtual intervention improved motivations toward physical activity in participants [12].

2. Cardio-metabolic Markers

Only one study measured the cortisol levels in participants found no statistically significant variation between both groups in the primary levels of cortisol, however, there was an increase seen in employees aged over 40 in comparison with younger employees [10].

In a study by Lynn Clemow, the intervention participant's systolic blood pressure (SBP) was reduced by 7.5mmHg over controls between baseline and follow-up in 10 weeks. The difference in the diastolic measurement was not significant [14].

No significant changes were observed in SBP and DBP in the healthy subgroup over 6 years in the findings reported by J. Y. Eng. However, the SBP in the hypertension subgroup was reduced by 2,36mmHg/year. Significant improvements in the SBP were found among participants who were at risk of HTN. Significant improvements were found in the Diastolic BP among hypertension and at-risk subgroups. This study assessed the effectiveness of low-intensity workplace health program on BP and found that the overall SBP improved by 0.1mmHg/year and DBP improved by 0.2mmHg/year [16].

3. Mood States

Four out of Nine studies measured the mood states of participants and significant differences were measured. In a study done by Michishita et al, post 10 weeks of intervention, "fatigue-inertia" were reduced, and vigor activity and friendliness in the POMS2 elevated in the Intervention group. BJSO items of interpersonal stress were found to be reduced in the IG [11].

Another study reported that the percentage of employees in the IG experienced less stress at the conclusion of the test (80%) to than of the beginning (87%). Symptoms like dyspepsia, palpitation, and chest pain were found to be reduced [10].

Significant improvements in the scores of emotional exhaustion and depressive rumination, as well as anxiety, dysphoria and hostility in favor of the intervention group, were noted [15].

4. Job Satisfaction and Performance

Three studies assessed job satisfaction and performance level in participants. The job demand score was found to be remarkably reduced at the conclusion of the study and an increased level of satisfaction with job was found in the treatment group [10]. A significant difference was reported in job dedication and job absorption at 12 months. Variations at six and twelve months in favor of IG were found for job performance and recovery from work fatigue. No changes were found for job satisfaction [11].

5. Cognitive Function

Reaction time at 3, 6, and 12 months for the corresponding level all in favor of IG compared with the Control [15].

6. Quality of Life

Quality of life was examined in one study by Edwardson et al which included four individual domains and between-group differences were found in two domains i.e., psychological and environmental domains in favor of IG [15]. Participants in the IG compared with CG reported an enhancement in the psychological environment and overall quality of life.

IV. Discussion

Worksite Wellness Programs:

Our findings suggest that worksite wellness program has a positive impact on physical and mental health outcomes in White-collar workers. A total of nine studies were evaluated. Different worksite wellness interventions were used in all the studies. Two out of Nine studies used multi-component intervention which included organizational strategies, behavioral and environmental strategies like height-adjustable workstations, regular exercise sessions, stress, and weight management programs.

Five out of Nine studies included Behavioral interventions like the active rest program 3000 more steps program and stress management techniques [13][14][20]. A study conducted by Anna Puig-Ribera used an Internet-delivered intervention named "W@WS". W@WS is an effective web-based program used to reduce occupational sitting time [18]. Watt1anapisit et al included a virtual run intervention program which is a three-phase intervention that records running and walking activities using an online platform

Alexopoulos et al emphasized educational interventions which consisted of educating the employees about relaxation techniques and other lifestyle health management programs [10].

Worksite wellness programs and Physiological Outcomes:

Six out of nine studies showed significant differences in physical health characteristics. The web-based program was effective in decreasing the everyday occupational sitting time while simultaneously it showed an increase in the daily step count in employees. The observed changes in step counts and sitting time were significantly associated with an average Waist circumference reduction. The program also showed a positive correlation in preventing chronic diseases.

Another study by Duchkee showed a positive effect on BMI, step counts, fat mass, and waist-hip ratio and thus had a positive correlation but it showed a negative correlation for self-efficiency and perceived benefits of exercise in employees [13]. In another study, though the program improved motivation towards PA in employees, there were no significant improvements in BMI and therefore had a negative impact on the participants [12]. The practice of active rest programs showed a positive correlation in improving PA and personal relationships in employees [11].

In the remaining two studies which included multi-component interventions, greater rates of some positive self-reported health behaviors were reported but had a negative correlation for clinical measures of health, healthcare spending, and employment outcomes [17]. No significant difference in the cortisol level of employees and thus the strategy had a negative impact [10].

Significant reductions in the SBP were found. The effect on DBP was moderate and was non-significant [15].

One out of the Nine studies corresponded with a specifically stressful period because of the increased financial crisis which had a negative impact on the income and safety in Greece [10].

Worksite wellness programs and Physiological Outcomes:

Four out of Nine studies evaluated the psychological health outcomes of the participants. Scores of emotional exhaustion and depressive rumination showed substantial betterment and had a positive impact [15]. In another study, there was a positive correlation between no. of exercise sessions and a change in the items of vigor activity in POMS2 [11].

Significant reductions were reported in stress-related symptoms like dyspepsia, chest pain, palpitation, and psychological job demands and thus had a positive effect [18]. A study by Edwardson also showed significant improvements in the dysphoria, hostility, and anxiety level of the participants [15].

The type of strategy administered may play a major role in determining the outcome, whether it be physiological or psychological. The highest level of evidence was found in support of Multi-component strategies followed by Environmental strategies leading to an overall reduction in sitting time and betterment of other health-related outcomes. Environmental or Multi-component strategies particularly incorporating sit-stand workstations found significant changes over other strategies.

Implications for Practice:

Multicomponent strategies incorporating behavioral, educational, organizational, or environmental strategies are beneficial in combating the health risk behaviors, with more emphasis on the environmental modifications

Limitations:

Heterogeneous study methods and outcome measures were recognized across the studies, and thus, a meta-analysis cannot be performed. Similarities between publications were difficult because of the diversity of outcomes interventions reported, as well as inadequate information about the programs provided in many of the articles.

Future Recommendations:

a) Common units to be used for reporting outcomes to facilitate comparison of future studies
b) RCTs with long-term follow-up (>1 year) assessments are needed to understand the actual impact of the different strategies on health and work-related outcomes and their related reduction in sedentary time
c) RCTs incorporating innovations like bike desks in offices, and cycling workstations should be considered
d) Working populations having little or no flexibility and control over work such as workers involved in call center work and data processing, and university employees should be addressed in future studies.

V. CONCLUSION

The studies yielded mixed results regarding the impact of wellness programs on health-related outcomes. There exists strong evidence demonstrating the impact of worksite wellness programs on major physiological outcomes such as blood pressure, BMI, waist circumference, sitting time, step count, waist to hip ratio, fat mass, and so on. Significant reductions in major psychological outcomes such as stress-related symptoms, anxiety, and depression were reported. However, the evidence on the impact of WWP on domains such as work productivity, job performance, absenteeism, and cognitive functions is insufficient or remains inconclusive. The validity of those findings is reduced by the lack of meticulous evaluation.

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