

Original Research Article

Action planning and coping planning based intervention on physical activity practice among desk-based office employees: a non-randomized explanatory mixed method study

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Received: 19 May 2022

Accepted: 08 June 2022

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ABSTRACT

Background: Desk-based office workers have sedentariness in the workplace due to the nature of their work. So we aimed to determine the effect of action planning and coping planning based physical activity intervention among participants and explore its utility.

Methods: This study was conducted among office staff employed in six to eight hours of desk-based office work of JIPMER, Puducherry during November 2020 to January 2021. Simple random sampling of employees from available database was done to select 150 participants based on inclusion criteria. Intervention was individual specific action and coping planning for physical activity (PA). Change in the level of PA and its stage, body composition parameters and step-counts were measured at end-line to assess the effect of intervention supported by the qualitative interviews.

Results: An adequate level (≥ 600 METS) of physical activity among participants in the intervention group increased by 42% among Total MET minutes spent ($p < 0.001$). Muscle mass improved in the intervention arm by 4% ($p > 0.001$).

Conclusions: Implementation plan is effective in improving the physical activity level of the participants and adopting healthy PA behaviour and advocates for health promoting workplace.

Keywords: Physical activity, Barrier elicitation, Action and coping planning, Desk-based office employees, Healthy workplace

INTRODUCTION

With the advent of industrialization and modernization, machines have transformed the work of human beings and led to a more physically inactive environment. One in four adults worldwide (21.4%) and 80% of adolescents has inadequate PA.¹ In ICMR Indian diabetes study, the prevalence of physical inactivity was 55.4% among adults. The absence of recreational activities in Tamil Nadu has been reported as 93.1%.² In Puducherry, the overall inactive population is 49.7%.³ This widening physical inactivity has a negative impact on the health of individuals, as well as increases health-related costs worldwide.³ The risk of various diseases is lower for those

who are physically active as compared to the sedentary lifestyle.¹ The WHO recommends 150 minutes of mild to moderate or 75 minutes of vigorous physical activity per week.⁴

Desk-based office workers have sedentariness in the workplace due to the nature of their work. Physical inactivity was found to be 70% among group C employees in Puducherry.⁵ In the current situation with lockdown and COVID related restrictions, individuals have adopted a sedentary behavior.⁶ The WHO has demonstrated that the work-setting has been identified as one of the suitable places for health promotion to improve physical activity levels. Approximately eight to ten hours are spent on work

daily. Evidences from literature have shown the effectiveness of interventions/solutions in improving physical activity in the workplace. Workplace health and wellness programs have shown a reduction not only in unhealthy outcomes but also in sick leave, health costs and compensation costs by 28%, 26% and 30% respectively.⁷

Planning is vital in overcoming obstacles. Planned behavior theory is a motivational model used in the area of health activities which is the key determinant for an action. Action planning is a process with simple steps by specifying when, where, and how to act according to one's objective purpose. Coping planning prepares a person to overcome obstacles.⁶

Time constraints, apathy and lack of motivation are commonly stated barriers and restrictions for physical activity.⁷ Strategies such as pedometer use, goal setting aligned with feedback and health education can improve physical activity in the short period. Pedometers have been used to improve physical activity levels by setting daily target steps, and in many studies pedometers have been shown to be effective in lowering body mass index and blood pressure.⁸ Body composition assessment devices are considered a promising approach in measuring the size of characteristic tissues over time. Bio-impedance analysis is a growing method for the evaluation of body cells in nutrition studies, sports medicine and assessment of hydration rate, fat mass and fat-free mass among healthy and sick people.⁹ However, additional steps need to be taken to explore strategies for improving and maintaining physical function over the long term. The primary aim of the study was at studying the effectiveness of strategies of planned behavioral theory; action planning and coping planning in improving physical activity levels and changes in body composition.

METHODS

Study design

A non-randomized explanatory mixed method study was conducted in two phases among the office staff from three different blocks in a tertiary care hospital Puducherry. The study was conducted from October 2020 to January 2021. In the first phase, we assessed the physical activity level and the body composition components followed by the second phase to explain the utility of intervention in improving physical activity.

Study population, sample size and sampling

We included staff aged 18-58 years who are employed in six to eight hours of desk-based office work. Staff who could not be followed for consecutive three months and having any disability that prevents from physical activity were excluded from the study. Assuming 20% increase in the physical activity among intervention group, with the power of 80% and 95% confidence interval and 5% loss to follow up, the calculated sample size for the study was 200.

Two institutional blocks were non-randomly allocated into intervention and control group. Simple random sampling from the database of employees was used to select the participants. At end of three months of intervention, six participants were selected using maximum variation sampling based on compliance to physical activity plan and in-depth interviews were conducted.

Study tools and intervention

The study was undertaken in four steps; baseline assessment, intervention, end-line assessment and self-administered questionnaire was used to collect socio-demographic details. Physical activity levels in terms of metabolic equivalent (METs) was assessed using global physical activity questionnaire (GPAQ) which consisted three domains namely workplace, travel and recreation. Stage of change was measured using self-administered questionnaire. Body composition parameters such as fat percentage and muscle mass were measured using OMRON bio-impedance analyzer. Formative research was conducted based on literature search and discussed with subject experts and specialists for development of intervention strategies. Weekly activity planner with four components of exercise which included strength, flexibility, balance and endurance was developed. Discussion meetings were conducted to elicit barriers and respective coping strategies were framed. Daily reminders with exercise demonstration videos were sent through WhatsApp platform and responses were recorded. Pedometers were provided and step-counts were noted. An interim followed up was done. Control group received only pamphlets. The details were re-assessed at the end-line and qualitative interviews were conducted with in-depth interview guide to explore the utility of the plan. Pilot study was done to examine the feasibility, applicability and objectivity of the questionnaire.

Data analysis

Quantitative

Data were entered in EpiData Manager Software (EpiData Association, Odense, Denmark) and analyzed using Stata version 14 (Stata corp. Texas, USA). Categorical variables were summarized as frequencies and percentages, and continuous variables were summarized as median with interquartile range (IQR). Mann Whitney U test was used to assess the change in number of METs in last seven days between the intervention and control group. The comparison of categorical variables such as BMI, visceral fat percentage and muscle mass percentage between the groups was done using Chi squared test or Fishers exact test. Change in physical activity levels, body composition measures such as BMI, visceral fat, muscle mass before and after the intervention was compared between the groups using difference in difference analysis. P value less than 0.05 was considered as significant. The IDIs were transcribed and thematic analysis was done. Deductive coding was done and represented as themes, sub themes

and codes. Conceptual framework was derived based on the results.

Ethical consideration

The research protocol was reviewed and approved by institutional scientific and ethics committee and institutional administration. The trial was registered in CTRI (REF/2020/03/032108). Informed consent was obtained from the participants and confidentiality of the data was assured.

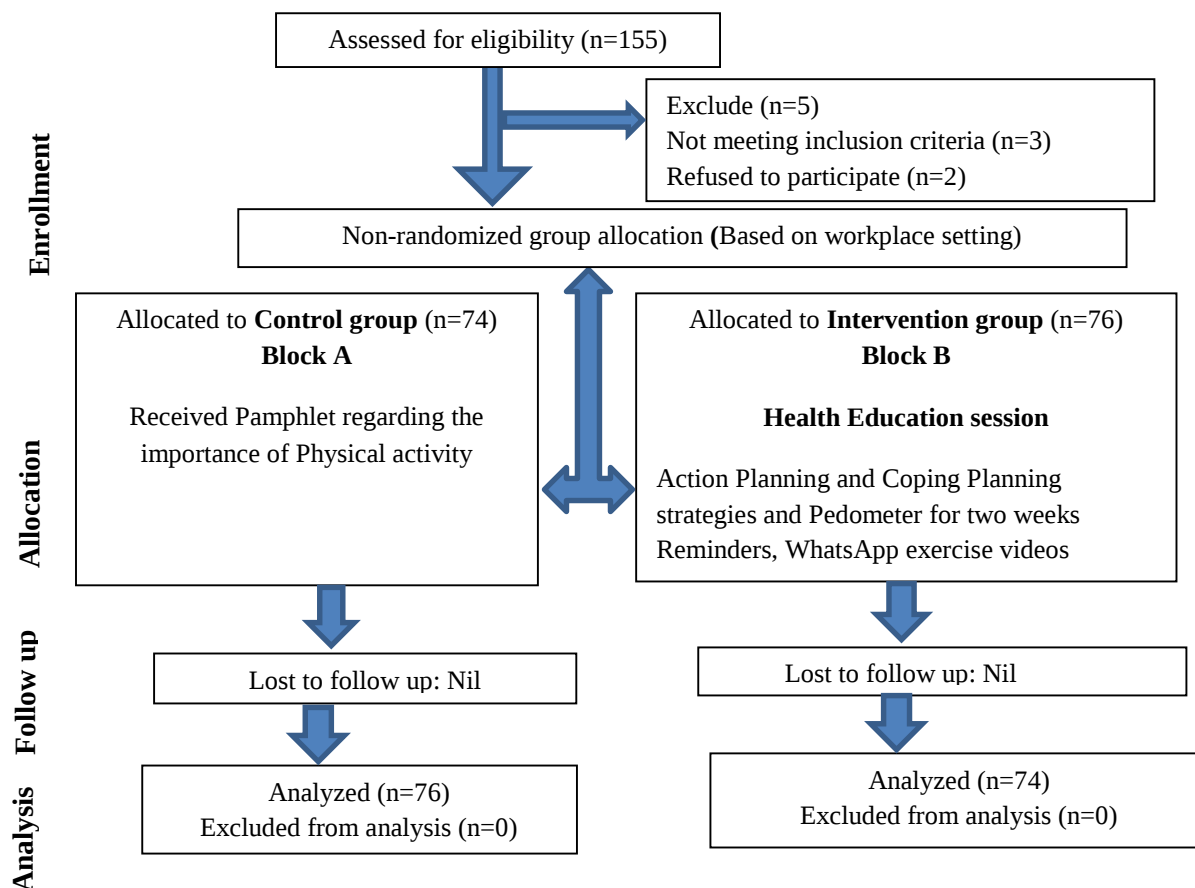


Figure 1: Participant flow diagram of the study.

RESULTS

A total of 150 participants were recruited into the study. At baseline, the study groups were not comparable with socio-demographic details except work experience among study groups. Most of the participants were in the age group of 30-58 years. Two-thirds of the participants were males (Table 1). At the end of the intervention, median METS increased by 66% in the intervention group, while their sedentary time was decreased by 25% (Figure 2). Median total METS in the IG had improved from 1877 in the baseline to 3205 at end-line whereas it had decreased from 1925 at baseline to 1587 at end-line in the CG (Table 2). There was no significant change in the muscle mass and BMI among the groups at end-line (Table 3). At baseline, important barriers towards physical activity were found such as lack of resources and skills, social influence and fear of injury. The coping strategies listed for the concerned barriers. Planning the activities and allotting time for physical activity (23%) was found to be a major coping skill practiced by the participants followed by

involvement with friends and family (18%), framing schedule for a day (8%) etc. Nearly 40% of the participants practiced the plan for about 3 to 4 days. There was a significant increase in action phase from 16% to 77%. At end-line there was a significant reduction in the perceived barriers such as lack of skills and resources and increase in proportion of participants in action phase was increased by 60%.

Qualitative exploration of the effect and utility of the physical activity program

Among six purposively chosen participants, interviews were conducted in their work-setting. Results were generated as themes, sub-themes and codes (Table 4). The participant used their free hours to perform activities and it was found to be easier way. Physical activity related improvement and feeling wellness further helped the participants to adopt an active behaviour. Participant's past experience is a motivating factor which was stimulated by the plan in improving physical activity. Daily reminders,

seeking companionship, self-monitoring and target-fixing with help of pedometer were additional cues to action. Increased work-related performance led to the positive outcomes felt by the participants that enabled to make some changes in their routine to adapt a healthy behaviour. Work at home and family commitments were barriers from preventing the participants to be active. Laziness, lack of

time and fear of COVID transmission were found to be the persisting barriers. Weight reduction and pain relief were initial expectations of the participants. Relief of back pain motivated the participants to comply with the plan. However non-compliant participants did not get satisfied with their expectations.

Table 1: Socio-demographic and morbidity details of desk- based office employee (N=150)

Variables	Intervention arm n=76 (%)	Control arm n=74 (%)	P value
	N (%)	N (%)	
Median age (IQR), in years	38.5 (32-47.5)	42 (35-50)	
Age (in years)			
20-30	15 (20.0)	10 (12.3)	0.182
31-40	33 (43.2)	25 (34.2)	
41-58	28 (36.8)	39 (53.5)	
Gender			
Male	54 (70.3)	50 (65.7)	0.636
Female	22 (29.7)	24 (34.3)	
Work experience (years)			
0-10	48 (63.1)	33 (44.6)	0.023*
11-20	6 (7.9)	24 (32.4)	
21-30	0 (0.0)	0 (0)	
>30	22 (29.0)	17 (23.0)	
Education			
Higher secondary	14 (18.4)	8 (10.8)	0.297
Under-graduate	41 (54.0)	40 (54.0)	
Post-graduate	21 (27.6)	26 (35.4)	
Presence of comorbidity[†]			
Yes	14 (18.5)	22 (29.7)	0.105
No	62 (82.5)	52 (70.3)	
Chronic musculoskeletal complaints[‡]			
Yes	24 (32.0)	15 (20.3)	0.114
No	52 (68.0)	59 (79.7)	

Note: *significant at $p < 0.05$; Chi square test; [†]includes diabetes, hypertension, asthma and thyroid; and [‡]includes low back ache and cervical pain.

Table 2: Difference in levels of physical activity among the study group at baseline and end-line.

Physical activity in METS	Groups	Baseline	End line	Difference in difference	P value
Total	Intervention	1877.4	3205.7		<0.001*
	Control	1924.9	1587.0		
	Difference	-47.5	1618.8	1666.3	
	P value	0.867	0.000*		
Vigorous	Intervention	88.4	532.1		0.01*
	Control	153.5	154.8		
	Difference	-65.	377.2	442.387	
	P value	0.606	0.003*		
Moderate	Intervention	1788.9	2673.6		<0.001*
	Control	1771.3	1432.1		
	Difference	17.5	1241.5	1223.9	
	P value	0.945	0.000*		
Sedentary	Intervention	174.6	125.5		0.093
	Control	214	214		
	Difference	-39.3	-88.4	-49	
	P value	0.05*	0.000*		

Note: *- Significant at $p < 0.05$.

Table 3: Anthropometry parameters at the end of intervention among the study groups

Components	Intervention n=76 (%)	Control n=74 (%)	P value
	N (%)	N (%)	
BMI category (kg/m²)**			
Underweight (<18.5)	2 (2.67)	1 (1.35)	0.322
Normal (18.5-22.9)	10 (12.0)	3 (4.05)	
Overweight (23-24.9)	13(17.3)	12 (16.0)	
Obese (>25)	51 (68.0)	58(79.0)	
Muscle mass in percentage§			
20-29.9	45 (60.0)	48 (64.9)	0.554
30- 39.9	29(38.7)	26 (35.1)	
>40	2 (1.33)	0	
Visceral fat in percentage			
>13	42 (56.0)	53 (71.7)	0.036†
<13	33 (44.0)	21 (28.3)	

Note: Body mass index (kg/m²) - Asia Pacific Classification; †-Significant at p<0.05; ‡-Chi square test; §- Fisher exact test.

Table 4: Utility of the implementation intention technique on physical activity.

Themes/domains	Codes	Quotes
Utility of the intervention strategies	Utilization of free time. Improved work at farm Pleasant flashback Cues to action	“Lack of time is my barrier so I utilized time whenever I am free to do my exercise plan mostly I prefer a walk even during office hour.” “It affected my performance in a positive way. After following up the exercises I could feel the change and perform the activities in a better way” “I could see me at younger stage of life... that was pleasant flashback...because I left cycling back 25 years ago I wanted to buy a cycle and do it again to bring back my days” “It had a positive impact on my activity because it made to follow the activity plan in a regular way.” “Self- monitoring made me perform better. I was feeling very good to see my improvement in numbers from 5000 step- counts to 7000 within 2 days”
	Increased work performance Positive outcomes Persisting barriers	“Many changes I felt. My body was feeling very good. As I told you, tiredness level became low. I felt being active.” “Once I started doing exercises my back pain improved well and I was feeling active” “Yes! Laziness, lack of time due to busy schedule especially because of work is my barriers and I get tired too.” “I still have the fear of going out as I was doing before due to Covid spread! Because I have elderly people at my home. I don't want to move out unnecessarily.”
Expectations about the plan	Expectations about the plan Fulfillment of Expectation Failure to meet expectation	“I thought I should be fit and reduce my weight since I gained some weight. So my main aim was to reduce my weight.” “Initially I had back pain due to prolonged sitting. Those problems got rectified. I mainly followed the plan for this... and I was happy that I am better now.”

Continued.

Themes/domains	Codes	Quotes
Suggestions for improvement	Recreational events Live demos. Dedicated space at office	"My walking habit was reduced due to the lockdown period hence it was bit difficult for me to catch the way I was walking before." "I have not reduced my weight because I could not perform daily exercise".
		".....conducting sports day and events will create a positive impact among other office workers." "Live demonstration and classes at office would have improved my activity level much better" "Dedicated space with privacy at office would have better for sustaining my plan against hindrance".

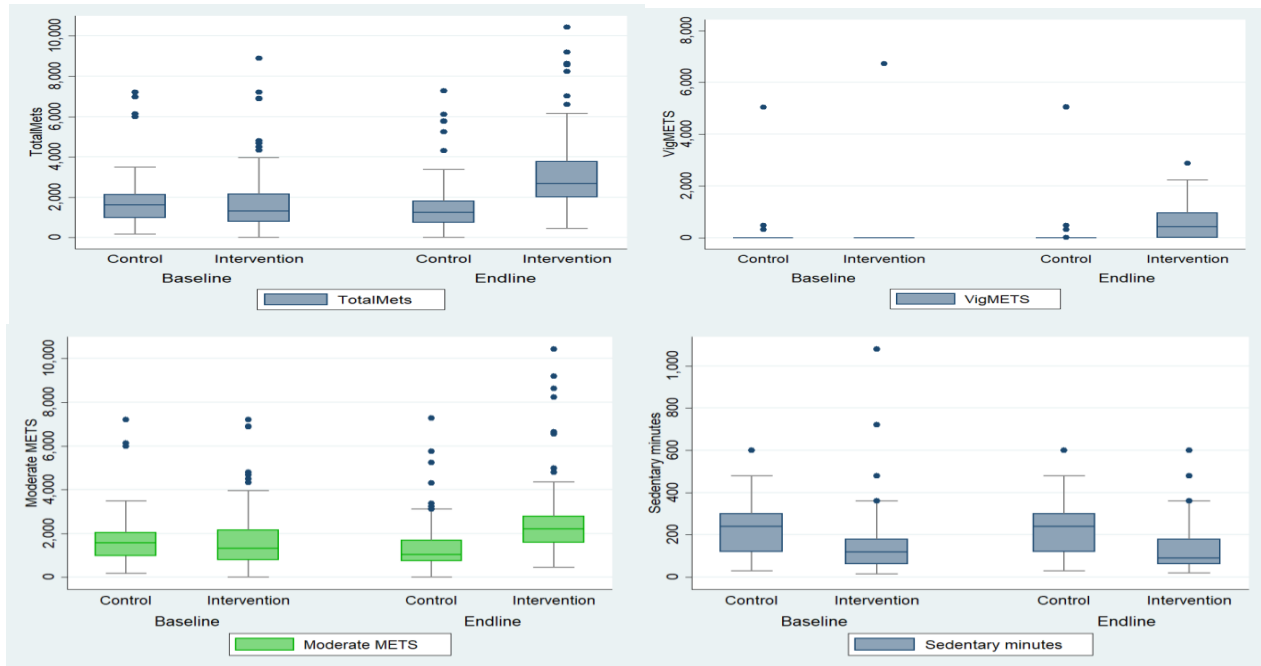


Figure 2: Comparison of physical activity levels among study groups (a) total METS; (b) vigorous METS; (c) moderate METS; and (d) sedentary minutes.

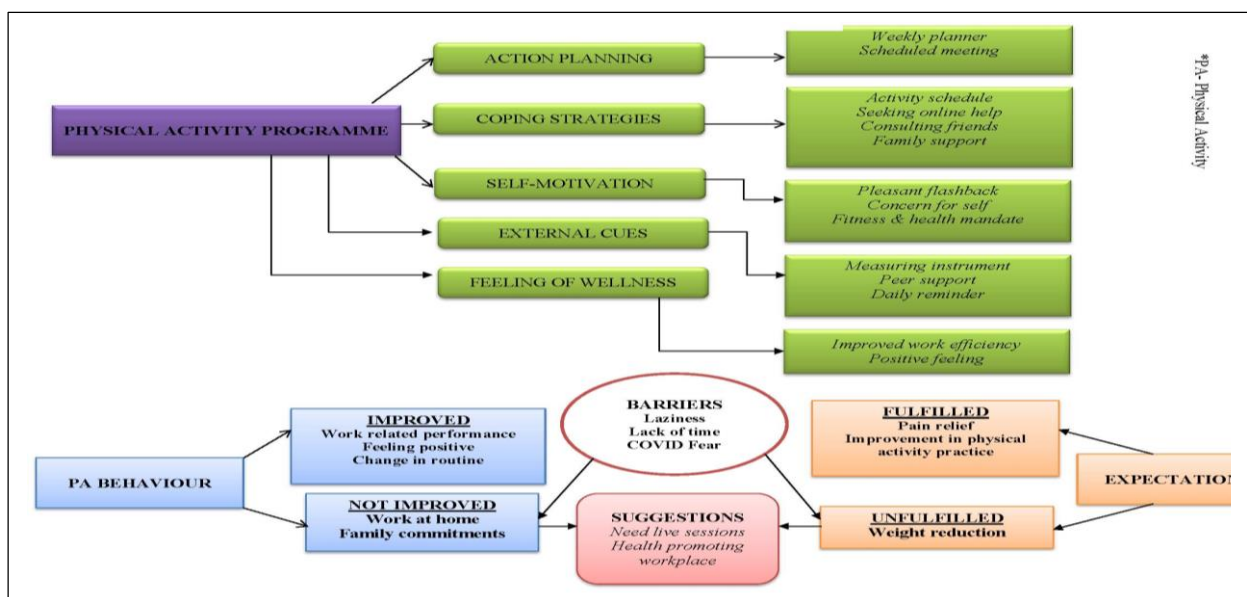


Figure 2: Comparison of physical activity levels among study groups (a) total METS; (b) vigorous METS; (c) moderate METS; and (d) sedentary minutes.

DISCUSSION

A non-randomized explanatory mixed-method intervention study was conducted among selected desk-based office employees of a tertiary care institution to determine the effectiveness of action planning and coping planning implementation intentions in improving physical activity levels.

Effect on physical activity levels and body composition measurements

The intervention included eliciting barriers for physical activity, action planning and coping planning along with reminders and motivational goal setting through a workplace program for three months. At the end of the intervention, total METS had improved by 71% in the intervention group whereas it has decreased by 17% in the control group. Increase in moderate physical activity was due to adherence to the fitness plan which included simple exercises to improve strength, flexibility and endurance. There is significant increase in number of days and minutes of moderate sports activity (five times). Time spent in sedentary activities decreased significantly by 28% in the intervention group and proportion with adequate physical activity had improved significantly from 83% to 97% in the intervention group whereas it increased by 10% in the control group. This can be due to the sedentary behaviour of the participants in the control group.

In this study, use of pedometer also additionally helped them to visualize their targets and streamline their physical activity routine. At end-line, increase in step-count was found to be 91% among the intervention group participants. This can be due to the self-monitoring of the step-counts and enhanced walking practice.

Activity tracker is used as an intervention strategy to increase the number of step-counts which stimulated the participant's walking habit and resulted in behaviour change for physical activity. Similar result was found in study conducted where activity trackers were used as an intervention to improve physical activity among workers in a clinical workplace setting with improved step-counts (644.8 $p \leq 0.01$) compared to baseline.¹⁰ Another study by Varna et al also demonstrated an increase in step counts by 41% and physical activity levels in terms of metabolic equivalents (MET) minutes by 28.3% at the end of one week.⁸

At end-line, proportion with obesity had decreased by 3% in the IG while it increased by 8% in the CG. This can be due to increase in sedentary behaviour during COVID-19 lockdown restrictions. Participants with high visceral fat had decreased by 14% in IG. This was supported by the study conducted by Nanda et al where guidance regarding the activity trackers led to reduction in body composition measures such as body fat mass ($p=0.01$), fat percentage ($p<0.01$) and visceral fat percentage ($p<0.01$).¹⁰

Utility of implementation intention techniques

In our study, action planning was self-framed by the participants before starting the exercise schedule. Action planning consisted of when, where and how to be physically active while coping planning was framed according to the barriers they specified. It was found that these plans were helpful in adhering to the plan. This result was in line with the study conducted to determine the adoption and maintenance level of physical activity in younger, middle, and older adults using the physical activity plan. It was found that planning which was made and assisted by the interviewer was useful for middle and older adults while a self-administered action plan was useful for younger adults. It was found that coping planning was useful for long-term compliance with physical activity in adults and Coronary heart disease patients.¹¹ Elicitation of barriers and coping planning is vital for improving physical activity level. In our study, lack of resources, skills, and companion accounted for majority of the barriers to physical activity. Participants in our study also expressed that absence of a platform for physical activity guidance at their workplace. Time constraints and family activities were the main barriers to physical activity participation in a study.¹²

In our study, participants were encouraged to propose barrier-specific coping plans to improve compliance towards their activity plan. The involvement of friends and family members was the most frequently adopted coping strategy. Similarly, a positive association between social support from friends and family on physical activity was resulted in other studies.^{1,13} At end-line, it was found that implementation intention was successful in reducing the perceived barriers like lack of resources, skills, motivation and fear of injury. The structured physical activity education program was effective in reducing skill gap and motivation. However, barriers such as lack of time and companionship, perceived strangeness while performing exercise still persisted. This highlights the need to make physical activity as a social phenomenon and organize workplace group events in line with 'Fit India Movement'. Reminders and social groups were helpful in sustaining the intervention in our study. Daily updates in WhatsApp were followed for three months and responses were noted. It was found that more than two-thirds (67%) of the participants were adherent to the plan on most days of the week. It was stated in interviews that the participants with musculoskeletal conditions could appreciate relief after performing the exercises. This finding is supported by similar results from other studies.¹ This study also utilized the Trans-theoretical model framework for promoting behaviour change progression towards adopting and maintaining behaviour. Participants were encouraged to move from pre-contemplation, contemplation stages to action and maintenance stages. Qualitative exploration of the intervention gave insights into the efficacy and utility of the program. The utility of the program was explained by the factors such as self-motivation, action planning,

coping strategies, and feeling of wellness and external cues such as pedometers and social network. Some expectations of the plan were fulfilled and physical activity behaviour was improved due to the implementation plan. However, some expectation such as weight reduction was unfulfilled due to persisting barriers such as lack of time and laziness. Suggestions about improving the physical activity were based on the fact that they could have performed in a better way. Health promoting workplace will enhance the participants to be active through the working hours which take most of the hours per day.

This study had several strengths. Unexplored area of implementation intention for physical activity was studied which is a key focus for research in non-communicable diseases. Barrier specific coping strategies were framed by the participants to improve adherence level. Ground research was done extensively for preparing the weekly activity planner, ways to be active and online platform for demonstration of exercise videos. Use of standardized tools and equipment, rigour in intervention delivery and assessment added to the validity of the study. However, due to COVID safety protocols, group events could not be organized to promote sports and activity. Awareness events such as marathon or walkathon would have motivated participants to a higher level. As the study period was limited to three months, participants could not be followed up for long term sustainable behaviour change of physical activity.

It was found that this implementation plan is effective in improving the physical activity level of the participants and adopting healthy physical activity behaviour. Use of interventions like action planning and coping plans to overcome the barriers to physical activity will be beneficial especially for the target population who are sedentary during the majority of working hours. Further, engagement of stakeholders is essential to sustain such interventions which can also integrate other components of nutrition and stress reduction at workplace for holistic health promotion. These findings suggest that a multi- pronged approach towards physical activity promotion is beneficial and it advocates for further measures to sustain a health promoting workplace. The concept of health promoting workplace with the aim of adopting healthy behaviour among office staff shall be introduced which will be in line with 'fit India movement'. Implementation plan is effective in improving the physical activity level of the participants and adopting healthy physical activity behaviour. These findings suggest that a multi- pronged approach towards physical activity promotion is beneficial and it advocates for further measures to sustain a health promoting workplace.

CONCLUSION

Implementation plan is effective in improving the physical activity level of the participants and adopting healthy

physical activity behaviour and advocates for health promoting workplace.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Nambirajan MK, Govindan D, Patel N, Roy G, Lakshminarayanan S. Action planning and coping planning based intervention on physical activity practice among desk-based office employees: a non-randomized explanatory mixed method study. *Int J Community Med Public Health* 2022;9:2927-35.