Original Article

Effects of Motivation Program in Work Exercise Movement Based on COM-B Model for Reducing Sedentary Behaviors of Office Employees: A Randomized Controlled Trials

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Background: Covid-19 affects health behaviors in terms of less physical activity and increased sedentary behavior of office employees, which is a cause of non-communicable diseases.

Objective: To investigate the effectiveness of a motivational enhancement program in work exercise movement (MEP in WEM) based on the Capability Opportunity Motivation Behavior (COM-B) model.

Materials and Methods: The cluster randomized controlled trials (RCTs) were designed to collect data and test the program's effectiveness. Fifty-eight officers, divided into two groups, with 28 officers in the experimental group and 30 officers in the control group, were included in this study. This was calculated by statistical power analysis for the behavioral sciences with an effect size of 0.80, p-value 0.05. The data were collected from the Likert rating scale with a Cronbach's reliability score of 0.776 to 0.911. The MEP ran for 11 weeks with 12 intervention activities between April and July 2021. Descriptive statistics and t-tests were used for data analyses.

Results: After participation, employees' motivation (mean 3.12, SD 0.520) and sedentary behavior (mean 2.65, SD 0.691) were at a high level, and the MEP in WEM was significantly effective in enhancing motivation. Additionally, the experimental group had the higher motivation and less sedentary behavior than the control group before participating in the intervention at a significance level of 0.05.

Conclusion: This ME program should be used to initiate policies in promoting physical activity of office employees.

Keywords: Sedentary behavior; COM-B; Employee; Motivation; Work exercise; Motivational program

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As a result of the transformation in the population's way of life, there are now fewer opportunities for daily movement and exercise. However, inadequate physical activity has a negative impact on health, especially the occurrence of non-communicable diseases (NCDs). The main types of NCDs are diabetes mellitus, cardiovascular diseases, cancers, chronic respiratory diseases, and obesity[1-3]. NCDs have risen to the top as the primary cause of early mortality and cause 41 million deaths annually, or 71% of all fatalities. Between the ages of 30 and 69, more than 15 million people worldwide die every year from NCDs. Estimates for 2021 indicate that low- and middle-income countries are responsible for 85% of these "sudden and unexpected death"[4]. Therefore, Thai people are prone to these illnesses. According to this relationship, physical activity can be categorized into three levels, which are low-level such as short distance walking and house cleaning, medium-level, such as fast-paced walking and cycling, and high-level such as running and playing any sports[5,6]. People who have movement slower than the low level are recognized as having sedentary behavior.

Sedentary behavior can be described as minimal to no body movement from sitting, reclining, and lying still. Examples of minimal to no body movement

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after awakening are plenty with the use of a phone while sitting up, sitting in a car, meetings in the workplace, using a computer, laying back watching television, lying entirely still, or even working on a hobby[7-9].

Studies stated that an average of 3.5 million people per year have a high casualty rate from lack of exercise or physical activity, especially in 15 years and older[10,11]. Furthermore, the casualty rate from symptoms of NCDs was 71%, the highest among all signs. One in three casualties was caused by sedentary behavior, following the research on the decline in physical activity of Thai citizens[12]. The World Health Organization and the Ministry of Public Health of Thailand have taken steps to assure the well-being of their citizens. There were three strategies to counter the sedentary behavior. The first strategy is to provide guidelines for physical activities and set up laws and regulations to promote exercise for its citizens. The second strategy is to create a suitable environment for physical activity in workplaces, service providers, and communities. The last strategy is to develop experience-exchanging programs and monitor results in all areas for further development[13,14].

People between 18 and 59 years old have moderate physical activity averaging two hours per day and have sedentary behavior averaging 13 hours per day. Due to the nature of traffic jams in Bangkok, a hefty amount of time is spent on transportation to and from work. This adds to the time sitting still at a desk while working or sitting in a meeting. More importantly, telecommuting workers were less physically active and had longer sedentary during the lockdown and work-from-home policies in organizations, such as coronavirus 2019 pandemic, leading to the rising trend of more sedentary behavior and physical activity impairment in the working-age population[15,16]. Thus, the organizations will be heavily affected by the decrease in productivity and work performance of employees, and the rise in expenses such as employee benefits, compensations, and sick leaves[17,18]. In extreme cases, employees' sedentary behavior could lead to depression and anxiety[19,20]. Based on the issues mentioned above, research has been done to find more details and studies of sedentary behavior in Thailand and other countries. From the research, Thai citizens fall into sedentary behavior[21,22]. However, experimental projects have been implemented internationally showing that reducing sedentary behavior is possible[23-25].

Moreover, researchers have performed studies focusing on motivation and found that the Capability Opportunity Motivation Behavior (COM-B), which is part of the behavior change wheel (BWC), invented by Michie et al[26] is adequate. In addition, an Intervention Function could be applied to design the motivational enhancement program (MEP) based on the COM-B model to reduce sedentary behavior in office workers in Bangkok. Michie et al also presented three factors that were capable of changing human behavior, which are capability, opportunity, and motivation[27]. In this regard, the development and promotion of those three factors are as follows. 1) Capability refers to a person's physical readiness and capacity for goal achievement. 2) Opportunity refers to a suitable place and its surroundings. The distance between the workstations and the photocopier, for example, encourages movement and decreases sedentary behavior. 3) Motivation is the drive behind emotions, effort, an impulsive urge for self-improvement, and the habit of challenging.

The COM-B framework has been implemented for international research projects in quantitative, experimental, and qualitative domains. For example, MacDonald et al[28] used the COM-B model to describe how British office workers behaved when working. Additionally, Munir et al[29] applied the BWC concept to create a program to drastically reduce sitting time at the office. The campaign is known as "Stand More AT Work (SMArT Work)". In other publications, such as a study by Barker et al[30], the BWC concept of COM-B and Intervention Function had indeed been investigated to explain behavior and apply it to behavior change. It was employed in behavioral studies to comprehend how those who have hearing loss behave and to create initiatives to support the transition to hearing aids. McDonagh et al[31] also applied the concept to study and comprehend the behavior of Britons tested for sexually transmitted infections.

In conclusion, COM-B and intervention function models were performed as guidelines to design and study the correlated interventions. The COM-B model could be utilized as a framework for research into how health behaviors change and develop, as well as how to create a dynamic work environment for healthy employees. Therefore, the authors aimed to investigate the effectiveness of MEP in work exercise movement (WEM) based on the COM-B model.

Materials and Methods

The parallel trials study was the cluster randomized controlled trials (RCTs) to study the effectiveness of MEP in WEM based on the COM-B

model to reduce the sedentary behaviors in office workers of a private company in Bangkok. The company was a one-stop media advertising company, ranging from providing advertisement services on LED screens to social media.

The inclusion criteria consisted of the employees that had less physical activity movement. All participants were 22 to 55 years old, working with portable laptops or stationary computers, and voluntarily participating in the program. The exclusion criteria consisted of employees who were not pregnant or had restrictions on mobility disabilities. Sixty-two employees were included in this study. This sample size was calculated by the G*Power program for the behavioral sciences with a high effect size of 0.80 at the p-value of 0.05. Fifty-eight out of the 62 employees showed interest in participating in all activities. The employees were divided into two groups using cluster random sampling with 28 subjects in the experimental group with an average age of 31 years old, and 30 subjects in the controlled group with an average age of 30 years old. Controlling confounding factors was done by assigning groups based the job position level of employees, thus, the operation and management in the control group and experiment group had the same number of employees. These two groups were working on different floors to avoid contamination and eliminate the external factors with block size.

The participants also had to attest that they were in good physical and mental health and free of any ailments including NCDs, diabetes, hypertension, or other conditions that would have affected the experiment negatively. Moreover, the researchers also requested permission to review the employee's health and illness records after providing the condition to re-confirm that they were actually in good mental and physical health.

The operational definition

The COM-B model-based activist motivation program to reduce sedentary behavior referred to a series of activities designed by researchers aiming to change behavior through motivational exercises in office workers. The researchers designed the present program using the application of the intervention function of the BCW concept as a paradigm for understanding how people behave in various environments in the program design. In the present study, the degree and relationship between biosocial characteristics and motivation for exercise and sedentary behavior were studied to gather data for the construction of a psychological program with a behavior modification process. Various activities were tailored to the situation, instructional approaches, cultural norms, and environment of the office workers. The goal was to facilitate behavior change in office workers through the process of change. Eleven activities were performed over the course of 12 weeks. Three follow-up sessions and other activities including lectures and online formats were added such as 1) Let's get to know the behavior of the sedentary, 2) How much is enough, 3) Let's join together, and 4) Notification messages.

Sedentary behavior referred to the actions of employees who sat, reclined, or lied down while awake for more than an hour in a row. All three of these gestures could be performed in tandem with screen time or away from the screen, such as sitting at work, sitting in a meeting, sitting in training, sitting down to eat, or sitting in a bus or car. The researchers created a measure based on the operational definition and adapted it from the Workforce Sitting Questionnaire (WSQ)[32]. The measure was a form of behavioral observation and self-assessment over the past week while at work and at home. The measure consisted of 12 items. It was a 4-level estimation scale that "urgently" was given 4 points and "no practice or less than" was given 1 point.

Instruments and procedure. Three self-administered questionnaires were used in the first experimental stage. The general demographic information questionnaire included four questions. The sedentary behavior questionnaire with seven questions, using a four-point grading scale, developed by Marshall et al[32], was modified by referring to the definition to measure the movement of subjects through sitting, reclining, and lying while awake for more than one hour per standing up or walking in a week, with a reliability of 0.776. The Motivation to perform a physical activity questionnaire used the definition developed from Thararat[33]. It is a 24 questions questionnaire that is using a four-point grading scale, with 12 questions focusing on internal motivation, and another 12 questions focusing on external motivation, with a reliability of 0.905. For the second experimental stage, which was between April and July 2021, an intervention, based on the COM-B model with 12 activities, was performed to reduce the sedentary behaviors of office workers in 11 weeks. The experimental group participated from the first to the twelfth activities. The activities include an educational program to provide knowledge to increase the understanding of sedentary behaviors through

online lectures, goal setting, designing a suitable movement/sitting environment, sharing techniques to solve obstacles mutually, face-to-face reflection, rightfully rewarding, monitoring results, and notifying feedback to continuously improve the behaviors. The controlled group only participated in the happy work-life activities of the organization.

Content validation: Five experts accepted the COM-B model-based intervention for all activities with the Index of Congruence ranging from 0.5 to 1.00.

Statistical analysis

First, to accurately measure the data collected, a descriptive statistic was employed to determine the mean, standard deviation (SD) values, and percentage (%) to study the levels of motivation and sedentary behavior. Second, the independent-samples t-test was used to compare the mean level of motivation and sedentary behavior in the demographic diversity after participating in the program. Finally, the paired sample t-test was used to compare averaged values in both groups before and after participating in the program. In addition, a two-tailed p-value of less than 0.05 was considered statistically significant.

Ethical approval and consent to participate

Ethical approval has been given to the present research from the Board of Ethics Committee of Srinakharinwirot University with a certificate numbered 057/2564 as of February 15, 2021. Furthermore, the informed consent had been given to every participant, along with detailed information about the program before undergoing the experiment.

Results

Demographic data

Fifty-eight participants were interested to join in the MEP. Two groups were formed from two departments of the same company and working on different floors in the same building. There were 28 subjects in the experimental group and 30 subjects in the control group. The experimental group included 16 or 57.14% males and 12 or 42.86% females. Fifteen or 53.57% of the experimental group employees were between 30 and 45 years old. Twenty-one or 75% of the employees' job level was at the operation level. Twenty-two or 78.57% of the employees exercise regularly. For the control group, ten or 33.33% were male and 20 or 66.67% were female. Eighteen or 60% of the employees were between 22 and 29 years old. Twenty-three or 76.67% of the employees' job level was the operation level. Lastly, 16 or 53.33% of the employees did not exercise, as shown in Table 1.

Table 1. Demographic Information of the participants

Demographic	Experimental group (n=28)		Control group (n=30)	
	Quantity (person)	Percentage (%)	Quantity (person)	Percentage (%)
Sex				
Male	16	57.14	10	33.33
Female	12	42.86	20	66.67
Age				
22 to 29 years old	13	46.43	18	60.00
30 to 45 years old	15	53.57	12	40.00
Job position level				
Operation	21	75.00	23	76.67
Management	7	25.00	7	23.33
Exercise record				
Regular exercise	22	78.57	14	46.67
Lack of exercise	6	21.43	16	53.33

Table 2. The comparison of the means of the levels of motivation and sedentary behavior after participation

Variable	n	Mean	SD	t	df	p-value
Motivation to perform physical activity						
Experimental group	28	3.12	0.520	2.753*	53.04	0.008
Control group	30	2.77	0.439			
Sedentary behavior						
Experimental group	28	2.65	0.691	–2.901*	44.36	0.005
Control group	30	3.09	0.426			

SD=standard deviation

* p<0.05

The independent samples t-test was performed to compare the means of the two groups on the levels of motivation and sedentary behavior after participating in the program. In addition, Levene's test for equality of variances was analyzed, and the assumption of homogeneity of variances was met. Thus, the equal variances assumed part was shown in the result after running the independent samples t-test. After participation, employees in the experimental group had levels of motivation, with a mean of 3.12 and 2.77, and sedentary behavior with a mean of 2.65 and 3.09, was at a better level than the control group. The result revealed a significant difference between the means of the two groups on motivation levels after participation in the program. Furthermore, the motivation levels to perform physical activity at work were significantly higher in the experimental group than in the control group. In addition, there was a significant difference

Table 3. The comparison of the means of experimental and control groups before and after participation

Variable	Experimental group (n=28)					Control group (n=30)				
	Mean	SD	t	df	p-value	Mean	SD	t	df	p-value
Motivation to perform physical activity										
Pre-experiment	2.81	0.511	2.317*	27	0.028	2.78	0.379	0.124	29	0.902
Post-experiment	3.12	0.520				2.77	0.439			
Sedentary behavior										
Pre-experiment	3.23	0.415	4.268*	27	0.000	2.99	0.486	2.269*	29	0.031
Post-experiment	2.65	0.691				3.09	0.426			

SD=standard deviation

* p<0.05

between the means of the two groups on the levels of sedentary behavior after participating in the program. The levels of sedentary behavior were significantly lower in the experimental group than in the control group, as shown in Table 2.

The paired sample t-test was used to compare the difference between the means of the variables before and after the participation. The Kolmogorov-Smirnov test for normality was achieved prior to run the t-test. The results revealed that the means of motivation levels to perform physical activity at work in office employees was significantly higher after the treatment (t=2.317, p=0.028). There was no significant increase in the means of motivation levels in the control group. After participation, the means of motivation levels in the control group were slightly lower than before (t=0.124, p=0.902). For the sedentary behavior, there was a significant decrease in the means of the levels of sedentary behavior in the experimental group compared to before the intervention trial (t=4.268, p=0.000). Furthermore, there was a significant increase in the means of the levels of sedentary behavior in the control group compared to before the intervention trial (t=2.269, p=0.031), as shown in Table 3.

Discussion

COM-B theory developed by Michie et al[26] has been applied to the research. The COM-B was used as the concept to create a framework to present that the program was effective in enhancing motivation in the experimental group as in other previous research papers.

The MEP at WEM based on the COM-B model for reducing sedentary behavior of office employees is one of the frameworks that has the intervention activities during work. The design is to incorporate but not interfere with different working scenarios, methodologies, cultures, and environments in the workplace. The purpose is to enhance the motivation to perform physical activity at work based on the COM-B model to reduce sedentary behavior which is in line with the research of Lin et al[34]. The present research studied the effectiveness of a long-term program in office workers by increasing their motivation level. Moreover, the results were also relevant to the finding of Irvine et al[23], which used a website to increase the physical activities of office workers via setting up the notifications alert, creating self-awareness, and setting up a goal to achieve. Consequently, the present research decided to implement an Intervention Function guideline from the BCW concept to adapt and explain the behaviors of individuals within different environments. It is also to create a psychological intervention for each specific behavior through the different activities. The period of the intervention was eleven weeks with 12 activities consisting of various activities such as providing knowledge to increase a better understanding of sedentary behaviors, designing a suitable environment in the workplace, sharing techniques to mutually solve obstacles, rightfully rewarding, monitoring results, and notifying feedbacks to continuously improve. The majority of activity sets included human interaction and internal communication. Therefore, before starting the program, it must build up the relationships between the researchers and the participants as well as among participants themselves. The purpose was to create an environment filled with warmth, relaxation, friendliness, and cooperation to collectively change their behaviors through ice-breaking activities. The results stated that the effectiveness and efficiency of behavior change occurred from human interaction and proper internal communication among participants as well. The result can be supported by the using SMArT Work based on COM-B for a working group that consisted of 39 people. The results showed that this program had an increased motivation to work after

the transformation of their working desks, set visibly reachable goals, created an automatic notification system, as well as monitored and announced results. Mentioned practices had shown results to increase movements and progression to reach the set goals of all participants[29]. Hence, it is recommended that private organizations and public health bodies motivate employees to have more physical activity and these interventions must be implemented to mitigate the negative effects of COVID-19 on sedentary behavior. Longitudinal studies might provide further insights into the relationship between health, mental health, and activity levels in the relevant population. Finally, the ME program should be further investigated in a sizable clinical trial to examine the program's viability and influence on health difficulties, or in a senior age group with concomitant disorders to investigate this impact.

Limitation

The office area was a small area in the city. Therefore, it was difficult to design the environment for activity movement. The activities focus on setting computer screen short breaks to monitor the employees' performing exercises by walking or stretching. Thus, the present research is a preliminary report, which should be further studied by controlling variables, determining more appropriate sample selection criteria, and conducting better trials.

Conclusion

The reduction in sedentary behavior happens when office workers have both internal and external motivation. The MEP to reduce sedentary behavior can also be simultaneously applied to different demographic diversities. Furthermore, the MEP has been studied and can prove that the result is effective and can be further developed and applied to study in the future.

What is already known in this topic?

The levels of motivation to perform physical activity and sedentary behavior of office workers is well-known. According to the present research findings, the results of motivation and sedentary behavior levels were performed to design a MEP, which has a process of changing the behavior. The results showed that the levels of the motivation to perform physical activity at work and sedentary behavior were at a high level, thereby leading to a policy of both public and private organizations to apply MEP in WEM for office workers of all age groups.

What this study adds?

This study also found that the motivation to perform physical activity and sedentary behaviors questionnaire had high quality, which could be used for screening and evaluating in a training program for office workers. The intervention based on the COM-B model with 12 activities for eleven weeks could increase motivation and reduce the sedentary behaviors of all age groups. Human resource officers can apply the ME program to encourage healthy employees' behaviors by setting computer screen breaks to allow employees to rest and perform exercises by walking or stretching, placing trash bins far away to get up and walk, or setting up the working corner that stands to work between teams.

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Conflicts of interest

The authors declare no potential conflicts of interest.

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