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The Development of Prototype Organizations for Physical Activity Promotion to Reduce Sedentary Behavior

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ABSTRACT

This article aims to explore the problems of sedentary behavior (SB) and compare the patterns of physical activities (PA) which affect the physical performance of organizational employees. The study also proposes the developed prototype of PA promotion to reduce SB within an organization. The mixed methods approach was employed to conduct experimental research together with qualitative research. Fifty participations with the total of 200 participants selected from 4 recognized organizations attended the focus group. The results of this study show that personal training with individual participant is more effectively than group training. In addition, this study also reveals that pattern of training that includes Combination of Zumba, Yoga, and Aerobics Cardio leads to stronger physical body. However, in the group that lack of exercise instrument, to explore only Zumba could also support the healthy of participants.

Keywords
Sedentary Behavior, Physical Activity, Prototype Organization, Model Organization, Physical Fitness

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Introduction

Nowadays, public health problems have become a serious concern, especially those related to sedentary behavior (SB) embedded in daily transportation, regular use of mobile phones, and long hours of desk work. The sedentary lifestyle or SB is becoming a part of metropolitan lifestyle which involves little exercise and eventually leads to harmful consequences (Thai Health Promotion Foundation, 2018). It can impact human bodies and cause a wide range of health problems (Saiphiroonthong et al., 2015). SB has emerged as a potential risk factor for chronic diseases. SB includes activities requiring low energy expenditure (≤1.5 metabolic equivalents) performed in a sitting or reclining posture (Magda, Bruno, Daniel & Adriana, 2020). The aforementioned behaviors are also evident in many workplaces, resulting into more attention given to physical activities, especially the exercises require constant body movements. The objective of exercising is to systematically promote healthcare, entertainment, and social bonding towards simple activities such as walking, running, rope skipping, workout, weightlifting, and playing sports (Department of Health, Ministry of Public Health, 2018).The physical fitness development aims to enhance the physical performance or the physical fitness capability of people in order to make the body to conduct daily life activities and work more effectively, actively and energetically. It can also increase endurance, decrease tiredness and speed up stamina recovery. According to the Ministry of Tourism and Sports (2019), physical fitness means the effective function of body parts such as the heart, blood vessels, lungs, and muscles, which brings about better health conditions and more effective everyday performance.
Many prior studies have been conducted for examining PA plans. Many studies regarding the health benefits gained from exercises (Thongdara, Yingratanasuk & Chardenwattana, 2015). This study found that exercise can enhance physical capability of the elderly population (Thumrongsub et al., 2019; Celeste et al., 2020; & children (Felipe et al., 2020). Some researches revealed that SB can cause health problems such as obesity, diabetes, and high blood pressure (Pratt, Jacoby, & Neiman, 2004; Saiphiroonthong, Choaksuwankij, & Chaimanee, 2015). A study conducted by the Department of Occupational and Environmental Medicine, Hanyang University, revealed that exercise has beneficial effects on the relative heart rate (RHR) (Soo-Jin et at., 2020). Another study regarding the effects of physical activity intervention in a workplace towards the application of PA promotion program and psychological coaching also showed that physical activity intervention could change the employees' behavior (Simone et at., 2020). There was also a research exploring the reduction of sedentary behavior towards work scheduling (Hadi, Alireza, Haleh & Najmeh, 2019). Moreover, a meta-analysis from 661 relevant studies found that the number of studies on the effects of exercise on employees' health conditions was still limited (Víctor et al., 2020).
Moreover, there are also studies concerning the importance of exercise among organizational employees (Praman et al., 2015) and suitable places for exercise (Kaewpan & Kalampakorn, 2012; Khumduang et al., 2009). This study showed that exercise promotion in business and industrial organizations could reduce the sickness absence rates among the employees (Pronk, 2009). Nonetheless, these studies have not explored the issue in different types of organizations such as public schools, private schools, industrial factories, and local government organizations. In addition, there was a study on the design of a home-based system prototype for reducing sedentary behavior among older adults; this research used monitoring devices with the alert function to detect the excessive sedentary behavior among elders (Tzafit et al., 2020). but this method would be too complicated when applying to big organizations.

Therefore, this study aims to explore how to effectively promote physical activity among employees based on their preferences in order to improve their physical performance. This research investigates the current situation of sedentary behavior problems in public and private organizations and evaluates physical capability of the organizational employees before-during and during–after experiments under the behavioral change program in both public and private organizations. The physical activity programs were developed for the prototype organizations in both the public and private sectors, and the findings obtained from the experiments were used for developing a prototype of physical activity promotion to reduce sedentary behavior among the employees and increase active exercise in the organizations.

Methodology

This study aims to find the most suitable pattern and procedures to promote a PA plan in public and private sectors. The public organizations consisted of public schools and local government organizations. The private organizations included private schools and industrial factories selected by the purposive sampling technique with the support from executives and policy-making organizational members. Then, the researcher proposed the four selected organizations located in Bangkok Metropolis and Vicinity to the institutional review board (IRB). This study receives the certificates of MUSSIRB approval No.2018/011.0901 and MU-SSIRB No. 2018/010(B1) from the committee for research ethics in full compliance with international guidelines of human research protection. The research tools for data collection on this study included 1) a physical capability evaluation form, 2) a data recording form, 3) a focus group form, and 4) a group conference form. Apart from the approval from the IRB, the four research tools were also evaluated by and received suggestions from the national institutional review board in order to prepare the tools for this study. The level of physical capability was evaluated before, during, and after the SB mitigation program within the organizations in order to find out which pattern and procedures for promoting a PA plan would be the most effective way to enhance physical capability among employees in public and private sectors. Results of this study were applied to the prototype development for PA promotion in both public and private sectors.

There were 200 samples in total, which were composed of 100 samples from the public sector and 100 samples from the private sector, that used the systematic random sampling and quota from each level of staffs in each organization. The employees were classified into four levels: executives, professors or moderate-level employees, office workers, and janitors. 50 samples from each level were selected from each organization to participate in this study. These public and private organizations were located in Bangkok and its vicinity. The data was collected throughout the entire period of 18 months from July 2018 to December 2019. In terms of the quantitative research, the data was collected towards the use of a data recording form conducted with the samples as well as a physical capability evaluation form. It was collected three times in total: before the experiment, nine months after the experiment had been started, and nine months after the second data collection round. Each testing session was conducted by the experts. The evaluation consisted of 1) skinfold thickness test, 2) grip strength test, 3) 60-second chair stand test, 4) sit-and-reach test, 5) zig-zag run test, and 6) 3-minute step test. The indicators in the evaluation included height-weight-BMI, waist size, pulse rate, blood pressure level (systolic / diastolic), skinfold thickness of biceps, triceps, subscapular and suprailiac skinfolds (from the skinfold thickness test or the fat fold test), grip strength test results, the number of times from the 30-second chair stand test, flexibility level from the sit-and-reach test, the number of seconds from the zig-zag run test, and the pulse after the 3-minute step test. Regarding the qualitative research, the data was collected from focus group discussions conducted throughout the experiment period and another focus group held at the end of the study. The data from the first two focus group discussions was collected towards the use of a focus group form. These focus group discussions consisted of 4 representatives from 4 organizations (16 in total). They were held after the experiment had been conducted for 6 months and 12 months, respectively. The last focus group consisted of 200 participants during the last six months of the experiment; the data was collected towards the use of a group conference form.

Data Analyses

The statistical tools used in analyzing the data include the descriptive statistics for the data from the questionnaires on problems and health risks among the employees in the sample organizations. Using the paired sample *t*-test for comparing the physical performance of employees in the sample organizations 2 parts of the experiment. The method of analysis of variance (ANOVA) and multiple comparison (Post-Hoc Test) were used for analyzing the differences between the physical performance results gained from four different patterns of exercise used by the four sample organizations; the multiple comparison model and Duncan's homogeneous subsets were employed. And in the qualitative section were used the content analysis (Typology and Taxonomy) for the data gained from observation and focus groups before, during, and after the experiment; the data was also synthesized in order to construct a model.

Results

4.1 The current situation of SB in public and private organizations

The result of the demographic information of the frequency of exercises of organizational employees. The sample comprised 200 employees had been moderate to regular exercising 19 percent. They confirmed holding mainly, or highly, sedentary occupations 59 percent and did not do exercises at all 22 percent. Those who rarely exercised 51 percent, exercised once or twice a week 22.5 percent,

exercised every two days 14.6 percent, and exercised on a daily basis 11.9 percent.

The body mass index (BMI) of organizational employees have range betweent 18.5 and 22.9. The BMI results of the employees were mostly above the average (54.2 percent), while only 35.5 percent were in the average range. The last section presents the medication history and the health check-up history of organizational employees. The medication history results show that most of the employees (72.5 percent) did not use any medication, while 28.5 percent were on regular medication, and 4.5 percent used sleeping pills. In addition, result of the Health Check-up History of Organizational Employees. Most of the employees (63.2 percent) received annual health check-ups, while 20.1 percent had received health check-ups some time in the past, and 16.7 percent never had a health check-up.

4.2 The pattern of active exercise to reduce SB in the organizations

The results from the focus group would lead to the appropriated exercise programs for each organization. The physical capability measurement results of the research participants were derived from the activity promotion experiments conducted differently in four different organizations with the following patterns:

1) The equal amounts of Zumba, Aerobics (Cardio) and Yoga exercises were provided.
2) The combination of Zumba, Yoga, and Aerobics (Cardio) with more emphasis on Zumba was provided.
3) The combination of Zumba and Aerobics (Cardio) with more emphasis on Zumba was provided.
4) Only Zumba was provided.

4.3 The evaluation of physical capability of the organizational employees before, during, and after treatment

The comparison between the differences in the results of six different physical capability measurements from the four aforementioned patterns of exercises are illustrated as follows.

Table 1 Analysis Results of Positive Changes in Physical Capability from Different Measurements

Positive Changes in Physical Capability	Sumsquare		Degree of Freedom		P-value
	Between Patterns	Within the Pattern	Between Patterns	Within the Pattern	
Decrease in Skinfold Thickness	663.993	3501.701	3	164	0.000
Increase in Grip Strength	.151	.812	3	164	0.000
Increase in Grip Strength (Right Hand)	306.646	1891.568	3	164	0.000
Increase in Grip Strength (Left Hand)	106.698	2431.859	3	164	0.040
Increase in Repetitions (30-Second Chair Stand Test)	3104.901	8429.202	3	164	0.000
Decrease in Flexibility Level (Sit and Reach Test)	185.857	1765.616	3	163	0.001
Increase in Speed (seconds) (Zig-Zag Run Test)	1169.677	1717.035	3	163	0.000
Decrease in Pulse (3-Minute Step Test)	3009.783	26918.311	3	166	0.001

Table 2 Comparison between Positive Changes in Physical Capability from Four Different Patterns of Exercises by Duncan-based Multiple Comparison with the Significance Level of 0.05

Decrease in Skinfold Thickness Increase in Grip Strength	Arranging from the most to the least of the mean with α = 0.05 (Group/(Mean))			
	Pattern 1: Equal amounts of Zumba, Aerobics (Cardio) and Yoga	Pattern 2: Combination of Zumba, Yoga, and Aerobics (Cardio) with more emphasis on Zumba	Pattern 3: Combination of Zumba and Aerobics (Cardio) with more emphasis on Zumba	Pattern 4: Zumba only
Increase in Grip Strength (Right Hand)	1(4.976)*	1(4.829)*	2(0.512)	2(1.476)
Increase in Grip Strength (Left Hand)	1/(0.0707)*	1/(0.0746)*	2/(0.0088)	1/(0.0843)*
Increase in Repetitions (30-Second Chair Stand Test)	1/(4.574)*	1/(3.039)*	2/(0.812)	1/(3.052)*
Decrease in Flexibility Level (Sit and Reach Test)	1/(3.793)*	1,2/(2.961)	2/(1.1611)	1,2/(2.502)
Increase in Speed (seconds) (Zig-Zag Run Test)	2/(2.643)	1/(11.854)*	2/(1.395)	2/(1.683)
Decrease in Pulse (3-Minute Step Test)	1,2/(1.90)	1/(3.17)*	3/(0.30)	2,3/(1.15)
Decrease in Skinfold Thickness	1/(6.8602)*	1/(6.7141)*	3/(0.4709)	2/(3.5112)
Increase in Grip Strength	1/(14.95)*	1/(10.93)*	2/(4.09)	1/(13.67)*

* The results of the test are higher than other patterns with the significance level of 0.05.

According to Table 1 and Table 2, the positive changes derived from the four patterns of exercises had some differences. Regardless of the amount of time given, the patterns that included all three types of exercises (Zumba, Aerobics, and Yoga) produced better results compared to other patterns that involved less than 3 exercises. Surprisingly, the study also found that the pattern with Zumba alone produced better results compared to the pattern that involved both Zumba and Aerobics (even if there was emphasis on Zumba).

Table 3 Comparison between positive changes in physical capability from four different patterns of physical activity promotion: before, during and after the experiments in public and private sector

Physical Activity Promotion Patterns	**Positive Changes in Physical Capability ($\alpha = 0.05$)**	
	Before-During	**During-After**
Pattern 1: Equal amounts of Zumba, Aerobics (Cardio) and Yoga (Public Sector)	Yes	No
Patter 2: Combination of Zumba, Yoga, and Aerobics (Cardio) with more emphasis on Zumba (Private Sector)	Yes	Yes
Pattern 3: Combination of Zumba and Aerobics (Cardio) with more emphasis on Zumba (Public Sector)	No	No
Pattern 4: Zumba only (Private Sector)	No	Yes

According to Table 3, the comparison of the employees' physical capability test results between before during and after the exercises shows positive results across all patterns. In terms of the results before-during the experiment, only Pattern 1 and Pattern 2 produced the positive trends, while the results during-after the experiment show that only Pattern 2 and Pattern 4 produced positive outcomes.
According to the investigation of the results from the focus groups from each organization, the comparison between the public sector (with Pattern 1 and 3) and the private sector (with Pattern 2 and 4) showed that the experiments in the private sector provided better outcomes on the samples' physical performance. Moreover, Zumba Only program allowed the samples in the organizations with limited space to improve their physical performance later on.

4. The development of physical activity programs in these prototype organizations in both the public and private sectors.

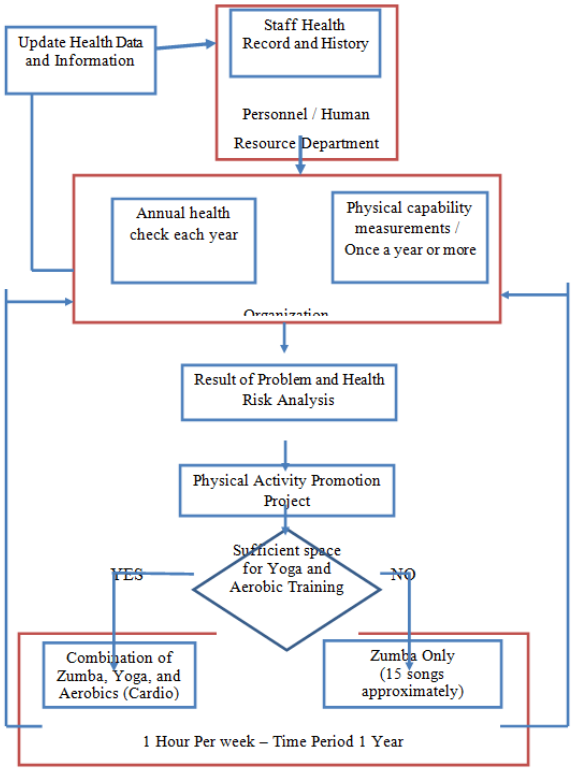

Figure 1 Model of Prototype Organization from sedentary to Physical Activity Promotion

According to Figure 1, in order to develop the prototype of PA promotion to reduce SB, the staff health records and histories annually/occasionally collected by the human resources department of each organization in the public and private sectors were reviewed to analyze the health problems and health risks of the employees. The results from such analysis were used for developing the PA promotion project. The project was organized in cooperation with professional coaches. Researchers also observed the availability of activity space within each organization's facilities. The organizations with available space can organize physical activities which include the combination of Zumba, Yoga, and Aerobics (Cardio). If the location does not have sufficient space for conducting Yoga or Aerobics, conducting only Zumba could be offered as an alternative. Zumba is a great option because it is a fun activity that can be conducted in any empty space within each organization; hence, the physical performance can be enhanced. Each Zumba session is one hour long, consisting of 15 songs being played. It is a PA designed for lessening SB one hour a week. If the employees continue participating in the Zumba activity, it is expected that their physical performance will be enhanced.

Discussions and Conclusion

The research results revealed that the health problems among the employees in the prototype organizations resulted from the SB both when they were on and off duty. Most of the participants exercise very little, and the majority was considered overweight due to their high BMI. All of these caused their health problems. This conforms to a study on

physical health promotion in the US. The increase of sedentary activities gave rise to obesity and other non-communicable diseases in a rapid rate throughout the US, and it was one of the main causes of deaths and disabilities in the US and around the world (Pratt et al., 2004). Other studies also state that office work had a positive correlation with obesity and other diseases such as diabetes and high blood pressure (Saiphiroonthong et at., 2015). After having a discussion on the health issues, lack of exercise and SB, the researchers provided information about metabolism and a healthy diet, which could affect the physical capability and motivation of the participants to change their behavior, including participating in PA promotion. This conforms to a study which states that activities such as demonstrations, practices, and verbal encouragement could lead to better physical capability (Thumrongsub et al., 2019).

The results of this study show that the continuity in promoting PA for an hour per week for consecutive months could enhance physical capability of the employees. For instance, training with elastic bands for 4 weeks could make a difference in terms of muscular flexibility (Thongdara et al., 2015). The results from continuous exercising in a playground show improvements in physical capability such as an increase in skinfold thickness, more sit-ups and push-ups, and better results in sit-and-reach running, zig-zag running and long-distance running. The differences could be seen from the differences between before and after exercises (Khumduang et al., 2009). Furthermore, according to the study, the results of using the Yoga fit and Zumba gold programs by providing the exercise programs to the samples twice a week for half an hour in each session for 12 weeks show positive health-related outcomes (Eckmann et al., 2019).

This study also found that compared to public and private organizations, support public and academic sectors to encourage health promotion. The support from the top management thus affected the participants in the organizations. In this study, the private organizations produced greater results in physical capability improvement compared to the public organizations; this conforms to a previous study which reveals that the owner or the management team of an organization plays a significant role in promoting health in a workplace. The ideology of good health from the public sector could encourage health promotion in private organizations (Nakornkate et al., 1999). According to the research results, the support from top management in both private and public organizations was very essential in terms of active participation. The private organization employees were more likely to respond to the top management's policy more than the employees in public organizations. This conforms to a study which discovered that the acknowledgement of health problems and the support of the top management affected the participation of the employees. Therefore, there was a higher progress in the prototype private organizations (Kongsamarn et al., 2017). Hence, PA promotion in the private organizations should be supported by all parties. The results of the improvement of physical capability in the private organizations were satisfactory as there were positive effects on both the employees and the employers such as fewer absences and sick leaves, leading to more profits for the business. Therefore, business organizations and industrial organizations should promote PA in order to equip the employees with better health and lower sickness rates (Pronk, 2009).

According to the study, it can be clearly seen that private industrial business organizations require the top management to support the PA promotion due to its effects on the production chain. Also, the PA promotion would not be effective if employees were asked to exercise after work because they would want to go home and take a rest. Therefore, if the management team allowed the activity to be conducted during work time, the employees would embrace the importance of exercise. This may reduce the amount of working time, but it can build healthy and happy employees, which will benefit the organizations in the long run. The type of exercises also played a huge role in PA promotion due to the fact that some of them were more exciting compared to others. For example, Zumba dancing could be played with other kinds of music apart from Latin. This also conforms to a study showing that the type of exercises could significantly affect the interest in workout among individuals (Praman et al., 2015). The dancing exercises could attract both men and women, while some exercises could not interest both genders. For instance, men were less likely to be interested in Yoga. Therefore, the dancing exercises were the most suitable PA for both men and women. However, different organizations may produce different results due to the diversity in perceptions and behaviors, as shown in a study conducted with students from different educational institutions (Panthong, 2013). According to (Ljubojevic et al., 2014). dancing exercises with exciting music such as Zumba could produce positive results of PA promotion, leading to better health. Furthermore, in terms of obesity, Zumba dancing could reduce the overall body fat percentage by burning calories and fat (Jackson, 2013).

Finally, most of the employees from private and public sector have many health problems such as obesity, diseases, and regular drug usage. More importantly, most of them rarely exercise, which can be implied from the fact that only one-fifth of all samples did exercise. Due to some circumstances, promoting the PA within the organizations must be adjusted to different individual contexts. The analysis of the most suitable exercise patterns for each organization were derived from the research results, the opinions of top management teams, team leaders, participants, experts, researchers, and the organizational environment. The findings revealed two major effective patterns of PA promotion. First, the equal combination of Zumba, Aerobics, and Yoga exercises could be provided when there was sufficient space for stretching exercise activities such as Yoga. This pattern could attract more participants and produced better physical capability when compared to other patterns. The second pattern is to provide Zumba exercise solely. When there was not sufficient space, the availability of PA was also limited since it was impossible for stretching activity. Quite often, the only available space was an empty space in the organizations with no other facilities, so Zumba was the only option. Moreover, since Zumba is a type of exercise that could be done in group and adapted to the taste of music of the

employees, it is the most suitable activity. It also produced positive results in physical capability enhancement.

The main suggestion from the model of prototype organization from sedentary to physical activity promotion was the PA promotion within the organization should involve the three main activities, if possible. This includes heavy dancing such as Aerobics, Zumba, or dancing to music and stretching exercises such as Yoga. These activities have positive effects on physical capability. However, if the diversity of activities and the exercise space are limited, Zumba dancing is the best option. The PA promotion is quite successful in the private organizations when the management team realizes the importance of good health. Hence, the management teams in other private organizations should support PA promotion among their employees. Related agencies should support, educate and promote national PA promotion projects, too. This is to encourage the private organizations to pay attention to PA promotion among their employees. Furthermore, the support from related national and international organizations for raising awareness among private organizations about the benefits of exercise is also crucial. And the educational institutions may have some difficulty in PA promotion. This is because the administrators, the instructors, and the staff need to constantly perform their daily duties, which leave them only the semester break for free time. Thus, the progress of the PA is not steady. In order to continue the PA promotion, there is a need to set up a meeting and create small/informal groups with some teachers appointed as the leader in order to produce more effective results.

Declaration of Interest

The authors declare that no conflicts of interest exist in this research.

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