

## Effectiveness of a Program for Promoting Physical Activity to Prevent Obesity among Grade 4-6 Students in Northern Thailand

Research Article

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### Abstract

Inadequate physical activity among school children can lead to overweight and obesity. This two-group pretest-posttest quasi-experimental study proposed to assess the effectiveness of a program for promoting physical activity to prevent obesity among grade 4-6 students in Pho Prathap Chang District, Pichit Province, northern Thailand. A total of 120 samples were students studying in grade 4-6 selected using systematic random sampling. The subjects were classified into 2 groups, the intervention group and the control group. Each group consisted of 60 subjects. Data were obtained using a questionnaire. The questionnaire was tested using KR20 for knowledge and Cronbach's alpha coefficient for the attitude and their reliabilities were 0.87 and 0.83, respectively. Data were analyzed using frequency, percentage, mean, standard deviation, chi-square test, t-test, and McNemar test. The results indicated that after intervention, the intervention group had significantly higher mean scores of knowledge and attitude before intervention ( $p < 0.001$ ). The body mass index (BMI) of the intervention group decrease significantly ( $p = 0.001$ ) and proportion of adequate physical activity increased significantly ( $p < 0.001$ ). However, there was no significant difference of knowledge, attitude, BMI, and physically activity in the control group. The program for promoting physical activity to prevent obesity among 4-6 students is effective in the intervention group. Therefore, the related institution should employ this program in the targeted students to promote physical activity.

**Keywords:** Effectiveness; Program, Knowledge; Attitude; Body mass index; Physical activity; Grade 4-6 students; Obesity.

### Introduction

Lack of body movement or physical activity results in the body being unable to burn all the energy that has been received. It can cause the accumulation of fat in different parts of the body and eventually leading to obesity [1]. The obesity measurement can be calculated by the body mass index (BMI) and then comparing it to the BMI table according to age. If it is over 95 percentile of the criteria, it is considered to be overweight [2]. Overweight and obese children are likely to stay obese into adulthood and more likely to develop non-communicable diseases such as diabetes and cardiovascular diseases at a younger age. Further, obese children may lose of self-esteem and some of them are more aggressive than normal weight children. This might leads to depression [3].

The prevalence of overweight and obesity in children and adolescents has increased worldwide. It was estimated that 170

million children under 18 years of age were overweight or obese in 2008 and approximately 30% of all children will be affected by these conditions in 2030 [4]. In Thailand, the Department of Health, Ministry of Public Health reported the prevalence of overweight and obesity among school children in 2018 was high as 15% and physically active children was only 25% [5].

In 2017, Pichit Province had overweight and obese students was 15.7% which is the highest proportion in northern Thailand whereas Pho Prathap Chang District had overweight and obese children was 16.2% and was the highest rate in Pichit Province [6]. Therefore, the problem of obese children in Pho Prathap Chang District should be solved to reduce the risk of chronic diseases and its consequences in the future.

According to the previous studies, the intervention program applied the TCM (Tran-Theoretical Model) for parents who had

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obese children by counselling them about diet and exercise control over the phone for a period of 6 weeks and then assessing the results at the following 3 months. The study reported that after intervention the body mass index (BMI) in the intervention group reduced significantly compared to the control group ( $p < 0.05$ ) [7]. In addition, other intervention studies provided knowledge and attitude about diet and exercise programs for parents of obese children. Then, the studies followed up to assess the BMI of children. These studies found the BMI decreased significantly [8-10].

From such problems, the researchers, therefore, conducted the study on the effectiveness of a program for promoting physical activity to prevent obesity among grade 4-6 students in northern Thailand applied by the TCM. The study aimed to assess the effectiveness of the program before and after intervention. The results of this study can be utilized as a guideline for targeted students to change their physical activity behaviour to reduce the BMI and prevent obesity in adolescent and adult. The results also can prevent chronic diseases and psychological and social impacts in the future.

## Objectives

### General Objective

To study the effectiveness of a program for promoting physical activity to prevent obesity among grade 4-6 students.

### Specific Objectives

1. To compare knowledge, attitude, body mass index, physical activity in intervention group and control group before and after intervention.
2. To compare knowledge, attitude, body mass index, physical activity between intervention group and control group after intervention.

## Materials and Methods

### Study Design and Subjects

This was a two-group pretest-posttest quasi-experimental study. We conducted this study between November 2017 and May 2018. The study populations were grade 4-6 students in Pho Prathap Chang District, Pichit Province who were studying in grade 4-6 at 14 public schools. Then, two schools were selected, one for the intervention group and the other for the control group, by simple random sampling technique.

A total of 120 subjects were recruited, including 60 subjects in the intervention group and 60 subjects in the control group. The sample size was calculated based on the previous survey [11] which found that physically active among grade 4-6 students was 20.5%. The present study expected to increase this proportion up to 45.0% after intervention with 5% error, 95% confident interval, and 80% of the power. Then, a total of 120 subjects were included in this study. The study subjects were chosen using systematic random sampling from grade 4-6 students at the study schools. Inclusion criteria for the study subjects were:

- 1) aged 9-12 years, 2) being able to read and write Thai, and 3) being willing to participate in the study. The exclusion criteria were: 1) wanting to withdraw from the study, 2) not being able to participate throughout the program, and 3) being with some underlying diseases that may be affected by exercise.

### The Study Tools

There were 2 study tools in this study including a questionnaire and a program for promoting physical activity.

1. The questionnaire consisted of:

- 1) General characteristics include gender, age, grade, number of siblings, birth order, daily pocket money, and chronic disease (allergy and asthma) in the total of 7 items; multiple choices and short answer.

- 2) Knowledge of physical activity consisted of 10 items with multiple choices; giving one point for each correct answer and 0 point for each incorrect answer.

- 3) Attitude about physical activity included 10 items using 3-level of Likert's scale, where 1 meant disagree, 2 meant neutral, and 3 meant agree.

- 4) Body mass index obtained from physical measurement, including weight in kilograms compared with the height in meters squared.

- 5) Physical activity in this study followed the definition of the previous study [12]; physical movement included recreation and sports activities, such as jumping rope, playing football, running, weight lifting and daily activities, such as walking, climbing, walking ascending and descending stairs. Physical activity was recorded as frequency in number of time per week in minutes spent in physical activity. The physical activity was categorized as adequate ( $\geq 7$  hours per week) and inadequate ( $< 7$  hours per week).

2. A program to promote physical activity for grade 4-6 school students applied by the theory of Trans theoretical Model or Stage of Change Model [13] consisted of 5 steps; Step 1, Pre-contemplation (Week 1): This step aimed to encourage students to be interested in physical activity. The researchers organized activities by promoting knowledge to stimulate students to gain and be aware about physical activity and proper eating. Step 2: Contemplation (Week 2): This step provided activities for students to analyze the advantages and disadvantages of physical activity including analyzing problems and obstacles when they did physical activity at school, home, and community. Step 3: Ready to practice (Preparation) (Week 3-5): This was a step of organizing physical activity programs in each day for students to perform. The researcher team provided equipment and environment for students to do physical activity. Then, the students were explained about the process of physical activity promotion program and demonstrated how to do exercise from stretching the muscles, exertion and relaxation. Students were allowed to choose their favorite sports or recreation to perform together. This step also provided sports and recreation competition for students. Step 4: Action (week 6-14): This step was to implement the physical activity promotion program, including basic movements, physical

administration, exercise, sports and recreation activities such as stretching, running, jogging, sprinting, jumping rope, soccer, volleyball, ball throwing, rice ball, cinnabar, aerobics, dancing, music, etc. Step 5: Maintenance (Week 15-24): This step was a follow-up period to observe the sustainably behavioral change in physical activities.

### Questionnaire Assessment

The content validity and reliability of the questionnaire were assessed by the experts and the questionnaire was tested among 30 grade 4-6 students not include in the study. The Cronbach's alpha coefficients were 0.87 for knowledge and 0.83 for attitude.

### Data Collection

After the students were signed a consent, the researchers explained them the objectives of the program at the selected school and made the appointment with them to carry out the first data collection. The first data collection was conducted in the rooms at the selected schools by using the self-administered questionnaire. Once the questionnaires have been completed, the students were asked to measure their weight and height. The researchers processed and filled in the weighing and height into the questionnaire of each student. The following week, the researchers implemented the program to promote physical activity to the intervention group until completed and the second data collection was performed in the following week after the program ended (week 25).

### Statistical Analysis

The data analyses were explored by SPSS version 20 for Windows. Categorical data of the subjects were described using frequency and percentage. Mean and standard deviation were used to present continuous data. Paired sample t-test was computed to compare the different mean score of knowledge, attitude, and BMI within the experimental group and the control group before and after intervention. Independent sample t-test was used to compare the different mean score of knowledge, attitude, and BMI between groups before and after intervention. The chi-square test was performed to compare the differences of general characteristics and socio-demography of the subjects between groups before intervention and levels of physical activity between groups after intervention. McNemar test was calculated to compare levels of physical activity within groups before and after intervention. A p-value < 0.05 was considered significant.

### Ethical Considerations

This study was approved by the Ethics Committee of Naresuan University (IRB: 0215/2017). In addition, the researchers explained study objectives, research methodology, benefit, and the expected risks that might arise to the subjects and allowed them to be able to leave this study at any time. Further, the information collected from this study was kept confidentially and the results presented for the overall.

## Results

Characteristics and socio-demography compared between the

intervention group and the control group were not different ( $p>0.05$ ). The majority of the intervention group and the control group were male (61.7% and 53.3%) with age higher than 10 years old (58.3% and 55.0%). Most of the intervention group and the control group studied in grade 5 (38.3% and 36.7%). Sixty one point seven percent of the intervention group and 56.7% of the control group had total siblings 1-2 persons. The first and the second birth order of the intervention group was 95.0% and the control group was 91.6%. Most of the intervention group and the control group had daily pocket money to school less than 1.7 US\$ (68.3% and 60.0%) and 86.7% of the intervention group and 93.3% of the control group had no chronic diseases (Table 1).

Table 2 showed significantly different mean score of knowledge, attitude and BMI within the intervention group before and after intervention ( $p<0.05$ ). Mean score of knowledge increased from 6.83 to 8.22, attitude rose from 2.30 to 2.83, and BMI decreased from 24.70 to 23.13 kg/m<sup>2</sup>. Moreover, there were significantly differences and higher mean score of knowledge and attitude, and lower BMI in the intervention group than in control group after intervention (Data was not shown). However, there was no differences of these factors in the control group before and after intervention.

After intervention, there was significantly difference of physical activity in the intervention group ( $p<0.05$ ). The percentage of adequate physical activity raised from 25% to 81.6%. There was also significantly difference ( $p<0.05$ ) when compared physical activity between the intervention group and the control group (Data was not shown). However, physical activity in the control group was not statistically significant after intervention.

## Discussion

After implementing the program to promote physical activity for grade 4-6 students, the study found that mean score of knowledge and attitude were significantly higher whereas mean score of BMI was significantly lower. Further, percentage of physically active students were significantly greater in the intervention group than before intervention. However, there was no difference of these factors in the control group after intervention. Our study results were consistent with the studies related to physical activity in grade 4-6 school students. For example, Yammen and Duangsong studied the effects of health promotion programs to control the weight among grade 5 students with overweight in Mueang District, Phitsanulok Province [14]. The study of Uthachai and Buncharachakit implemented a program promoting food and exercise behavior to prevent overweight of grade 6 students in Khon Kaen Municipality. These two studies showed that the intervention group had knowledge about obesity, proper diet intake and exercise after intervention significantly higher than before intervention and the control group. Additionally, there was significantly lower body weight than before intervention and the control group ( $p<0.001$ ) [15]. Moreover, our results were in the line with the study of Kaewthet et al., which studied the effects of a program to promote food consumption behavior and physical activity in grade 4-5 students with overweight in schools under Bangkok Municipality. The results showed that the mean scores of dietary behavior and physical activity were higher than before intervention ( $p$ -value < 0.001) [16]. According to the results from the previous studies, it can be explained that the intervention

Table 1. Characteristics and socio-demography compared between the intervention group and the control group (Chi-square test).

Characteristics and socio-demography	Intervention group (N=60)	Control group (N=60)	p-value
	N (%)	N (%)	
<b>Gender</b>			
Male	37(61.7)	32(53.3)	0.641
Female	23(38.3)	28(46.7)	
<b>Age (year)</b>			
< 10	25(41.7)	27(45.0)	0.783
≥ 10	35(58.3)	33(55.0)	
<b>Grade</b>			
Fourth	21(35.0)	19(31.6)	0.85
Fifth	23(38.3)	22(36.7)	
Sixth	16(26.7)	18(31.6)	
<b>Total number of siblings</b>			
1-2	37(61.7)	34(56.7)	0.522
≥ 3	23(38.3)	28(43.3)	
<b>Birth order</b>			
First or second	57(95.0)	55(91.7)	0.834
Third or later	3(5.0)	5(8.3)	
<b>Pocket money per day (US\$)</b>			
< 1.7	19(31.7)	24(40.0)	0.397
≥ 1.7	31(68.3)	26(60.0)	
<b>Chronic disease (allergy and asthma)</b>			
No	52(86.7)	56(93.3)	0.352
Yes	8(13.3)	4(6.7)	

Table 2. Comparison of mean score of knowledge, attitude, and BMI within the intervention group and the control group before and after intervention (Paired sample t - test) (N=60 per group).

Variable	Mean (SD)	Mean Difference	t	df	p-value
<b>Knowledge</b>					
Experimental group					
Before	6.83 (1.32)	-1.37	-10.948	59	<0.001*
After	8.20 (1.11)				
Control group					
Before	6.94(1.45)	0.08	1.362	59	0.348
After	6.86(1.27)				
<b>Attitude</b>					
Experimental group					
Before	2.30 (0.89)	-0.53	-6.626	59	<0.001*
After	2.83 (1.13)				
Control group					
After	2.33(0.94)	-0.04	-0.629	59	0.532
Before	2.37(1.01)				
<b>BMI (Kg/m<sup>2</sup>)</b>					
Experimental group					
Before	24.70 (4.66)	1.57	3.607	59	0.001*
After	23.13 (4.22)				
Control group					
After	24.47(4.73)	-0.14	-0.558	59	0.579
Before	24.51(4.85)				

\* p-value < 0.01



**Table 3. Comparison of physical activity in the intervention group and the control group before and after intervention (McNemar Test).**

Physical activity	Experimental group (N=60)			Control group (N=60)		
	Before N (%)	After N (%)	P-value	Before N(%)	After N(%)	P-value
Adequate	15(25.0)	49 (81.6)	<0.001**	18(30.0)	23(38.3)	0.762
Inadequate	45(75.0)	11(18.3)		42(70.0)	37(61.6)	

\* p-value < 0.01

programs enhanced grade 4-6 school students to have learned more about physical activity. As a result, these students have gained knowledge and changed their attitude to do more physical activity, which helps overweight and obese students to burn fat to reduce their BMI [17].

Our study results were also consistent with the study of Sukchaisong et al., which applied the Trans-Theoretical Model to promote physical activity in nursing students [18]. The results showed that exercise behaviors of the intervention group were significantly better than before intervention. In addition, Panichkul and Saranbua have adopted the theory Trans-Theoretical Model to assess exercise behavior change in the elderly patients with hypertension [19]. The results showed that after the program implemented the experimental group increased change in exercise behaviors. Similarly, Puranamaniwiwat et al., employed the concept of Trans-Theoretical Model to study the exercise behavior modification in elderly patients with hypertension. The subjects had significantly higher on average score of exercise and eating behavior [20]. From the previous studies, most researchers have adopted the concepts of Trans-Theoretical Model to study exercise behavior change in teenager or adult subjects successfully. However, the use of such theories to promote physical activity for upper secondary school students (grade 4-6) was also successful. The students were able to change their physical activity and increase performing physical activity more regularly. It can be explained that the process in the model can motivate school students to change their physical activity to reduce weight especially in overweight and obese students.

## Conclusion

This study concluded that physical activity promotion program for grade 4-6 school students in Pho Prathap Chang District, Pichit Province applied by the Trans theoretical model or Stage of Change Model showed better modification of their knowledge, attitude, physical activity and BMI of students after intervention.

## Recommendation

1. Students, parents, teachers, school administrators and public health officials in Pho Prathap Chang District, Pichit Province can employ physical activity program to promote physical activity for students to practice both at school and at home.
2. The community leaders can use the findings from this study to provide arrangement of places and the environment in the community to facilitate the proper physical activity for children.
3. The researchers should utilize the study results for further

study to assess the sustainability of physical activity in the targeted students.

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