Journal of
Thai Interdisciplinary Research
Volume 12, Number 5, Pages 42 - 47

Health behavioral modification program for overweight and obese school-age children

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Abstract

This quasi-experimental study aimed to determine the effectiveness of behavioral modification program among overweight and obese students, grades 4-6 elementary students at Saint Nicholas School, Phitsanulok, Thailand. A transtheoretical model of behavior change was applied. Sixty participants were recruited and divided into two groups; 30 in an experimental group and other 30 in a comparison group. The experimental group participated with health behavioral modification program for 12 weeks along with the 5 stages: pre-contemplation, contemplation, preparation, action, and maintenance. Data were collected through self-report questionnaires. The descriptive statistics, paired-sample t-test and independent-sample t-test were used to analyze data. The results revealed that the average score including self-care behavior, self-regulation and self-efficacy of the experimental group was significantly higher than the comparison group ($p < 0.01$). The findings of this study suggested that the behavioral modification program could improve health behaviors and decreased bodyweight among overweight and obese grades 4-6 elementary students.

Keywords: behavioral modification program, overweight, school-age obesity, transtheoretical model of behavior change

Article history: Received 13 January 2017, Accepted 5 September 2017

1. Introduction

The prevalence of childhood obesity has increased substantially over the past three decades worldwide [1]. Among Thai children, the prevalence rates of overweight and obesity in children had been analyzed by National Health Examination Survey from 1995 to 2009 for several times and concluded that overweight and obesity in children increased rapidly, especially in school-age children. The survey found that overweight and obese children aged 6-14 years increased by 1.7 times (5.8 percent in 1995 and 6.7 percent in 2001) and gradually increased to 9.7 percent in 2009 [2]. As the prevalence of childhood overweight has increased, so has the incidence and prevalence of obesity-associated chronic diseases among overweight to obese children, including hypertension, hyperlipidemia, and type 2 diabetes mellitus [3]. The prevalence of type 2 diabetes in Thai children and adolescents has increased during the same period of childhood overweight/obese has increased [4]. Further, 25 percent of overweight children are more likely to become overweight adults, and about 80 percent of overweight adults have hypertension, diabetes, coronary artery disease, and high blood cholesterol and become the leading causes of death [5]. In addition, the physical and mental health problems were also include other complications in long term. Healthcare providers should collaborate the parents to keep their children from being overweight. The prevention and treatment of overweight children endorses to promote the quality of life of the children in the future [6].

The transtheoretical model of behavior change (TTM) or stage of change offers a theoretical framework to guide the design, content, implementation, and evaluation of population-based interventions for exercise and physical activity. In the TTM, individuals work through cognitive and affective processes leading to adoption of a new behavior, and then they move to using behavioral strategies to establish a new pattern of behavior. Based on this model, five distinct stages had been proposed involving in the process of behavior change: precontemplation, contemplation, preparation, action, and maintenance. Precontemplators are physically inactive and have no intention to become active. Contemplations are also inactive, but are thinking about becoming active, though no actual action has yet taken place. Preparations are physically active but not at the recommended level. Individuals in the action stage are physically active at the recommended level, but have been active for less than 6 months.

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DOI 10.14456/jtir.2017.41

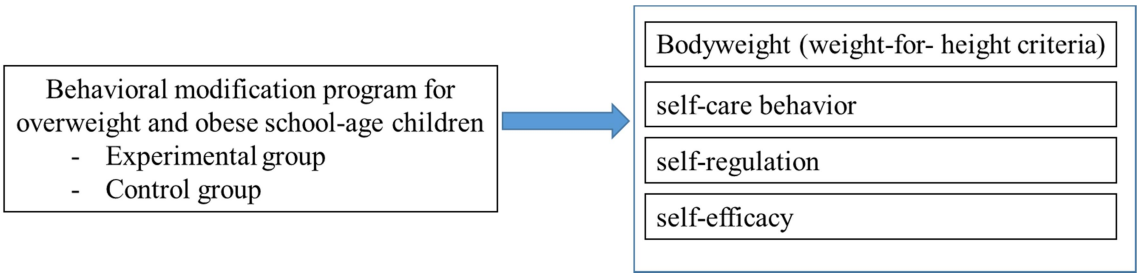

Figure 1 Conceptual framework of the study

Finally, individuals in the maintenance stage are physically active at the recommended level and have been active for 6 or more months [7].

Several theories have been incorporated to follow up behavior change including self-care behavior, self-regulation and self-efficacy. Self-care behavior refers to decisions and actions that an individual can take to cope with a health problem or to improve individuals health such as diet, exercise, and weight loss [8]. Self-regulation is the ability to monitor and control their own behavior, emotions, or thoughts, altering them in accordance with the demands of the situation. It includes the abilities to inhibit first responses, to resist interference from irrelevant stimulation, and to persist on relevant tasks even when individuals don't enjoy them [9]. Self-efficacy is the belief one has in one's capabilities to successfully carry out a course of action [10]. The 3-self health behaviors (self-efficacy, self-regulation, and self-care) modification program could reduce the weight in the late adolescents [11]. In addition, the self-efficacy, self-control and implementation intention (SSII) were developed as the SSII-healthy eating and physical activity intervention programs for obese elementary school children and showed the decrease for BMI [12].

The purpose of this study was to determine effects of a health behavioral modification program based on 3-self including, self-care behavior, self-regulation and self-efficacy among overweight and obese school-age children in Saint Nicholas Primary School, Phitsanulok, Thailand. Using existing models as a foundation, we developed a conceptual framework to depict the pathway that accounts for the intervention (Figure 1).

2. Materials and methods

2.1 Design

This research was a quasi-experimental research to study the effectiveness of the health behavioral modification program among school-age overweight to obese students.

2.2 Participants

A total of 60 subjects, Grade 4-6, in the Saint Nicholas Primary School, Phitsanulok, Thailand were invited to participate. Simple random assignment was used to divide the participants into two groups; the experimental group (30 subjects) and a comparison group (30 subjects). The inclusion criteria were: (i) overweight or obese (+1.5 SD to +3 SD); (ii) age between 10 and 12; (iii) no signs of mental disorders, communication, movement, and no signs of metabolic syndrome; (iv) agreed to participate in the study. The consent form to allow children to participate in the program were signs by parents.

2.3 Instruments

The self-report questionnaires were used to collect the data and they composed of 4 parts as the following:

- Personal information: gender, age, class level, weight, height, and weight-for-height levels that refer to the growth charts for boys and girls aged 5-18 years [13]. The levels were as follows: fatty (+1.5 SD to +2 SD), overweight (+ 2 SD to +3 SD), and obese (above +3 SD line).
- Self-care behavior questionnaire was composed of 20 items. The participants were required to select each item with a 3-point scale (1 = never to 3 = regularly). Cronbach's alpha was 0.78.
- Self-regulation questionnaire was composed of 14 items. The participants were required to rate each item with a 3-point scale (1 = never to 3 = regularly). Cronbach's alpha was 0.78.
- Self-efficacy questionnaire was composed of 10 items include the statements about how confident/sure of the participants that they could exercise regularly and eat healthy food. The participants were required to rate each item with a 3-point scale (1 = never to 3 = regularly). Cronbach's alpha was 0.78.

To obtain content validity, the measures were investigated by three experts. All experts confirmed that the items used were consistent with the variable definitions. A pilot test was then undertaken with 30 school-age children from the same population to ensure the instrument reliability.

Table 1 Health behavioral modification program was carried out based on Transtheoretical Model

Week and Stage of Change	Objective/ Topic	Activity
Week 1: Precontemplation	- Evaluated the weight control problem of the students - Discussed the benefits and the risks in overweight - Asked the intention to control the weight	Group discussion, learning through group work, stories
Week 3: Contemplation	- Reviewed the effects of obesity on physical and mental health - Discussed 3-self for controlling the weight	Stories, posters, songs
Week 5: Preparation	- Discussed how to control the weight based on food consumption and physical activity guidelines - Made the commitment to control weight	Workshops, group activities, games, self-recorded diaries
Week 7: Action	- Engaged in active behaviors to change	Group discussion, learning through group work, stories, posters
Week 9: Maintenance	Sustained change that was made	Group discussion, learning through group work, stories, posters
Week 12: Maintenance	Sustained change that was made	Group discussion, learning through group work, stories, posters

2.4 Intervention

The health behavioral modification program was carried out based on Transtheoretical Model (TTM) or stages of change. The program was designed to experimental group providing for 12 weeks (6 meetings every two weeks each meeting lasted 60-90 minutes). In the first meeting, the participants were evaluated their weight control problem themselves by measuring their weight and height. The benefits and the risks in overweight were discuss and then asked their intention to control the weight. This step was designed to figure out the precontemplation stage. Secondly, the participants considered the pros and cons of the overweight and 3-self were discussed. Thirdly, the participants made a commitment to control their weight. Fourth to sixth meeting, the weight control of the participants were followed and discussed. Moreover, the contents of program consisted of food digestion, five food groups, a diet pyramid, healthy food tips, physical activity guidelines, behavioral reinforcement, and realistic goals to help the children solve their problems. The activities based upon group discussion, learning through group work, games, workshops, group activities, stories, posters, songs, and self-recorded diaries (Table 1). All the meetings were organized and directed the activities by the 3-researchers (C.S., P.P., S.K.).

2.5 Measurement

The three trained assistant researchers obtained height and weight measurement of students. Each subject was evaluated for the following parameters: self-care behavior, self-regulation and self-efficacy through self-report questionnaires. Descriptive statistics were employed to describe participants' characteristics and bodyweight. The data were analyzed using a paired t-test and an independent t-test to compare mean differences within and between the groups, during before and after the program.

3. Results and discussion

Of the 60 subjects in the study sample completed the study with 30 subjects in the comparison group and 30 in the experimental group. The characteristics of the school-age children by sex, class level and bodyweight (wt/ht) at the time of data collection conducted before the program are shown in Table 2.

Table 3 contains the data on the children bodyweight (wt/ht) after the health behavioral modification program. The levels of overweight as categorized by bodyweight (wt/ht) of the experimental and comparison groups were different. The percentage of obesity decreased in the experimental group from 73.33% to be 60% (-13.33%), while there was a little decrease in the comparison group from 66.67% to be 63.33% (-3.34%). Table 4 indicates there were no significantly decrease in the mean weight between two groups ($p = 0.501$

Table 2 Characteristics of the overweight school-age children in the experimental and comparison group

Characteristics	Experimental (n = 30) N (%)	Comparison (n = 30) N (%)
Sex		
Male	18 (60)	23 (76.67)
Female	12 (40)	7 (23.33)
Class		
Pratom 4	16 (53.33)	10 (33.33)
Pratom 5	7 (23.33)	10 (33.33)
Pratom 6	7 (23.33)	10 (33.33)
Bodyweight (weight-for-height)		
Fatty (+1.5SD to +2SD)	1 (3.33)	2 (6.67)
Overweight (+2SD to +3SD)	7 (23.33)	8 (26.67)
Obese (> +3SD)	22 (73.33)	20 (66.67)

Table 3 Comparison of bodyweight (weight-for-height) variables between the experimental and comparison groups

Bodyweight (weight-for-height)	Experimental (n = 30) N (%)	Comparison (n = 30) N (%)
Before		
Fatty (+1.5SD to +2SD)	1 (3.33)	2 (6.67)
Overweight (+2SD to +3SD)	7 (23.33)	8 (26.67)
Obese (> +3SD)	22 (73.33)	20 (66.67)
After		
Fatty (+1.5SD to +2SD)	3 (10)	2 (6.67)
Overweight (+2SD to +3SD)	9 (30.00)	9 (30)
Obese (> +3SD)	18 (60)	19 (63.33)

Table 4 Comparison of average weight between the experimental and comparison groups

Bodyweight	Experimental (n = 30)		Comparison (n = 30)		T	p value
	$\bar{x}$	SD	$\bar{x}$	SD		
Weight (kilograms) (before)	65.20	12.797	65.23	14.457	0.009	0.992
Weight (kilograms) (after)	62.80	12.563	65.17	14.430	0.678	0.501

**p < .01

Table 5 Changes in characteristics after intervention of experimental group (N = 30)

Variables	Before	After	T	p value
	$\bar{x}$ (SD)	$\bar{x}$ (SD)		
Self-care behavior	44.93 (4.059)	53.07 (4.11)	8.56**	0.000
Self-regulation	32.13 (3.471)	39.20 (2.772)	10.398**	0.000
Self-efficacy	23.90 (2.708)	28.63 (2.076)	8.628**	0.000
Total	100.97 (7.554)	120.90 (7.126)	11.558**	0.000

**p < .01

Table 6 Changes in characteristics after intervention between two groups (N = 60)

Variables	Experimental group	Comparison group	T	p value
	$\bar{x}$ (SD)	$\bar{x}$ (SD)		
Self-care behavior	53.07 (4.110)	40.43(4.531)	11.311**	0.000
Self-regulation	39.20 (2.772)	28.87(3.893)	11.844**	0.000
Self-efficacy	28.63 (2.076)	21.73(2.753)	10.960**	0.000
Total	120.90 (7.126)	91.03(8.252)	15.003**	0.000

**p < .01

In experimental group, the self-care behavior, self-regulation and self-efficacy were significant increase after the program (Table 5). The comparison between the experimental and comparison groups found that the self-care behavior, self-regulation and self-efficacy were also significant increase (Table 6).

Our study examined the effectiveness of the health behavioral modification program based on TTM with 12 weeks. The children bodyweight (wt/ht) slightly decrease after the health behavioral modification program but they were no significantly when compared with comparison group. This is not beyond our expectation because the improvement of bodyweight was the normal growing process in the school-age children without any change in food consumption and physical activity [13]. The study results showed that after the intervention, self-care behavior, self-regulation and self-efficacy significantly improved among children in the experimental group and also significantly increased when compared with the comparison group. Besides, the program was provided to the children so that they were activated their efficacy, accountability, and awareness based on TTM which later discussed in experimental group to share successful experience. Moreover, the TTM has been used to create interventions to change health behaviors, including smoking, emotional distress, alcohol abuse, weight loss, and mammography screening. The key successes are the movement between stages in the model is linear and individuals' present stage [14]. In addition, the 3-Self health behaviors were applied in behavior modification program and also succeed to reduce obesity of late adolescents [11]. Our findings are consistent with the study that has reported positive effect of TTM-based interventions on caloric intake, consumption of foods in high fat, weight and BMI [15]. The TTM combined with nutrition and physical activity interventions tends to produce better health outcomes [16]. The effective intervention is important to combat the noncommunicable diseases [17]. However, a review study showed that there is a little evidence about sustainable weight loss in TTM-intervention [16]. Recently, the combined approach of TTM-based exercise counseling and exercise classes showed more benefited to overweight/obese children than exercise classes alone. In addition, development of the theory-based intervention incorporating information obtained from the needs assessment of children and parents increased the intervention effectiveness [18].

The limitation of this study need to be borne in mind because the number of subjects in the study was small (n = 30), although the study's longitudinal character could make this limitation of only relative importance. Suggestion, a follow-up process should be done after the program was completed to find out the sustainability of the program for health behavior.

4. Conclusions

In summary, the present study has applied TTM-based intervention to attempt to manage self-care behavior, self-regulation and self-efficacy for overweight and obese school-age children. The results suggest that self-care behavior, self-regulation and self-efficacy significantly increased that may possibly lead to decreases in overweight and obese children. Although the intervention gave positive results, a follow-up process should exist its sustainability.

Acknowledgements

The authors would like to express gratitude to the teachers and participants in Saint Nicholas Primary School, Phitsanulok, Thailand for their providing participation on this project.

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