

Effects of an Obesity Control Program for Thai Elementary School Children: A Quasi-Experimental Study.

Jaruwan Phaitrakoon, Arpaporn Powwattana, Sunee Lagampan, Jeeranun Klaewkla

Abstract : This quasi-experimental study tested the effectiveness of an Obesity Control Program (OCP) in elementary school student. The development of this program's activities was guided by previous OCPs of health promoting schools and literature reviews. Participants were grade 1-3 overweight students and their parents, teachers, and cooks in two private schools in Nakhornnayok Province, Thailand. The 40 students assigned to the experimental group received 8 obesity control activities in 16 weeks. These were: healthy food prepared by cooks; integration of nutrition content into all subjects by teachers; nutrition education; planting vegetables; healthy day/healthy corner; newsletter; morning exercise; and nutrition, physical activity, perceptions and physical fitness assessment, performed by the researchers. The 44 students assigned to the control group did not receive any of these tailored activities. The program was evaluated three times, before, during, and after the intervention. Structured questionnaires assessed the children's perception of obesity, food consumption and exercise behaviors; and skin fold measurement was used to assess body fat percentage. Repeated measure ANOVA was used analyze the data.

By program end, the nutritional status of experimental students had improved. The calorie intake per day and body fat percentage in the experimental group was significantly less than the control group. A key success factor of the healthy program was the participation of all parties such as school director, teachers, cooks, parents, and students. This program requires further testing in several schools to help reduce obese children in Thailand. Public health nurses can make important contributions to assist in reducing the alarming crises in overweight and obese children, through developing and implementing such programs, to educate them to lead healthier lives.

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Introduction

The overweight and obesity prevalence among children and adolescents has risen greatly worldwide.¹ This has led to the increase of obesity-related morbidity, and consequently, a burden on health care systems, and the concerns of nurses and other health professionals. Several reports have shown that the prevalence of children and adolescents who are overweight or obese

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has increased by 8.3–40%.^{2–4} Therefore, the overweight and obesity in children and adolescent is a major health problem that warrants serious actions.¹

In Thailand, the National Health Foundation and Thailand Research Fund found that 12.0 % and 5.0% of children were obese and overweight, respectively.⁵ The health report of a private school indicated an increasing prevalence of overweight children from 4.9% in 2008 to 8.2%, 8.3% and 8.4% in 2009, 2010, and 2011, respectively. In 2011, the overweight prevalence among elementary grade 1–3 students was 8.7% which was higher than those of grade 4–6 (8.1%) and grade 7–9 students (5.4%).⁶ Therefore, the prevalence of overweight children grade 1–3 in the school settings were above average. The childhood obesity in Thailand was largely caused by inappropriate lifestyles such as sedentary lifestyle and high-calorie diets.⁷ This situation is prominent in central region of Thailand, the setting of this study.

Nakhornnayok Province in central Thailand is now facing the problem of increasing numbers of children who are overweight or obese due to life style changes such as over-eating and lack of physical activities. The rate is higher than other provinces around Bangkok and the recommended standard for Thailand.⁸ During childhood, many transitions, both biological and physical occur, such as size, shape, muscle, fat and hormones. However, these have slower growth or changes than in infancy, and adolescence stage. Various dietary factors are positively associated with a child's overweight or obesity. Moreover, sedentary lifestyle patterns have been related to obesity, especially playing digital games, using computers and watching television.

Currently, all parties concerned had proposed different strategies, especially nutrition and physical activity interventions to solve this problem but the outcomes of which were not satisfactory.^{9,10} Different methods of childhood obesity prevention were developed but the outcomes of these methods were not sustainable. In order to overcome these challenges and effectively solve the problem, a new approach was developed by combining the Health Promoting Schools(HPS) strategies, collaboration, and participation of all

stakeholders. HPS strategies have been used in the management of obesity prevention in previously successful HPS programs.¹¹ Therefore, the program described in this paper, the OCP could be congruent with main factors for development of obesity and appropriate with children with obesity in school. The aim of this study was to examine the effectiveness of OCP with participation of school, students, and parents regarding elementary school students' perception of obesity, calories of dietary intake, energy expenditure per day, and body fat percentage.

Literature Review

Childhood obesity is a challenging problem faced by pediatric health care providers. The problem is influenced by genetic factors,¹² habitual overeating,¹³ high-fat foods¹⁴ and sweets consumption,¹⁵ sedentary lifestyles,¹⁶ inadequate physical activity,¹⁷ child rearing patterns,¹⁴ and environment.¹⁸ Many strategies worldwide are used to solve this problem¹⁹ such as nutrition only,²⁰ physical activity only,²¹ physical activity and nutrition,²² nutrition, physical activity and family involvement,²³ nutrition and family involvement,²⁴ nutrition, physical activity and teacher involvement,²⁵ nutrition, physical activity, family involvement and teacher involvement,²⁶ nutrition, physical activity, family involvement, teacher involvement and multidisciplinary,²⁷ and nutrition, physical activity, family involvement, teacher involvement and community involvement.²⁸

In Thailand, many studies have been carried out to develop strategies in prevention and control of obesity problem, including nutrition and physical activity programs in school. The programs included nutrition education,^{7,20} health foods in school,²⁸ and adequate exercise at home and school.²⁹ However, the interventions of some studies were not sustainable because they involved only clinicians or nutritionists without the participation of other stakeholders.³⁰ In order to effectively solve this problem, an intervention should not only include nutrition, physical activity or the involvement of participants, but must also be supported by national policies¹¹ and participation of

all parties.¹⁹ The development of our HPS was based on the four pillars, that is, policy, human resources, collaboration, and resource mobilization.³¹ It was believed that supportive health policy together with the collaboration of all parties could effectively support an OCP to achieve its goal or sustainable of program. In order to try to solve childhood obesity appropriately, the activities in this study were developed by integrating and applying the activities of previously successful OCPs from HPS.

Method

Design: A quasi-experimental design was used.

Ethical considerations: Ethics approved was obtained from the Research Ethics Committee of the Faculty of Public Health, Mahidol University. All participants who were the stakeholders in this study (school directors, teachers, cooks, students, and parents) were informed about the objectives of the study, any activities they were required to participate in, and the right to withdraw at any time without any adverse repercussions. The children signed assent forms, after their parents signed a consent form indicating they could participate in the study. Students were provided information on the intervention process to try to reduce any negative impacts of the research intervention.

Setting and sample:

A private school in Nakhornnayok Province in central Thailand a high prevalence of obesity in students, especially in grade 1-3, was selected as the experimental school. The control school was a private school in the same province and with the same demography. The outputs and outcomes of the program were compared between the two schools. A power analysis was conducted to determine the sample size, with an alpha of 0.05, a power of 0.80.³² Therefore, a sample size of 28 participants per group (experiment and control) was determined to be needed for a total of 56 participants. Of the students who were overweight or obese in grades 1-3 and willing to participate in experimental and control group numbered 40 and 44, respectively, a total of 84 students finally participated in the study.

Procedure and Data collection:

The Obesity Control Program

The activities in this program were modified from the OCPs of four previously successful Diamond Levels Health Promoting Schools (DLHPS). The participants included teachers, parents, and students using A-I-C (Appreciation Influence and Control) technique³³ which resulted in contextually, socially, and environmentally appropriate OCP. The results in eight activities for obesity control were as follows:

1) *Nutrition education program:* The content was delivered by researchers composed of 6, 2, and 4 topics for students, parents, and cooks, respectively. All participants could attend all topics. Two main activities of nutrition education program were knowledge enhancement and skill building i.e., obesity assessment, the five food groups, the quantity and energy of foods, energy expenditure and exercise, food labels and the adverse effects of soft drinks and snacks.

2) *Healthy food:* The healthy food activity focused on vegetables and fruits consumption. Providing low-sugar fruit juices and reducing the use of seasoning and fat in school-lunch meals was the main focus of health foods in school. Cooks received nutrition education from the first researcher and prepared healthy school lunches for students.

3) *The integration of the nutrition content into all school curriculums:* A discussion with eight teacher representatives who taught the students in grades 1-3 was carried out to integrate the information about obesity control into all classroom subjects. These teachers taught mathematics, Thai language, English language, arts, sociology, science, health education and physical education, and basic vocational education.

4) *Growing vegetables at home:* The main objective was to enhance students' knowledge about growing vegetables, and they received two types of vegetable seeds to sow at home with assistance from their parents. The researcher inquired about the growth and development of their vegetables during the nutrition education class, and some students brought their produce for cooking.

5) *Health Day/Health Corner*: This was held by the researcher, teachers, and research assistants as an extra-curricular activity that included the provision of information and game on OCP (i.e., health game and health exhibition) to galvanize the students to be aware of obesity problems and to enhance their skills in obesity prevention. Health Corner was an activity aimed for increasing knowledge in health and set up in a corner in the cafeteria.

6) *Newsletter*: The information about OCP was distributed by newsletters. These helped parents to understand the intent of the program’s activities and encouraged them to agree to participate. Seven newsletters were sent to the parents.

7) *Morning exercise*: The participants exercised to a song for 10 minutes every morning for one month. The songs were supported by the Department of Health, Ministry of Public Health. These songs included “Food Dance”, “Food Consumption” and “Fitness”. The

activity was designed and organized by students, the research team, and the health education and physical education teacher.

8) *Assessment of physical fitness*: This was measured by using the Sports Authority of Thailand Simplified Physical Fitness Test (SATST) which is used to test the basic physical performance of those >7 years old. There were five activities in this test which included 30-seconds push-ups, 60 seconds sit-ups, sit and reach, standing broad jump, and zig-zag run.

Most activities were performed at school by researcher and a research assistant, teachers, and cooks. The parents’ roles were healthy food preparing, and supporting healthy activities at their home. All activities were implemented according to the schedule (See **Table 1**). The above eight activities were implemented and evaluated in the experimental school, while only the assessment of physical fitness was carried out in the control school.

Table 1 Schedule and content of OCP

Time Schedule	Activities/Contents	Participants/Time
1 st Week	- Nutrition, physical activity, perceptions and physical fitness assessment by researchers	Students /T1
	- Nutrition education by researchers <i>Students</i> : To enhance understanding of cause, effect and prevention of obesity and control weight to normal levels; and to increase the obesity assessment and nutrition status according to growth curve.	Students /T1
	<i>Cooks</i> : To enhance knowledge of cause, effect and prevention of obesity; control weight at normal levels; increase obesity assessment and nutrition status by growth curve; and to record the type and frequency of nutritional intake, and physical exercise per day.	Cooks/T1
2 nd Week	- Newsletter by researchers	Parents/T1
	- Teacher meeting with researchers for integration of nutrition content in all subjects.	Teacher/T1
3 rd Week	- Nutrition education by researchers <i>Students</i> : To enhance information about 5 food components; increase understanding of food portions for consumption according to flag nutrition and 9 food protocols; and describe the type and benefit of 5 vegetable colors.	Students /T2
4 th Week	- Nutrition education by researchers <i>Cooks</i> : To enhance knowledge of the type and 5 food components; to increase knowledge of food portion for consumption according to flag nutrition and 9 food protocols, and to enhance the skill of school lunch planning.	Cooks /T2
	- Teacher meeting with researchers to integrate nutrition content in all subjects	Teacher/T2

Table 1 Schedule and content of OCP (Continued)

Time Schedule	Activities/Contents	Participants/Time
5 th Week	- Nutrition education by researchers <i>Students:</i> To enhance information about type, quantity and energy of food intake per day; and increase understanding of healthy food choices and avoiding unhealthy foods.	Students /T3
6 th Week	- Newsletter from researchers - Nutrition education by researchers <i>Parents:</i> To enhance knowledge of cause, effect and prevention of obesity and control the weight to normal level; increase obesity assessment and the nutritional status according to growth curve; and record the type and frequency of nutrition and physical or exercise per day.	Parents/T2 Parents/T1
7 th Week	- Nutrition education by researchers <i>Students:</i> To enhance understanding of the types and benefits of vegetables, and increase vegetable planting skills at home. <i>Cooks:</i> To enhance knowledge of the danger of carbonated drinks and snack, and increase skills in food and snack selection in schools.	Students /T4 Cooks/T3
8 th Week	- Students plant the vegetables with parents - Teacher meeting for integrating nutritional content in all subjects by researchers - Nutrition, physical activity, perceptions and physical fitness Assessment by researchers	Students Teacher/T3 Students /T2
9 th Week	- Nutrition education by researchers <i>Students:</i> Conducted to enhance understanding of appropriate and beneficial exercise, and to arrange exercise types according to energy expenditure levels from high to low.	Students /T5
10 th Week	- Newsletter by researchers	Parents/T3
11 th Week	- Healthy Day and Healthy Corner in school by teachers, researchers, and team - Nutrition education by researchers <i>Students:</i> To enhance knowledge and skills about nutrition label reading, and increase the understanding of dangers of carbonated drink and snacks.	Students Students /T6
12 th Week	- Nutrition education by researchers <i>Parents:</i> To enhance knowledge of healthy snack Choices and nutrition label reading, and to increase the knowledge of dangers of carbonated drinks and snack. <i>Cooks:</i> To enhance knowledge of nutrition label reading, and increase skills in comparing beneficial snacks.	Parents/T2 Cooks/T4
13-15 th Week	- Teacher meeting with researchers regarding nutrition content in all subjects. - Newsletter by researchers - Exercise daily in morning by teachers, researchers, and team - Newsletter by researchers	Teacher/T4 Parents/T4 Students Parents/T5-7
16 th Week	- Exercises daily by teachers, researchers, and team - Nutrition, physical activity, perceptions and physical fitness assessment by researchers	Students Students/T3

Note: T = Time of activity

T1- T7 = Activity times from 1-7 times

Data collection

Students in the experimental group completed a baseline survey at the beginning of the program (Time 1). They answered questions about their perceptions of obesity and consumption behavior and

also measured calories of dietary intake per day, physical activity at the beginning, during the program (week 8=Time 2), and after the program (week 16 = Time 3). Students in the control group completed the same set of questionnaires as the experimental group (See **Figure 1**).

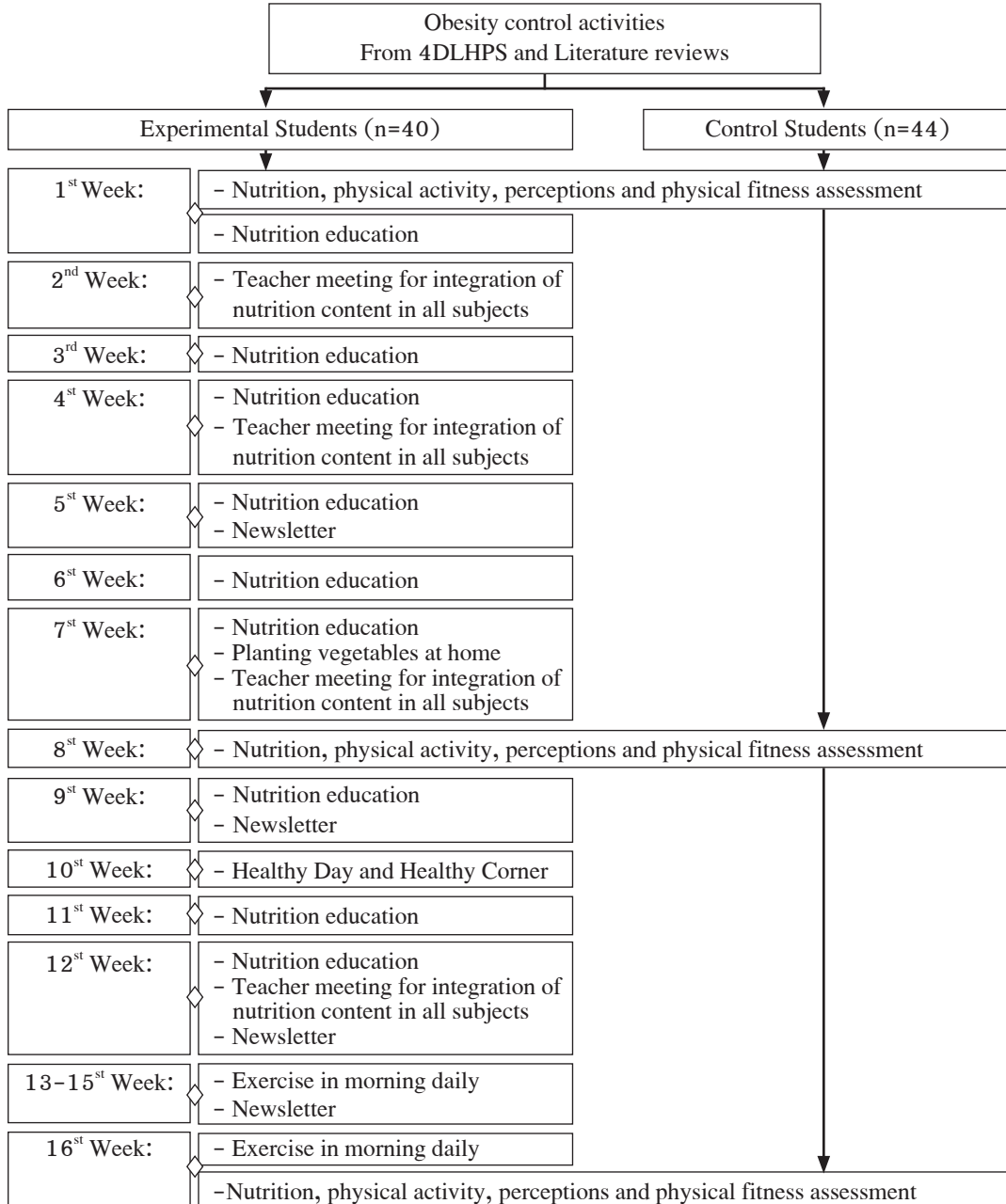


Figure 1 Flow chart of procedure

Instruments:

To assess children's perception of obesity, six items measuring the perception of obesity in children, modified from the *General Health Perception Battery Guideline* (GHPBG),³⁴ were included in the questionnaire. The six items included prior health, current health, health outlook, resistance and susceptibility to illness, health worry and concern, and sickness orientation. Examples of the items are: "Obese children will grow to obese adults" and "At this age, you should eat in large portion size for growing". Possible responses to each item range from 1 = disagree to 3 = agree. The total score, which ranges from 6–18, is obtained by summing the response values across all items. A higher score represents a better perception of obesity.

The *Consumption Behavior Instrument* (CBI) was used to assess children's food consumption behaviors. The children were asked about the number of meals they had per day, types and frequency of snacks or food between meals per week, types of desserts or food between meals such as Thai desserts, fast food, fruit juice, soft drink, and fruits they had.

Moreover, the food frequency questionnaire or 24-hour recall³⁵ was used to calculate the calories of dietary intake/day. The meals, type of foods, ingredients, and quantity of ingredients were recorded in each meal for 2 study days and a holiday. The calories of dietary intake/day were analyzed by the computerized program INMUCAL-Nutrients of the Institute of Nutrition, Mahidol University.

The *Bouchard Three Day Physical Activity Record* (BTDPAC)³⁶ was used to determine the energy expenditure of the physical activities and leisure exercise of the children. Nine groups of activities comprised lying down, seated and standing; light activity; moderate activities, light manual work; low intensity sports or leisure activities; moderate manual work; moderate intensity sports or leisure activities; vigorous sports; and manual work. Energy expenditure of physical activity was computed by using the formula: Energy (energy expenditure of activity/kg./15 min) × Weight (Body weight of individual subject) × Time (the frequency

of 15-min periods of time).

Skinfold thickness measurement using skinfold caliper and tape was used to determine body fat percentage, calculated by Tricep Skinfold Thickness measurements.³⁷ The tricep skinfold between acromion of scapular bone and olecranon process of ulnar bone were measured three times, and the average of which was used as the value of the tricep skinfold thickness. The research team was trained to measure this by marking the skin with a non-permanent marker, gently picking up the skin and underlying subcutaneous adipose tissue with left thumb and index finger, using the caliper to measure the thickness, pressing the caliper for about three seconds, and then releasing, reading and recording the value of the scale.

The content validity of all tools was assessed by five experts (the instructors, each of whom was specialized in physiology, nutrition, physical education, and qualitative research, respectively). The revised questionnaires were piloted with 30 students who had similar characteristics as the studied sample. Cronbach's alpha coefficient was used to determine the study instrument's reliabilities. The reliabilities, in the pilot test, ranged from 0.71 – 0.79, while the reliabilities of the instruments in the actual study, ranging from 0.61–0.85.

Data analysis:

Two-way repeated measures of ANOVA was used to compare the effects of OCP for three times (baseline before intervention program, during (week 8), and after (week 16) intervention) between the experimental and control groups. The outputs and outcomes tested included: 1) children's perception of obesity, 2) the calories of dietary intake per day, 3) the energy expenditure per day, and 4) the body fat percentage.

Results

The characteristics of the experimental and control groups

No significant differences were found between the two groups with regard to gender, age, and nutritional status as presented in **Table 2**. Results of testing the effectiveness of the OCP, the outputs, and

Table 2 Description of characteristic of experiment and control group (n=84)

Characteristic	Experimental group (n=40)		Control group (n=44)		χ^2	p
	n	%	n	%		
Gender						
Boy	26	65.0	27	61.4	0.12	0.73 ^a
Girl	14	35.0	17	38.6		
Age (years)						
6	4	10.0	5	11.4	1.18	0.24 ^b
7	12	30.0	17	38.6		
8	11	27.5	12	27.3		
9	8	20.0	8	18.2		
10	5	12.5	2	4.5		
$\bar{X} \pm SD$;	7.95±1.19		7.66±1.05			
Nutritional status						
At risk of overweight	5	12.5	8	18.2	2.23	0.33 ^a
Overweight	17	42.5	12	27.3		
Obese	18	45.0	24	54.5		

Note: ^a = Pearson's chi-square test; ^b = Paired t-test

Table 3 Mean Score Differences, Across Time, between groups and within groups

Source of variables	SS	df	Ms	F ^a	p
Perception of obesity^b					
Between groups					
Groups	0.308	1	0.308	0.067	NS
Between groups error	372.398	81	4.598		
Within groups					
Time	2.975	2	1.488	0.322	NS
Groups *Time	15.952	2	7.976	1.727	NS
Within groups error	748.127	162	4.618		
Calories of dietary intake/day^c					
Between groups					
Groups	3665612.53	1	366561.53	25.36	< 0.001
Between groups error	1.171E7	81	144513.92		
Within groups					
Time	89739.15	1.57	44869.57	1.69	0.046
Groups *Time	1192541.78	1.57	759300.53	22.53	< 0.001
Within groups error	4288186.01	127.22	33707.67		

Table 3 Mean Score Differences, Across Time, between groups and within groups (Continued)

Source of variables	SS	df	Ms	F ^a	p
Energy expenditure /day^c					
Between groups					
Groups	846499.44	1	846499.44	4.61	0.035
Between groups error	1.485E7	81	183348.60		
Within groups					
Time	74889.67	1.79	41761.66	9.19	<0.001
Groups *Time	231155.21	1.79	128901.97	28.39	<0.001
Within groups error	659489.61	145.25	4540.24		
Body fat%^c					
Between groups					
Groups	142.80	1	142.80	7.17	0.009
Between groups error	1612.73	81	19.91		
Within groups					
Time	0.52	1.61	0.37	0.12	0.032
Groups *Time	61.65	1.61	38.32	13.73	< 0.001
Within groups error	363.51	130.31	2.79		

Note: ^a = Two-way repeated measure ANOVA; ^b = Sphericity Assumed; ^c = Greenhouse-Gesser; NS = $p > 0.05$

outcomes variables, are shown in **Table 3**.

Children’s perception of obesity:

The mean scores of perception of obesity of the experimental and control groups measured at three points of time were not significantly different ($p=0.79$). Most students had a moderate level of perception (scores of 10–13). The mean scores of the perceptions of the experimental group increased from 12.4±2.5 at Time 1 to 13.3±2.2 at time 2, but slightly decreased to 13.2±2.4 at Time 3. Likewise, the mean scores of perception of the control group slightly increased from 13.0±2.1 at time 1 to 13.1±1.9 at Time 2, but dropped to 12.6±1.6 at Time 3.

The calories of dietary intake per day:

The average calories of dietary intake per day of the experimental group was significantly less

than that of the control group ($p<0.001$). The calories of dietary intake per day of the experimental group decreased from 1309.4±278.5 at Time 1 to 1022.8±250.0 at Time 2, and further decreased to 892.8±252.8 at Time 3. Similarly, the calories of dietary intake per day of the control group reduced from 1448.9±296.8 at time 1 to 1186.0±182.1 at Time 2; however, it rose to 1332.3±268.9 at Time 3 (See **Figure 2**). The interaction between group and difference of time measurement was significantly different ($p<0.001$). The overall within group factors indicated that some pairs of the calories of dietary intake per day in time were different ($p\leq 0.05$) since the differences between both groups were statistically significant at Time 1 and Time 2, Time 1 and Time

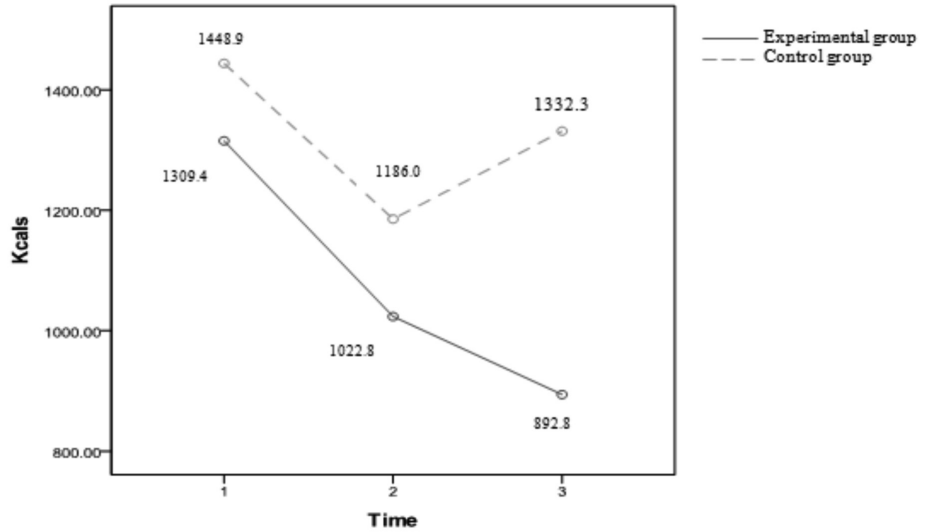


Figure 2 Mean scores for calories in daily dietary intake

3, and Time 2 and Time 3.

Energy expenditure per day:

The average energy expenditure per day of the experimental group gradually increased from 1214.5±282.1 at Time 1 to 1276.8±267.8 at Time 2, and to 1369.2±266.2 at Time 3. On the contrary, the average energy expenditure of the control group decreased from 1448.9±296.8 at Time 1 to 1434.2±242.6 at Time 2,

and to 1412.2±236.2 at Time 3 (See Figure 3). On average, the experimental group had less energy expenditure per day than the control group ($p=0.035$). However, the changing trends of both groups indicated that the energy expenditure per day in the experimental group was increasing, while that of the control group was decreasing. The overall within group factors indicated that had some pair of energy expenditure

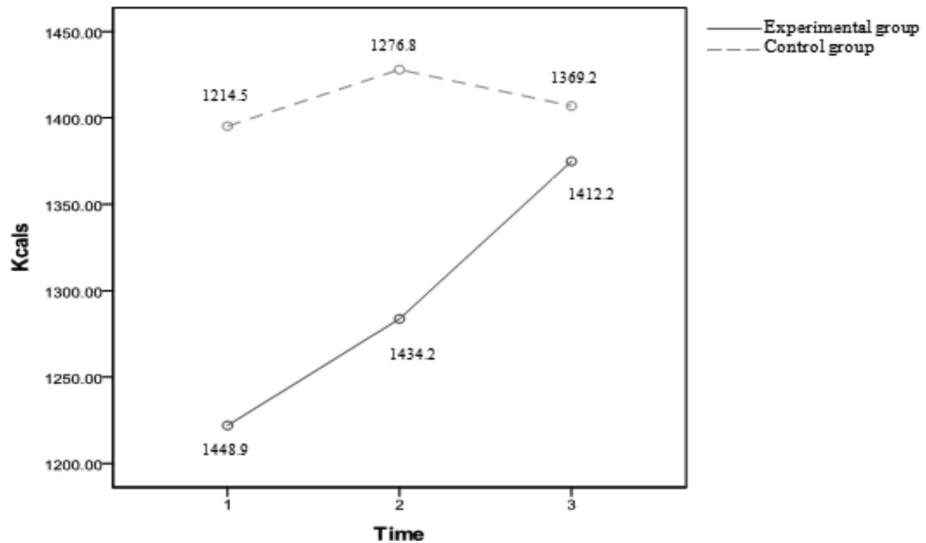


Figure 3 Mean scores for the energy expenditure per day

per day in time interaction was different, ($p < 0.001$).

Body fat percentage:

It was found that the average body fat percentage of the experimental group decreased from 36.4 ± 3.1 at Time 1 to 34.7 ± 2.9 at Time 2, but slightly increased at Time 3 (34.8 ± 3.4). However, a reverse trend was found among the control group of which the average

body fat percentage rose from 36.7 ± 2.8 at Time 1 to 37.3 ± 2.7 at Time 2, but, slightly decreased to 36.8 ± 2.5 at Time 3 (See Figure 4). The average body fat percentage of both groups were significantly different ($p = 0.009$). The overall within group was different across time (Time 1 and Time 2, Time 1 and Time 3) ($p = 0.032$). The interaction between groups and difference of time

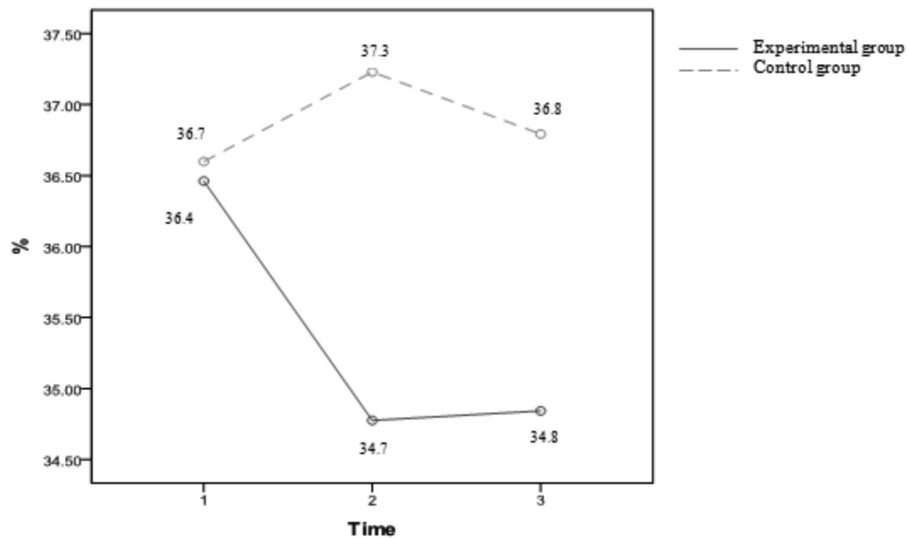


Figure 4 Mean scores for body fat percentage

measurement was significantly different ($p < 0.001$).

Discussion

The results of this study revealed that the effect of program development could improve several outcomes such as decreased waist circumference in obese children without intervention. The degree of weight loss was significantly associated with the amount of improvement of the components of the metabolic syndrome.³⁸ In this study, children's perception of obesity, calories of dietary intake per day, energy expenditure per day, and body fat percentage were discussed as follows:

Children's perception of obesity: The reason the program could not significantly increase the

students' perception of their obesity may be due to the fact that the students were too young and did not ready to understand their problem within a short period of time. Perception can be shaped by learning, memory, and expectation.³⁹ Therefore, enhancing awareness and knowledge of the students to form and strengthen their perception of obesity should be an integral part of the program and teachers should be supported to continuously carry out the OCP in schools.

Calories of dietary intake per day: The number of meal consumptions at Time 1, 2 and 3 in the control group was higher than the experimental group, both during school days and holidays. Moreover, the calories in the dietary intake per day in the experimental group decreased. This was consistent with a previous study which found that after a school-based intervention

program, the intervention group ate more fruits but less fats/oils and sweets/beverages than the control group.⁴⁰

Energy expenditure per day: The energy expenditure of the experimental group increased over time, even after the completion of the OCP. The possible explanation of this phenomenon was that students in the experimental group exercised more both at school and at home. The OCP provided opportunities for the experimental students to do more exercise such as exercise in nutrition education classes, physical fitness examination, and morning exercise. These findings were consistent with previous studies which showed that an exercise program in school had significantly increased daily physical activity among students in the experimental schools than those in the controlschools.⁴¹

The body fat percentage: The body fat percentage of the experimental group was less than the control group, so upon the completion of the intervention, the OCP could help the participants to reduce their body fat percentage when compared with baseline information prior to the intervention. This result is supported by other studies which found that an obesity prevention intervention improved the body fat percentage of the participants.⁴² The activities in this intervention consisted of physical therapy, nutrition, exercise and fitness which positively affected BMI and body fat percentage.

In summary, experimental students performed all eight activities that helped increase the healthy food consumption and physical activity behavior, and nutritional status. In the future, the effect of OCP should be investigated in the long term for participation of all parties. Moreover, local administrators, shopkeepers around schools, and other organizations cooperated in the program to promote the sustainability of OCP.

Limitations

Several limitations need to be taken into consideration regarding our findings. First, OCP activities might not be appropriate in every school because the context and policy of each school might be difference. Thus, future research needs to consider applying activities

in other schools according to the context and policy of school. Second, data was collected and analyzed three times, at the beginning, during the program, and after the program. Thus, in further studies data should be collected after finish about one month after the program completion, and ideally at longer periods, to try to ascertain the sustainability of OCP. Third, there were a small number of participants in all groups in this study. Future research needs to consider increasing the group sizes, including those of students, nurses and public health personnel, in order to test this program.

Conclusions and Implications for Nursing Practice

Findings indicated that OCP effectively helped to improve healthy eating and physical activity behaviors among grade 1-3 students. The cooperation of all stakeholders was a key success factor of the health project. After further successful testing of this program, public health nurses can apply this for obesity control in schools. They could cooperate with school health teachers and health care service organizations to develop guidelines for designing obesity control activities for all groups such as students, parents, teachers, and cooks. This program had the benefit for all schools especially school health teachers. The manual developed in this OCP can be distributed and used in other schools. The integration of nutrition contents into all classroom subjects was shown to be an effective strategy for sustainable OCPs. Results of this study can be used to inform and guide policies and the development of training programs in designing school children OCPs. Moreover, after further testing there is the potential for this program to be used in other populations after suitable redevelopment.

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ผลของโปรแกรมการควบคุมภาวะโภชนาการเกิน สำหรับนักเรียน ชั้นประถมศึกษา: การวิจัยกึ่งทดลอง

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บทคัดย่อ: การวิจัยกึ่งทดลองเพื่อทดสอบโปรแกรมการควบคุมภาวะโภชนาการเกินในเด็กนักเรียนชั้นประถมศึกษา กิจกรรมของโปรแกรมพัฒนาจากแนวคิดโรงเรียนส่งเสริมสุขภาพและการทบทวนงานวิจัย กลุ่มตัวอย่างประกอบด้วยนักเรียนน้ำหนักเกินชั้น ป.1-3 ผู้ปกครอง ครู และแม่ครัว เปรียบเทียบในโรงเรียนเอกชน 2 แห่ง จังหวัดนครนายก นักเรียนกลุ่มทดลอง 40 คน ได้รับกิจกรรมควบคุมภาวะโภชนาการเกินจำนวน 8 กิจกรรม ใน 16 สัปดาห์ คือ 1) โภชนศึกษา 2) อาหารสุขภาพ 3) บุรณนาการเนื้อหาของโภชนาการในทุกรายวิชา 4) ปลูกผัก 5) วันสุขภาพ/มุมสุขภาพ 6) จัดหมายข่าว 7) ออกกำลังกายตอนเช้า และ 8) การประเมินด้านโภชนาการ ออกกำลังกาย ความรู้ และสมรรถภาพทางกาย นักเรียนกลุ่มเปรียบเทียบ 44 คน ทำกิจกรรมตามปกติ วัตถุประสงค์โปรแกรมจำนวน 3 ครั้ง คือ ก่อนระหว่าง และหลังการได้รับโปรแกรม โดยใช้แบบสอบถามความรู้ภาวะโภชนาการเกินของนักเรียน แบบวัดการบริโภคอาหารและการออกกำลังกาย การทดสอบเปอร์เซ็นต์ไขมันในร่างกาย ใช้สถิติการวิเคราะห์ความแปรปรวนแบบวัดซ้ำ

ผลการศึกษาพบว่าภาวะโภชนาการของเด็กนักเรียนดีขึ้น พลังงานที่ได้รับจากอาหารต่อวัน และเปอร์เซ็นต์ไขมันในร่างกายของกลุ่มทดลองต่ำกว่ากลุ่มเปรียบเทียบอย่างมีนัยสำคัญทางสถิติ โปรแกรมนี้สามารถลดการบริโภคอาหารที่ให้พลังงานเกินความจำเป็น ปัจจัยความสำเร็จคือการมีส่วนร่วมของทุกภาคส่วน ดังนั้นการพัฒนาโปรแกรมการควบคุมภาวะโภชนาการเกินควรมีการดำเนินการอย่างต่อเนื่อง

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