

# Effectiveness of a Family-Based Behavioral Counseling Program among School-aged Children with Obesity: A Quasi-Experimental Study

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**Abstract:** Leading causes of obesity in school-age children are unhealthy eating and less physical activity. This study examined the effectiveness of the Family-based Behavioral Counseling Program on healthy eating behavior, physical activity, and body mass index in school-age children with obesity. Participants were 10-12-year-olds from municipal schools in a southern province of Thailand. Twenty-two participants were recruited into each group: intervention Group I receiving a 7-week family-based behavioral counseling program, intervention Group II receiving a 7-week group-based behavioral counseling program, and the control group receiving only a usual program. Data were collected using the Health Eating Behavior Questionnaire, the Physical Activity Questionnaire, and the Scale for Weight and Height. Repeated Measures ANOVA and ANCOVA were used to analyze data.

The results revealed that after completing the interventions, healthy eating behaviors and physical activity of participants in Group I were significantly higher than those in Group II and the control group. Body mass index of the participants was not significantly different between these three groups but in Group I this decreased over time. The findings indicated that this program can enhance healthy eating behavior and physical activity, and decrease body mass index among children with obesity. This program should be further verified through being studied over a longer period and in different locations in Thailand. It has potential for school nurses to use as a modified health lifestyle leading to weight control among school-aged children with obesity.

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## Background

The prevalence and incidence of children with obesity is an alarming health concern, with a significant rising rate throughout the world. In the last 40 years, there has been more than a 10-fold increase in the number of school-aged children and adolescents with obesity,

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from 11 to 124 million in 2016.<sup>1</sup> In Thailand, children aged 6–14 years are increasing becoming overweight and obese, for example from 2017 to 2019, increasing 11.1%, 11.8, and 13.6% respectively.<sup>2</sup> One out of

four children with obesity is likely to become obese during their adulthood<sup>3</sup> and have a 75% possibility of developing non-communicable diseases.<sup>4</sup> Obesity in childhood impacts physical health and psychological consequences,<sup>5,6</sup> and is associated with depression, perceived poorer quality of life, emotional and behavioral disorders, and low self-esteem during childhood. Obesity stigma, teasing, and bullying experiences can exacerbate these psychological problems.<sup>5</sup>

Obesity occurs when an energy imbalance between calories consumed and calories expended. To keep a particular weight, the energy gained from eating and drinking must be equal to the energy used in physical activity (PA).<sup>5-9</sup> Obesity in children is related to unhealthy eating and less PA, influenced by individual, behavioral and environmental factors that act in combination.<sup>6,8,10</sup> Accordingly, among predominant factors influencing obesity in children, their self-efficacy and living environment with family, friends, and school plays important roles.<sup>10</sup> Self-efficacy in determining nutrition-related behavior change appears to have a positive correlation between the ability to choose healthy foods<sup>11</sup> and participation in healthy activities<sup>10-12</sup> since self-efficacy strongly influences motivation, affection, and action of favorable outcomes. Self-efficacy is also found to be a powerful predictor of behavioral changes and performance in children and adolescents with obesity.<sup>13</sup> High self-efficacy is related to increased intake of fruits and vegetables and lower intake of fat, sugar, and sodium.<sup>10</sup> Children are more physically active when they have greater seeking support self-efficacy for engaging in PA.<sup>14</sup> Moreover, counseling facilitates growth and changes in the children to become more freely and fully functional<sup>16</sup> since counseling concentrates on the needs, problems, and feelings of the children to enhance acceptance of them. Besides, environmental factors are important, especially related to family support that substantially affects children's health diets and PA.<sup>14-17</sup>

Previous studies investigating the relationships of individual factors, environmental factors, and the

behavior modification of children with obesity have been conducted in children alone or with children and family as a family-based program<sup>18-21</sup> and the outcomes including more positive eating behaviors, PA,<sup>5,18,20</sup> and body mass index (BMI).<sup>18-19</sup> A number of studies demonstrated that a family-based treatment strategy,<sup>21</sup> behavior modification,<sup>22</sup> home visits,<sup>23</sup> and telephone counseling<sup>24</sup> led to increasing healthy eating behavior (HEB) and PA in children with obesity. Since family serves as an environment that directly impacts children's behaviors, the family must act as a model to encourage children in modifying their health behaviors. A systematic review uncovered that a family-based program was an intervention that enabled children to adjust their eating behavior and physical activities which led to weight control and maintained their behavior in the long run.<sup>16,19,23</sup>

In Thailand, the majority of studies have adopted multi-components of behavior modification, including HEB and PA modification for school-aged children with obesity.<sup>4,26</sup> Nevertheless, there is a limited number of studies involving a family-based program known as family-based treatment (FBT). FBT required parents to participate actively and hold most of the responsibility. However, as a group-based intervention, FBT has a non-flexible schedule which retards some parents' participation in group treatment sessions.<sup>25</sup> In an action research study,<sup>26</sup> the participants comprised parents, teachers, vendors, and overweight school-aged children. Even though the result after the 16-week intervention showed that body weight and waist circumference did not reduce, the co-operation from each party could correct obesity in school-aged children. It was noticeable that this group-based family study was not rigid in its study design, nor fully employed parents as key players in their children's weight control. However, in Thailand, no extensive studies had been done to compare if self-efficacy behavioral counseling programs, namely a school-aged children group-based program, and an individual family-based program provide different outcomes in HEB, PA, and BMI of school-aged children with obesity. To fill this gap of knowledge,

a family-based behavioral counseling program delivered to school-aged children and family as individual families, compared with school-aged children group-based behavioral counseling program, with stringent research methodology is needed.

This study's intervention aimed to enhance the HEB and PA among school-aged children with obesity and was developed by applying the self-efficacy concept<sup>11</sup> in content. This was to help them master situations and produce a positive outcome, a family system<sup>27</sup> as support for changes, and counselling<sup>17</sup> as a process of changing belief and behaviors. Family practices, as children's main environment, are the key factor for increasing obesity in children.<sup>6</sup> Young children depend on their parents to provide them food; that is, a child's food environment is constrained and shaped by parents' own food preferences and eating behaviors, foods that parents make available for children, and child feeding practices.<sup>21</sup> Additionally, to try to solve the problem of obesity in children, counseling is a strategy among others that have been applied. Counseling methods have been used to enhance children's self-understanding, to change beliefs, to make them aware of opportunities, and to develop the potential for behavioral change. A study that evaluated the preliminary efficacy of a pediatric practice-based referral program, showed that telephone counseling sessions to guide parents in helping their child improve his/her eating behaviors and physical exercise could reduce short-term BMI and improve dietary and sedentary behaviors of their children.<sup>25</sup>

## **Study Aim and Hypothesis**

The study aim was to investigate the effectiveness of the family-based behavioral counseling program and the group-based behavioral counseling program on HEB, PA, and BMI in school-aged children with obesity. The study proposed three hypotheses:

1. Mean scores on HEB and PA among school-age children with obesity who received a

family-based behavioral counseling program would be higher significantly than in the group-based behavioral counseling and the usual program respectively at post-intervention (week 8) and follow-up (week 16).

2. Mean scores on BMI among school-age children with obesity who received the family-based behavioral counseling program would have significantly lower scores than in the group-based behavioral counseling and usual program respectively in post-intervention (week 8) and follow-up (week 16).

3. In the family-based behavioral counseling group, there would be significant differences in mean scores of HEB, PA, and BMI across 3 times measured at baseline, post-intervention (week 8), and follow-up (week 16).

## **Methods**

**Design:** We employed a quasi-experimental design with three groups and pre-test (week 0), post-test (week 8), and follow-up (week 16). The three groups included two intervention groups receiving 1) the family-based behavioral counseling program (FBCP) (intervention group I), 2) the group-based behavioral counseling program (GBCP) (intervention group II), and 3) the control group receiving the usual program from the school.

**Participants and Setting:** Participants consisted of school-aged children with obesity ( $BMI \geq 85^{\text{th}} \text{ percentile}$ )<sup>28</sup> who were 10–12 years, without chronic disease, living in Mueang district with their families, and studying at municipal schools in a southern province of Thailand. Exclusion criteria included school-aged children with obesity who developed chronic disease, unable to be involved in the intervention for more than a session for any reason, and the children whose families had separated from them during the intervention implementation.

G\*power was used to calculate the estimated sample size for repeated measure ANOVA statistics analysis with a level of significance of .05 and a power

of .80. The effect-size of 0.62 was employed, based on a meta-analysis of family-behavioral weight-loss treatment for children.<sup>29</sup> The result of G\*power yielded 54 participants as the minimum number of the total sample ( $n = 18$  participants per group). If the expected drop-out of the sample from the study intervention was about 20%,<sup>30</sup> a total of 66 participants was needed ( $n = 22$  participants in each group recruited and allocated into each group).

A research assistant used a simple random sampling to select 3 out of 4 municipal schools, which had similar contexts of school environment, number

of students and teachers, school activities and lunch, and management. The schools were randomly assigned into two intervention groups and a control group. Then, the eligible participants in each school were invited to participate in the assigned groups; intervention Group I (27 participants), intervention Group II (25 participants), and the control group (26 participants). From baseline (pretest) to follow up, 15 children dropped out due to being sick, participated in an academic camp, or moved away. Therefore, a total of 63 children with obesity were analyzed: 20 for Group I, 21 for Group II and 22 for the control group (Figure 1).

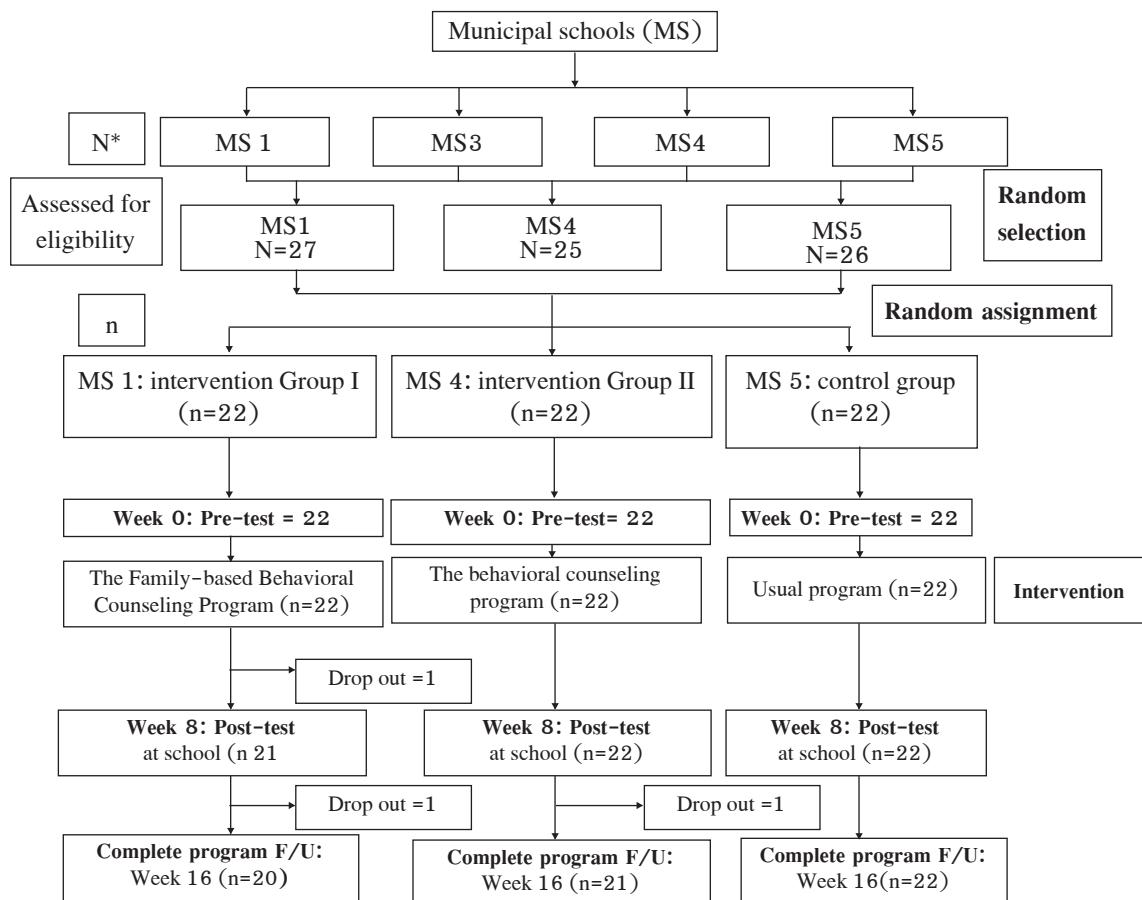


Figure 1 Flow Diagram of Data Collection

**Instrumentation:** The study employed the following instruments:

The Personal Demographic Record Form was used to obtain information about the children and their families including age, gender, income, educational level, the number of family members, and money allowed for meal and snacks per day (in Thai baht).

A standardized digital weighing scale made by “Tania” was used to record the children’s weight in kilograms.

A portable stadiometer was used to measure children’s height. Height was recorded in centimeters to the nearest 0.1 cm and later calculated to be a unit in meters.

The children’s height and body weight were used to calculate their BMI-for-age ( $BMI = \text{kg}/\text{m}^2$ ). Then, BMI was used to compare with the children’s growth chart. The  $BMI \geq 85^{\text{th}}$  percentile is considered as obesity.

The Eating Behaviors Questionnaire was modified by the researchers based on a review of related literature and the Eating Behaviors Questionnaire for Children 6–13 years of the Bureau of Nutrition.<sup>31</sup> This questionnaire was validated by 5 experts and had a content validity index (CVI) of .88. It is a 19-item self-report questionnaire with questions asking about eating behavior over a week (7 days) of school-aged children with obesity. Responses to items are rated on a 4-point Likert-type scale (1 = never practice, 2 = practice 1–3 days per week, 3 = practice 4–5 days per week, and 4 = practice 6–7 days per week). Examples of items are: “eating breakfast before school” (positive item) and “eating more than three times a day” (negative item). A higher score indicates better healthy eating behaviors. Cronbach’s alpha reliability from this study was .79.

The Physical Activity Questionnaire for Older Children (PAQ-C) was developed by Kowalski et al.<sup>32</sup> and translated into Thai by Ar-yuwat.<sup>33</sup> It is

a self-administered questionnaire used to measure the types and frequency of PA during the prior seven days and has ten items. The first item examines the spare time activities from the past week with a 5-point scale (1 = no activity, 2 = 1–2 times per week, 3 = 3–4 times per week, 4 = 5–6 times per week, 5 = seven times or more per week). Items 2–8 examine the type and frequency of activities during physical education class, recess, lunch, after school, evenings, and weekends. The response choices for these items range from 1 (the lowest activity response) to 5 (the highest activity response). Item 9 examines the frequency of PA for each day of the previous week and it is rated similarly to the first item. Examples of items are: “In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were very active?” and “On the last weekend, how many times did you do sports, dance, or play games in which you were very active?” The final score is calculated on items 1 to 9. A higher score indicates more PA. Cronbach’s alpha reliability in this study was .85.

**Intervention programs:** There were two intervention programs developed by the researchers and validated by 5 experts: a nutritionist, a professor from sports science, two professors in pediatric and family nursing, and a professor from behavioral science. The convenor of the program was the primary investigator (PI), who was trained for family counseling. The intervention comprises 5 stages: 1) understanding the reality of HEB and PA, 2) setting goals for increasing HEB and PA, 3) promoting ability in switching to HEB and PA, 4) supporting and maintaining behaviors, and 5) evaluating the program. Before implementing the interventions, a pilot study was conducted to test the program feasibility. The intervention was a 7-week program and delivered in 5 sessions: 50 minutes each. Except for family involvement, the components of program interventions provided in Groups I and II are similar as described in Table 1.

**Table 1** Schedule, objectives, and activities of the intervention programs

Week	Objectives	Activities	
		Group I: FBCP	Group II: GBCP
0	Pre-test: To obtain baseline data  <i>Session 1-3</i>	<ul style="list-style-type: none"> <li>- The participants answered questionnaires and measured BMI at school.</li> </ul> <p><i>An individual family intervention at family home:</i></p>	<ul style="list-style-type: none"> <li>- Same as FBCP</li> </ul> <p><i>A group intervention at school:</i></p> <ul style="list-style-type: none"> <li>- Same as FBCP, but without family involvement</li> </ul>
1 <sup>st</sup>	Session 1: To understand the reality of HEB and PA, and set goals for increasing HEB and PA in children (30–50 minutes) (stages 1, 2, 5)	<ul style="list-style-type: none"> <li>- Building trusting relationships between the researcher and children and family; Introducing each other</li> <li>- Exploring beliefs about HEB, PA and impact on children and families</li> <li>- Discussing the children and families' expectations</li> <li>- Setting goals for increasing HEB and PA in children</li> <li>- Commending children's and family's intention to increase HEB and PA</li> <li>- Reflecting and discussing the plans or ideas related to children and their family practices that they would like to do in daily life</li> <li>- Strengthening relationships</li> </ul>	
2 <sup>nd</sup>	Session 2: To promote children's ability for positive change in HEB and PA of children (30–50 minutes) (stages 3, 5)	<ul style="list-style-type: none"> <li>- Challenging beliefs about HEB and PA of family and children</li> <li>- Providing updated information and skill training related to HEB and PA and return demonstration with children and family</li> <li>- Arranging family environments to promote HEB and PA</li> <li>- Recognizing the behavioral change of children and their families</li> <li>- Reflection and feedback about changing behavior and encouraging family/children by providing HEB and PA</li> <li>- Discussing additional plans or ideas related to what children and their family would like to do at home</li> </ul>	<ul style="list-style-type: none"> <li>- Same as FBCP, but without family involvement</li> </ul>
4 <sup>th</sup>	Session 3: To promote children's ability of positive change in HEB and PA of children (30–50 minutes) (stages 3, 4, 5)	<ul style="list-style-type: none"> <li>- Encouraging family practice as a model of HEB and PA for children</li> <li>- Family support by trying to modify eating behavior and PA</li> <li>- Recognizing the beliefs and behavior change of children and their family</li> <li>- Monitoring HEB by discussion and assisting children and their families about their competence</li> <li>- Commending ability of the child and family in trying to modify eating behavior and PA</li> <li>- Discussing additional plans or ideas related to obesity and family practices about HEB and PA</li> </ul>	<ul style="list-style-type: none"> <li>- Encouraging children's peer as a model of HEB and PA</li> <li>- Group support HEB and PA</li> <li>- The rest activities were the same as those in FBCP, but without family involvement.</li> </ul>

**Table 1** Schedule, objectives, and activities of the intervention programs (Cont.)

Week	Objectives	Activities	
		Group I: FBCP	Group II: GBCP
3 <sup>rd</sup>	Session 4: To meet the goals for increasing HEB and PA, promoting children and their family's ability of changing HEB and PA, supporting and maintaining, evaluating and reflecting (30–50 minutes) (stages 3, 4, 5)	<p><i>Telephone counseling</i></p> <ul style="list-style-type: none"> <li>- Asking questions and problem solving of individual children</li> <li>- Encouraging and promoting the ability of behavior change in family and children</li> <li>- Recognizing the behavior change of children and their families</li> <li>- Reducing child's stress by encouraging feeling expressions and mental support</li> <li>- Commending the ability of children in changing eating behavior and PA</li> <li>- Reflection and feedback about the program and supporting family/children in HEB and PA</li> </ul>	<p><i>Telephone counseling</i></p> <ul style="list-style-type: none"> <li>- Same as FBCP, but without family involvement</li> </ul>
5 <sup>th</sup>			
6 <sup>th</sup>			
7 <sup>th</sup>	Session 5: To support, maintain, evaluate, and reflect the program. (30–50 minutes) (stages 4, 5)	<ul style="list-style-type: none"> <li>- Recognizing the behavior change of children and their families in maintaining HEB and PA</li> <li>- Commending the ability of children for improving HEB and PA</li> <li>- Closing the program and thanking every child and family</li> </ul>	<ul style="list-style-type: none"> <li>- Same as FBCP, but without family involvement</li> </ul>
8 <sup>th</sup>	Post-test: To obtain posttest data (30 minutes)	<ul style="list-style-type: none"> <li>- Participants answered the same questionnaires as used in the pre-test and measured their BMI.</li> </ul>	<ul style="list-style-type: none"> <li>- Same as FBCP</li> </ul>
16 <sup>th</sup>	Follow up: To obtain the follow-up data (30 minutes)	<ul style="list-style-type: none"> <li>- Participants answered the same questionnaires as used in the pre-test and measured their BMI.</li> </ul>	<ul style="list-style-type: none"> <li>- Same as FBCP</li> </ul>

The Family-Based Behavioral Counseling Program (FBCP) was based on the self-efficacy concept, family system, counseling process, and a literature review. It was conducted as an individual intervention for the school-aged children with obesity in Group I and their family at home. The parents in this group were responsible for participation in the sessions, arranging the family environment, encouraging, and supporting the participants for changing HEB and PA.

The Group-Based Behavioral Counseling Program (GBCP) was based on the self-efficacy concept, counseling process, and a literature review. It was conducted as a group intervention for children with obesity in Group II at their school with two small groups of school-age children with obesity, 11 children per each group.

**Usual program:** This was provided for the participants in the control group, which involved school teachers advising about healthy eating in the form of brochures and leading the children's exercise.

**Ethical considerations:** The study received approval from the Institutional Review Board, Faculty of Nursing, Burapha University for the Protection of Human Subjects (IRB #15-01-2561). The participants and their parents were informed about the research aim, methods, potential risks and benefits of participation in the study, and their rights to discontinue involvement. The confidentiality of participants was protected. Signed informed consent and assent forms were obtained from parents and children, respectively.

**Data collection procedures:** This was a single-blind study in which the research assistant (RA) did not know which group participants belong to. The RA was a school health teacher in each school. They were trained on the sampling method, the process of data collection with questionnaires, and research ethics. The RAs collected the data at pre-test (baseline at 0 week), post-test (8<sup>th</sup> week), and follow-up (16<sup>th</sup> week). RA met the participants in each group and asked them to answer the questionnaires, and measured their body weight and height. The data collection took place at the participants' school for all three groups. It took about 30 minutes.

After the pre-test was completed by RA, the PI explained about the intervention for the children at school. The PI made appointments to meet the individual children and their family at home for Group I and met the Group II participants at their schools.

**Table 2** The demographic data at baseline of school-aged children with obesity among the intervention groups and control group.

Characteristics	Groups						$\chi^2$	p-value
	Intervention I (n= 20)		Intervention II (n= 21)		Control (n= 22)			
	n	%	n	%	n	%		
<b>Gender</b>								
Boy	13	65	14	66.7	18	81.8	1.80	.41
Girl	7	35	7	33.3	4	18.2		
<b>Age (years)</b>								
10	5	25	10	47.6	7	31.8	5.10	.28
11	5	25	4	19	9	36.5		
12	10	50	7	33.3	6	28.6		
<b>Education</b>								
Grade 4	5	25	9	42.9	7	31.8	5.16	.27
Grade 5	4	20	5	23.8	9	36.5		
Grade 6	11	55	7	33.3	6	28.6		
<b>Parents</b>								
Father	4	20	3	14.3	3	13.6	4.46	.35
Mother	16	80	18	85.7	19	86.4		
<b>Sibling</b>								
≤ 2	18	90	16	76.2	13	59.1	13.47	.10
3-4	2	10	5	23.8	9	40.9		
<b>Birth order</b>								
1 <sup>st</sup>	8	40	7	33.3	6	27.3	6.21	.40
2 <sup>nd</sup>	12	60	12	57.1	11	50		
≥ 3 <sup>rd</sup>	0	0	2	9.5	5	22.7		

**Data analysis:** Descriptive statistics and chi-square test were used to examine the differences in the demographic characteristics between all groups at baseline. Analysis of variance was performed to compare the outcome variables at baseline. Repeated measures ANOVA with, within, and between participants were used to compare HEB and BMI between three groups at 3-time measures (3x3). Repeated measures ANCOVA with, within, and between participants were used to compare the PA between the three groups for 3-time measures (3x3).

## Results

There were 63 school-age children with obesity from 4th – 6th grades of primary schools, with 20 participants in group I, 21 in group II, and 22 in the control group. The demographic data for these 3 groups were not significantly different (Table 2).

ANOVA was used to compare the scores of three outcome variables measures at baseline (week 0) (Table 3). The results present the scores of HEB and BMI interaction. There were no differences between the intervention and control groups. However, the score of PA between the intervention and control groups showed a statistically significant difference ( $p < .05$ ). Thus, analysis of covariance (ANCOVA) was used to compare the differences of mean scores of PA between the three groups by adding the scores at baseline as covariates

As shown in Table 4, participants who received the FBCP and the GBCP had higher scores of HEB than the participants who received the usual program ( $F_{2,60} = 28.510, p < .001$ ). When time changed, the result showed the main effect of time and the interaction effect (time\*group), which were statistically different ( $F_{4,120} = 81.591, p < .001; F_{4,120} = 24.445, p < .001$ , respectively).

**Table 3** Comparisons of the mean scores of HEB, PA, BMI between intervention Groups I, II and control group at baseline (week 0)

Outcome variables	Intervention I (n=20)	Intervention II (n=21)	Control (n=22)	SE	F	p-value
	M (SD)	M (SD)	M (SD)			
HEB	2.924 (0.299)	3.055 (0.260)	3.110 (0.220)	0.364	2.688	.076
PA	1.890 (.0184)	1.817 (0.212)	2.082 (0.198)	0.085	10.239	.000
BMI	95.10 (2.693)	95.00 (3.193)	95.910 (3.250)	5.350	0.569	.569

**Table 4** Repeated Measures ANOVA of HEB Scores

Source of variation	SS	df	MS	F	p-value
Within subjects					
Time	7.449	2	3.725	81.591	.000
Time*group	4.465	4	1.116	24.445	.000
Error time	5.478	120	0.046		
Between subject					
Group	3.432	2	1.716	28.510	.000
Error	3.612	60	0.060		

**Table 5** Repeated Measures ANCOVA of PA Scores

Source of variation	SS	df	MS	F	p-value
Within subjects					
Time	0.199	1	0.199	2.301	.135
Time*covariance (baseline scores)	0.151	1	0.151	1.743	.192
Time *Group	0.024	2	0.012	0.140	.869
Error	5.098	59	0.086		
Between subject					
Covariate (baseline)	0.136	1	0.136	1.701	.197
Group	2.333	2	1.167	14.616	.000
Error	4.709	59	0.080		

Table 5 shows that participants who received the FBCP and the GBCP had higher mean scores of PA than the participants who received the usual program ( $F_{2,59} = 14.616, p < .001$ ). Over time, the result showed the main effect of time and the interaction effect (time\*group), which were not significantly different ( $F_{1,59} = 2.301, p = .135; F_{2,59} = .140, p = .869$ ).

Table 6 indicates that participants who received the FBCP and the GBCP had no different scores of BMI from the participants who received the usual program ( $F_{2,60} = 2.478, p = .093$ ). However, over time, the result showed the main effect of time and the interaction effect (time\*group) were statistically different ( $F_{2,825,85,561} = 5.910, p = .009; F_{2,825,85,561} = 23.155, p = .000$ ).

**Table 6** Repeated Measures ANOVA of BMI Scores

Source of variation	SS	df	MS	F	p-value
Within subjects					
Time	3.016	1.426	2.115	5.910	.009
Time*group	23.634	2.852	8.287	23.155	.000
Error time	30.620	85.561	0.358		
Between subject					
Group	137.654	2	68.827	2.478	.093
Error	1666.822	60	27.780		

## Discussion

These findings indicate that the FBCP can enhance HEB and PA and decrease BMI for children with obesity. To promote HEB and PA for BMI improvement in children with obesity, FBCP is more advisable than GBCP. The findings are similar to those in other multi-site randomized clinical trial showing that the family-based intervention program provided remarkably reduced BMI outcomes of children with overweight or obesity.<sup>35</sup> Also, the school nurse-led obesity intervention significantly increased the PA level and improved the health habitual of children. Specifically, the 2-hour nutritional class training combined with school visits and phone calls for parents, and four classes of nutritional education over 6 weeks resulted in the children consuming healthier foods and improved their BMI significantly.<sup>35</sup> The following can help explain these findings.

The FBCP started with a discussion about the reality of HEB and PA among children with obesity and their family, which helped them to practice HEB and PA within their circumstances. Then the PI encouraged the parents and children to set goals for increasing HEB and PA. The PI did not judge the family/children but provided updated information, deep listening, and compassion, and assisted them in reducing stress, which could get rid of barriers for changing behaviors. Therefore, an entire family was on board with a plan to meet and achieve the goals. The children depended on their parents to provide

them food; a child's eating behaviors were shaped by parents' food preferences and eating behavior, and the foods parents made available for children, and child feeding practices.<sup>36</sup> Similar to this relationship between child's and family's eating behavior, family support has been positively linked to increased PA.<sup>23</sup>

Importantly, the FBCP challenged the confidence of both the children and their family confidence in their ability to practice HEB and PA. Especially, the family supported their children, trusted them, and avoided blaming them. Updated information congruent with their needs was provided for them. Self-efficacy is a powerful tool in family-based interventions for obesity in children and adolescents because it can change behaviors and performance.<sup>13</sup> Likewise, a study on the effect of social cognitive theory-based interventions on dietary behavior suggested that children with high self-efficacy consumed more fruits and vegetables and less fat, sugar, and, sodium-containing foods.<sup>10</sup> That is, in a family-based intervention based on the concept of self-efficacy, parents need to be encouraged to be positive role models for their children and to incorporate safe physical activities.<sup>37</sup> Consequently, children can have self-confidence and practice healthy behaviors as their parents do. The PI also encouraged the children to assess, maintain, and reflect changes in eating behavior and PA then made commendations for them, which could strengthen their abilities. These activities helped the children with obesity to continuously maintain their behaviors longer than those who did not receive the FBCP.

The BMI in the participants receiving the FBCP decreased over time, even if it was not significantly different from receiving the GBCP and usual program. This might be due to the intensity of obesity, the long period of obesity, or the intervention period that played a role in weight control.<sup>14, 38</sup> With consideration of child anthropometrics and the dose of intervention program, these need to be further studied to understand the change in weight loss in the long-term.

However, for the GBCP without family involvement in changing the eating behavior and PA, it is difficult for children to change and maintain these particularly when the school environment is interrelated with unhealthy choices of food and beverages, and has less supports for PA. A school serves as a powerful role model in establishing a culture that supports the efforts of children to promote healthful living.<sup>39</sup> Overweight and obesity in school-aged children come from a combination of genetics, behavior, and powerful social and environmental forces that come from not only from within the family. Consideration of these is crucial for healthy behavioral adoption in these children. However, the PA of children also depends on the PA and support of parents. In this multi-site randomized clinical trial, it revealed that after participating in a 4-month family-based program, children with overweight or obesity receiving social facilitation maintenance for 4–12 month involving sustained monitoring and goal setting, support from the family and home environment, and healthy peer interactions enhanced children's weight outcomes.

### **Limitations**

There are some limitations that may minimize generalizability. First, the concepts of a family base and self-efficacy were used to develop the interventions, but these were not evaluated regarding how family characteristics and self-efficacy influenced HEB and PA. A meta-analysis study revealed that family constraints, parental motivation, and strategies to PA change,

such as goal-setting and reinforcement combined, accounted for PA outcomes.<sup>39</sup> Secondly, the time of collecting data might not have been long enough to see a sustainable change in PA and BMI. Besides, the participants from the same school in the same group may tend to perform the measured outcomes, such as PA, better or less than the other participant-clustered school. However, to minimize the limitations, the study employed a control group, time-series measurement, and repeated measures analysis of variance with mixed-effects models so that the study's results can be generalized to children with obesity in other similar schools in real situations.

### **Conclusions and Implications for Nursing Practice**

The FBCP can be utilized as an additional nursing intervention especially for school health nurses to improve HEB and PA. The cooperation between children and their family lead to success for modifying HEB of children. However, there are barriers, in which some families cannot accompany the children with obesity to exercise, which may impact BMI. Revisions of the program may need to be made to sustain the change for families with time constraining for supporting their children with obesity. Besides, the success of a family-based treatment program should also be supported with a healthy school environment. Schools and local authorities should work together to provide healthy meals and healthy food choices at school as well as establishing policies for promoting HEB and PA in school-age children. Further studies should invest not only enough time in collecting data, but also larger samples size with stronger study designs and measurement of possible mediator variables to determine the sustainable change of HEB, PA, and BMI and if all changes come from the program intervention. As a result, effective evidence-based interventions can be further developed.

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## การวิจัยกึ่งทดลองประสิทธิผลของโปรแกรมการให้คำปรึกษาด้านพฤติกรรมโดยใช้ครอบครัวเป็นฐานในเด็กวัยเรียนที่มีภาวะอ้วน

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**บทคัดย่อ:** สาเหตุสำคัญของภาวะอ้วนในเด็กวัยเรียนเกี่ยวข้องกับการรับประทานอาหารที่ไม่ดีต่อสุขภาพและการออกกำลังกายน้อยลงการศึกษานี้มีวัตถุประสงค์เพื่อตรวจสอบประสิทธิผลของโปรแกรมการให้คำปรึกษาด้านพฤติกรรมสำหรับครอบครัวเกี่ยวกับพัฒนาการรับประทานอาหารเพื่อสุขภาพ การออกกำลังกายและด้านนิเวศภัยในเด็กอ้วนวัยเรียนกลุ่มตัวอย่างเป็นเด็กนักเรียนอายุ 10-12 ปี จากโรงเรียนเทศบาลในจังหวัดหนึ่งทางภาคใต้ของประเทศไทยผู้เข้าร่วม 22 คน ได้รับคัดเลือกในแต่ละกลุ่ม: กลุ่มทดลองที่ 1 ได้รับโปรแกรมการให้คำปรึกษาด้านพฤติกรรมโดยใช้ครอบครัวเป็นฐาน เป็นเวลา 7 สัปดาห์ กลุ่มทดลองที่ 2 ได้รับโปรแกรมการให้คำปรึกษาด้านพฤติกรรมเป็นกลุ่มเป็นเวลา 7 สัปดาห์ และกลุ่มควบคุมได้รับโปรแกรมตามปกติ ควบรวมข้อมูลโดยใช้แบบสอบถามพฤติกรรมการกินเพื่อสุขภาพ แบบสอบถามกิจกรรมทางกายและการวัดน้ำหนักและส่วนสูง การวิเคราะห์ทางสถิติใช้การวิเคราะห์ความแปรปรวนและการวิเคราะห์ความแปรปรวนร่วมและเมื่อมีการวัดซ้ำ (repeated measures ANOVA and ANCOVA)

ผลการวิจัย หลังจากเสร็จสิ้นการทดลองพบว่ากลุ่มทดลองที่ 1 มีพัฒนาการรับประทานอาหาร และกิจกรรมทางกายสูงกว่ากลุ่มทดลองที่ 2 และกลุ่มควบคุมอย่างมีนัยสำคัญ ด้านนิเวศภัยของกลุ่มตัวอย่างระหว่างทั้งสามกลุ่มไม่มีความแตกต่างกันอย่างมีนัยสำคัญ แต่ด้านนิเวศภัยในกลุ่มทดลองกลุ่มที่ 1 ลดลง ผลการวิจัยพบว่าโปรแกรมการให้คำปรึกษาด้านพฤติกรรมโดยใช้ครอบครัวเป็นฐานสามารถเพิ่มพัฒนาการรับประทานอาหารที่ดี กิจกรรมทางกายและสามารถลดด้านนิเวศภัยในเด็กที่มีภาวะอ้วนได้ โปรแกรมนี้ควรได้รับการการพัฒนาเพิ่มเติมโดยใช้ระยะเวลานานขึ้นเพื่อใช้ในการปรับเปลี่ยนวิถีชีวิตด้านสุขภาพที่นำไปสู่การควบคุมน้ำหนักในเด็กวัยเรียนที่มีภาวะอ้วน

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**คำสำคัญ:** การให้คำปรึกษาด้านพฤติกรรม ด้านนิเวศภัย ครอบครัวเป็นฐาน พฤติกรรมการกินเพื่อสุขภาพ กิจกรรมทางกาย

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