

Effects of Executive Function–Specific Activity Program on Parenting Practices and Executive Functions among Preschool Children: A Quasi–Experimental Study

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Abstract: Executive function is an essential foundation for learning, academic achievement, and social relationships. The preschool years are the optimal period for executive function development through parenting practices at home. However, few programs are available to enhance parenting practices in organizing activities tailored to executive function development. This quasi-experimental study sought to investigate the effect of the executive function-specific activity program on parenting practices and executive function among preschool children. The participants were 48 parents of children aged 3–5 years attending kindergartens in a municipality in the northern province of Thailand, purposively selected following the inclusion criteria. The 10-week program, guided by the scaffolding concept and executive function-specific activities, comprised two weeks of education followed by eight weeks of executive function activities. The experimental group ($n = 24$) received the program while the control group ($n = 24$) received regular care. Data were collected between December 2023 and July 2024 using the Home Executive Function Environment scale and the Executive Function Development Behavioral Checklist. Data analysis was done using descriptive statistics and repeated measures analysis of variance with a post-hoc test.

The results revealed that the experimental group had better mean scores of parenting practices in organizing home environments and children's executive function than the control group and than before the program. Nurses and teachers can use this program in helping parents create home learning environments to promote executive function in preschool children, but further testing is needed in other sociocultural contexts to enhance applicability.

Keywords: Activity program, Executive function, Function-specific, Home environment, Parenting, Preschool children

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Introduction

Executive function (EF) is the higher cognitive process involving working memory, cognitive flexibility, and inhibitory control that underpins

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goal-directed behavior.¹ EF is essential for promoting children's academic growth and classroom behavior by helping them focus and pay attention to work, prevent improper behavior, and recall and respect complicated rules and instructions.² EF is fundamental in establishing learning behaviors through increased motivation, cooperation, attention, and persistence, contributing to children's academic success.³ Moreover, a strong EF is essential for fostering healthy peer relationships through more positive social interactions.⁴ The preschool years, expanding from the age of 3 to 5 years, are the best time for EF development due to the significant growth of the prefrontal cortex,⁵ serving as a foundation for developing higher-order cognitive processes.⁶ Unfortunately, preschool children were found to have a very low level of working memory assessed through the backward word span task and the direction following task.⁷ In Thailand, suboptimal levels of EF were reported in 38.78% of preschool children,⁸ and the prevalence of executive dysfunction was 23.6% in preschool children.⁹ Since deficits in EF among preschool children contribute to later emotional and behavioral issues,¹⁰ EF promotion is paramount.

EF is not innate but is developed through experience and training shaped by environmental stimuli that include the pattern of adult-child interactions and physical environment features.¹¹ Parents are significant adult figures who interact with children through parenting practices by creating an atmosphere for learning at home in which they offer cognitively challenging activities and emotional support to their children.¹² However, parents still lack an understanding and ability to arrange home environments to promote EF. Parents' understanding of the home environment varies, depending on their education and perspectives.¹³ Previous interventions employed several techniques to improve EF in preschool children, such as the building blocks and scaffolding of play,¹⁴ a computerized approach to attention and math instruction, along with socioemotional and material learning paradigms,¹⁵ and a classroom-based board game

intervention.¹⁶ However, these interventions primarily focused on direct training for preschool children and teachers through play and learning activities. In the Thai context, existing interventions focused on promoting parents' positive attitudes, increasing subjective norms, and developing perceived behavioral control.¹⁷ There is a paucity of interventions to train parents to promote their parenting practices by arranging a home environment and activities specific to EF development. Thus, we developed the EF-specific activity program that enhances parenting practices, incorporating individualized training of parental scaffolding skills to promote preschool children's EF with a focus on engaging parents in EF-specific activities at home, such as games that require children to think before acting, practice attention, and perform physical movement. This not only raises parents' awareness of the significance of EF development but also equips them with the skills needed during their interactions to promote children's EF in home environments.

Conceptual Framework and Review of Literature

Parents act as a critical support system and assist children in EF development through parental scaffolding. Parental scaffolding involves parents assisting their children in finishing difficult assignments before progressively letting children handle the process on their own, learning from their errors as they are capable of doing so.¹⁸ The scaffolding interaction process helps children develop their problem-solving abilities through 1) persuasive speech to demonstrate the task's significance and to view the task's broad scope before beginning it; 2) simplifying the activity by dividing it into manageable segments; 3) offering assistance and motivation to reach the intended objectives; 4) emphasizing the unique aspects of the assignment; 5) encouraging self-directed behavior without passing judgment on errors; and 6) illustrating and modeling

approaches to problem-solving to teach children the proper technique.¹⁹ This interactive process of parental scaffolding is positively associated with EF development in preschool children,²⁰ particularly through numeric and board games.²¹

Environments also influence EF development, especially at home. The EF-specific home learning environment includes proximal parenting practices (such as learning tasks) and more distal techniques (such as providing educational resources at home) that support children's learning. The ideal home environment for EF involves 1) playing games that promote children's concentration, such as jigsaw puzzles; 2) playing a game that teaches children to pause and consider their actions before acting (e.g., the red light or green light game); 3) playing a game requiring children to practice their memory skills; 4) encouraging children to do activities that involve physical movement for at least 30 minutes daily; and 5) doing activities related to music and singing by having children repeat and devise lyrics.²² These abilities, which flourish from interacting with parents within their homes, encourage children's cognitive development and help them reach their goals in life. Studies have supported the positive influence of the home environment on EF development.^{22,23} Preschool children who engaged in physical activity games with parents at home had better cognitive and physical development,²⁴ and those who participated in card games at home had better concentration and inhibitory control, contributing to EF.²⁵ Providing cognitively challenging projects at home, toys for learning, and parent-child interactions like reading books or teaching vocabulary effectively promoted EF skills in preschool children.²⁶

Study Aim and Hypotheses

The aim of this study was to investigate the effects of the EF-specific activity program on parenting

practices in organizing home environments and preschool children's EF. It was hypothesized that: 1) the experimental group parents would have a significantly higher mean score of parenting practices in organizing home environments than the control group parents, both immediately after the program (posttest 1) and three months later (posttest 2), and 2) the experimental group children would exhibit higher EF scores than the control group children, both at posttest 1 and posttest 2.

Methods

Design: This was a two-group pre-post quasi-experimental study prepared following the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND).²⁷ The participants were blinded from knowing their group assignment. The quasi-experimental methodology was chosen over a more robust randomized controlled trial because it was not possible to completely control the learning activities between the research settings. Although each kindergarten was governed by the Early Childhood Education Curriculum 2017,²⁸ the specific learning activities were designed by each teacher and thus might be slightly different.

Participants and Settings: We calculated the sample size using G*Power 3.1.9.7. Based on the F-test (repeated measures ANOVA), setting the estimated effect size to 0.25 from a previous study,²⁹ which is a medium effect size on the test difference between many means, with power of 0.85, and a significance value of 0.05. The estimated total sample size was 46 (23 participants per group). A total of 56 parent-child dyads (28 per group) were initially recruited to accommodate an expected 20% dropout rate. Eventually, 48 dyads (24 per group) completed the study.

This study was conducted in two kindergartens in one province in upper northern Thailand selected using convenience sampling. From a total of nine districts in this province, one district was selected

using simple random sampling. In this district municipality, there are 12 government kindergartens. The kindergartens in this municipality are similar in characteristics, such as providing full-day service from 7:30 am to 3:30 pm under the same preschool curriculum and local administration policies. To address cross-contamination, cluster random sampling was employed, where two kindergartens were randomly selected and then assigned randomly to either the experiment or control setting. Both kindergartens had a sufficient number of parent-student dyads to fulfil the determined sample size. Parents in each kindergarten were purposively selected using the inclusion criteria: 1) 18–45 years of age, 2) being a parent of a child aged 3–5 years and having raised the child for at least 6 months; 3) being able to communicate in Thai;

4) being able to communicate via mobile phone and LINE application; and 5) being willing to participate in this study. The inclusion criteria for children were: 1) age 3–5 years; and 2) attending kindergarten in the municipality. Exclusion criteria included intellectual disabilities, attention deficit hyperactivity disorder, and autism spectrum disorder based on the physician's diagnosis.

In this study, four parent-child dyads from the control group and four from the experimental group withdrew due to relocation to another province and busy work schedules, leaving 48 dyads for the study, with 24 participants from each group included for analyses (Figure 1). The parents and their children in the experimental group participated in the EF-specific activity program for 10 weeks in addition to regular care. The control group received only regular care.

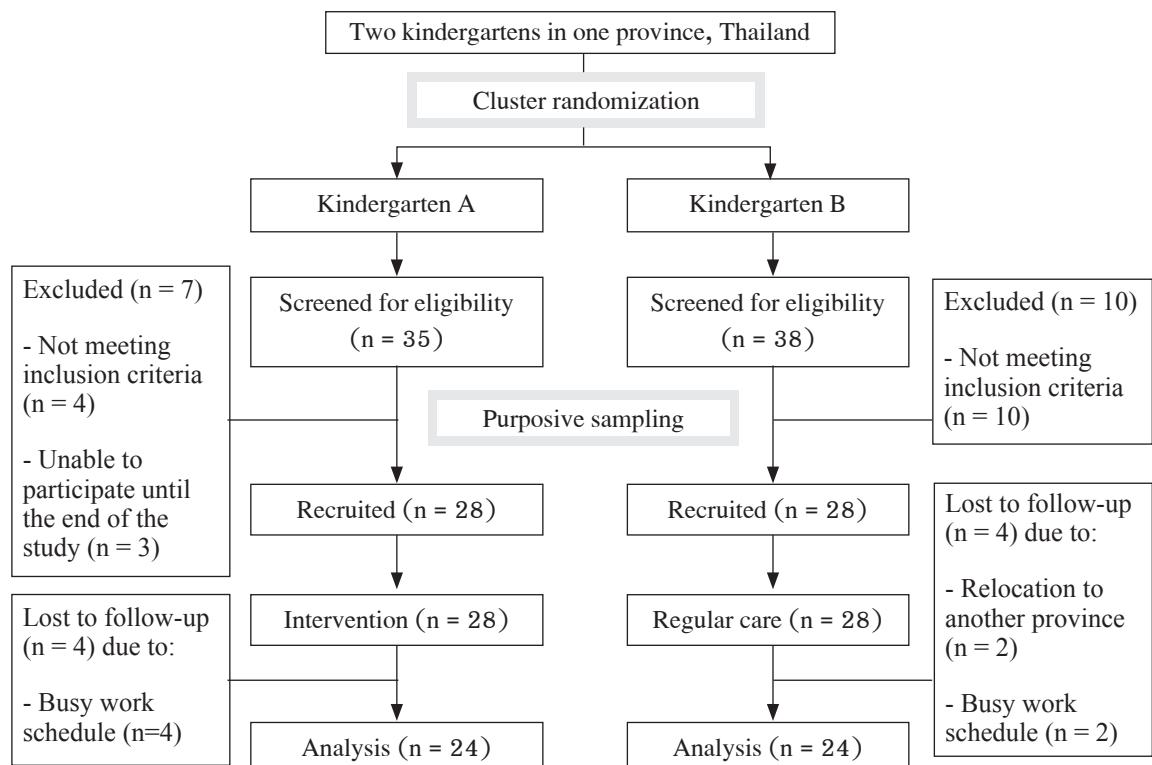


Figure 1. Flow diagram of participant allocation, follow-up, and analysis

Ethical Considerations: Approval for ethics was acquired from Phayao University's Research Committee (No. HREC-UP-HSST 1.3/036/66). The participants were provided with details and relevant activities upon participation in the research and were made aware that they could leave the study at any point. Participation was voluntary. All parents provided a written consent for their own participation and another written consent for their children to participate. The primary investigator (PI) securely stored all participant data in a locked cabinet, and confidentiality was maintained. To protect participants' anonymity, no names or number codes appeared on the questionnaires. The study results were presented as a comprehensive overview solely for academic purposes.

Research Instruments: The data collection instruments were as follows:

The Demographic Questionnaire was developed by the research team. It consisted of gender, age, marital status, occupation, education, family income, number of children, and exposure to information on promoting EF.

The Home Executive Function Environment (HEFE) scale, developed by Korucu et al.,²² was used with permission to evaluate parenting practices in organizing home environments to promote EF. In our study, the HEFE was translated into Thai by four bilingual experts using a cross-cultural translation and adaptation technique.³⁰ It consists of 18 items rated on a 5-point scale: 1 (never practice), 2 (practice once), 3 (sometimes practice), 4 (often practice), and 5 (always practice). An example item is "I encourage my children to express themselves freely even if he/she disagrees with me." The total score is between 18 and 90, where a higher score indicates better performance of activities to promote EF in children. Content validity was evaluated by three experts (an expert in teaching curriculum, an expert nurse in pediatric nursing, and a clinical psychologist), yielding a scale-level content validity index (S-CVI) of 0.92. Cronbach's alpha

was 0.76 in the pilot study ($n = 30$) and 0.85 in the actual study.

The EF Development Behavioral Checklist (MU.EF-101), developed by Chutabhakdikul et al.,³¹ was employed to assess children's EF. The behavioral checklist reveals the development of EF-related behaviors, as well as the normative criteria for evaluating EF proficiency in a Thai social setting. It consists of 32 items in five skills: inhibit, shift/cognitive flexibility, working memory, emotional control, and planning/organization. Example item is "Children focus on his/her own activities without disturbing others." The behavioral checklist makes it easier for teachers to observe students' behaviors in the classroom by utilizing the rubric scales (0–5) that show how often the behaviors have been witnessed over the previous three months. The response from 0 (never), 1 (1–2 times per month), 2 (1–2 times per week), 3 (3–4 times per week), and 4 (every day). The total score ranges from 0–128 and is calculated to obtain a standardized T-score according to children's age, with a higher score indicating higher EF.³¹ Cronbach's alpha was 0.93 in the pilot study ($n = 30$) and 0.97 in the actual study.

The EF-Specific Activity Program (EFSAP)

This program was developed by the research team based on Vygotsky's scaffolding concept,¹⁸ and the program activities were guided by EF-specific activities that included playing games that promote concentration, training thinking, practicing memory, encouraging physical activity, and engagement in music and singing activities to promote creativity.²² The EFSAP was reviewed by the same panel of experts above. Suggestions were given for setting goals to train children's discipline and to do daily routines. Therefore, additional content was added to the program. A guide for observing and providing suggestions for interactions with children during jigsaw puzzle activity was developed by the PI to provide consistent suggestions. The EFSAP, the guide for observing scaffolding

interactions, and the video clips of the model's organizing activities to promote EF for preschool children were pilot tested with three parents of preschool children to determine the weaknesses, the sequence of steps, and the appropriateness of the content presentation method. Then, the EFSAP was revised and tested with 15 parents of preschool children. After that, the quality of the lesson plans and activities was improved before being used with the actual sample (**Appendix Table A1**).

Regular Care

Regular care refers to the services provided by the municipality kindergartens to preschool children and their parents, which include education activities based on the Early Childhood Education Curriculum 2017²⁸ that involve facilitating experiences to promote EF in the classroom, such as physical movement with songs, matching games, and drawing to express one's thoughts and feelings. For parents, there was one parent–teacher meeting per semester on the educational activities and students' performance. There was no education session for parents on EF development at home.

Data Collection: This study was conducted after IRB approval, between December 2023 and July 2024. The PI approached potential participants to invite them to join the study, explained the research objectives and details, and asked for written consent. For the pre-test, parents completed the demographic data questionnaire and the questionnaire on parents' practices in creating home environments to promote children's EF for approximately 15–20 minutes. Homeroom teachers were trained by the PI on how to complete the MU.EF-101 to evaluate EF for children in both the control group and the experimental group. The experimental group took part in the 10-week program facilitated by the PI, whereas the control group was provided with an educational meeting and a handbook on promoting child EF after data collection was completed. Post-tests were conducted in both groups immediately and three months after the program

ended. Parents completed the questionnaire on their practices in creating home environments to promote children's EF, and homeroom teachers completed the MU.EF-101.

Data Analysis: SPSS version 26.0 for Windows was utilized to analyze the data. Descriptive statistics, which included frequency, percentage, mean, and standard deviation, were used to assess the demographic data. The Kolmogorov–Smirnov test was employed to assess the dependent variables' normality, and the results showed that all quantitative variables displayed normal distributions. Homogeneity testing was conducted using the Chi-square test and the independent t-test for the characteristics and study variables in both groups. The means of parenting practices in organizing home environments and children's EF score at baseline, immediately after the program ended, and 3 months after the program ended were compared with two-way repeated measures analysis of variance (RM-ANOVA) along with post-hoc test. The assumption was tested. From Mauchy's test of sphericity, we found a p-value of 0.001 for children's EF, which was under the permissible value of 0.05, meaning that sphericity was violated. Thus, we used the Greenhouse–Geisser Epsilon to report the results of repeated measures ANOVA.

Results

There were 24 participants in each group. In both groups, most of the participants were female, aged between 20 and 41 years, and had a high school education or higher. The majority of participants were employed, earning a monthly income of 5,000–10,000 Thai baht (USD 150.52–301.02). They were married, with at least one child. Almost all participants in both groups had not received health education about EF promotion. We noted no significant differences in the characteristics between the two groups (**Table 1**).

Table 1. Demographic characteristics of the participants (n = 48)

Characteristics	Experimental group (n = 24)	Control group (n = 24)	χ^2 or t	p-value
	n (%)	n (%)		
Gender			0.167	0.683
Male	3 (12.50)	4 (16.67)		
Female	21 (87.50)	20 (83.33)		
Age (years)			0.263	0.611
Mean ± SD	30.42 ± 5.70	30.83 ± 5.28		
(Range)	20-41	21-41		
≤ 25	3 (12.50)	4 (16.67)		
26-30	10 (41.67)	10 (41.67)		
31-35	6 (25.00)	5 (20.83)		
≥ 35	5 (20.83)	5 (20.83)		
Education			1.47	0.688
Primary school	4 (16.67)	4 (16.67)		
High school	8 (33.33)	11 (45.83)		
Diploma	6 (25.00)	6 (25.00)		
Bachelor's degree	6 (25.00)	3 (12.50)		
Occupation			4.83	0.975
Unemployed	4 (16.67)	4 (16.67)		
General laborer	7 (29.17)	9 (37.50)		
Company employee	3 (12.50)	3 (12.50)		
Merchant	6 (25.00)	5 (20.83)		
Government officer	4 (16.67)	3 (12.50)		
Monthly income in Thai baht (USD)			1.042	0.903
≤ 5,000 (150.51)	5 (20.83)	8 (33.33)		
5,001-10,000 (150.52- 301.02)	9 (37.50)	8 (33.33)		
10,001-20,000 (301.03- 602.12)	7 (29.17)	6 (25.00)		
> 20,001 (602.13)	3 (12.50)	2 (8.34)		
Marital status			2.125	0.547
Married	17 (70.83)	15 (62.50)		
Single	7 (29.17)	7 (29.17)		
Divorced	-	2 (8.34)		
Number of children			0.091	0.995
1	12 (50.00)	11 (45.83)		
2	10 (41.67)	11 (45.83)		
3	2 (8.33)	2 (8.33)		
Health education about executive function promotion			0.356	0.551
No	22 (91.67)	23 (95.83)		
Yes	2 (8.33)	1 (4.67)		

Note. SD = Standard deviation, χ^2 = Chi-square test, t = Independent sample t-test

The between-group comparison result showed no significant difference in parenting practices in organizing home environments and children's EF at baseline between the experimental and control groups. However, the scores were significantly different

between groups immediately after the program ($p = 0.003$, $p < 0.001$, respectively) and at three months after the program ($p = 0.002$, $p = 0.001$, respectively) (Table 2).

Table 2. Mean differences in parenting practices in organizing home environments and children's executive function of the experimental and control groups at each point of measurement (n = 48)

Variable	Experimental group (n = 24)		Control group (n = 24)		t	p-value
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
Parenting practices						
Baseline	66.13 (8.55)	67.38 (7.22)	0.547	0.587		
Immediately after program	76.71 (7.71)	69.13 (8.87)	3.16	0.003		
3 months after program	74.63 (4.20)	68.75 (7.75)	3.27	0.002		
Children's executive function						
Baseline	84.00 (18.79)	86.33 (18.32)	0.436	0.665		
Immediately after program	116.92 (5.94)	95.58 (21.34)	4.72	<0.001		
3 months after program	113.04 (7.07)	97.21 (19.84)	3.68	0.001		

Note. t = Independent sample t-test

The results from within-group comparison at each point of measurement revealed significant differences in the mean scores of parenting practices ($p = 0.032$) and children's EF ($p = 0.012$) between groups and between each measurement point in each group ($p < 0.001$), with significant time-group interaction ($p < 0.001$) (Table 3). Multiple pairwise comparison between each measurement point with Bonferroni test demonstrated significant differences in parenting practices and children's EF scores of the experimental group between baseline and immediately

at the program completion ($p < 0.001$, $p < 0.001$, respectively) and between baseline and three months following the program completion ($p < 0.001$, $p < 0.001$, respectively). However, the difference was not significant between immediately after the program ended and three months after the program ended ($p = 0.510$, $p = 0.154$, respectively). For the control group, the differences in parenting practices and children's EF scores at any point of measurement were not significantly different (Table 4).

Table 3. Differences in parenting practices in organizing home environments and children's executive function between control and experimental groups at each point of measurement

Variables	SS	df	MS	F ^r	p-value	η^2
Parenting practices						
Between subjects						
Group	596.174	1	596.174	4.887	0.032	
Error	5,611.486	46	121.989			
Within subjects						
Time	1,022.681	2	511.340	21.072	< 0.001	0.310
Time x Group	526.847	2	262.424	10.856	< 0.001	
Error	2,232.472	92	24.266			

Table 3. Differences in parenting practices in organizing home environments and children's executive function between control and experimental groups at each point of measurement (Cont.)

Variables	SS	df	MS	F ^r	p-value	η ²
Children's executive function						
Between subjects						
Group	4,853.444	1	4,853.444	6.886	0.012	
Error	32,423.861	46	704.867			
Within subjects						
Times	13,505.722	2	11,743.076	126.735	< 0.001	0.429
Time x Group	3,681.556	2	3,201.072	34.547	< 0.001	
Error	4,902.056	92	92.658			

Note. F^r = 2-way repeated measures ANOVA

Table 4. Multiple pairwise comparisons of parenting practices and children's executive function scores between the control and experimental groups at each point of measurement

Variable	Baseline	Immediately	3 months	p-value		
	(1) M (SD)	(2) M (SD)	(3) M (SD)	(1) VS (2)	(1) VS (3)	(2) VS (3)
Parenting practices						
Experimental	66.125 (1.615)	76.708 (1.697)	74.625 (1.272)	< 0.001	< 0.001	0.510
Control	67.375 (1.615)	69.125 (1.697)	68.750 (1.272)	0.240	0.304	1.00
Children's executive function						
Experimental	84.00 (18.79)	116.92 (5.94)	113.04 (7.07)	< 0.001	< 0.001	0.154
Control	86.33 (18.32)	95.58 (21.34)	97.21 (19.84)	0.334	0.186	1.00

Note. M = Mean, SD = Standard deviation, Post hoc test using the Bonferroni test

Discussion

In this study, the EFSAP was effective in increasing parenting practices in organizing home environments and children's EF. Education about EF in preschool children and approaches to promoting EF at home helped parents gain an awareness of the importance of promoting EF, allowing them to develop a better understanding and attitude towards organizing activities to promote a home environment for EF. Consistently, a parent education program on

scaffolding social-emotional, cognitive, and self-regulation development contributed to parents' more supportive behaviors towards their children.²⁹ Additionally, parents were trained with scaffolding skills by reflecting after the jigsaw puzzle activities and providing support to help children complete tasks on their own. Training about play and learning strategies led to significantly higher scores in parents' sensitivity to children's needs, greater use of stimulating questions, and book-reading behaviors.³² The reflection-based approach is an important strategy for teaching scaffolding interactions,

helping parents become aware of their own behaviors in case they attempt to interfere with children's thinking during the activity. In this study, parents were encouraged to organize specific activities to promote EF by assigning tasks, providing equipment and video media as models for organizing activities, with telephone follow-up via the LINE application. Since most of the parents were general laborers with moderate to relatively low family income, supporting them with games and learning materials facilitated them to organize activities conveniently. Using video clips as a model in organizing activities allowed parents to visualize and learn how to organize activities to promote EF easily. Online education on organizing activities to promote EF through video presentations, practical skills teaching, and demonstrations was found to be equally effective as face-to-face education, with benefits such as easy access, saving travel time, and allowing for self-revision of the content.³³

The EFSAP improved children's EF, as parents perceived the importance of promoting EF, they provided a home environment that promoted learning, and organized daily EF-specific activities to help children develop EF, which echoed earlier research where parents' EF-specific activities at home contributed to children's better EF.²² Parenting behaviors are crucial to children's EF development. Parenting that is responsive to children's needs, providing scaffolding to encourage children to take action, make mistakes, and solve problems on their own, and creating an atmosphere that stimulates learning at home is associated with higher EF in children.²⁰ Creating positive discipline, recognizing and responding to children's needs, and supporting them to solve problems on their own help children develop EF.³⁴ In our study, parents were encouraged to carry out EF-promoting activities, such as board games, on weekends as guided by the video multimedia that served as an effective means to improve parents' knowledge about organizing EF-promoting activities at home.³³ Board games in which preschoolers use their memory,

focus, and think before acting are effective in developing their EF, while games that promote motor skills and muscle strength help enhance EF.²⁴ However, in some resource-limited settings, such as in the Thai context, the use of games that promote children's attention and rule orientation is rare.³⁵ Therefore, the role of school nurses, in addition to promoting children's health, should include giving parents health education about EF so that parents have the knowledge and skills to organize specific activities for promoting EF at home. In this study, the parents were encouraged to perform EF-specific activities with their children for at least 30 minutes daily. They kept a daily diary and received telephone follow-up in weeks 3–4 to address obstacles in organizing activities with encouragement for continuity of EF-promoting activities. Effective interventions to promote EF require repeated practice of challenging tasks with facilitated participation. Consistently, play-based activities involved parents' practice of at least one EF-promoting activity with their child every day for eight weeks, with weekly meetings for parents to share their experiences, led to children's better attention, reduced problematic behaviors, and better self-regulation of their emotions.³⁶

However, we found that the experimental group's mean scores of parenting practices in organizing home environments and children's EF reduced slightly at 12 weeks after the program, when compared to immediately after the program. Most of the parents in the experimental group were employed (83.33%), with 20.83% of them earning < 5,000 Thai baht (USD 150.51) and 37.50% earning 5,001–10,000 Thai baht (USD 150.52–301.02) per month, indicating they were in the lower- to upper-middle income categories.³⁷ The demands of employment, as well as the socioeconomic situation, may limit the degree to which parents participate in EF-enriching activities with their child.³⁸ Thus, in order to ensure the sustainability of the program, booster interventions are needed to maintain parents'

awareness of the importance of promoting children's EF, such as a yearly education session on EF-specific activities at home, assigning parents to do EF-specific activities with their children on weekends, and monitoring children's EF. Moreover, social support should be provided to parents to support EF development at home, such as group chats on social media platforms where they can share their experiences and seek relevant solutions, and the establishment of a community library to borrow educational materials free of charge. For parents, social support provided by community organizations that involved educational resources accessible from community infrastructure, particularly libraries, was a protective factor that maintained their ability to promote children's EF continuously.³⁹

From our findings, the control group's EF also increased, but was lower than that of the experimental group. This could be attributable to the regular care, where all children were provided with learning activities from the kindergarten curriculum. Typical classroom interactions between teachers and students can promote EF development in preschool children.⁴⁰ More research should be carried out to compare and determine the ideal duration, frequency, and intensity of interventions that can be more readily administered while still producing the best results in terms of children's EF performance.

Limitations

There are some limitations in our study. First, selection bias may exist due to the potential risk of contamination and the impracticability of using a randomized controlled trial design. Second, the participants could not be blinded because of ethical considerations, so it may have affected the research result, particularly in the experimental group. Third, this study was conducted with the parents of preschool children attending two kindergartens in a province in northern Thailand, which can limit the findings' generalizability to broader contexts.

Conclusions and Implications for Nursing Practice

The EFSAP employing scaffolding was effective in improving parenting practices in organizing home environments and increasing EF scores in preschool children. This program would be beneficial as a training tool to improve school nurses' ability to communicate with children and their parents. School nurses should be trained to apply this program to enhance parents' competencies in arranging home environments for EF development through scaffolding interactions. School nurses can help parents to recognize the significance of promoting children's EF in the home environment by creating video clips on social media, holding brief workshops, consultation sessions and continuous monitoring with a variety of options in terms of delivery modes (face-to-face or online) to suit the preferences and contexts of diverse parents. Future research is recommended to add a method to assess parenting practices in organizing home environments by using an observation scale on parental scaffolding and test the effectiveness of this program in other settings to broaden its applicability.

Author Contributions

Conceptualization, Method and design: P.T., J.P.
Tool development/translation and validation,
Data acquisition, Editing manuscript: P.T., J.P., I.M., J.C., N.J.
Data analysis and interpretation, Drafting the manuscript: P.T.
Revised manuscript: P.T., J.P.
Final approval of the submitted version: J.P.

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Appendix

Table A1. Content of the EF-Specific Activity Program

Categories	Session 1 (180 minutes)	Session 2 (30-45 minutes)	Sessions 3-10 (Once a week, 30 minutes per session)
Goal	<ul style="list-style-type: none">- Understand and explain EF in preschool children, how to promote EF in home environment- Specific activities to promote EF in preschool children	<ul style="list-style-type: none">- Understand parental scaffolding- Achieve parental scaffolding skill	<ul style="list-style-type: none">- Support participants to perform activities to promote EF with children
Introduction	<ul style="list-style-type: none">- Show video clips of children's inhibitory control- Have participants share experiences in teaching children to be disciplined	<ul style="list-style-type: none">- Build rapport with parents and children- Ask parents to help children do jigsaw puzzle activities like they used to do at home- Ask permission to record video during play with children- Reflect on how to improve interactions with children, using questions to encourage children to think and act on their own	<ul style="list-style-type: none">- Assign worksheets for organizing EF promotion activities on weekend once a week- Support tools for organizing EF promotion activities- Send video clips of model activities via social media- Give telephone visit to inquire about problems and obstacles in organizing activities
Development	<ul style="list-style-type: none">- Describe the definition, significance of EF, parenting related to EF promotion in preschool children, organize activities that encourage children's EF- Have participants share experience about problems encountered in training children's discipline	<ul style="list-style-type: none">- Train interaction skills in activities that encourage children to practice thinking, doing, and solving problems by themselves without intervening in children's problem-solving- Train skills in asking questions to stimulate children to think by themselves	<ul style="list-style-type: none">- Have participants organize activities to promote EF with children
Ending	<ul style="list-style-type: none">- Set goals to promote children's discipline at home- Inform participants about the next class's activities	<ul style="list-style-type: none">- Have participants reflect on their practices in using questions to encourage children to think and act by themselves- Give feedback on participants' practices	<ul style="list-style-type: none">- Have participants share feeling and experiences about performing EF activities- Write a daily activity log on promoting EF activities with their children

Table A1. Content of the EF-Specific Activity Program (Cont.)

Categories	Session 1 (180 minutes)	Session 2 (30-45 minutes)	Sessions 3-10 (Once a week, 30 minutes per session)
Methods & Tools	<ul style="list-style-type: none">- Lecture, PowerPoint presentation- Video clips for training children's discipline- A guide for parents to promote EF in their children- Demonstrate activities to promote EF	<ul style="list-style-type: none">- A guide for observing scaffolding interactions- Jigsaw puzzle materials- Video recorders	<ul style="list-style-type: none">- Provide worksheets explaining the activities- Video clips demonstrating activities that promote children's EF- Provide tools used in activities- Write a daily activity log

ผลของโปรแกรมกิจกรรมเฉพาะสำหรับการคิดเชิงบริหารต่อการปฏิบัติการเลี้ยงดูและการคิดเชิงบริหารในเด็กก่อนวัยเรียน : การวิจัยกึ่งทดลอง

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บทคัดย่อ การคิดเชิงบริหารเป็นพื้นฐานที่สำคัญสำหรับการเรียนรู้ ความสำเร็จทางวิชาการ และความสัมพันธ์ทางสังคม ช่วงก่อนวัยเรียนเป็นช่วงเวลาที่เหมาะสมสำหรับการพัฒนาการคิดเชิงบริหารผ่านการปฏิบัติการเลี้ยงดูที่บ้าน อย่างไรก็ตาม ยังมีโปรแกรมเพื่อส่งเสริมการปฏิบัติการเลี้ยงดูให้มีการจัดกิจกรรมที่เหมาะสมกับการพัฒนาการคิดเชิงบริหารอย่างจำกัด การวิจัยกึ่งทดลองนี้มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมกิจกรรมเฉพาะสำหรับการคิดเชิงบริหารต่อการปฏิบัติการเลี้ยงดูและการคิดเชิงบริหารของเด็กก่อนวัยเรียน ผู้เข้าร่วมวิจัยประกอบด้วย ผู้ปกครองของเด็กวัย 3-5 ปีที่เข้าเรียนชั้นอนุบาลในเขตเทศบาลของจังหวัดหนึ่งในภาคเหนือของประเทศไทย จำนวน 48 คน ซึ่งได้รับการคัดเลือกแบบเฉพาะเจาะจงตามเกณฑ์การคัดเข้า โปรแกรมมีระยะเวลา 10 สัปดาห์ พัฒนาตามแนวคิดการส่งเสริมต่อการเรียนรู้และกิจกรรมเฉพาะสำหรับการคิดเชิงบริหาร ประกอบด้วยการให้ความรู้ 2 สัปดาห์ และกิจกรรมสำหรับการคิดเชิงบริหาร 8 สัปดาห์ กลุ่มทดลอง ($n = 24$) ได้รับโปรแกรม ในขณะที่กลุ่มควบคุม ($n = 24$) ได้รับการดูแลตามปกติ เนื้อข้อมูลระบุว่าเดือนธันวาคม พ.ศ. 2566 ถึงกรกฎาคม พ.ศ. 2567 โดยใช้แบบประเมินการจัดสิ่งแวดล้อมเพื่อส่งเสริมการคิดเชิงบริหารที่บ้าน และแบบประเมินพัฒนาการทั้งการคิดเชิงบริหารในเด็กปฐมวัย วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา และการวิเคราะห์ความแปรปรวนแบบวัดช้าด้วยการทดสอบหลังการวิเคราะห์

ผลการศึกษาแสดงให้เห็นว่ากลุ่มทดลองมีคะแนนเฉลี่ยของการปฏิบัติการเลี้ยงดูในการจัดสภาพแวดล้อมที่บ้าน และการคิดเชิงบริหารของเด็กดีขึ้นกว่ากลุ่มควบคุม และดีกว่าก่อนเข้าร่วมโปรแกรม พยาบาลและครุศาสตร์ใช้โปรแกรมนี้ในการช่วยให้ช่วยให้บิดามารดาสร้างสภาพแวดล้อมการเรียนรู้ที่บ้านเพื่อส่งเสริมการคิดเชิงบริหารในเด็กก่อนวัยเรียนแต่ควรทดสอบในบริบททางสังคมวัฒนธรรมอื่นเพื่อเพิ่มความสามารถในการนำไปใช้

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