Effects of a Parenting Skills Training Program on Executive Function in Children Two to Five Years: A Quasi-Experimental Study

Siriporn Nirapun, Renu Pookboonmee, Apawan Nookong, Natkamol Chansatitporn*

Abstract: Executive function is essential for child development; however, few parenting programs focus on enhancing executive function skills in early childhood. This quasi-experimental study evaluated the effects of a parenting skills training program on parents' attitudes, subjective norms, perceived behavioral controls, intention, and behaviors in promoting children's executive function, as well as on the executive function skills of children aged 2 to 5. Two child development centers in a single province near Bangkok, Thailand, were randomly assigned to experimental and control groups, with 38 parent-child dyads selected based on inclusion criteria. Data were collected through a parent questionnaire on promoting children's executive function and assessments of children's executive function skills using the Behavior Rating Inventory of Executive Function–Preschool Version (BRIEF-P). Statistical analyses comprised chi-square tests, independent t-tests, descriptive statistics, and generalized estimating equations.

The study found that children in the experimental group showed significantly higher executive function skills immediately and one month later than the control group. Parents in the experimental group exhibited higher attitudes, perceived behavioral control, intentions, and behaviors related to promoting executive function immediately after completing the intervention. However, after one month, only attitudes and perceived behavioral control remained significantly higher, with no changes in subjective norms at either time. This study indicated the effectiveness of a parenting skills training program in enhancing children's executive function. It suggests that it can be implemented by nurses, teachers, or other personnel working in early childhood health and education. However, further study for booster activities is recommended to determine the program's sustainability.

Keywords: Attitude, Early childhood, Executive function, Intention, Parenting skills training program, Perceived behavioral control, Subjective norm

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Introduction

Executive functions (EFs) are higher-level cognitive abilities, including inhibitory control, working memory, and cognitive flexibility, essential for goal achievement, adaptation, and social interactions.[1] EFs are traditionally linked to frontal lobe activity.[1] Rapidly developing during preschool years under caregiver support, EFs enable children to regulate emotions, make decisions, solve problems, and focus, fostering persistence, attention, and delayed gratification.[2] Strong EF skills contribute to academic and life success,[3] reduce risky behaviors in adolescence and promote better health,[4] increase income,[4] and improve quality of life in adulthood.[4] Conversely, EF deficits, commonly observed in children with neurodevelopmental disorders such as attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), significantly impact working memory, inhibition, and planning. These impairments often lead to challenges in academic study, social interactions, and overall development.[5] Behavioral dysregulation, poor inhibitory control, and cognitive inflexibility are frequent consequences, with long-term effects including lower academic achievement, reduced employment opportunities, and heightened risks of addiction and mental health issues.[6] Research indicates that EF deficits in early childhood are associated with difficulties in academic performance, social interaction, and behavioral regulation, as well as being closely linked to various psychiatric disorders.[5-6]

EF deficits are a significant concern among Thai children. A nationwide survey highlighted the prevalence of EF deficits among early childhood children and indicated a high prevalence of suspected developmental delays, estimated at approximately 26.48% during 2019-2021.[7] These findings underscore the urgent need for early identification and intervention to mitigate EF deficiencies and improve cognitive, academic, social, emotional, and behavioral outcomes. In response, the Thai Ministry of Health introduced a policy to establish a system for developmental surveillance and screening to address developmental delays while also integrating the promotion of EF skills among healthcare personnel and parents to support early childhood development.[7] While the Developmental Surveillance and Promotion Manual (DSPM) provides clear guidelines for screening, monitoring, and addressing developmental delays,[7] its guidance on improving EF skills is less well-defined. Additionally, data from Thai parents of early childhood indicate that many face challenges in fostering their children's EF skills due to limited knowledge and practical experience.[8] To address this issue, it is imperative to establish defined methods and provide effective interventions to promote EF skills in early childhood, thereby reducing the occurrence of EF deficits or dysfunctions during this critical developmental period in children. Thus, this study aimed to design and evaluate a Parenting Skills Training Program (PSTP) to strengthen EF in early childhood for those aged 2-5 years.

Literature Review and Conceptual Framework

EF development can be promoted through the active involvement of parents. The research underscores the strong impact of parental behaviors on children's EF skills development. Positive parental behaviors, such as warmth, responsiveness, and sensitivity, as well as cognitive behaviors like autonomy support and scaffolding, are associated with better EF outcomes in children.[9] Conversely, negative behaviors such as control and intrusiveness are linked to poorer EF development.[9] The critical period for these influences appears to be early childhood, particularly for cognitive parental behaviors, which show more substantial effects in younger children.[11] Additionally, parental involvement in guiding children to complete tasks independently and teaching them patience is essential for developing EF skills.[10] This is supported by findings that maternal cognitive capacities

and scaffolding uniquely predict EF in early childhood, highlighting the importance of early cognitive stimulation and supportive parenting practices.[11] Moreover, socio-environmental factors, including parental knowledge and behaviors, play a vital role in EF development, especially in low-income households where children often demonstrate weaker EF performance.[12] Overall, EF skills, essential for goal-directed behavior and cognitive control, can be significantly enhanced through targeted parental involvement and supportive home environments, thereby preventing potential deficits in early childhood.[13] Therefore, parents have a vital role in guiding their children's behavior and skills related to EF.[9,14]

This study combined Ajzen's Theory of Planned Behavior (TPB) and the concept of parental scaffolding to develop the intervention for parent training. TPB describes human actions as influenced by three main elements: subjective norms, attitudes, and perceived behavioral control.[15] Favorable attitudes, social support, and confidence in ability strengthen behavioral intentions, predicting actual behavior.[15] The TPB has been widely applied across various domains, including health-related behaviors, technology adoption, and social behaviors, demonstrating its versatility and robustness in predicting behavior.[16-17]

TPB is well-suited for training parents, as previous studies have demonstrated its effectiveness in analyzing key beliefs influencing health-related behaviors. This includes parental actions that affect children's health outcomes, such as sexual health,[18] the reduction of aggressive behaviors,[19] the development of children's life skills,[20] and reducing children's screen time.[21]

TPB enhances parental skills in guiding children, particularly concerning EF skills, by targeting parents' subjective norms, attitudes and perceived behavioral control, which influence their intentions and behaviors. For instance, the Parent Training Program (PTP) based on TPB aimed to improve parents' child-rearing abilities and support for their children's life skills, including EF, by addressing beliefs, attitudes, and self-efficacy through structured sessions and a parent handbook.[20] Similarly, a 5-week PSTP focused on modifying parents' behavioral, normative, and control beliefs to reduce children's aggressive behaviors, which could enhance parents' efficacy and intentions to engage in positive behavior modification.[19] Also, a study utilized TPB to reduce children's screen time by fostering positive parental attitudes and perceived norms through group discussions and encouraging more interactive and cognitively stimulating parent-child activities.[21] Additionally, research on parental decision-making for children's screen time highlighted the importance of parental role construction, which integrates societal expectations and personal beliefs, further influencing parents' intentions and behaviors to limit screen time, thereby promoting better EF skills in children.[22] Moreover, the Parent Participation in a Technology-based Adolescent Sexuality Education (PPTASE) program demonstrated that TPB could enhance parents' communication skills, particularly in discussing sensitive topics like sexual health, by improving attitudes, perceived norms, and behavioral control through interactive activities and digital tools, which can be extrapolated to other areas of child guidance, including EF skills.[18] Lastly, research supports that TPB elements such as subjective norms, attitudes, and perceived behavioral control predict parents' intentions to engage in health-promoting behaviors for their children, which mediate the relationship between these constructs and actual behavior.[23] This comprehensive approach ensures that parents are motivated by their beliefs and social pressures and equipped with the necessary skills and confidence to implement effective behavioral strategies, enhancing their children's development and overall well-being.

Parental scaffolding refers to the supportive interactions between parents and children, where parents provide just enough assistance to help their children achieve tasks independently, gradually reducing the support as the child becomes more competent. This concept, rooted in Vygotskian theory, emphasizes the dynamic adjustment of parental guidance based on the child's current abilities and needs.[24] Scaffolding is crucial for various aspects of

child development, including EF, language acquisition, and cognitive skills. For instance, research has shown that parental scaffolding during problem-solving tasks at age three directly enhances children's EF by age four. In contrast, scaffolding at age two indirectly benefits EF through improved verbal abilities by that age.[25] Additionally, scaffolding is crucial for developing self-regulation, as parental guidance helps children manage their behavior and emotions effectively. This process is shaped by biological, psychological, and cultural factors and involves reciprocal interactions between parents and children.[26] Moreover, the family environment and parental characteristics are critical factors that shape the effectiveness of scaffolding, as these elements contribute to the child's learning environment and emotional development.[27] By acting as educators and companions, parents can create a supportive atmosphere that nurtures the child's social-emotional skills, which are foundational for EF development. Therefore, parents play a multifaceted role in scaffolding, encompassing not only the provision of cognitive support but also fostering an emotionally conducive environment for learning and development.

Effective strategies from parental interventions that enhance EF skills in early childhood include fostering independent task performance, teaching patience, and providing appropriate tools and toys that promote cognitive development. Parental involvement is crucial, as it supports children in developing independent thinking and decision-making skills while fostering resilience in the face of mistakes.[10] The Enhancing Neurobehavioural Gains with the Aid of Games and Exercise (ENGAGE) intervention, a play-based program that includes parental involvement, has shown significant reductions in attentional problems, hyperactivity, and impulsivity among preschool-age children, indicating its effectiveness in improving EF-related behaviors at home.[28] Additionally, systematic reviews highlight that implementation interventions incorporating cognitive challenges, movement, and high fidelity are particularly effective. Approaches such as mindfulness, mediated play, and physical activity have robust evidence supporting their efficacy in enhancing self-regulation and EF skills.[29] The Active Early Learning (AEL) intervention, which integrates physical activity into daily routines, has also improved inhibition and expressive vocabulary, further supporting the role of structured physical activities in EF development.[30] Moreover, the use of a children's book with embedded cognitive tasks led to significant gains in EF skills, which were maintained even two months post-intervention.[31] These findings collectively suggest that structured play, physical activities, and everyday cognitive challenges, supported by active parental involvement, are among the most effective strategies for enhancing EF skills in early childhood.

This Parenting Skills Training Program, guided by TPB and parental scaffolding, aimed to foster parents' positive attitudes toward improving their children's EF, strengthen perceived norms around effective parenting, and boost their confidence in providing proper scaffolding (perceived behavioral control), all to motivate intentions and behaviors that support the development of their children's EF.

Aim and Hypotheses

This study aimed to examine the effects of the PSTP on parents' subjective norms, attitudes, perceived behavioral controls, intentions, and behaviors in promoting children's executive function, as well as on the children's executive function skills. The hypotheses were: 1) parents in the experimental group would show significantly higher mean scores on attitudes, subjective norms, perceived behavioral control, and intentions and behaviors related to promoting their child's EF than that of the control group, both immediately after the intervention (posttest 1) and one month later (posttest 2), and 2) Children in the experimental group would exhibit lower mean scores on the Behavior Rating Inventory of Executive Function-Preschool Version (the lower score, the higher executive function) compared to those in the control group, both at posttest 1 and posttest 2.

Methods

Study Design: This research employed a quasi-experimental approach that included a comparison group. This report followed the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) checklist.[32]

Samples and Setting: This study occurred at two child development centers (CDC) under the Sub-district Administration Organizations (SAO) in a province near Bangkok, within a university hospital's social engagement area in Thailand. The CDCs, with similar characteristics such as size and local administration policies, were randomly assigned as experimental and control settings. The sample size was determined based on an effect size of 0.28 from a related study,[33] with a power of 0.80, and a significance level of 0.05.[34] The estimated sample size was 35 participants per group, with a 15% dropout rate factored in. As a result, 40 parent-child dyads were included in each group. The inclusion criteria for parents were: 1) being the mother or father of a child aged 2 to 5 years, 2) residing in the same household and primarily responsible for the child's care, 3) being able to communicate, read, and write in Thai, and 4) owning a smartphone and capable of using the LINE mobile phone messaging application. The inclusion criteria for children were: 1) age 2 to 5 years, 2) normal development with no underlying diseases or health conditions, and 3) living with their parent(s).

In the experimental setting, 60 parent-child dyads met the inclusion criteria, and 40 were randomly selected. Similarly, 56 dyads met the requirements in the control setting, and 40 were also randomly chosen. This brought the total number of participants to 80 dyads. However, two dyads from both the control and experimental groups withdrew, leaving 38 dyads in each group for the study.

Ethical Considerations: This study was approved by the Institutional Review Board (IRB) of the Faculty of Medicine at Ramathibodi Hospital, Mahidol University, Thailand, with approval number COA. MURA2021/262. Participants were fully informed about the study's objectives, pertinent details, and potential advantages and disadvantages to allow them to assess the risks and benefits. Participation was voluntary, and each participant provided written consent. They were also entitled to withdraw from the study at any time. 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.

Instruments: The study utilized two sets of instruments: one for data collection and the other for the intervention. The data collection instruments were as follows:

The Demographic Questionnaire consists of two parts: 1) Parent demographic data, which gathered information on age, education, gender, occupation, marital status, family income, family structure, and the number of children. It also explored parental practices and beliefs, such as sources of child-rearing advice, the quality of time spent with their children, and the screen time allowed for them; 2) Child demographic data, including age, gender, and relevant medical history.

The Parent Questionnaire on Promoting Child Executive Function was divided into five sections: parental subjective norms, attitudes, perceived behavioral control, intention, and behaviors related to promoting child EF. The PI developed this questionnaire, which was validated by a panel of five experts, including a pediatric nursing educator, two pediatricians, and two educators specializing in neuroscience and early childhood EF assessment. The content validity index (CVI) and Cronbach's alpha reliability in a pilot study with 30 participants and in the actual study (n = 80) are shown in **Table 1**. A total of 46 items were divided into the following sections:

Attitudes toward promoting child EF included eleven items rated on a 1–4 scale (1 = strongly disagree, 4 = strongly agree), with a mix of positive and negative statements. The score ranges from 11 to 44, with higher scores reflecting a more positive attitude.

Subjective norms regarding child EF promotion included five items, which were rated on a 1–5 scale (1 = strongly disagree, 5 = strongly agree), with scores ranging from 5 to 25. Higher scores indicate more substantial agreement with subjective norms that support EF promotion.

Nine items of *perceived behavioral controls for promoting child EF* were rated on a 1–5 scale (1 = Not confident at all, 5 = Very confident), with total scores ranging from 9 to 45. Higher scores indicate greater confidence in promoting EF.

The intention to promote child EF was measured using a single item rated on a 1–5 scale (1 = definitely do not, 5 = definitely do), with higher scores indicating stronger intent.

Behaviors promoting child EF included 20 items that were rated on a 1–5 scale (1 = never, 5 = often), with total scores ranging from 20 to 100. Higher scores reflect more consistent parental efforts to promote EF.

The Behavior Rating Inventory of Executive Function–Preschool Version (BRIEF-P) is designed to be completed by a child's parent or teacher (or another educational professional familiar with the child). In this study, only the parent-assessed version was used. This scale assesses executive functioning skills in the home environment, including inhibition, shifting, emotional control, working memory, and planning/organization. It is tailored specifically for early childhood children aged 2 to 5 years and 11 months.[35] The Thai-language version of the BRIEF-P was used in this study with permission from the original developer to retain the instrument copyright. The form consists of 63 items, rated on a 3-point scale: 1 = never, 2 = sometimes, and 3 = often. Raw scores range from 63 to 189 and are subsequently converted into T-scores. A rating of "Often" indicates that the child frequently exhibits inappropriate behavior. Higher scores on the BRIEF-P signify lower executive functioning skills, while lower scores indicate higher executive functioning skills. The scale underwent evaluation for language comprehension and reliability through a pilot study involving 30 parents. The Cronbach's alpha reliability in the pilot study and the actual study (n = 80) is shown in **Table 1**.

Table 1. Content validity index, Cronbach's alpha reliability, and examples of items of instruments (n = 80)

Instruments	No. of items	CVI	Cronbach's alpha coefficient		Example of items
			Pilot study	Actual study	
1. Parent Questionnaire on Promoting Child EF					
Attitudes	11	0.98	0.89	0.84	"Training children to do housework helps encourage them to think, plan, and solve problems."
Subjective norms	5	1.00	0.89	0.88	"My parents or relatives expressed satisfaction or admiration when I took time to engage in activities to promote EF skills."
Perceived behavioral controls	9	1.00	0.90	0.89	"I am confident that I can conduct play activities with my child to promote EF skills."
Intention	1	1.00	0.88	0.81	"I intend to do activities to promote EF skills with my children every day."
Behaviors	20	0.99	0.89	0.87	"I organize a variety of activities for my child to do or play with each week."
2. BRIEF-P	63	–	0.94	0.95	"This child has trouble putting the brakes on his/her actions even after being asked."

Note. The Parent Questionnaire on Promoting Child EF was divided into five sections: attitudes, subjective norms, perceived behavioral controls, intention, and behaviors. The scale used to assess various executive functioning skills in preschool children was the Behavior Rating Inventory of Executive Function–Preschool Version (BRIEF-P).

The Parenting Skills Training Program (PSTP)

The PSTP is a 12-week intervention designed to enhance children's EF skills through parental engagement, grounded in the TPB and the concept of parental scaffolding. The program comprises an initial in-person workshop and an 11-week online engagement. The first part, conducted during the first week, is a four-hour workshop with three sessions focused on promoting positive attitudes, increasing subjective norms, and developing perceived behavioral control among parents. These sessions, designed using the TPB framework, incorporate interactive group activities, visual presentations, and video demonstrations to foster parental strategies for supporting children's EF development. The second part involves weekly engagement via the LINE messaging app over the subsequent 11 weeks. Parents receive infographics, participate in semi-structured discussions, and engage in collaborative problem-solving sessions facilitated by the PI. Training materials emphasize strategies such as playing, storytelling, and guiding children in daily routines and chores using scaffolding techniques. Validated by a panel of five experts—comprising a pediatric nursing educator, two pediatricians, and two educators specializing in neuroscience and early childhood EF assessment—the program achieved a perfect CVI score of 1.00. Detailed program content and validation information are available in **Appendix Table A1.**

Usual Care: The children receive daily care and a normal upbringing from their parents while their teacher provides learning experiences and age-appropriate activities aligned with the CDC's early childhood education curriculum.

Data Collection: This study was conducted from April to September 2021. After receiving IRB approval, the PI contacted potential participants and invited them to join the study. Participants were provided with all necessary information, and informed consent was obtained. Group assignments were blinded to participants.

Two research assistants (RAs), both pediatric nurses, were trained in the study guidelines, including preparing questionnaires and collecting the data, but they were blinded regarding the participants' group status. The experimental group took part in the 12-week program facilitated by the PI, whereas the control group was provided with a handbook on promoting child EF after data collection was completed.

The experimental and control groups completed questionnaires before the intervention, assessing parents' subjective norms, attitudes, perceived behavioral controls, intentions, and behaviors related to child EF promotion and children's EF skills using the BRIEF-P. After the program (posttest 1), parents completed the same assessments. One month later (posttest 2), they completed the assessments again.

Data Analysis: The data were processed using IBM SPSS Statistics software for Windows, version 28.0. Descriptive statistics were used to assess demographic characteristics. Chi-square tests, Fisher's exact test, and independent t-tests were performed to analyze the differences between the experimental and control groups. Specifically, the independent t-test was employed to analyze variations in parents' subjective norms, attitudes, perceived behavioral control, intentions, and behaviors between the two groups at baseline. To analyze changes in mean scores of outcomes for parents and children across different time points and between the groups, the generalized estimating equations (GEE) method was employed.

Results

The average age of parents in the control group was 31.95 years, compared to 33.20 years in the experimental group. In both groups, the most common level of education was a high school diploma. Most parents were employed and indicated they spent a similar amount of quality time with their children during weekdays and holidays. Most participants' primary source of parenting advice came from their parents or other relatives. Reports of children's screen time, including activities like watching television and using smartphones

or computers, were consistent across both groups. Overall, the control and experimental groups had no significant demographic differences.

The characteristics of the children in both groups were similar, including factors such as sex, age, and medical history. Most of the child participants were girls. The average age was 38.53 months in the control group and 39.42 months in the experimental group. Both groups also showed comparable health status. There were no significant demographic differences between the control and experimental groups.

An independent t-test compared the two groups' mean scores of normally distributed variables. The initial assessment showed no significant differences between the control and experimental groups regarding parents' subjective norms, attitudes, perceived behavioral control, intention, behaviors, and child EF scores from the BRIEF-P (see **Table 2**).

Table 2. Baseline comparisons of study variables between the control and experimental groups

Variables	Control group (n = 40)	Experimental group (n = 40)	t	df	p-value
	Mean (SD)	Mean (SD)			
Attitudes	32.63 (3.30)	32.45 (3.96)	0.215	78	0.830
Subjective norms	19.70 (2.26)	19.83 (1.75)	-0.277	78	0.783
Perceived behavioral controls	36.53 (3.69)	35.53 (2.90)	1.347	78	0.182
Intentions	4.18 (0.68)	4.10 (0.55)	0.547	78	0.586
Behaviors	77.08 (10.83)	76.15 (9.63)	0.404	78	0.688
BRIEF-P	51.79 (6.37)	53.15 (7.72)	-0.857	78	0.394

Note. BRIEF-P = the Behavior Rating Inventory of Executive Function-Preschool Version

In the experimental group, the average scores for parents' attitudes and perceived behavioral controls regarding child EF promotion were significantly higher than those in the control group at both posttests 1 and 2. While parents' intentions and behaviors scored significantly higher in the experimental group at posttest 1, there was no notable difference between the groups at posttest 2. On the other hand, the experimental group showed no significant difference in parents' subjective norms compared to the control group at either posttest 1 or 2 (see **Tables 3 and 4**).

Table 3. Comparisons of the program's effects on parents' outcomes at posttest 1 following the intervention, between the control and experimental groups, using GEE

Variables	Baseline	Posttest 1	β	SE	95% CI	Wald Chi-square	df	p-value
	Mean (SD)	Mean (SD)						
Attitudes								
Control group	32.63 (3.30)	31.82 (3.45)						
Experimental group	32.45 (3.96)	35.66 (3.45)	4.02	0.66	2.72, 5.32	36.73	1	< 0.001
Subjective norms								
Control group	19.70 (2.26)	19.39 (2.13)						
Experimental group	19.83 (1.75)	20.21 (1.66)	0.69	0.47	-0.24, 1.6	2.118	1	0.146
Perceived behavioral controls								
Control group	36.53 (3.69)	34.76 (5.83)						
Experimental group	35.53 (2.90)	35.97 (2.28)	2.23	0.963	0.34, 4.12	5.365	1	0.021
Intention								
Control group	4.18 (0.68)	4.21 (0.62)						
Experimental group	4.10 (0.55)	4.76 (0.43)	0.63	0.14	0.36, 0.89	21.49	1	< 0.001

Table 3. Comparisons of the program's effects on parents' outcomes at posttest 1 following the intervention, between the control and experimental groups, using GEE (Cont.)

Variables	Baseline Mean (SD)	Posttest 1 Mean (SD)	β	SE	95% CI	Wald Chi-square	df	p-value
Behaviors								
Control group	77.08 (10.83)	78.21 (8.74)						
Experimental group	76.15 (9.63)	85.08 (9.21)	7.82	1.90	4.09, 11.55	16.867	1	< 0.001

Note. β = standardized coefficient, SE = standard error

Table 4. Comparisons of the program's effects on parents' outcomes at posttest 2 following the intervention, between the control and experimental groups, using GEE

Variables	Baseline Mean (SD)	Posttest 2 Mean (SD)	β	SE	95%CI	Wald Chi-square	df	p-value
Attitudes								
Control group	32.63 (3.30)	32.03 (3.81)						
Experimental group	32.45 (3.96)	34.61 (4.16)	2.76	0.81	1.16, 4.35	11.52	1	0.001
Subjective norms								
Control group	19.70 (2.26)	19.42 (2.25)						
Experimental group	19.83 (1.75)	20.24 (1.82)	0.68	0.37	-0.04, 1.42	3.380	1	0.066
Perceived behavioral controls								
Control group	36.53 (3.69)	34.61 (4.01)						
Experimental group	35.53 (2.90)	36.00 (2.18)	2.42	0.81	0.83, 4.00	8.949	1	0.003
Intention								
Control group	4.18 (0.68)	4.18 (0.77)						
Experimental group	4.10 (0.55)	4.34 (0.48)	0.23	0.18	-0.11, 0.58	1.74	1	0.188
Behaviors								
Control group	77.08 (10.83)	79.00 (10.73)						
Experimental group	76.15 (9.63)	81.97 (8.78)	3.93	2.40	-0.78, 8.63	2.679	1	0.102

The results of this study indicated a significant difference in child EF scores, assessed using the BRIEF-P, between the experimental and control groups ($p < 0.05$). Children in the experimental group experienced a more significant decline in scores than those in the control group in both posttest 1 and posttest 2 (see **Table 5**).

Table 5. Comparisons of the program's effects on child EF scores from BRIEF-P at posttest 1 and posttest 2 following the intervention, using GEE

Variables	Baseline M (SD)	Posttest 1 M (SD)	Posttest 2 M (SD)	β	SE	95%CI	Wald Chi-square	df	p-value
BRIEF-P scores									
Control group	51.79 (6.37)	51.58 (7.94)	-						
Experimental group	53.15 (7.72)	49.58 (6.64)	-	-3.37	1.06	-5.44, -1.29	10.15	1	0.001
Control group	51.79 (6.37)	-	51.80 (8.00)						
Experimental group	53.15 (7.72)	-	49.65 (7.15)	-3.51	1.33	-6.12, -0.90	6.95	1	0.008

Discussion

The PSTP program in this study, grounded in the TPB and parental scaffolding concepts, successfully improved attitudes and perceived control over behavior, intentions, and behaviors aimed at fostering children's EF skills among parents and improving children's EF skills. Through behavioral change by improving parental attitudes, intentions, and perceived control, the program encourages parents to adopt effective behaviors that directly support their children's EF skills. This alignment between parental intentions and actions demonstrates the practical application of TPB principles. The program does not just improve parental factors; it results in measurable improvements in children's EF skills. This highlights the efficacy of parental scaffolding strategies taught in the program and their real-world impact. The findings of this study align with research results highlighting strategies such as parent-child interaction through play,[28-29] storytelling,[31] and guiding children in daily routines and household chores,[30] utilizing scaffolding techniques[27] to enhance EF skills in children.

Interventions, such as group discussions and situational analysis, proved effective in boosting and maintaining parents' positive attitudes towards supporting their children's EF skill development. These sessions gave parents the chance to discuss, explore, and share insights on the factors influencing the development of EF skills and the impact of deficiencies in these skills. Our results align with previous research, indicating that group discussions and situational analysis effectively motivate parents to support their children's EF skills actively.[23] According to Ajzen's expectancy-value model, attitudes are formed through a similar process.[14] When parents engage in discussions and exchange insights about the factors affecting EF skill development and the consequences of deficiencies, their attitudes naturally shift towards fostering these skills in their children.

When parents hold positive beliefs about fostering EF skills in their children, they feel greater control over their ability to nurture these skills. This is demonstrated in several ways. Parents confidently integrate activities like playing, storytelling, and learning into daily routines and household tasks using scaffolding. They consistently include these activities in quality time with their children, which helps to promote EF skills. Additionally, parents show confidence in carrying out these activities with their children. As a result, our findings suggest that parents in the experimental group gained a heightened sense of control due to the program's activities. These findings align with related studies, showing that enhancing parental self-efficacy can improve children's EF skills.[36-37] Additionally, previous studies support this finding, indicating that parents' use of scaffolding techniques during play or other activities is an effective strategy for promoting EF skills in their children.[38]

However, our study did not find a significant difference in the subjective norm scores of parents promoting EF skills in their children between the control and experimental groups. Although the experimental scores tended to be higher from the baseline in post-tests 1 and 2 compared to the control group, the difference was not statistically significant. This may be attributed to the program's lack of individualized activities and possible time constraints. Parents might need more tailored activities and additional time to adjust their subjective norms regarding promoting EF in their children. Therefore, it is suggested that a diverse range of activities be included in the program to strengthen these norms. For example, engaging parents in community activities can offer insights into common child-rearing practices and standards. Witnessing peers actively enhancing their children's EF skills could influence their behaviors and attitudes, including their subjective norms.

The experimental group's intentions and behaviors to support their children's EF skills consistently increased after the intervention but declined after one month. Despite this decrease, their intentions and behaviors remained higher than those of the control group at both

post-intervention measurement points. In the TPB context, "booster" interventions are crucial for sustaining behaviors over longer periods. Such interventions aim to refresh and strengthen TPB constructs, mitigating any decline in behavior. For example, they may include creating social support networks, group activities, or community forums for participants to share experiences and solutions. This collective support can establish shared norms, aiding the upkeep of desired behaviors. Additionally, providing extra resources or training can enhance individuals' ability to overcome challenges, increasing their perceived behavioral control. Regular reminders, motivational messages, or ongoing mentorship can further support individuals' confidence and perceived capability to maintain the behavior.

Limitations of the Study

The quasi-experimental design of this study introduced specific threats to its internal validity. One such threat is the non-randomization of participants into study groups, known as a "selection" threat. Additionally, the study's external validity is due to the sample potentially not being representative of the wider population, reducing the extent to which the findings can be generalized. This issue arises from the sample not being randomly selected.

Conclusions and Implications for Nursing Practice

The parenting skills training program significantly enhanced parents' attitudes, perceived behavioral controls, intentions, and behaviors, empowering them to support their children's EF development better. Grounded in the TPB and parental scaffolding, the program provided education on EF development, challenges, and benefits through engaging activities like play, storytelling, routines, and chores. These interventions improved parental support for EF skills and highlighted the role of evidence-based practices in early childhood development. Professional nurses, particularly community and pediatric nurses, can integrate program activities into their daily interactions with families in various settings such as schools, hospitals, and communities. Incorporating these strategies into parenting courses can foster EF skill development in young children, given parents' critical role in early childhood growth. To sustain these advancements, booster activities are recommended. Future research should include longer follow-ups, younger children, extended family members, and randomized controlled trials to explore the program's long-term impact and scalability.

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Appendix

Table A1. Description of content and activities of the PSTP

Part/Session/Objectives/Duration	Content and activities
Part 1: Intensive training (Week 1)	**Interactive group activities aimed at enhancing behaviors for promoting children's executive function**
Session 1: Promoting positive attitudes (30 minutes)	- Introduction: Discuss current child developmental challenges and issues related to children's EF - Present a short video explaining EF skills and the importance of promoting these skills - Group discussion: Explore attitudes, feelings, and problems related to promoting children's EF - Discuss and share ideas about activities that support the development of EF skills in children
Session2: Increasing subjective norms (30 minutes)	- Present a video showing a family experience that successfully promotes EF skills in children - Group discussion: Share experiences and discuss participants' beliefs about who is primarily responsible for their child's development and involvement in EF-promoting activities
Session3: Developing perceived behavioral controls (180 minutes)	- Role play: Practice promoting EF through activities like play, storytelling, and guiding children in daily routines and chores, using scaffolding and techniques targeting EF components (e.g., working memory, flexibility, inhibition, emotional control, and plan and organization) - Group discussion: Share ideas about the factors that support or inhibit the promotion of children's EF skills - Feedback and summary: Review strategies for promoting EF, including monitoring, planning, goal setting, and role modeling
Part 2: Ongoing support (Weeks 2-12) : Motivating and reviewing knowledge and skills for child EF promotion (Once a week, every week, for 15-30 minutes)	- Reviewing the contents and practicing child EF promotion at home - Assigning weekly homework to promote EF in children - Encouraging communication, group discussion via a LINE application, and the PI posting weekly infographics - Following up with parents over the phone about their practices and any problems with promoting executive function skills with their child during weeks 3, 6, and 9

ผลของโปรแกรมอบรมพ่อแม่ต่อทักษะการคิดเชิงบริหารของเด็กอายุ 2 ถึง 5 ปี : การศึกษากึ่งทดลอง

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บทคัดย่อ: การทำงานของสมองมีความสำคัญต่อพัฒนาการของเด็ก อย่างไรก็ตาม โปรแกรมการเลี้ยงดูลูกสำหรับพ่อแม่มีจำนวนอยู่น้อยที่มุ่งเน้นส่งเสริมเสริมทักษะการคิดเชิงบริหารในช่วงเด็กปฐมวัย การศึกษากึ่งทดลองนี้มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมอบรมพ่อแม่ต่อทัศนคติ บรรทัดฐานทางสังคม การรับรู้ความสามารถ เจตนาและพฤติกรรมของพ่อแม่และทักษะการคิดเชิงบริหารของเด็กอายุ 2-5 ปี ศูนย์พัฒนาเด็กเล็ก 2 แห่ง ที่ตั้งในจังหวัดหนึ่งใกล้กรุงเทพมหานครของประเทศไทย มีการคัดเลือกแบบสุ่มแบ่งเป็นกลุ่มทดลองและกลุ่มควบคุม กลุ่มตัวอย่าง คือ พ่อแม่ของเด็กที่เข้าเรียนในศูนย์พัฒนาเด็กเล็กเหล่านี้ โดยได้รับการคัดเลือกตามเกณฑ์การคัดเข้า จำนวน 38 คนในแต่ละกลุ่ม เครื่องมือในการเก็บรวบรวมข้อมูล ได้แก่ แบบสอบถามพ่อแม่เกี่ยวข้องกับการส่งเสริมทักษะการคิดเชิงบริหารของเด็กปฐมวัยและประเมินทักษะการคิดเชิงบริหารของเด็กวัยก่อนเรียนโดยใช้แบบประเมิน BRIEF-P การวิเคราะห์ข้อมูลใช้ chi-square tests, independent t-tests, สถิติเชิงพรรณนา และ generalized estimating equations

ผลการศึกษาพบว่าเด็กในกลุ่มทดลองมีทักษะการคิดเชิงบริหารที่ดีขึ้นอย่างมีนัยสำคัญทั้งในระยะเวลาหลังการทดลองทันทีและ 1 เดือนเมื่อเทียบกับกลุ่มควบคุม พ่อแม่ในกลุ่มทดลองมีทัศนคติทางบวก มีการรับรู้ความสามารถ ความตั้งใจ และพฤติกรรมที่เกี่ยวข้องกับการส่งเสริมทักษะการคิดเชิงบริหารสูงกว่ากลุ่มควบคุมหลังการทดลองทันที แต่มีเพียงทัศนคติและการรับรู้ความสามารถเท่านั้นที่ยังคงสูงกว่ากลุ่มควบคุมหลังการทดลอง 1 เดือน ส่วนการรับรู้บรรทัดฐานทางสังคมไม่มีความแตกต่างในทั้ง 2 ช่วงเวลา การศึกษาครั้งนี้แสดงหลักฐานที่ชัดเจนว่าโปรแกรมอบรมพ่อแม่ช่วยส่งเสริมทักษะการคิดเชิงบริหารของเด็กให้ดีขึ้นได้ โดยที่พยาบาล ครู หรือบุคลากรอื่นๆ ที่ทำงานด้านสุขภาพและการศึกษาในเด็กปฐมวัยสามารถนำโปรแกรมนี้ไปใช้ได้ อย่างไรก็ตาม ควรมีการศึกษาเพิ่มเติมเกี่ยวกับกิจกรรมเสริมหรือกระตุ้นเพื่อคงผลลัพธ์และความยั่งยืนของโปรแกรมการส่งเสริมทักษะการคิดเชิงบริหารไว้ให้ต่อเนื่อง

Pacific Rim Int J Nurs Res 2025; 29(2) 369-383

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