Original Article

doi:10.31674/mjn.2024.v15i03.002

MJN

The Impact of The Participatory Program on Preschool Children's Executive Function Skills in Thailand

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ABSTRACT

Introduction: This research aimed to explore the impact of the participatory program on the executive function skills of preschool children in Thailand. A set of eight module activities was developed for the integration of health promotion and prevention of COVID-19 into the preschool's curriculum in Thailand to promote basic EF skills. **Methods:** A quasi-experimental, pretest-posttest design was used to test the effectiveness of the educational intervention for promoting EF skills. A purposive sample of 60 preschool children was divided into two groups, including 30 for the experimental group and 30 for the control group. Over 8 weeks, the experimental group participated in the intervention modules, and the control group participated in the standard curriculum. EF skills were assessed using the MU-EF 101 instrument, and scores were compared within and between groups using *t*-testing. **Results:** After participating in the program, there was a statistically significant difference ($p< 0.001$) in the mean scores of the post-test for all basic EF skills among the experimental group compared to their pretest scores. Moreover, the independent t-test analysis showed that this group had significantly higher mean scores on all basic EF skills than the control group ($p<0.001$). The core concepts of the participatory program included age-appropriate developmental tasks, play, and learning activities with integrated health care by themselves. The core concept and participatory program support the key elements of EF and relate to the local Thai culture and context. **Conclusion:** Participatory programs may enhance preschool children's EF abilities. Nurses play a crucial role as responsible individuals in promoting health, actively engaging in the integration of discipline-building activities for health care within the educational framework.

Keywords: Executive Function Skills, EF Skills; Participatory Program; Preschool Children

INTRODUCTION

Executive function (EF) is a group of mental skills that consists of three essential components: inhibitory control, working memory, and shifting. These abilities assist us in dealing with emotions, thoughts, and behaviors in daily life in order to achieve goals, plan, and complete tasks based on previous experiences (Tamaekong, 2019). It follows that executive function can be considered a critical issue for school readiness and classroom learning (Koşkulu-Sancar *et al.*, 2023). EF abilities are essential for children to successfully navigate future obstacles. EF, as defined by the Centre for the Development Child at Harvard University, encompasses a collection of abilities that aid in concentration, decision-making, error correction, and plan adjustment as needed. Furthermore, the primary components of EF development during infancy and preschool lay the groundwork for the development of higher cognitive processes that are necessary and can be extended into adulthood (Tamaekong, 2019). Providing educational tools such as puzzles is recommended to enhance the cognitive development of children (Pratiwi, Andriati, & Indah, 2020). Education should encompass more than just providing learners with knowledge; it should also cultivate essential qualities such as the inclination to learn, moral values, analytical abilities, and the capacity to coexist well with others (Arsan, Seree, & Thanasetkorn, 2018).

EF skills should be developed between the ages of two and six years, as this age range has the most rapid

Received: January 4, 2024 Received in revised form: January 5, 2024 Accepted: January 6, 2024

synaptic development in the human brain. Also, the densest neural network development occurs between the ages of four and six. Following this period of heightened brain development in early childhood, the neural network becomes superfluous and only plays a minor role; they don't contribute a lot of output, and they are finally removed from the neural network (Keller *et al.*, 2023). This effective process of organizing neural networks is called "Synaptic Pruning." Consequently, the age range of 2–6 years old is a crucial phase for developing executive function skills in learners. Effective EF skills are essential for navigating daily existence. If executive function (EF) is trainable from a young age, the educational practices implemented in the early years may also influence it (Guerrero, Núñez, & Corbacho, 2023). These skills have a strong correlation with academic success, healthy behaviors, physical well-being, and future achievements in both professional and personal relationships (Tamaekong, 2019).

A study conducted in Thailand examined a group of 243 children between the ages of 3 and 6. The study utilized the standardized test MU.EF-101 to assess the children's EF skills. The results revealed that 18.5 percent of the children exhibited difficulties in EF, particularly in the areas of inhibitory control, working memory, and cognitive flexibility/shift. According to the study, EF dysfunction was seen in over thirty percent of infants aged 2 to 6. These days, a number of initiatives have been put in place to improve EF abilities in early childhood education and development. These programs consist of classroom curricula, computerized training programs, sports and aerobic exercise combinations, computer and non-computer games, martial arts, and mindfulness exercises (Imnamkhao, & Siripul, 2020). An integrative literature review and synthesis revealed that key principles for promoting EF skills are the use of challenging activities with the clear goal of creating a secure learning environment (Liu *et al*., 2015). Parental or caregiver participation is also important. According to the RLG Institute study that analyzed the effects of the 101s Positive Discipline program on the EF skills of children in Thailand since 2009, the implementation of positive interaction practices has the potential to improve the EF skills of children. Additionally, teachers could enhance children's EF abilities by implementing the 101 positive discipline technique, and the EF guideline may assist teachers in designing learning experiences for promoting EF skills in preschoolers (RLG Institute, 2018). However, in kindergarten, there is also a need to collaborate with parents at home to promote EF skills.

A participatory program was designed in this study to improve EF skills in Early Childhood Development Center classrooms and at home with early childhood families. The name of the program comes from two important keys to success in the promotion of EF abilities. The first key is participatory, meaning that the participants are the ones who mentor at school. The second key is parents or caregivers who participate in promoting EF at home. In addition, it is highlighted that genetic transmission and social factors such as parent-teacher-child interactions play a significant role in EF development (Koşkulu-Sancar *et al.*, 2023). Currently, while there have been several investigations conducted in developed countries regarding EF skills in early childhood, research in Thailand is limited. The current research focuses mainly on the fundamental elements of the EF skills, which are inhibitory control, working memory, and cognitive flexibility/shift. These skills were identified as having the lowest scores among Thai children. Consequently, the primary objective of this research was to examine the effects of the participatory program on the EF abilities of preschool-aged children in Thailand. A greater knowledge of this will assist multi-healthcare providers in planning effective interventions to develop EF skills in children.

METHODOLOGY

Population and Sample: The participants in this research comprised children aged 3 to 5 who were enrolled in kindergarten in Meung District, Mahasarakham Province, North East Thailand. They were purposively selected based on the inclusion criteria: 1) 3-5-year-old boys and girls who had never experienced participating in an EF intervention program; 2) parents who decided to engage in this program signed a consent form; 3) Children with physical disabilities such as blindness, deafness, or a handicapping condition and whose parents declined to give their consent for their participation were excluded from this study. Sixty children in the study were recruited from two early childhood development centers, or nursery classrooms. Thirty people were placed in the control group (n=30) and thirty people were placed in the experimental group (n=30). While participants in the control group engaged in routine school activities, those in the experimental group participated in a participatory program. Additionally, after the study was completed, the children in the control

group received the participatory program to ensure any prospective advantages.

Research Variables

The Independent Variable: Participatory Program. The Dependent Variables: Inhibitory Control, Working Memory, and Shifting; and Confounding Variables: Age, Gender, and Parent Educational Level.

Data Collection

The letter of recommendation and permission for data collection were sent to the school directors of the targeted schools. The researcher contacted the school personnel to explain the research objectives, expected benefits, and details of the participatory program.

Obtaining consent from the children's parents and answering their questions regarding the study. Prior to the program's implementation, educators in the experimental and control groups evaluated the pretest utilizing the MU-EF 101 tool, a rating scale intended to evaluate children's executive function between the ages of two and six. The findings are expressed as a T-a score. The working memory, shifting, and inhibitory control items on this test have reliability estimates of 0.661, 0.969, and 0.936, respectively. For eight weeks, the kids in the experimental group participated in the program. The control group children engaged in the regular curriculum and activities of the school throughout the research weeks. Using MU-EF 101 as a post-test, the teachers of the experimental group and the control group evaluated the kids' EF abilities after eight weeks.

Intervention Program Development: The participatory program was developed in two stages, as presented in Figure 1.

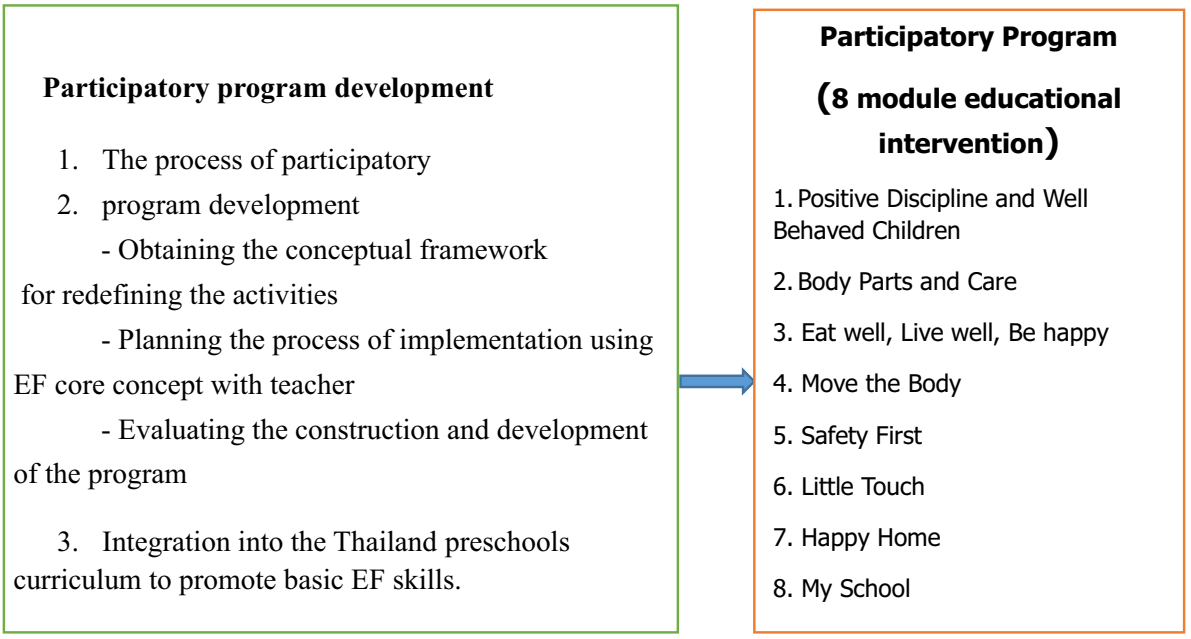


Figure 1: The Processes for the Development of the Participatory Program Intervention

Conceptual Framework

Obtaining the conceptual framework for the programs and activities aimed at enhancing EF skills was the initial step in determining and defining the objectives and focus of the participatory program. The idea behind the participatory program comes from understanding the best age-appropriate relationship-based learning methods based on research, as well as the basic elements of executive functioning (EF) skills. This is done to fix the problems that previous research has found. The EF Matrix, depicted in Figure II, provides an overview of the program's conceptual framework and the guiding principles for activity development in the participatory program.

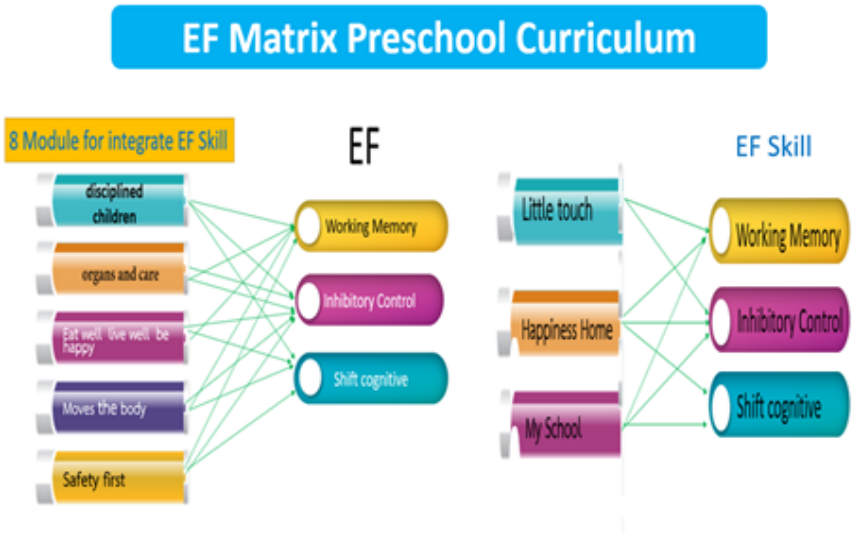
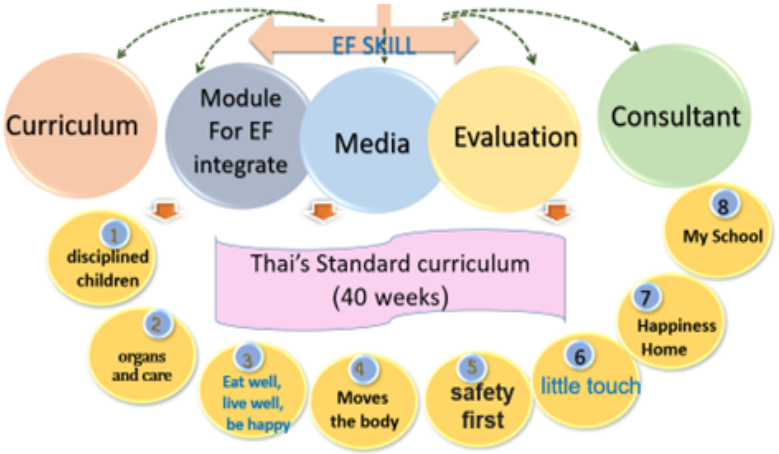


Figure 2: The Conceptual Framework and Participatory Program Principles 's EF Matrix

Figure 3 Show The second step in the process of participatory program development is to plan the process of program implementation. This program is being integrated into the Thaipreschool curriculum in order to develop basic EF abilities.

Integrated Participatory Program



Evaluation EF Score by MU- EF101

Ethical Consideration

Ethical approval was obtained from SMNC (Approval Number: 017/2021). This approval was valid from 23rd April 2021 until 23rd April 2022.

RESULTS

Descriptive and inferential statistics were used to analyze the data. The demographic characteristics of the sample consisted of 60 preschool children with an equal distribution by gender that was divided into two groups: the experimental group (n=30) and the control group (n=30). The children had an average age of 4.7 years.

This study looked into two hypotheses: 1) According to the MU EF-101, the experimental group will

have considerably higher post-test scores on EF skills than their pretest following program participation. A paired sample *t*-test was used to see whether there were any significant changes between the pre- and post-tests within the groups. 2) Following their participation in the program, the children in the experimental group will have significantly higher MU EF-101 scores on EF development than the children in the control group. An independent sample *t*-test was employed to compare the significant differences between the two child groups.

The researchers looked at the data and discovered that the experimental group's mean scores for inhibitory control, cognitive flexibility/shift, and working memory changed significantly between the pre-test and post-test (t = 9.33, 14.57, and 18.23, respectively). The children in the experimental group achieved the following posttest scores: cognitive flexibility/shift (M=55.66, SD=7.60), inhibitory control (M = 55.73, SD=8.04), and working memory (M = 50.03, SD=8.68) subsequent to their engagement in the participatory program. Their mean scores on inhibitory control (M=53.60, SD=7.29), cognitive flexibility/shift (M=51.43, SD=7.20), and working memory (M=46.80, SD=8.75) were significantly higher than their pretest scores. The outcomes demonstrated that the interactive program enhanced the EF abilities of the children. Consequently, the mean scores of the children in the experimental group on the EF skill were significantly higher on the posttest compared to their pretest scores.

Table 1: The Impact of the Participatory Program on Executive Function in Experimental Groups

EF Skill	Pretest			Posttest			*t*	*p*-value
	Max	Min	Mean	Max	Min	Mean		
Inhibitory Control	66	35	53.60±7.29	71	36	55.73±8.04	9.33	0.000
Cognitive flexible/Shift	68	39	51.43±7.20	71	42	55.66±7.60	14.57	0.000
Working Memory	68	33	46.80±8.75	68	35	50.03±8.68	18.23	0.000

p-value <0.001

A Comparison of the Development of Executive Functions between the Experimental and Control Groups

The second hypothesis, which read, "After participating in the program, the children in the experimental group have significantly higher scores on EF development than children in the control group," was verified using an independent t-test. In this instance, the independent t-test's premise was evaluated before doing an independent *t*-test. The hypothesis that was tested yielded a normal distribution and an interval scale, requiring the application of an independent t-test.

According to Table 2, the results showed that there were significant differences between the EF development of the experimental group and control group mean scores on inhibitory control and working memory within the experimental group (t=3.41, 8.93, p<0.05, respectively). After participating in the program, the EF development of children in the experimental group on inhibitory control (M =61.96, SD=4.05), cognitive flexibility/shift (M=60.73, SD=10.30), and working memory (M=62.53, SD=3.60) were significantly higher than children in the control group on inhibitory control (M=55.73, SD=8.04), cognitive flexible/shift (M=55.66, SD=7.60) and working memory (M=50.03, SD=8.68). The findings indicated that the participatory program had a positive impact on children's EF skills. As a result, the children in the experimental group had significantly higher mean EF development scores than the children in the control group.

Table 2: The Comparison Between the Executive Function and The Development of The Experimental Group and Control Group

Executive Function Skills	Experimental Group(Mean of Executive Function Development)	Control group (Mean of Executive Function Development)	*t*	*p*-value
Inhibitory Control	61.96±4.05	55.73±8.04	3.41	0.002
Cognitive flexible/Shift	60.73±10.30	55.66±7.60	1.97	0.058
Working Memory	62.53±3.60	50.03±8.68	8.93	0.000

p-value <0 .005

DISCUSSION

The findings showed that the children in the experimental group had a statistically significant improvement in their EF skills post-test scores (MU.EF-101) since their engagement in the participatory program. Moreover, the participatory program may be an effective program for parents and teachers to promote children's EF skills in preschool classrooms or kindergarten with cooperation and participation in the home environment. Teachers should get better at including kids in making decisions as a group and letting them have choices (Delijeva & Ozola, 2023, July). The core concepts of the participatory program included age-appropriate developmental tasks, play, and learning activities with integrated health care by themselves in a preschool curriculum consisting of 8 modules, such as hand washing that integrated protection of COVID-19 in the 'my body' lesson, and positive relationships. The core concept and participatory program support the key elements of EF and relate to the local Thai culture and context. This program targeted children between the ages of three and five for age-appropriate developmental tasks, as this was the optimal time to promote brain development and EF skills (Liu *et al.*, 2015). The activities in the participatory program included physical exercises to provide children with opportunities for movement to learn to say no or stop (inhibitory control) and to sing a song about hand washing to develop working memory. Prior studies had long proven that children were well-behaved and prepared to learn when their emotions were secure and protected (Laureys *et al*., 2022). In addition, the majority of children enjoyed imitating role models and participated in role-playing through online media.

The results of the study support the second hypothesis, which states that "children in the experimental group achieved significantly higher scores on EF development after participating in the participatory program." However, age and gender may influence the rate at which children acquire EF skills (Hudson *et al.*, 2021). The results of this study indicated that an intervention with a participatory design could assist in the development of EF skills in children. When the lesson plan incorporated the EF core concept, post-test scores on EF skills were significantly higher in the experimental group than pre-test scores (Ahmed *et al.*, 2021). Implementing activities focused on developing EF (Executive Functions) skills in pre-school children helps to improve disciplinary practices within the pre-school curriculum. This effort has a positive impact on the integration of discipline training into the holistic care of personal well-being. Instilling hygienic behaviors such as maintaining body hygiene, handwashing, and infection avoidance are examples. Positive outcomes for preschool children include the development of discipline in promoting health, preventing illnesses, and cultivating excellent health behaviors. Healthcare professionals should collaborate with teachers and child caregivers to improve parents' knowledge and understanding of how to successfully promote executive function development in preschool children (Duangruetai *et.al*., 2019).

CONCLUSION

The development of a participatory program was grounded in a conceptual framework that emphasized positive relationships, age-appropriate development tasks, and the fundamental concepts of EF skills. Additionally, instructors and parents may be able to collaborate on the development of interventions that aid in the improvement of children's EF skills. Furthermore, the outcomes of this interactive initiative revealed a favorable influence on the children's executive functioning abilities. Nurses have a significant role in promoting health as responsible individuals, actively participating in the integration of discipline-building activities for health care within the educational framework. They work with teachers and caregivers to put health-promoting measures into action. In Thailand, a multidisciplinary team organizes activities to improve health, assess nutritional status, and monitor children's growth and development progress.

Conflict of Interest

The authors declare that they have no conflict of interests.

ACKNOWLEDGEMENT

In support of this research, the authors would like to acknowledge the kindergarten director in the Meung district. Also, the author would like to express our gratitude to all the personnel of the Pediatric Nursing Department at Srimahasarakham Nursing College for their support.

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