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Nurturing Young Minds Through Nature: Investigating Children's Executive Functions in a Forest Kindergarten in Turkey

Deniz Kahriman-Pamuk [a], Tülin Güler Yıldız [b], & H. Gözde Ertürk-Kara*[c]

* Corresponding author
E-mail: gozde.erturk@kocaeli.edu.tr

a. Department of Early Childhood Education, Mersin University, Mersin, Türkiye.
b. Department of Early Childhood Education, Hacettepe University, Ankara, Türkiye.
c. Department of Early Childhood Education, Kocaeli University, Kocaeli, Türkiye.

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ABSTRACT
The research aims to examine the executive functions (EFs) of children who attended a forest kindergarten. Therefore, a case-study approach is utilized to scrutinize how participants in this study constructed their executive function within a particular case. The study group consists of 35 children aged 50-70 months (17 females, 18 males) in a forest kindergarten in Mersin. The data were collected via observations and interviews. The results based on observations during forest time and the teachers' views showed that the time spent in the forest supports EF's components. Therefore, a kindergarten's adoption of the forest school approach contributes positively to the development of children's executive functions (EFs). Based on this result, it is recommended to expand this approach in kindergartens.

KEYWORDS
Early childhood; forest school; forest kindergarten; executive functions.

INTRODUCTION

There is growing recognition in early childhood education regarding executive functions (EFs) contribution to children's developmental outcomes. EFs are generally defined as higher-order self-regulatory functions that support goal-directed behaviors (Ackerman & Friedman-Krauss, 2017; Blair, 2002; Diamond, 2006; Garon et al., 2008; Miyake et al., 2000). A high level of self-regulation can be considered integrating EFs components into behavior successfully (McClelland & Tominey, 2010). EFs are a set of high-level cognitive and behavioral processes, such as organizing, prioritizing, shifting/thinking flexibly, accessing working memory, and self-monitoring/self-checking, that are all interrelated (Meltzer, 2007). Diamond (2013) collapsed EFs into three related skills: working memory, cognitive flexibility, and inhibitory control. Working memory helps a child keep information in their mind and use it to complete a task. A child with poor working memory has difficulties remembering crucial information to complete a task. Cognitive/mental flexibility lets a child focus attention and switch the way they are thinking or acting in response to changing cues and situations. A child with poor flexibility has difficulties making another choice when the first choice proves unworkable. Inhibitory control (self-control or impulse control) enables a child to stop doing something if it is not practical or appropriate and helps them focus on their task by ignoring distractions. A child with poor inhibitory control struggles to stop and think before taking action (Ackerman & Friedman-Krauss, 2017; Ernst & Burcak, 2019; Meltzer, 2007; McKenzie, 2015; Sevina et al., 2018).

EFs can be considered a foundation for learning and goal achievement throughout life. These skills are not only essential for academic success but also for many domains of functioning, including parenting, school readiness, social relationships, mental and physical health, and future socioeconomic status (Fuhs et al., 2013; Korucu et al., 2020; Morrison et al., 2010; Vitiello et al., 2011; Zelazo et al., 2016). Investing in improving EFs in the early years yields greater returns for society in the future. Children with strong executive functions typically exhibit several key behaviors that reflect their ability to manage their thoughts, emotions, and actions. For example, they can refrain from interrupting others or wait their turn in a game; keep track of their school assignments or organize their playtime in a way that allows them to complete tasks on time; finish activities like homework or puzzles without getting easily distracted; follow multi-step instructions or remember a list of things they need to do throughout the day; adjust their approach or try something new without becoming frustrated; and resist the temptation to engage in inappropriate activities, such as speaking out of turn in class or reaching for a toy that belongs to someone else (McClelland & Tominey, 2010).

EFs development, understood to be critical for support in the early years, is closely related to children's experiences and environments. Because EFs are malleable, adults can help children learn to use strategies to improve EF skills. Imaginary play, cooperative play, self-monitoring, and the ability to interact with peers (social competence) are the intermediary factors supporting EFs development in the preschool period (Bronson, 2000). Outdoor learning

environments are enriched settings that provide children opportunities for playing, interacting with others, and self-monitoring. Because activities conducted in outdoor environments are less structured, children encounter diverse opportunities for decision-making, which stimulate problem-solving and creativity. Such activities promote executive functioning, a crucial skill for lifelong success (Burdette & Whitaker, 2005). Forest School is a popular form of regular and repeated outdoor learning (Harris, 2017a). Forest School, which is approached as a learning environment in this research, encourages children to develop independent behavior and self-confidence. In addition, Forest Schools are defined as learning environments that primarily emphasize motivating and exciting elements such as group games, games with natural materials, and story activities; involve some difficulties and risks to be overcome; allow children to play an active role in the learning process; and strengthen social interaction (Knight, 2011).

According to Knight (2023), Forest Schools are based on the understanding that nature provides an excellent environment for learning and allows children to develop resilience, problem-solving skills, and creativity through interaction with the natural world. These schools offer children experiential learning opportunities, enabling them to explore, discover, and learn through play and interaction with their surroundings. This connection to nature forms the foundation of the Forest School approach, as it supports holistic development and helps establish a deep, lasting relationship with the environment. The Forest School approach aims to support children's autonomy, develop self-confidence and independent behavior, and establish healthy relationships with their peers and their environment, especially the natural environment (Barrable & Arvanitis, 2018). It mainly focuses on play, movement, and benefiting from fresh air in nature (Maynard, 2007). Noble and McGrath (2008) state that schools can support positive emotions in students by implementing programs like Forest Schools, which emphasize and encourage feelings such as a sense of belonging, pride, satisfaction, optimism, security, and enjoyment. Its philosophy is based on encouraging individuals of all ages to learn with the joy of playing in nature. In this way, it is stated that individuals' creativity, self-confidence, ability to act independently, and academic competencies are enhanced (Blackwell, 2005).

Research shows that the Forest School approach helps children to develop intrinsic motivation towards learning, improve their autonomy, questioning, critical and creative thinking skills, and positively serve the development process of EFs (Ernst & Burcak, 2019; Louv, 2017; Malone & Waite, 2016; McCree et al., 2018; Ulset et al., 2017; Wells & Evans, 2003; Zamzow & Ernst, 2020). Ernst and Burcak (2019) examined the impact of nature-based games played in nature kindergartens on children's curiosity, executive functions (higher cognitive skills), creative thinking, and resilience development. In the study, the developmental progress of children attending nature kindergartens in these skills was compared with that of children attending high-quality but non-nature-based play kindergartens. The results indicated that nature play positively contributes to children's development. Children attending nature kindergartens exhibited higher levels of curiosity, creative thinking, and resilience compared to

their peers in non-nature-based kindergartens. In terms of executive functions, nature kindergarten students performed at a similar level to those in non-nature-based kindergartens while exceeding national averages. Dilek (2019) found that the 7-week Forest School approach practice, which was carried out with 100 children aged 53 to 63 months and studying in a village school in the eastern region of Turkey, had a positive effect on children's attention, motivation, autonomy, and effortful control skills. Furthermore, Eroglu (2018) implemented a 12-week educational program in the playground of an early childhood education classroom. The program was designed based on the Forest School approach and included learning experiences for children. At the end of the program implementation, the researcher observed improvements in children's executive functions, including attention and motivation skills and skills such as decision-making and collaboration skills. Based on the analyses conducted by Dillon and his colleagues (2005), various positive effects of Forest School practices have emerged. In terms of cognitive effects, children have begun understanding their environment better and, for example, have started to remember the names of plants. It has been observed that some children have emotionally developed respect for the environment and have informed other children about how to protect flora and fauna. In social skills, practitioners have noted that children have made progress in teamwork and have increased their use of descriptive language. Regarding physical and behavioral effects, improvements in children's resilience and balance have been recorded.

In this regard, in the current research, the executive functions of children attending a forest kindergarten were investigated in depth using a holistic approach. Children's time spent in the forest and teachers' views in a forest kindergarten were examined in depth in the context of executive functions. For this purpose, the research questions are as follows:

1. How do children experience executive functions while spending time in the forest?
2. What are teachers' perspectives on the role of forest experiences in supporting children's executive functions?"

MATERIAL AND METHODS

Design of the study

In this study, a qualitative methodology is adapted to grasp an in-depth understanding of the executive functions of children attending a forest kindergarten. A case-study approach is utilized to examine how participants of this study constructed their executive functions. The particular case in this study is "attending a forest kindergarten" (Stake, 2006). As Creswell (2007) underlined, a case study should be conducted in a bounded system, and a variety of sources of information about the case should be considered to investigate the thoughts and experiences of participants." For the current study, the EFs of kindergarteners who have been attending a forest kindergarten is examined.

General information about the school and the participants

As Merriam (2009) stated, qualitative research should include detailed accounts of the research context to understand the case better. Hence, the school setting and the study participants are explained in detail to define the boundaries of this study.

The Forest Kindergarten is in a cosmopolitan city called Mersin, in the south of the Mediterranean region in Turkey. Mersin is one of Turkey's largest and most developed cities in terms of industry, economy, and education (Turkish Statistical Institute, 2022). The forest kindergarten is in the city center of Mersin, and there is a forest next to it. The forest kindergarten integrates the national early childhood education curriculum (Ministry of National Education [MoNE], 2013) with the forest school approach. Daily forest walks and discoveries are planned and experienced with all children. During these discoveries, children are sometimes prompted with a question or task. A unique program or task related to executive functions is not implemented.

The kindergarten building is in an area adjacent to the forest and free from distractions. For example, activities that have the potential to make constant noise at school, such as repairs, are done when children are not in the building. The classrooms are very bright, and not too much color is used on the walls or furniture. Two stone buildings, a bristle tent, and a container were designed for various workshops. An area is designed for children to grow vegetables and fruits. In this area, children are engaged in gardening. Mealtime menus are usually designed using unprocessed, healthy foods.

Children spend almost the whole day outdoors in any weather conditions, even if the temperature drops to -5 degrees celsius, which is the lowest for the city. The daily routine starts with breakfast. The children have yoga classes. After yoga class, children walk to the forest. In the afternoon, children return to school and have their meal. In the afternoon, children engage in various language, science, math, and art activities, mainly in outdoor learning centers.

One manager, one education expert, two teachers, and four assistants and personnel serve 35 children aged 50-70 months (17 females, 18 males) in the kindergarten. The manager has two years of teaching experience in nature-based kindergartens, in addition to 10 years of experience in school administration. The education expert is qualified in outdoor learning and environmental education, and she is employed to design the curriculum and monitor its implementation. The teachers are female, aged 25 to 30, and they have bachelor's degrees. The teachers strive to assume leading and guiding roles both in the class and the forest. They do not choose to interrupt children's learning process except for an accident or a severe conflict. Furthermore, the teachers observe children and take notes on them. In addition, teachers engage in the children's play to support them with scaffolding when necessary, ensuring they utilize enriched play skills. There are two groups of children in the forest kindergarten, grouped by age (50-60 months and 60-70 months). The children's families have middle and upper-middle socioeconomic levels, and most of their parents have bachelor's degrees.

General overview of a typical forest time in the kindergarten

The forest area, where children spend time every day for exploration, contains trees of diverse heights, as well as medium-sized cliffs, steep slopes, and medium-depth pits. It also includes an area for making a fire, and suitable environments to safely conduct individual exploration.

Exploring time in the forest begins every day after breakfast and yoga. Children have become familiar with this routine, so immediately after yoga, they go to their classrooms and take the water bottles, magnifying glasses, and observation notebooks needed in the forest. Children go to the forest, which is very close to the kindergarten, on foot. The forest routines begin with a circle. Attendance is taken first in this circle. In the attendance-taking process, each child jumps up and says their name when it is their turn. Then, the children discuss the agreements to be followed in the forest. All the children agree to the following rules: "not to hold large stones on the ground, not to run with long branches in our hands, not to go too far away from the teacher, not to harm any living thing. Then, the exploration and play process begins in the forest. Children play unstructured games individually or in groups, they have created. During the unstructured play process, they use natural materials such as stones, cones, and branches in the forest area. They climb trees and run over rough terrain. Various materials are also provided for children to encourage their exploration. If they want to, Children can observe and discover the change in nature by walking through the forest's depths, accompanied by the leader.

Data collection

The study collected multi-source data, including child observations during forest approach practices and teacher interviews.

Observation Form: An observation form was developed to investigate which EFs are experienced by children during forest approach practices. The observation form consists of three parts: inhibitory control, working memory, and cognitive flexibility. There are 15 items to be evaluated. Before the observation form was developed, two researchers conducted observation sessions at two forest kindergartens and two regular preschools. Children were observed in the forest during free playtime. After a detailed literature review, an item pool was constructed. The item pool was reviewed by three early childhood experts specializing in executive functions research. The final observation form was constructed after field experts agreed on the content validity of the items in the observation form.

One researcher, who has also been familiar with children and the classroom teacher, and the classroom teacher observed each child during forest discoveries and filled out the form. To strengthen the classroom teacher's ability to make a reliable assessment, the form finalized as a result of expert opinion, was individually reviewed with the teacher, and a consensus on its intelligibility was reached. In addition, they took notes exemplifying the specific cases related to the children’s executive functions. Informal observation notes were taken for one month, and then checklists were filled out. In the study, the percentage agreement method was used to ensure reliability between the two observers. Accordingly, the agreement percentage for the

observations conducted in the first week was calculated to be 95% (Miles & Huberman, 1994). It has been determined that there is high reliability among the observers (Stemler, 2004). A total of 35 children were observed three times a week for one month. Each observation session conducted in the forest lasted approximately an hour. Observers focused on two or three children for each observation session. Observation forms were analyzed by descriptive techniques.

Table 1.

Sample Items of the Observation Form

	Working memory	Inhibitory control (Impulse control/self-control)	Cognitive flexibility (Flexible shifting /focusing attention)
Items	Takes the materials she may need during her/his time in the forest.	Waits for his/her turn patiently.	Focuses attention flexibly and switches the way he/she is thinking
	Remember which rules must be obeyed in the forest.	The system works well despite distractions.	Says things that caught his attention in the forest (hiking, etc.)

Interview Form: Interviews were conducted with four teachers to consider their views on the role of forest school approach in the kindergarteners' executive functions. Researchers developed an interview protocol. This interview form included only one open-ended question: What do you think is the role of time spent in the forest in supporting children's executive functions? Before the interview sessions, one of the authors of this article, who specializes in executive functions, visited the school and shared her experiences with executive functions research and studies in the early years.

Interviews with teachers were conducted after school hours at the school library. During interviews, teachers were asked how the forest school approach enhances kindergarteners' executive functions. Each interview took 30 minutes, and teachers' answers were recorded. Interview records were transcribed verbatim and considered data. Interview data were analyzed using content analysis techniques. The content analysis process was examined within the framework of the codes specified by the two researchers, considering the literature on executive functions. The percentage agreement method was used to ensure reliability between the two researchers. Accordingly, the agreement percentage for the interview records was calculated to be 98% (Miles & Huberman, 1994). High reliability among the researchers, as noted by Stemler (2004), has been determined. Emerging codes were defined and categorized, and quotations were given.

In this study, an approach in accordance with scientific research ethics was adopted. Participants were included in the study on a voluntary basis, and their rights to confidentiality and privacy were meticulously protected throughout the process. The collected data were used

only for research purposes and were not shared with third parties. Children are represented by "C" and teachers by "T," along with their respective numbers.

RESULTS

1. What EFs do children experience while spending their time in the forest?

The findings regarding the children during their time in the forest were examined under the categories of working memory, inhibitory control (impulse control/self-control), and cognitive flexibility (flexible shifting/focusing attention). Emerged codes were given under these categories as follows.

Table 2.

Emerged Codes and Categories Obtained from the Observation Form

Category	Codes
Working memory	Remembering forest rules
	Keeping in mind the materials needed
	Remembering the instructions regarding the use of materials
	Remember to use the appropriate tool.
	Remember to collect tools when leaving
Inhibitory control (self-control/impulse control)	Setting up and planning games easily
	Difficulty in ending forest time.
	Difficulty in staying on the observed task.
	Distractions during circle time activity
	Plucking the flower during his/her observation
	Motivation on fulfilling the given task.
	Waiting patiently for their turn
	Following the agreement
Cognitive flexibility (Flexibly shifting/focusing attention)	Sustained attention during a forest walk
	Sustained attention to play.
	Adapting very quickly to the tasks given
	Thinking of alternatives
	Deciding by choosing among different options

Working memory

According to research data, research data determined that all the children kept the forest agreements in their minds. Also, it was observed that they remembered to take the materials they may need while spending time in the forest (bottles, coats, magnifiers, notebooks, etc.). In an activity prepared by the teacher, the children remembered followed the instructions for using the materials. For example, they did not pick up a stone that was too big to hold. While searching for flowers to use in painting, they tried to collect many flowers around, but they did not pluck the flower if there was only one. It was observed that almost all the children remembered to use the appropriate tools to observe creatures in the forest. For example, some children made various observations with a magnifying glass, some with a loupe, and some with binoculars. Moreover, when leaving, all the children remembered to collect their belongings

without needing a reminder from the teacher or anyone else. The children were careful while collecting leaves and branches that had decayed or were beginning to blend into nature, noticing the natural cycle of decay and renewal in the environment.

Inhibitory control

It was frequently observed that children had no difficulty setting up and planning games during the time spent in the forest. However, it was observed that some of the children could not continue their activities due to distractions. For example, in one observation, it was noticed that while the teacher was reading a book in the circle, C32 was playing with the stone and soil he/she found on the ground. Similarly, at the time of discovery, C18 tried to pluck the flowers he/she had seen for the first time, while observing them using a magnifying glass. He/she then left the magnifying glass, and started to deal with the flowers. Many of the children have had a hard time leaving the forest because they were interested in activities that captured their attention for approximately an hour during their return. In most of the observations, children were observed strolling on their way back to school after the closing circle; they did not want to leave the tree they were playing with and noticed flowers, branches, and insects along the way. It was observed that they wanted to examine the assets.

Observations indicate that nearly all children are willing to complete the assigned task and put in effort to achieve success. For example, it has been noted that children make repeated attempts to finish the task, work collaboratively, and motivate themselves by celebrating small successes. Additionally, some children have been observed asking the teacher or their peers for extra hints to better perform the task. Another remarkable point in the observations was that some children frequently warned their friends about the appropriate behavior. For example, C30 often instructs his friends by giving instructions like "Zip up/button up your coat!", "Let us make a circle!", "We put branches here!". In addition, during the observation process, children patiently waited for their turn and followed the agreement. A remarkable anecdote about these findings during the observation process is given below.

After circle time, the children spent time in the art centers, the teacher had prepared in the forest. In one of them, the children were experiencing the colors of the flowers; in the other, they tried to paint while sitting on the swing hanging on the tree, and in the last center, they hung the ropes they cut with scissors, on the branches of the tree. Teacher intervention was minimal in all three centers. The children decided on the center they wanted to play in, used materials interchangeably, and waited patiently for their turn.

While in the forest, it was observed that most children distracted their friends during the activities. The observation notes taken regarding this situation are as follows: During circle time, C2 threw the soil and the dry pine branches at the other children while the teacher read a book. While the other children were trying to create a human model with leaves, C5 stomped on their collected leaves and the models made with them. C10 distracted his/her friends by asking questions about the subject at inappropriate times during the activity. During the math activity,

while C9 was counting the stones they collected, C21 took the stones that were in front of C9 and started to build a tower.

Cognitive flexibility (Flexibly shifting/focusing attention)

During the exploration process, children encountered many creatures in the forest and examined them with various tools such as magnifying glasses and binoculars asking questions. In addition, many cases attracted the attention of children. For example, in one of the observations, C12 wanted to find the source of the smell of thyme, which he noticed in the forest, and he reached the thyme by smelling many plants one by one (sustained attention). This process then started to attract the attention of the whole class, and they all asked many questions about thyme. Children often played with their friends; sometimes, they preferred to play individually, using natural materials in the forest. They continued playing games from where they left off when they came to the forest (for example, the next day). For example, C1 and C9 used trees to set up a game in which they made a nest for a lion. In this game, they became the guardians of the lion's nest. C3 and C14 joined the game, taking the role of protectors of the lions and protecting them from other dangers in the forest. When they returned to the forest, the next day, just after circle time, C1, C3, C9, and C14 went to the same tree during the free play time, and continued their game from where they had left off (sustained attention).

During the time spent in the forest, children often experienced a changing environment due to natural changes. Goals and tasks were also variable. During the observation process, children were observed to adapt very quickly to the tasks given in the forest (shifted attention), were excited to fulfill them, and showed self-monitoring. For example, in a game where children searched for natural entities on the cards they drew, they quickly easily found items such as leaves, feathers, stones, and branches on the card they chose. After that, they brought these entities to the teacher. Almost all the children who found the natural being they were looking for, said self-motivating words such as "Yayyyy! I found it… I want one more card now!".

It was observed that children think of alternatives when needed and make decisions by choosing between different options.

While the children spent time in the art centers, the teacher had prepared in the forest, they occasionally required adult support. However, they tried to solve problems among themselves without asking their teachers. For example, in the center, where they were experiencing the colors of the flowers, the mallet they used to crush the flower had its head come off the handle. One of the children suggested using stones, and they continued the activity with them.

2. What are the teachers' views on the role of time spent in the forest supporting children's executive functions?

Research findings related to the teachers' views on the role of time spent in the forest supporting the children's EFs are examined under three categories: working memory, inhibitory control, and cognitive flexibility.

Table 3.

Emerged Codes and Categories Obtained from the Interview Form

Category	Codes
Working memory	Remembering forest rules Keeping in mind places in the forest Keeping in mind creatures in the forest Keeping the changes in nature in mind Remembering circle time routines
Inhibitory control (self-control/impulse control)	Not giving up easily in challenging situations Motivation on fulfilling the given task. Waiting patiently Following the agreement
Cognitive flexibility (Flexibly shifting/focusing attention)	Sustained attention during exploration Adapting to different circumstances

Working memory

The teachers' views indicated that the time spent in the forest enhanced the children's working memory skills. T2 said, *"Teacher, we saw here before; we saw this tree; we saw these purple-flowered plants while we were walking…".* This indicated that children remembered the places and creatures they had seen before. Similarly, T4 said that children keep the changes in nature in mind during their explorations in the forest. For example, they have always noticed the fruits of the sandalwood growing throughout the winter in the forest and have remembered the growth stages. T1 emphasized that children remember the circle time routines, often implement them without needing instructions and remind their friends of the agreements when necessary.

Inhibitory control

Another executive functions component thought to be developed by all teachers in forest settings is inhibitory control. All the teachers talked about following the agreements on circle time routines. T1 said, "Circle time routines at the beginning of the forest activities improve children's ability to follow the agreements." *In circle time, children learn and remember all the agreements and remind their friends.* T2 expressed his/her view on the subject by saying, "Forest agreements are reminded at every exploration time, and children are attentive to complying with these agreements. All teachers emphasized that during the time spent in the forest, children should exert significant effort to be able to do activities such as walking on bumpy roads and climbing trees. All teachers stated that patience improves in the forest. For example, while T1 said, "Children have to wait patiently to talk during the circle," T2 said, "Children have to wait patiently in line to climb the tree and to speak at circle time." *They often experience situations that require active participation in the forest, which also means many situations where they must wait patiently.* Furthermore, T3 conducted an evaluation based on the forest approach pedagogy. He/She said, "Activities in the forest generally require a process that children need to wait patiently for, such as observing the growth of a plant". *Also, they need to observe*

patiently how the paper decomposes in the soil, but the plastic does not decompose even after months.

Finally, the teachers stated that the time spent in the forest improves the children's intrinsic motivation. T2 said, “Children never give up on practices in the forest.” *For example, he/she tries to climb a tree; fails several times but still does not give up. It is also a great source of motivation to learn to climb trees, to cross rough roads, and to motivate oneself by saying, "I am a forest child, I can do and learn anything."* Additionally, T3 said, “While searching for a plant in the observation list in the forest, the children enthusiastically try to find the plant and learn its name.” *Their motivation for learning never ends.”*

Cognitive flexibility

When the teachers' views on children's EFs experiences in the forest school were examined, four teachers emphasized the ability to adapt to different circumstances. The consensus among the teachers is that the forest's challenging conditions require acting as a group. Teachers thought that spending time in the forest within the group, and following agreements enhanced the ability to adapt. All four teachers were observed discussing children's ability to focus attention. While T1 said, *“Children listen carefully when they talk about exploration walks in the forest, making observations, circle time, and forest agreements*, " T2 stated that they focus their attention, especially when examining plants and encountering an animal they see for the first time. Additionally, S3 exemplified the process by saying, “When we search for natural products such as fossils, cones, and different plants in the forest exploration. Children are cautious, and they focus on the activities until they complete their work.”. T4 emphasized that the processes in the forest improve the ability to focus attention by saying, “I think children have to focus every moment we spend in the forest." *We experience several hazardous moments in the forest. For example, they climb trees, run, and play with branches. Accidents can happen if they do not focus their attention while doing all these activities. In times of exploration, they also need to be very careful to understand and follow directions.”.*

DISCUSSION AND CONCLUSION

Observations of how executive functions are supported in the forest have shown that children often experience certain routines during the school day. In The Chicago School Readiness Project, researchers studied 32 Head Start kindergartens with the participation of a total of 602 children. In this study, instructions were given to teachers about the design and implementation of certain routines in the classroom, such as reinforcing positive behavior and redirection for negative behavior. Their study showed some improvements in the children’s skills in inhibitory control, attention, and working independently (Raver et al., 2011). McCree et al. (2018) presented the finding that attending forest school weekly, and outdoor learning sessions over three years positively impacted children in terms of their academic attainment, well-being, and connection to nature.

Results of this research indicated that children practice EFs when they keep the forest rules in mind, take the materials they may need, and pay attention to the elements in the forest. Another piece of evidence that children use EFs is that they plan long and complex games using natural materials and space in the forest. While playing, children experience a process of making plans, making decisions, experimenting, and evaluating themselves. Children who plan games, think before performing any role. This also allows them to regulate their behaviors and movements during the play process. Coates and Pimlott-Wilson (2019) state that play in forest school has also been linked to the development of children's confidence in their abilities and their capacity for independent thinking. In addition, it is known that when children make their own decisions and plan their choices, their motivation and attention span are longer in their games (Bodrova et al., 2003; Güler, 2007; Bodrova & Leong, 2017). O'Brien and Murray (2006) stated that the time spent in the forest increases children's self-confidence, as it provides opportunities such as the freedom for planning and designing games with their ideas, taking a leading role in the forest, interacting with their peers, and acting independently.

During the time spent in the forest, it was observed that some children were observed to become distracted and disengage from the activity. However, it has been observed that not all children want to leave the forest, as the forest attracts their attention and interest. These observations showed that children's inhibitory control could be supported individually. These children may need more reminders and visual stimuli. According to Chang (2004), visuals show how children can do specific tasks by themselves, facilitate the learning process, and increase productivity—for example, a poster in the forest reminding children of the rules as they stand in a circle. This helps the teacher support children's inhibitory control. However, children need to use strategies such as slowing down their steps while walking on a narrow path; this shows that they are trying to perform the appropriate behavior.

It has been observed that the activities implemented in the forest attract the children's attention and motivate them. It is thought that the most significant reason for this is that the activities include experiences requiring the active participation of children. In these activities, children control the process themselves, think of alternatives, try to solve the problems they encounter, and can evaluate themselves (such as climbing a tree, finding the same flower on the card in nature, using stones instead of hammers). According to Harris (2017a), forest schools allow children to engage with nature directly via the five senses: feeling, hearing, smelling, seeing, and tasting. It is thought that this process in the forest will serve to develop executive functions, skills that are expected to be used frequently. In this regard, children who know their strengths and weaknesses do not expect others to teach them information, and they endeavor to acquire it themselves (Lima et al., 2019). Long-term forest school programs enhanced resilience in children by providing self-directed learning opportunities, where children participate in making their own decisions and engaging in activities that they enjoy and those within their capabilities (Blackwell, 2015).

During forest time, it was observed that the children had difficulty controlling their impulses and refraining from reacting or behaving (such as disturbing each other or misusing materials). It is thought that this situation may arise from the children not having internalized the agreements even though they know them. Children also need to see visual reminders during the time spent in the forest or the classroom. However, it may be suggested that the teacher include structured games in their program to enhance executive functions, mainly inhibitory control. In their experimental research, Tominey and McClelland (2011) found that an intervention program consisting of games in which children need to control their impulses and act appropriately to the instruction, for example, touching your shoulder when you say touch your head, has positive effects on children's executive functions.

Teachers state that during the time spent in the forest, children must take some responsibilities and risks to better focus on the tasks, activities, and environment. Similarly, Harris (2017b) found that all the practitioners in the forest school thought that children often took responsibility and risks during forest practices. Horn et al. (2003) stated that acting without considering the risk is associated with poor executive functions, including attention skills. From this point of view, unlike many other environments in the child's life, forest schools accept the significance of risk-taking and teach the child to evaluate and cope with the risk instead of worrying about creating a risk-free environment. In this context, Knight et al. (2023) highlight risk and creativity as one of the key features of the playful activities offered in forest school, emphasizing that these activities provide beneficial effects for participants, such as physical development, mental health, and learning. Malone (2007), on the other hand, views Forest kindergartens as a learning environment that assesses risk for children. This approach contrasts sharply with overprotective environments where adults control the situation, and the child cannot learn to assess risks for herself or himself.

Participant teachers stated that they observed that the children kept the agreements in mind during the routine practice, in which they repeated the forest agreements before beginning the activities in the forest. This finding is in line with the observations. However, the findings that children have difficulty following the agreements, even during activities if they remember them, suggest that teachers should enhance inhibitory control skills. At this point, considering that children face many opportunities that require active participation, taking risks, and evaluating themselves during the time spent in the forest, it can be said that teachers should include practices such as modeling and using visual and audio reminders/signs . For example, teachers call "hu hu" or something similar and invite children to the meeting area.

Teachers stated that children had many challenging experiences in the forest. Children's efforts to complete challenging activities and show patience indicate inhibitory control skills (Ertürk Kara et al., 2018). This also provides an opportunity for teachers to observe children's efforts. In traditional classrooms, it often takes time for teachers to determine what is challenging for children. It is thought that the forest kindergarten provides more opportunities

for the teacher to observe what is challenging for the child due to the physical elements the school has (trees, big rocks, stones, pits, heavy materials, etc.)

The teachers stated that the children's intrinsic motivation is high, as indicated by the observation findings during their time spent in the forest. In the study by Harris (2017b), forest kindergarten teachers claimed that children also learn about themselves as they discover the types of activities they feel comfortable engaging in, and how to overcome fears and uncertainty when encouraged to try new things. These experiences support children's learning skills, such as paying attention and focusing for a long time (Malone, 2008).

The results based on the forest time and the teachers' views showed that forest time supports the components of executive functions, especially working memory, inhibitory control, and cognitive flexibility. Therefore, it can be said that a kindergarten's adoption of forest approach contributes positively to the development of children's executive functions. Based on this result, it is recommended to expand the use of forest approach pedagogy in kindergartens. It can be suggested that the administrators and the teachers who work in early childhood education institutions benefit from professional development services related to the subject so that they can embody the requirements of forest approach in the school climate. For kindergartens not located near the forest area, it is recommended to increase the time spent outdoors in the daily schedule and encourage children to play with natural materials and play risky games as much as possible. In the present study, the observation time is limited to 12 hours. It is recommended that researchers conduct long-term studies on the contribution of forest approach pedagogy to the child's development and education process by using multiple data sources. Studies using various approaches, such as quantitative, mixed methods, and comparative studies, are also worth recommending. In this study, children's executive function skills were examined based on child observations and teacher interviews. In future studies, gathering parents' perspectives on the process could enrich the data.

This study has some limitations: Teachers' views are limited to the questions included in the interview form. In future research, interviews with teachers can reveal different perspectives by asking questions about the challenges in forest environments and the differences compared to traditional school settings. The limitations of this study include the sample size and the absence of frequency data in the observations. These factors restrict the ability to generalize the findings and their overall applicability. Future research should involve larger and more diverse samples, as well as more detailed and continuous data collection in observations, to enhance the reliability and validity of the findings. The barriers that children encounter in their learning processes regarding skills addressed within the framework of executive function, and teachers’ support on improving these skills, can be examined in greater detail. Observations in this study were conducted only during free play. This limitation means that the behaviors of children in other activities were not observed. Future research could provide more comprehensive results by including observations during a wider range of activities.

Conflicts of Interest

The authors declare that there are no financial or other significant conflicting or competing interests that may influence the conclusions or interpretation of the article.

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