



How Play in the Forest Affects Toddlers' Attention and Environmental Sensitivity

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Abstract:

Background: This study investigated the effects of forest play activities on toddlers' attention span and environmental sensitivity. The subjects of the study were 4-year-old toddlers in two classes at T Children's Center in S City, randomly assigned to experimental and comparison groups. The data collected were analyzed using SPSS.

Materials and Methods: In this prospective randomized controlled study, the t-test and ANCOVA were conducted using the 26.0 program. The results showed that, first, the attention span of toddlers in the experimental group who practiced forest play activities was statistically significantly higher than that of the comparison group, and second, the environmental sensitivity of toddlers in the experimental group who practiced forest play activities was statistically significantly higher than that of the comparison group.

Results: The study demonstrated that the forest play activities had a statistically significant effect on both attention span and environmental sensitivity in toddlers from the experimental group compared to the comparison group.

Conclusion: This study provides empirical evidence of the positive effects of forest play activities on toddlers' attention and environmental sensitivity, suggesting that early childhood education professionals should implement forest play activities more systematically and consistently.

Keywords: Forest experience, Forest-Group, Young Children, Attention, Environmental Sensitivity.

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I. Introduction

Rapid industrialization and digitalization have led to environmental pollution, extreme weather events, and global warming, threatening ecosystems worldwide. These changes have diminished young children's opportunities to engage with nature, develop sensory awareness, and explore freely^{1,2}. Environmental education is now critical to fostering harmony between humans and nature, and such education must begin in early childhood³.

Early childhood is a foundational period for lifelong development. Forest play activities enhance children's awareness of nature and facilitate experiential learning⁴. These activities cultivate curiosity about living organisms, sensitivity to natural changes, and a sense of environmental responsibility. By stimulating imagination and peer interaction, forest play promotes socialization, teamwork, creativity, and problem-solving skills—essential competencies for holistic development.

In an era dominated by digital media, direct engagement with nature through exploration and discovery remains vital for child development. Attention span—defined as the ability to selectively focus on specific stimuli and sustain task engagement⁵—enables children to set and achieve goals autonomously, fostering self-confidence through successful experiences⁶. Forest play contributes to emotional regulation, environmental sensitivity, respect for life, and improvements in creativity, socialization, problem-solving, and attention [4].

Empirical evidence suggests that preschoolers in forest kindergartens exhibit superior attention spans compared to those in conventional settings⁷. A German study by Gorges (2002) found that forest kindergarten students outperformed peers in social skills, concentration, mathematical thinking, creativity, music, and physical education⁸. Nancy Wells (2003) further demonstrated that exposure to green spaces enhances concentration, cognitive clarity, and stress resilience in children⁹. These findings underscore the



synergistic relationship between forest play and attentional development, motivating this study's focus on toddlers.

The Korean Ministry of Environment (2021) defines environmental sensitivity as an attitudinal construct encompassing aesthetic appreciation of nature, recognition of ecological importance, and reverence for living organisms. This concept integrates emotional stability, empathy for environmental issues, and responsiveness to natural stimuli. Forest play immerses children in nature's beauty, instills a sense of safety, and teaches ecosystem interdependence. Highly sensitive children develop deeper respect for biodiversity, heightened interest in sustainability, and proactive attitudes toward conservation—laying the groundwork for responsible environmental stewardship^{4,11,12}.

To cultivate coexistence with diverse lifeforms, fostering environmental values from early childhood is imperative. The 2019 Revised Nuri Curriculum emphasizes this through its Social Relationships domain (promoting self-respect and communal living) and Nature Exploration domain (encouraging inquiry-based learning and harmony with nature)¹³. Forest play aligns with this child-centered pedagogy by nurturing curiosity, concentration, and biophonic connections. Despite its documented benefits, existing research prioritizes physical, emotional, and social outcomes over cognitive and ecological dimensions¹⁴. Addressing this gap, our study investigates forest play's effects on 4-year-olds, a stage marked by exploratory play and cognitive plasticity¹⁵. At age four, children enter a crucial developmental phase where they actively seek out adventurous play experiences. When these exploratory activities take place in forest environments, they tend to stimulate children's curiosity far more profoundly than indoor or urban playgrounds, leading to richer forms of expression and more varied play patterns.

As modern society continues to reduce children's opportunities for meaningful contact with nature, researchers are increasingly focusing on how natural environments shape early childhood development and learning. A growing body of research specifically investigates how forest play activities influence young children's attention spans and environmental awareness. Current theories suggest that immersive experiences in natural settings provide unique developmental benefits - potentially enhancing both concentration abilities and ecological sensitivity. These findings promise to significantly advance our understanding of nature's role in child development while guiding policymakers and educators in creating more effective learning environments.

This study examines how forest play activities impact both attention spans and environmental sensitivity in four-year-old children. Our investigation addresses two key questions.

First, how does play in forest environments affect young children's ability to focus and maintain attention? Second, what influence does forest play have on the development of environmental awareness and sensitivity in early childhood?

II. Research Methods

2.1 Research subjects

This study randomly selected 40 children aged 4 and a half years old from Daycare Center T in City S as the experimental group (11 boys and 9 girls) and the comparison group (10 boys and 10 girls). The children in both classes were from middle-class

families with similar socio-cultural backgrounds, and their average age was 61.99 months in the experimental group and 61.93 months in the comparison group. The t-test showed that the two groups were homogeneous, with no statistical difference in age.

2.2 Research tools

2.2.1 Attention measurement tools

To measure the attention span of toddlers, we used the Attention Span Test for Children developed by So-Young Kwak¹⁶ and modified by Ji-Hyun Yang¹⁷. The subscales of the attention test are color recognition (8 items), listening and answering statements (8 questions), and listening and finding questions (6 questions), for a total of 22 questions. Step 1, "Identify the color," and Step 2, "Listen and answer the question," are done by the teacher listening and recording the child's answer, and Step 3, "Find the picture that matches the word," is done by the teacher asking the question and the child recording it. Each question is worth one point for a correct answer and zero points for an incorrect answer. Each question is scored on a scale of 1 to 3, with higher scores indicating better attention. The test was administered in a one-on-one interview between the teacher and the child. The overall reliability Cronbach's α coefficient of the attention test for toddlers was .926.

2.2.2 Environmental sensitivity measurement tools

To measure the environmental sensitivity of infants, the infant environmental sensitivity screening tool developed by Kim, Eunjung¹⁸ and Jang, Jungae¹⁹ was preliminarily tested by the researchers, and items that were difficult to measure or ambiguous to answer were deleted and modified, and items with similar content were reorganized into one. The environmental sensitivity sub-scales are Sensitivity (7 questions), Aesthetics and Emotional Stability (7 questions), and Sympathy and Compassion (6 questions), totaling 20 questions. Each question is based on a 5-point Likert scale, with higher scores indicating higher environmental sensitivity. The test was administered through a one-on-one interview between the teacher and the child. The overall reliability Cronbach's α coefficient of the environmental sensitivity screening tool for toddlers was .948.

2.3 Research Procedures

2.3.1 Preliminary inspection

A preliminary test was conducted to determine the appropriateness and time required for the screening tool. The pilot was conducted with 10 4-year-old toddlers from a daycare center in a similar setting to the study children. The attention and environmental sensitivity tools were administered 1:1 with the infants by the researcher. The tests took 15 to 20 minutes each, and no problems were found during the testing process, so they were used as a research tool.

2.3.2 Disposing of Experiments

The experimental treatment was conducted twice a week for 8 weeks for a total of 16 sessions. The daily routine of the experimental group and the comparison group was operated according to the life theme. The experimental group had storytelling sessions on each of the Nuri Course life themes, followed by forest play activities. The comparison group had a

storytelling session related to the Nuri Curriculum life theme followed by outdoor play activities at the same time.

2.3.3 Pre- check

The pretest to ensure the homogeneity of the experimental and comparison groups was conducted by the researcher over four days. The pretest of infants' attention and environmental sensitivity was conducted individually in a consultation room and took about 15 to 20 minutes.

2.3.4 Teacher training

Teacher training on forest play activities was conducted three times. The activity plan for the experimental and comparison groups was organized by reflecting the opinions of the participants on the selection and development of forest play activities, the

purpose and significance of the study, the activity plan, and the teaching method.

2.3.4.1 Select a forest play activity

The forest play activity program applied in this study was based on Jang, Hee-Kyung, and Park, In-Jin (2014) and the annual plan of the Nuri curriculum, and was adapted to meet the purpose of this study by linking forest play activities. To verify that the play activities were suitable for teachers to operate in terms of content and method, the content validity of the activities was verified by three daycare center teachers, two early childhood education majors, and two forest interpreters. As a result of the content validity test, the forest play activities were evaluated as appropriate, and the play activities of the selected experimental group are shown in Table 1.

Table no 1. Experimental Group play plan

Session	Subject	Forest Activities	Expected Effect
1~2	precious me	A Conversation	<ul style="list-style-type: none"> • I know my precious feelings and express them according to the situation. • I cherish and love my precious body.
		Find natural objects with colors you like	<ul style="list-style-type: none"> • I am interested in the various colors of nature and feel the beauty. • Classifies natural objects of the same color.
3~4	healthy body and mind	A Conversation	<ul style="list-style-type: none"> • I am interested in my growth process.
		Expressing my feelings through natural objects	<ul style="list-style-type: none"> • Observe natural objects that can be seen in the forest. • I express my emotions using natural objects.
5~6	my family	A Conversation	<ul style="list-style-type: none"> • I know how to say thank you to my family. • I talk about my thoughts in a proper manner.
		various insect families	<ul style="list-style-type: none"> • I feel the diversity of insects.
7~8	diverse family	A Conversation	<ul style="list-style-type: none"> • I know there are different types of families. • I am interested in various family structures.
		forest wedding	<ul style="list-style-type: none"> • The experience of the wedding is expressed in a play. • Experience how to form a family through a wedding ceremony. • I try making props for the bride and groom with natural objects.
9~10	Our neighborhood	A Conversation	<ul style="list-style-type: none"> • I am interested in the neighborhood I live in
		Create a forest village map	<ul style="list-style-type: none"> • Feel the diversity of nature. • Make a map of our neighborhood using natural objects.
11~12	a local institution	A Conversation	<ul style="list-style-type: none"> • I am interested in institutions in my neighborhood.
		leaf color play	<ul style="list-style-type: none"> • You can feel the aesthetics and beauty through various leaves..
13~14	various occupations	A Conversation	<ul style="list-style-type: none"> • I am interested in what people in my neighborhood do and know the names of various occupations.
		forest village store play	<ul style="list-style-type: none"> • You can feel mysterious through the importance of nature.
15~16	neighbors together	A Conversation	<ul style="list-style-type: none"> • Have a grateful heart and attitude toward neighbors who provide and receive help.
		photosynthesis play	<ul style="list-style-type: none"> • You can feel the coexistence of nature that forms a community in the forest.

2.3.4.2 Steps and Processes in the Experimental and Comparison Groups

The experimental group participated in forest play activities twice weekly for eight weeks, totaling 16 sessions. Each

forest play activity lasted approximately 40 minutes. The specific procedures and implementation steps for both the experimental and comparison groups are detailed in Table 2.

Table no 2. Activity Stages and Processes of Experimental and Control Group

Division	Experimental group	Control Groups	
Target	Age 4, 20 people		
Session	2 times a week for 8 weeks (16 times in total)		
Pre-Survey	Attention, Environmental Sensitivity		
Experimental Treatment	Forest experience play activities	outdoor play activities	
Group	Large group, small group, individual		
Progress	Introduction	Sharing stories about activity experiences	
	Deployment	Forest Experience Play Activities	Outdoor Play Activities
	Evaluation	Evaluation of Activities	
Post-survey	Attention, Environmental Sensitivity		
Teacher Role	" Creating a receptive atmosphere so that play activities related to life topics can be carried out. " Induce questions to encourage toddlers to participate actively " Recall/Goal Achievement/Expansion		

2.3.5 Post Inspection

The posttest was conducted using identical procedures and measures as the pretest, assessing both attention span and environmental sensitivity.

2.4 Data Processing

All collected data were analyzed using SPSS 26.0. Independent samples t-tests examined between-group differences, while analysis of covariance (ANCOVA) was employed - with pretest scores as covariates - to determine the specific effects of

forest play activities on toddlers' attention and environmental sensitivity.

III. Findings and Interpretation

3.1 Effects of Forest Play on Toddlers' Attention Spans

To evaluate the impact of forest play activities on attention development, we analyzed the mean scores and standard deviations of attention span measures for both experimental and comparison groups, as presented in Table 3.

Table no 3. Descriptive Statistics

Group	Pre-survey		Post-survey		t
	Mean	Std. Deviation	Mean	Std. Deviation	
Experimental group(n=20)	23.10	4.36	34.55	.60	
Control group(n=20)	19.55	2.52	21.60	2.42	

In the experimental group, the pre-test and post-test means of toddler attention 23.10 (SD=4.36) and 34.55 (SD=.60), respectively. In the comparison group, the pretest-posttest means of toddler self-confidence 19.55 (SD=2.52) and 21.60 (SD=2.42), respectively. Experiment set see that the experimental group increased their pretest to posttest mean by 11.45 points, the group

their pretest to mean by 2.05 points, the experimental group increased their mean more than the control group. To determine whether these mean differences were statistically significant, we conducted an analysis of covariance (ANCOVA) with pretest scores as covariates and posttest scores as the dependent variable. The results are shown in Table 4.

Table no 4. Tests of Between-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig
Covariance	1.16	1	1.16	.369	
Group	1365.89	1	1365.89	433.48	.000
Error	116.59	37	3.15		
Total	1794.78	39			

*** $p < .001$

The results of the covariance analysis showed that the mean of the experimental group was significantly higher than the mean of the comparison group with $F=433.48$ ($p < .001$) for the group variable. In other words, it was proved that the forest play

activity had a statistically significant effect on the attention of the toddlers. The graphical representation of the results of infants' attention concentration through forest play activities is as follows [Figure III-1].

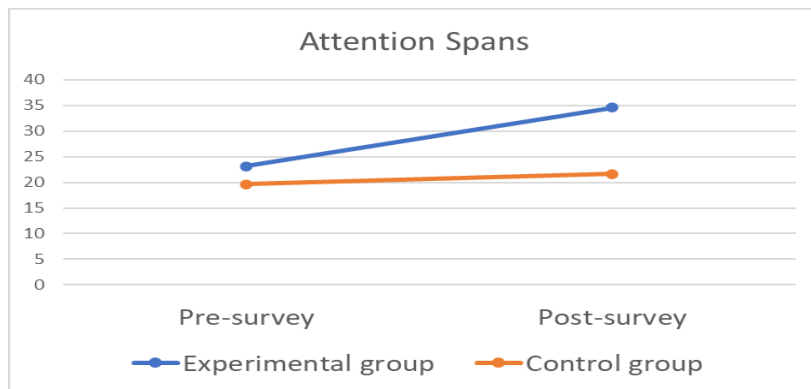


Figure 1. Pre- and post test results for overall attention.

3.2 Effects of Forest Play on Toddlers' Environmental Sensitivity

To investigate the effect of the forest play activity on toddlers' environmental sensitivity, the mean and standard deviation of toddlers' environmental sensitivity for the experimental and comparison groups are shown in Table 5.

Table no 5. Descriptive Statistics

Group	Pre-survey		Post-survey		t
	Mean	Std. Deviation	Mean	Std. Deviation	
Experimental group(n=20)	47.65	3.63	86.10	5.02	
Control group(n=20)	45.10	2.15	70.40	3.46	

In the experimental group, the pre- and post-test means of infant environmental sensitivity 47.65 (SD=3.63) and 81.10 (SD=5.02), respectively. In the comparison group, the pre- and post-test means of infant self-confidence 45.10 (SD=2.15) and 70.40 (SD=3.46), respectively. Experiment set We see that the experimental group increased their pre-test to post-test mean by

38.45 points, the control pre-test to mean by 25.30 points, meaning that the experimental group increased their mean more than the control group. To determine whether these mean differences were statistically significant, an analysis of covariance (ANCOVA) was conducted with pretest scores as covariates and posttest scores as the dependent variable. The results are shown in Table 6.

Table no 6. Tests of Between-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig
Covariance	.947	1	.95	.05	
Group	2032.17	1	2032.17	106.86	.000
Error	703.65	37	19.02		
Total	3169.50	39			

***p<.001

The results of the covariance analysis showed that the mean of the experimental group was significantly higher than the mean of the comparison group with F=106.86 (p<.001) for the group variable. In other words, it was proved that the

environmental sensitivity of infants through forest play activities showed a statistically significant increase. The graphical representation of the results of infants' environmental sensitivity through forest play activities is as follows [Figure III-2].

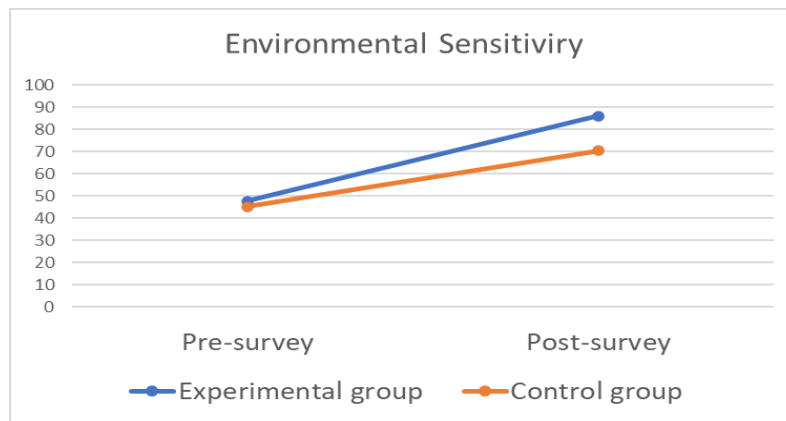


Figure 2. Pre- and post-test results for overall environmental sensitivity

IV. Discussion and Conclusion

The purpose of this study was to verify the effects of forest play activities on toddlers' attention spans and environmental sensitivity, and to provide foundational data for research on enhancing these abilities in young children. The findings of this study are analyzed below to discuss the effects of forest play activities on toddlers' attention spans and environmental sensitivity.

First, the 4-year-old children demonstrated enhanced attention spans through forest play activities, showing increased curiosity while exploring nature. These results indicate that forest play has a positive effect on children's attention spans, meaning that children who experienced forest play showed higher attention spans than those who only experienced outdoor play activities. Attention tests comparing toddlers who visited the forest daily with those who did not confirmed that forest education promotes attention development in young children. This result aligns with

the study by Kang Tae-soon²⁰, which found that children attending forest kindergartens or forest daycare centers had higher attention spans than those attending regular kindergartens. It is also consistent with previous research by Lee Myung-hwan and Kim Eun-sook⁷, demonstrating that children in forest-based educational institutions showed greater attention spans than those in conventional settings.

Forest play activities positively affected toddlers' attention spans. We believe these activities could yield even greater educational benefits if implemented consistently in early childhood education centers rather than as temporary interventions. In this study, we observed that toddlers who visited the forest daily engaged in free and active play, focusing on plants and animals while developing environmental awareness. Through these experiences, the children demonstrated noticeable development in their attention and concentration skills. Therefore, we suggest that

forest play activities can serve as an effective teaching method for improving toddlers' attention and concentration abilities.

Second, when examining the effects of forest play activities on toddlers' environmental sensitivity, the experimental group showed significantly greater improvement and more positive results compared to the control group. While both groups - the experimental group that participated in Nuri curriculum-linked forest play activities and the control group that participated in standard outdoor play activities - showed increased environmental sensitivity test scores after the intervention, the improvement was statistically more significant in the experimental group.

Across all sub-domains of environmental sensitivity - sensitivity, aesthetic appreciation/emotional stability, and sympathy/compassion - both groups showed changes from pre-test to post-test, but the experimental group demonstrated more significant differences. This confirms that forest play activities positively affect children's environmental sensitivity. These findings support Chae Kyung-hee's²¹ assertion that direct interaction with natural environments through participatory opportunities is crucial for developing environmental sensitivity.

The positive impact of direct forest play experiences on environmental sensitivity stems from how environmental education allows toddlers to perceive and experience nature through multiple senses, which benefits sensitivity development. These results are consistent with the study by Kang Young-sik and Kim Yong-suk¹², which showed that play activities in natural environments positively influence both the formation of environmental sensitivity and behavioral changes in toddlers.

This study suggests that forest play provides opportunities for toddlers to interact with nature while developing confidence and positive attitudes toward the natural environment. It also appears to play an important role in shaping children's environmental awareness and attitudes.

Nature experiences in forest settings give toddlers opportunities to perceive and understand the environment, leading to greater environmental comprehension, respect, and positive attitudes. Play activities in natural forest environments have demonstrated sufficient educational impact to promote environmental sensitivity in young children and facilitate behavioral changes. Furthermore, life-respecting forest play activities have proven effective in promoting environmental sensitivity changes, as children perceive nature as a living entity and interact with it through direct experiences.

The results suggest that forest play helps improve toddlers' attention spans and serves as an effective method for promoting environmental sensitivity through hands-on experiences and exploration of various natural phenomena. These findings indicate that forest play can provide age-appropriate, engaging, and effective education for young children, while emphasizing the need for nature experiences like forest play even in urbanized environments. This approach can help children develop healthily and grow into citizens who support sustainable environments.

Limitations of this study included weather-related variables in natural forest settings and potential risks associated with unprepared forest play spaces. Based on the study's conclusions, we offer the following recommendations for early childhood education practices and suggestions for future research:

First, since this study only tested 4-year-olds in S City, the results may not be generalizable to all 4-year-olds.

Second, there may be differences in the appropriateness of the research tools, as the instruments were modified and adapted to fit this specific study.

Third, as the study was conducted with arbitrarily selected geographic and age parameters, generalizing the findings may prove challenging.

Finally, based on the above conclusions, we make a recommendation for further research: this study will be published on May 2, 2023.

The study was conducted for 9 weeks from March 30th to June 30th, so the study was conducted only during the 'spring' season. In addition, there are weather-related variables such as fine dust in spring, which made the study difficult. If the study had been conducted over a longer period of time, it would have led to long-term observation of the children's changes over the seasons. Therefore, it is necessary to consider how the forest changes over the seasons and how it affects the holistic development of infants by conducting a long-term study.

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