

Original Article

Linking Attention and Collaboration: How Stakeholder Perceptions Reflect the Benefits of Nature-Based Learning for Students with ADHD

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Abstract - The present research studies the impact of Nature-Based Learning (NBL) on attention and collaborative play in students with Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD), based on reports by parents and teachers. In order to determine whether NBL serves as a worthy educational framework to improve attention and social interaction in school children with ADHD/ADD, a mixed-methods study was conducted wherein 79 respondents (both parents and teachers) filled out an online survey. An independent-samples t-test, along with one-way ANOVA, correlation, and multiple linear regression, was employed to examine gender disparities, stakeholder influences, and the predictive relationships among variables in the quantitative data. For the open-ended questions in the survey, thematic analysis was utilised to analyse the responses. This method revealed notable conceptual patterns in participants' understanding of NBL. The results showed that men and women were very different when it came to knowing about ADHD. Women comprehended the disorder more effectively than men ($p = .04$). There were no significant effects of gender or stakeholders on attention or cooperative play. Collaborative play, conversely, emerged as a significant predictor of ADHD awareness ($\beta = .47, p = .002$), representing 25% of the variance in awareness scores. Correlational findings revealed robust positive correlations among awareness, attention, and collaboration, suggesting that perceptions of cooperative social behavior in outdoor environments are associated with an enhanced comprehension of ADHD. These results indicate that NBL not only enhances attentional engagement but also promotes social development. Incorporating structured outdoor learning into educational environments may improve inclusivity and self-regulation for students experiencing attention difficulties.

Keywords - ADHD, attention, Collaborative play, Nature-Based Learning, Outdoor education, Teacher and parent perceptions.

1. Introduction

Nature-Based Learning (NBL) refers to planned educational experiences in natural or nature-like outdoor settings that use those settings as the core learning resource rather than a backdrop. Recent review work frames NBL as structured outdoor instruction that varies by setting type, frequency, and duration, and that is evaluated on academic and socio-emotional outcomes, including attention and other aspects of cognitive performance (e.g., minimum regular lessons or residential programs; outcomes such as engagement and well-being). These definitions and outcome targets are explicit in a registered systematic review protocol that synthesizes school-age evidence on NBL in outdoor educational settings. (Mann et al., 2021).

In the last few decades, there has been more research on NBL. This is clear from the planned comprehensive searches of major databases for studies published between 2000 and 2020, which utilised PRISMA-guided procedures and quality

appraisal tools for both quantitative and qualitative designs. That protocol also points out that there are not enough strong links between academic metrics and the benefits of socio-emotional learning, and it suggests using narrative synthesis to bring together different types of interventions in both natural and man-made outdoor settings. These signals show that there is a growing, systematic effort to figure out when and how outdoor learning helps students (Mann et al., 2021). Across populations, NBL appears to support attention and on-task behavior. In early childhood, observational work across multiple preschools found that large, integrated green play yards with richer vegetation were associated with lower observed inattention, with hyperactivity and impulsivity also trending lower. The sky-view factor did not have a significant impact, and the results show helpful methods for evaluating outdoor features that help people pay attention. These results suggest that thoughtfully designed green environments can scaffold attentional control for young children. (Mårtensson et al., 2009).



The case for NBL is especially strong for students with ADHD or ADD. A national parent-report study found that everyday activities carried out in green outdoor settings produced larger immediate reductions in ADHD symptoms than the same activities indoors or in built outdoor spaces, with matched-activity analyses helping to rule out alternative explanations. Related survey work showed better post-activity attention following leisure in greener after-school settings, whereas residential greenness alone was not significant. A within-subject experiment further reported that a brief walk in a park improved concentration for children with attention deficits. Together, these studies point to routine, feasible “doses” of nature as a complementary support for attention and self-regulation in ADHD. (Kuo & Faber Taylor, 2004; Faber Taylor, Kuo, & Sullivan, 2001; Faber Taylor & Kuo, 2009).

1.1. Prevalence of ADD/ADHD in Children in the 21st Century

Neurodevelopmental disorders such as ADD (Attention Deficit Disorder) and ADHD (Attention Deficit Hyperactivity Disorder) are highly diagnosed in children. The occurrence of ADHD has consistently risen globally during the 21st century. Global meta-analyses indicate that around 5–7% of children fulfill the diagnostic criteria for ADHD; however, regional estimates fluctuate based on diagnostic guidelines and assessment methodologies (Polanczyk et al., 2015). National surveillance data from the United States of America indicated that ADHD prevalence in children aged 3-17 has increased from 6.1% in the 1990s to 10.2% in 2016-18. This signifies both enhanced diagnostic recognition and shifts in clinical awareness (Danielson et al., 2018; Centers for Disease Control and Prevention, 2023).

Similar trends are evident worldwide. For example, the reported rates of ADHD in Europe have gone up from 2% to 4% in the early 2000s to 5% to 7% in the 2020s (Sayal et al., 2018). Historically, reported rates have been lower in low- and middle-income countries; however, recent research indicates a movement towards global averages as awareness, diagnostic accessibility, and recognition by educators and parents improve (Faraone et al., 2021). There are several factors contributing to the increase in reported prevalence. First, the DSM-5’s diagnostic criteria made it easier for symptoms to show up in different ways and raised the age-of-onset barrier. This meant that more people were diagnosed (American Psychiatric Association, 2013). Second, more awareness among doctors, schools, and parents has probably led to better identification instead of a real rise in cases (Hinshaw & Scheffler, 2014). Third, increased academic and behavioral expectations in contemporary educational environments have made attentional and self-regulatory difficulties more evident (Sonuga-Barke & Halperin, 2010).

Although discussions persist on the degree to which these increases signify enhanced recognition versus overdiagnosis, there is a general agreement in the studies that ADHD

continues to be a pervasive disorder affecting cognitive, social, and educational development. As a result, educational frameworks that facilitate attentional regulation—such as nature-based learning—have become increasingly significant in modern educational research and practice.

1.2. Importance of Nature-Based Learning for Students with ADHD/ADD

According to DSM-5, ADHD is a long-term pattern of inattention and/or hyperactivity-impulsivity that makes it hard to do everyday things. Symptoms begin prior to age 12 and manifest in multiple contexts. The manual differentiates between inattentive, hyperactive-impulsive, and combined presentations (Centres for Disease Control and Prevention, 2024). ICD-10 has a narrower view and puts these conditions under F90 “hyperkinetic disorders” with stricter, more widespread criteria (for example, F90.0 Disturbance of activity and attention). That tighter net often means that fewer kids meet the threshold than with DSM-based methods (World Health Organization, 1992). This gap in definitions is not just a footnote; it changes which studies are seen as proof of Nature-Based Learning (NBL) and who is included in a review.

Attention-restoration theories are the primary reason why people are interested in NBL for ADHD. Attention Restoration Theory suggests that natural environments present “soft fascination,” effectively engaging individuals to sustain attention without exhausting cognitive resources, which promotes the restoration of directed attention (Kaplan, 1995). The existing research validates this assertion: even slight exposure to natural environments enhances tasks dependent on directed attention compared to urban stimuli (Berman et al., 2008). Over the course of a year, greener educational settings have been associated with improved working memory and reduced inattentiveness. This indicates that the environment may help stimulate attention processes that are usually suppressed in individuals with ADHD (Dadvand et al., 2015). The effects differ in magnitude, and not all groups demonstrate an identical level of increase; however, the overall trend of change seems to be fairly stable.

Nature-based learning does not just refer to teaching outdoors. Rather, it encompasses a lot more stimulating and charged lessons than indoor learning. Teachers have reported that students tend to exhibit greater levels of concentration in an outdoor environment (Kuo et al., 2018). Other studies support this claim with research reporting that outdoor lessons, when held regularly, lead to significant improvements in academic, social, and health indicators (Becker et al., 2017). Similarly, Mann et al. (2022) also held that in order to see real changes in social-emotional and academic areas, nature-based learning is essential in schools. This idea operates on a simple thought: rather than having students complete assignments on worksheets, teachers can instead encourage students to perform the same tasks outdoors.

Several studies indicate significant advantages for individuals with ADHD. A 20-minute walk in the park helped kids with ADHD focus better than a walk of the same length in the city; the improvements were similar to those seen with stimulant medication for that group (Faber Taylor & Kuo, 2009). National-level parent-report data indicate a decrease in symptoms on days featuring green outdoor activities compared to built-environment activities (Kuo & Faber Taylor, 2004). Longitudinal research appears to link increased outdoor time in preschool to improved attention and reduced signs of inattention and hyperactivity (Ulset et al., 2017). Design research adds a practical layer: larger, greener play areas seem to support attention better than cramped, hard-scaped ones (Mårtensson et al., 2009). In combination, NBL may offer low-stakes “attention recovery” windows and a more pleasant sensory profile, which probably aids self-regulation and task focus more than staying inside all day. Of course, access is important; a school with only one shade tree has fewer options than one with a field and a tree line.

A recent systematic review of seven studies on diagnosed ADHD demonstrated a consistent trend: heightened exposure to nature is associated with a reduction in diagnoses and a decrease in symptom severity across longitudinal, quasi-experimental, and cross-sectional methodologies (Hood & Baumann, 2024). The review concentrated on school-aged children with formal diagnoses and included studies employing objective greenness metrics (e.g., NDVI) and standardized setting classifications. This is where examples are useful. In a German cohort, multi-year NDVI (Normalized Difference Vegetation Index, a satellite-derived measure of how green a given area is) values were associated with a diminished risk of ADHD (Markevych et al., 2018; Hood & Baumann, 2024). Brief durations in woodland environments were more advantageous for concentration tasks compared to urban settings (van den Berg & van den Berg, 2011). Satellite-based evaluations of greenness in school vicinity predicted a decline in parent-reported symptoms (Yang et al., 2019). These patterns are evident across various age groups and income levels, indicating, though not conclusively, that regular exposure to green environments and organized outdoor activities may benefit students with ADHD/ADD (Faber Taylor & Kuo, 2011; Hood & Baumann, 2024). Residual confounding factors, such as community assets and parental involvement, may persist; thus, the associations should be regarded as strong indicators rather than conclusive evidence of causation.

In this context, Outdoor Education (OE) gained recognition as an inclusive approach that incorporates local environments and culture into the traditional curriculum while addressing the needs associated with ADHD. The cited benefits include physical, social, psychological, and academic dimensions (Natalini & Savastano, 2024). Hood and Baumann’s (2024) synthesis offers a quantitative basis for this concept: both structured outdoor learning and the

“background” of greener everyday environments appear to mitigate symptom severity and improve cognitive and behavioral functioning. The main question is not if outdoor education should be tried, but how to do it right. Schools need to make sure there are safe places for kids to play, teach their staff how to do their jobs, and plan for bad weather, among other things.

1.3. Attention and Collaborative Play

Attention is the mental habit of focusing on something important and staying with it long enough to learn something. It sounds easy, but it usually is not, especially for students with ADD/ADHD, who have trouble paying attention all the time (often with hyperactivity or impulsivity), and this makes school life hard (CDC, 2024). Kids playing together to reach a common goal or tell a story is a different but related type of play. Those are the things that make up friendship: talking back and forth, being patient, and taking turns. A lot of kids with ADD/ADHD have trouble in both places. Holding on to focus slips. Friends can also go back and forth when impulses get ahead of themselves or when distractions win. Putting all of these problems together shows that kids need help with their focus and safe, organized ways to practice playing with other kids.

Nature-Based Learning (NBL) seems to be a viable method of assistance. Kaplan (1995) posited that natural environments help rejuvenate directed attention by captivating us with subtle, low-effort stimuli, such as the rustling of leaves and changes in light. Brief exposure to natural environments, such as strolling through a verdant park or observing tree-filled vistas for a few minutes, appears to enhance performance on attention-demanding tasks compared to time spent in urban, noisy settings (Berman et al., 2008). This trend is clear in schools and colleges as a whole. Over the course of a year, children who spend more time in green spaces show better working memory development and fewer signs of inattention. This was shown in a study of people living in cities that lasted for a year (Dadvand et al., 2015). The layout of a playground is believed to be important. Larger yards containing a greater number of plants correlate with diminished inattentiveness and potentially reduced hyperactivity when contrasted with smaller yards featuring fewer plants (Mårtensson et al., 2009). This does not mean that trees automatically improve executive function. Instead, it means that places with more plants may help young people with ADHD, who often feel like their attention is too full.

Upon a closer look, the studies that look at kids with ADD/ADHD show clearer improvements. In a large U.S. sample, parents reported less severe ADHD symptoms when daily activities occurred in natural outdoor settings compared to indoor or constructed outdoor environments (Kuo & Faber Taylor, 2004). Another study found that people who spent time in green spaces were better able to concentrate after playing, even when the type of play and the social situation

were the same (Faber Taylor et al., 2001). Longitudinal studies indicate that increased outdoor activity in early life correlates with diminished issues of inattention and hyperactivity in subsequent years (Ulset et al., 2017). A small but interesting study found that a simple 20-minute walk in a park improved attention in children with ADHD to a level similar to that of a standard stimulant dose in the study (Faber Taylor & Kuo, 2009). It is accurate to assert that effect sizes differ and not all children react uniformly; however, the general consensus indicates that daily green play and meticulously designed outdoor lessons can function as effective supplementary measures for attention enhancement.

The social aspects may also get better. Outside, it is easier to work together creatively and without rules than it is in a desk cluster. Becker et al. (2017) assert that consistent outdoor education can enhance social skills, peer relationships, and academic achievement. Mann et al. (2022) say that communication and teamwork, which are important parts of collaborative play, have gotten better, which has made participants more interested. Children with ADHD are less likely to act out by grabbing things or interrupting people when they are in low-stress environments that let them move around, do not correct them too much, and have clear tasks to work on together.

NBL seems to help kids with ADD/ADHD focus and work together better, which are two things they often have trouble with. The assertion is not that green time substitutes for specific treatment or medication; it presumably does not. Studies show that activities like drawing science under a banyan tree, having a reading circle in the garden, or going for a “green lap” after lunch can help kids focus and work better with others. This often decides if a day is good or bad.

2. Materials and Methods

2.1. Aim

This study aims to investigate the perspectives of parents and teachers regarding the impact of nature-based learning environments on improving attention and collaborative play in kids with Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD).

2.2. Objectives

To assess how parents and teachers perceive the impact of nature-based learning on attention span in children with ADD/ADHD.

To evaluate stakeholder perceptions regarding the role of outdoor and nature-integrated environments in fostering collaborative play.

To compare similarities and differences in parental and teacher perspectives toward nature-based learning. To identify perceived challenges and opportunities for

implementing nature-based learning in school and home contexts.

2.3. Hypothesis

- H1: There will be a significant gender difference in awareness of ADHD, attention in NBL, and collaborative play in NBL.
- H2: Prior exposure to nature-based learning will significantly influence perceived attention and collaborative play in NBL.
- H3: Relationship to the child (teacher, mother, father) will significantly affect awareness of ADHD, attention in NBL, and collaborative play in NBL.
- H4: Awareness of ADHD will be positively correlated with attention in NBL and collaborative play in NBL.
- H5: Attention in NBL will be positively correlated with collaborative play in NBL.
- H6: Attention and collaborative play in NBL will jointly predict awareness of ADHD among teachers and parents.

2.4. Participants

The study involved 79 participants, including parents, teachers, and individuals who identified as both. Out of these, 52 consisted of parents, 11 said they were teachers, and 16 said they were both parents and teachers. There were 39 women and 39 men in the sample, and one person who did not wish to disclose their gender. Most of the people who answered lived in cities (n = 66), then in suburbs (n = 9), and finally in rural areas (n = 4). Forty-two participants indicated no prior exposure to nature-based learning (NBL), N = 26 reported occasional exposure, N = 7 noted regular exposure, and N = 4 had engaged in formal NBL programs. This varied sample offered a comprehensive view of perceptions of nature-based learning and its efficacy for students with ADHD/ADD in diverse educational and environmental settings.

2.5. Instrumentation

Data were collected using a structured questionnaire developed on Google Forms. The survey included both quantitative and qualitative components:

Demographic information, such as respondent role (parent or teacher), gender, urbanicity, and years of teaching experience.

Closed-ended Likert scale items assessing participants' perceptions of:

1. Understanding of Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD).
2. Effectiveness of nature-based learning in sustaining attention.
3. Effectiveness of nature-based learning in promoting collaborative play and peer relationships.

In order to understand the respondents' understanding of nature-based learning, they were asked to respond to an open-

ended question: “What is your understanding of the term Nature-Based Learning?” and responses were analysed qualitatively.

2.6. Procedure

The survey was conducted electronically using Google Forms and circulated through teacher networks, parent organizations, and other educational contacts. Participation required about 10 to 15 minutes. All replies were gathered anonymously. All data were safely preserved in digital format for future study.

2.7. Ethical Considerations

Participants were told at the start of the survey what the study was about, who could take part, and that their participation was optional. Participants gave their informed consent by filling out and sending in the questionnaire. To protect anonymity, no identifying information was collected, and all responses were kept strictly private. The data were only used for research and academic purposes. At the beginning of the survey, there were clear instructions that there were no right or wrong answers and that participants should answer honestly and to the best of their knowledge. They were also told that they did not have to take part and that they could stop at any time by not sending in the form.

3. Results

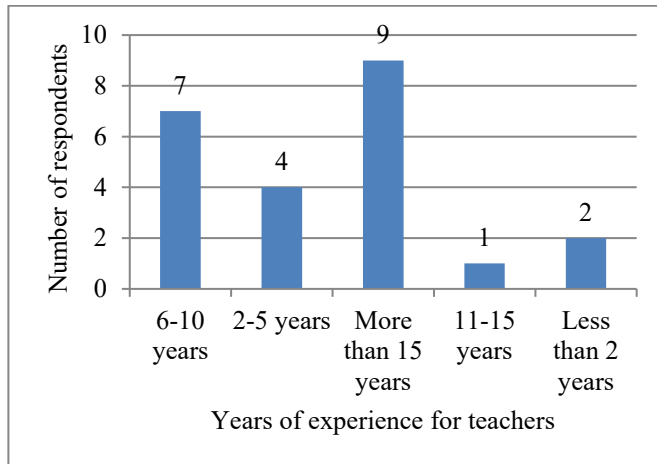


Fig. 1 Shows the years of experience for the respondents labelled teachers

Table 1. Shows the t-test values for gender groups and awareness of ADHD

	Male	Female
n	39	39
M	44.79	47.18
S.D.	5.28	4.8
t	2.09	
df	76	
p	.04	
Cohen's d	0.47	

An independent-samples *t*-test was conducted to examine gender differences in awareness of ADHD. The analysis revealed a significant difference between females and males. Females ($M = 47.18$, $SD = 4.80$) reported significantly higher awareness of ADHD compared to males ($M = 44.79$, $SD = 5.28$), $t(76) = 2.09$, $p = .04$, Cohen's $d = 0.47$. According to Cohen's guidelines, this effect size can be considered medium, indicating that gender accounts for a moderate difference in levels of ADHD awareness. This suggests that females may be more informed about ADHD than males.

Table 2. Shows the t-test values for gender groups and Attention in NBL

	Male	Female
n	39	39
M	29.72	31.51
S.D.	5.75	4.73
t	1.5	
df	76	
p	.137	
Cohen's d	0.34	

An independent-samples *t*-test was conducted to examine gender differences in attention in NBL. The analysis revealed no statistically significant difference between females ($M = 31.51$, $SD = 4.73$) and males ($M = 29.72$, $SD = 5.75$), $t(76) = 1.50$, $p = .137$, Cohen's $d = 0.34$. According to Cohen's guidelines, this effect size can be considered small to medium, suggesting that although females reported slightly higher attention scores than males, the difference was not large enough to reach statistical significance.

Table 3. Shows the t-test values for gender groups and collaborative play in NBL

	Male	Female
n	39	39
M	30.46	30.62
S.D.	6.06	5.14
t	0.12	
df	76	
p	0.904	
Cohen's d	0.03	

An independent-samples *t*-test was conducted to examine gender differences in collaborative play in NBL. The analysis revealed no statistically significant difference between females ($M = 30.62$, $SD = 5.14$) and males ($M = 30.46$, $SD = 6.06$), $t(76) = 0.12$, $p = .904$, Cohen's $d = 0.03$. The effect size was negligible, indicating that females and males reported almost identical perspectives of collaborative play.

According to Table 4, there is no significant difference in attention in NBL between participants with prior exposure ($M = 30.57$, $SD = 6.18$) and those with no prior exposure ($M = 30.66$, $SD = 4.46$). The results showed $t(76) = -0.08$, $p = .94$, indicating that the difference between the two groups was not

statistically significant. The effect size, Cohen's $d = 0.02$, suggests a negligible effect, meaning that prior exposure to NBL had no meaningful impact on attention levels in NBL.

Table 4. Shows t-test values showing prior exposure to NBL and attention in NBL

	Yes	None
n	37	41
M	30.57	30.66
S.D.	6.18	4.46
t	-0.08	
df	76	
p	.94	
Cohen's d	0.02	

Table 5. Shows t-test values for prior exposure to NBL and collaborative play in NBL

	Yes	None
n	37	41
M	29.08	31.85
S.D.	6.53	4.23
t	-2.25	
df	76	
p	.027	
Cohen's d	0.51	

According to Table 5, there is a significant difference in collaborative play in NBL between participants with prior exposure ($M = 29.08$, $SD = 6.53$) and those with no prior exposure ($M = 31.85$, $SD = 4.23$). The results showed $t(76) = -2.25$, $p = .027$, indicating that the difference between the two groups was statistically significant. Participants with no prior exposure reported higher levels of collaborative play compared to those with prior exposure. The effect size, Cohen's $d = 0.51$, suggests a moderate effect, meaning that prior exposure to NBL had a meaningful impact on collaborative play outcomes.

Table 6. Shows ANOVA Results for Relationship With the Child and Awareness of ADHD

	Teachers	Mothers	Fathers
n	20	24	34
M	45.65	47.46	45.15
S.D.	7.20	3.48	4.62
F	1.49		
p	2.32		
η^2	0.04		

A one-way ANOVA was conducted to examine whether awareness of ADHD differed by relationship with the child (teacher, mother, father). The results revealed no statistically significant differences among the three groups, $F(2, 75) = 1.49$, $p = .232$, $\eta^2 = .04$. Although mothers ($M = 47.46$, $SD = 3.48$) reported slightly higher awareness of ADHD compared to teachers ($M = 45.65$, $SD = 7.20$) and fathers ($M = 45.15$, $SD = 4.62$), these differences were small and did not reach

statistical significance. The effect size was small, indicating that the relationship with the child explained very little variance in ADHD awareness.

Table 7. Shows ANOVA Results for the Relationship Between the Child and Attention in NBL

	Teachers	Mothers	Fathers
n	20	24	24
M	29.30	32.21	30.26
S.D.	7.29	4.05	4.55
F	1.80		
p	.172		
η^2	0.05		

A one-way ANOVA was conducted to examine whether attention in NBL differed by relationship with the child (teacher, mother, father). The analysis indicated no statistically significant differences among the three groups, $F(2, 75) = 1.80$, $p = .172$, $\eta^2 = .05$. Mothers ($M = 32.21$, $SD = 4.05$) reported slightly higher scores in attention compared to fathers ($M = 30.26$, $SD = 4.55$) and teachers ($M = 29.30$, $SD = 7.29$). However, the differences were not statistically significant, and the effect size was small, suggesting that the relationship to the child had minimal impact on attention in NBL.

Table 8. Shows ANOVA results for the relationship between child and collaborative play in NBL

	Teachers	Mothers	Fathers
n	20	24	24
M	28.40	31.08	31.41
S.D.	6.98	5.11	4.76
F	2.05		
p	.135		
η^2	0.05		

According to Table 8, the one-way ANOVA results show that there is no statistically significant difference in Collaborative play in NBL across the three groups: Teacher ($M = 28.40$, $SD = 6.98$), Mother ($M = 31.08$, $SD = 5.11$), and Father ($M = 31.41$, $SD = 4.76$). The analysis produced an F-value of 2.05 with a p-value of 0.135, which is greater than the standard significance level of 0.05.

This means that the null hypothesis is not rejected, indicating that the relationship with the child (Teacher, Mother, or Father) does not significantly influence collaborative play in NBL. The effect size, as indicated by eta squared ($\eta^2 = 0.05$), shows that about 5.19% of the variance in Collaborative play can be explained by the relationship with the child. This represents a medium effect size according to Cohen's (1988) guidelines; however, since the results are not statistically significant, the observed differences are not considered meaningful.

Table 10. Shows the multiple linear regression showing whether attention and collaborative play in NBL are predictors of awareness of ADHD

	Constant	Attention in NBL	Collaborative play in NBL
Unstand ard. Coef. (B)	31.38	0.05	0.43
Standar d. Coef. (Beta)	—	0.05	0.47
SE	3.18	0.14	0.13
t	9.88	0.35	3.28
p	<.001	0.725	0.002
R²	0.25	—	—

A multiple linear regression was conducted to examine whether teachers' and parents' perceptions of attention in NBL and collaborative play in NBL predicted their awareness of ADHD. The overall regression model was significant, $R^2 = .25$, indicating that 25% of the variance in perceived awareness of ADHD was explained by the two predictors. The results showed that perceived attention in NBL was not a significant predictor of ADHD awareness ($B = 0.05$, $\beta = 0.05$, $t = 0.35$, $p = .725$). However, perceived collaborative play in NBL significantly predicted awareness of ADHD ($B = 0.43$, $\beta = 0.47$, $t = 3.28$, $p = .002$). This suggests that teachers and parents who view students with ADHD as engaging more in collaborative play within nature-based learning contexts also tend to report greater awareness of ADHD, whereas their perceptions of attention in NBL do not contribute meaningfully to this awareness.

Of the six hypotheses, three were supported by the data. H1 was partially supported: gender differences were found for awareness of ADHD, with females reporting significantly higher awareness than males, though no significant gender differences emerged for attention or collaborative play in NBL. H2 was partially accepted, as prior exposure to NBL did not significantly affect attention but did significantly influence collaborative play; participants with no prior exposure reported higher levels of collaboration. H3 was rejected, since relationships with the child (teacher, mother, or father) did not significantly impact awareness of ADHD, attention, or collaborative play.

H4 and H5 were both supported, revealing significant positive correlations between awareness of ADHD, attention, and collaborative play in NBL. Finally, H6 was partially supported: regression analysis showed that collaborative play significantly predicted awareness of ADHD, whereas attention did not. Overall, these findings highlight collaborative play as the most consistent and meaningful contributor to ADHD awareness within nature-based learning contexts.

Table 11. Shows the thematic analysis along with the codes and description

Theme	Codes	Description
Learning Through Direct Experience and Exploration	Experiential learning, Hands-on learning, Learning by doing, observation, and exploration	Emphasizes experiential, hands-on, and observation-based learning in natural environments; students learn by interacting with nature rather than through books or lectures.
Nature as a Classroom or Teaching Tool	Nature as a teacher/classroom, Learning from natural elements, Teaching using the environment	Nature itself serves as the classroom or educator; natural elements (trees, soil, water, etc.) are used as mediums of instruction and exploration.
Holistic Development and Well-Being	Emotional well-being, Calmness, Health benefits, Social and physical growth	Highlights the emotional, physical, and social benefits of connecting with nature, including calmness, creativity, and overall well-being.
Environmental Awareness and Connection with Nature	Environmental connection, Sustainability, Responsibility toward nature, Reverence for nature	Focus on fostering respect, responsibility, and a symbiotic relationship with nature; emphasizes sustainability and conservation.
Conceptual or Undefined Understanding	No idea, Unaware, Unclear understanding	Some participants expressed uncertainty, limited awareness, or had not heard of the term before.

A thematic analysis of the answers to the question "What does the term Nature-Based Learning mean to you?" was conducted, and the findings revealed five themes (Table 11) based on 79 codes generated. The most common ideas were "Learning Through Direct Experience and Exploration" (22 respondents) and "Nature as a Classroom or Teaching Tool" (21 respondents). A lot of people think of nature-based learning as doing things with the environment, not just being in it. One participant put it plainly: "Nature-based learning

means creating opportunities for children to learn directly from and within natural environments ... using trees, soil, water, and animals as tools for exploration, curiosity, and problem-solving” (Respondent 1).

A smaller group of seven people was more interested in Holistic Development and Well-Being. They said that being outside helped them think more clearly, feel calmer, and come up with new ideas. A respondent said, “Nature-based learning is an educational approach that incorporates the natural environment into the learning process, which will help improve focus, creativity, and problem-solving skills” (Respondent 41). This could mean that students see NBL more as a place that changes their mood and focus than as a method. For example, moving a math class under a banyan tree to calm down a class that is getting too loud. Nine respondents indicated that there was a clear link between environmental awareness and nature. In this case, learning about nature seems to be a good first step toward teaching people about sustainability. Another person who answered said it was “an approach to learning that uses nature and outdoor spaces to get people involved and make them more aware of the environment and sustainability” (Respondent 59). The focus is on developing daily habits and a sense of duty, not on measurable results.

Some people did not know what was going on. Eight people said they had a “conceptual or undefined understanding,” which means they were not sure what to say. Respondent 15 said, “No idea,” and Respondent 55 said, “No clue,” for instance. This could mean that people do not know what “NBL” stands for, not that they do not do lessons outside.

The answers all point to a working agreement: nature-based learning is mostly seen as hands-on, environment-centered teaching that is likely to help students focus, be more creative, and care more about the environment. The fact that not everyone knows the term well suggests that there is a language barrier. Some people might be doing the thing without saying what it is, which is important for training and policy. If we do not use the same words, the practice might be missed or not done the same way every time.

4. Discussion

The findings from the present research indicate that females have a higher awareness of ADHD compared to men. Evidence of related gender patterns is found in studies that examine outcomes in green settings for boys and girls. Kuo and Faber Taylor (2004) reported that greener everyday play was associated with milder ADHD symptoms for children regardless of gender, which frames gender differences as unlikely to drive core outcomes. Taylor and Kuo (2011) also observed symptom relief in greener play contexts for children with ADHD across subgroups, again without a gender moderation. Natural settings tend to increase concentration in

children with ADHD as compared to in-built setups (Van den Berg & Van den Berg, 2011). In the present dataset, gender differences were confined to awareness rather than outcomes.

The attention results align with the three comparison studies. In the present research, attention scores were similar across prior-exposure groups. Kuo and Faber Taylor (2004) used a large national dataset and showed that greener routine activity is related to lower symptom severity across demographic groups, which implies that context has a central role. Those children who play in green environments tend to report milder symptoms than the students with ADHD who engage in play in built-in settings (Taylor and Kuo, 2011).

Van den Berg and van den Berg (2011) provided a field comparison in which concentration tasks were performed better in woods than in town settings. The convergence across designs supports an interpretation in which the outdoor context, not gender or exposure history, is the main driver of attentional benefit during nature-based learning.

Furthermore, the present research found no differences in collaborative play based on gender or stakeholder role. A notable contrast appears for prior exposure. Participants with no prior nature-based learning exposure reported higher collaborative play than those with exposure. The three comparison studies describe greener settings as supportive social contexts. Van den Berg and van den Berg (2011) reported more positive behaviors and feelings in the woods than in town. Taylor and Kuo (2011) described greener play contexts that coincided with milder symptoms, a pattern that typically accompanies easier peer interaction. Kuo and Faber Taylor (2004) observed broad symptom reductions associated with green activity across diverse groups, which is consistent with conditions that promote smoother social functioning. The discrepancy with the present exposure finding likely reflects measurement differences. The three studies evaluate the quality of the current setting, whereas the present research used a coarse indicator of prior exposure that does not capture structure, facilitation, or recency of programs.

The results showed that students who knew more about ADHD were better at paying attention and working together to play. Children exhibiting elevated levels of collaboration also displayed a heightened awareness of ADHD-related behaviors. Although attention and collaboration were closely related, the regression analysis indicated that collaboration had a more pronounced role in predicting ADHD awareness, whereas attention did not appear as a significant independent factor. In general, the model explained a significant amount of the difference in ADHD awareness, which shows how important social and interactive aspects of the learning environment are. The three comparison studies did not assess adult ADHD awareness, thus failing to directly evaluate this association. But they do follow a path that fits this pattern. Each study links enhanced attention or reduced symptoms to

greener contexts (Kuo & Faber Taylor, 2004; Taylor & Kuo, 2011; van den Berg & van den Berg, 2011). Enhanced attentional regulation creates an environment that frequently fosters coordinated peer engagement. The current findings support this narrative by demonstrating that observable collaboration is the most significant behavioral indicator correlated with adults' self-reported ADHD knowledge in nature-based learning environments.

Across comparisons, the present research agrees with the central claim shared by the three studies. Environmental context matters. Natural settings consistently relate to better attention and milder symptoms in prior work (Kuo & Faber Taylor, 2004; Taylor & Kuo, 2011; van den Berg & van den Berg, 2011), and attention during nature-based learning in the present sample was stable across gender, stakeholder role, and exposure history. The social results invite a sharper focus on implementation. Collaborative play was higher among those with no reported exposure history, which contrasts with studies that evaluate current high-quality green contexts and report positive behavior in those spaces. The most actionable implication is to measure and design the nature-based learning experience with structure, facilitation, and frequency in mind. Previously mentioned research shows what supportive contexts can do; the present data indicate that collaboration is the clearest signal tied to adult awareness within those contexts.

The new synthesis aligns with your central claim that NBL can scaffold attentional and socio-emotional functioning. Population-level studies show an ambient greenness gradient; higher NDVI relates to lower ADHD risk, while micro-exposure experiments show rapid attentional benefits after brief contact with woods/parks; school-proximal greenness also relates to fewer parent-rated symptoms (Hood & Baumann, 2024; Faber Taylor & Kuo, 2011; van den Berg & van den Berg, 2011). Read together with your data, which highlight collaborative play as the strongest predictor of ADHD awareness, a practical interpretation is that natural contexts support attention directly and also make pro-social behaviors more observable, which adults may use as salient cues when updating ADHD knowledge in outdoor learning (linking perception-level awareness to symptom-level effects reported in prior work).

Methodologically, the systematic review focused on clinically diagnosed samples and symptom-level outcomes (diagnosis or severity), utilizing a descriptive synthesis due to the heterogeneity in measures and study designs (Hood & Baumann, 2024). This study builds on previous research by investigating stakeholder perceptions—specifically awareness, attention, and collaboration—within a community-based framework. This focus improves research on symptoms instead of repeating it, and it may help explain why there are no gender differences in attention and collaboration, which is

different from what other studies have found (Hood & Baumann, 2024).

Further investigation into Nature-Based Learning (NBL) could strengthen this foundation by incorporating NDVI-based greenness buffers surrounding educational institutions, along with succinct and organized outdoor lessons, thereby addressing both perceptual and clinical aspects of ADHD-related outcomes (Hood & Baumann, 2024; van den Berg & van den Berg, 2011). The results of a study demonstrate that collaborative play is the most significant predictor of adult ADHD awareness, corroborating evidence that Outdoor Education (OE) fosters pro-social engagement through experiential, spatially diverse tasks (Natalini & Savastano, 2024). Mechanistically, exposure to natural environments that integrate Attention Restoration Theory (ART) and Stress Recovery Theory (SRT) promotes the simultaneous movement of attention and social engagement, as demonstrated by the present research. Green environments seem to improve focused attention, lower physiological arousal, and encourage cooperation—things that teachers and parents often see as important for making outdoor learning easier (Natalini & Savastano, 2024). Prior research has concentrated on clinically diagnosed cohorts through descriptive syntheses (Hood & Baumann, 2024); this study investigates perceptual outcomes among community stakeholders, offering relevant insights rather than superfluous data. The persistent gender pattern in attention and collaboration observed in this study substantiates a context-first interpretation, with effects identified across multiple spatial scales, including ambient NDVI gradients linked to reduced ADHD risk, short woodland exposures that improve concentration and recovery, and nearby school greenness correlated with fewer parent-reported symptoms (Hood & Baumann, 2024). In conclusion, the present findings augment symptom-focused frameworks by elucidating awareness and collaboration as critical perceptual pathways through which natural environments may influence ADHD-related functioning.

5. Conclusion

The study examined the viewpoints of parents and educators concerning the influence of Nature-Based Learning (NBL) on the attention and cooperative play of children with ADD/ADHD. A gender effect was noted exclusively in ADHD awareness, with female respondents demonstrating superior awareness compared to their male counterparts. No gender differences were observed in perceptions of attention or collaborative play in NBL settings. Collaborative play was a more significant predictor of ADHD awareness than attention. This indicates that adults' comprehension of the disorder is more closely associated with the efficacy of peer collaboration and turn-taking than with individual task persistence.

Taken together, these results point to NBL as a plausible support for both cognitive and social domains. Outdoor activities that involve shared roles, e.g., dividing tasks during a short garden maintenance session or co-constructing a simple nature inventory, may be especially salient to adult observers. It is possible that such visible markers of cooperation make ADHD-related needs easier to recognize than isolated signs of sustained attention. If so, assessments of NBL's value could be biased toward contexts where social interaction is prominent, an interpretive asymmetry that future work should address.

For educational practice, the findings suggest that structured, time-bound outdoor tasks may help teachers and parents scaffold self-regulation and pro-social behavior while maintaining academic engagement. Short, predictable NBL routines (5–15 minutes) with explicit roles could be integrated into regular lessons without large timetable changes. Because collaborative play predicted ADHD awareness more strongly than attention, professional learning that trains adults to notice a wider range of attentional behaviors, beyond overt cooperation, may reduce blind spots in identification and support.

Limitations

- The sample size was modest ($n = 79$), which limits the precision of estimates and the breadth of subgroup comparisons.
- All outcomes relied on self-report, introducing risks of social desirability and common-method variance.
- Respondent groups (teachers vs. parents) were uneven, complicating cross-group inferences.
- Qualitative responses were brief, constraining interpretive depth.
- No behavioral observations were collected; perceptions, while informative, may not map cleanly onto children's actual attention or play patterns.

Future Research

- Replicate with larger and more diverse samples to assess stability and generalizability.

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- Incorporate direct behavioral observations of attention and play to triangulate with self-report.
- Use longitudinal designs to test whether sustained exposure to NBL predicts changes in attention and social functioning over time.
- Evaluate teacher training focused on NBL-aligned supports for ADD/ADHD and measure classroom practice as an outcome.
- Examine parent workshops that translate NBL strategies to home routines and track uptake as well as child outcomes.

Practical Recommendations

Parents

Introduce regular outdoor routines linked to simple, shared goals (e.g., watering a small plot together, a short "texture hunt," or timing a two-lap walk). Such routines may support attentional recovery and emotion regulation while normalizing collaborative behaviors.

Teachers

Embed brief NBL segments with clear roles—timekeeper, recorder, materials lead—into existing lessons (e.g., measuring shadow length in mathematics, classifying leaf types in science). These structures appear likely to encourage joint problem-solving and workable turn-taking.

Students with ADD/ADHD

Offer movement-based resets outdoors (e.g., a short circuit or a three-item sensory scan) as self-regulation options that can be initiated without disrupting class flow.

Awareness, attention, and collaboration in NBL contexts appear interrelated, with collaborative play more closely tied to adult awareness of ADHD than attention alone. This pattern may reflect how adults perceive and interpret children's behavior in social settings. When informed observation is paired with simple, well-structured outdoor tasks, schools and families are positioned to create environments that plausibly strengthen both focus and social participation for learners with ADD/ADHD.

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