

The Impact of Ecotherapy on Academic Performance and ADHD Symptom Severity in Children

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Abstract

Studying how ecotherapy affects school performance for Saudi Arabian kids with Attention Deficit Hyperactivity Disorder (ADHD) is the major focus of this research. This study focuses at ecotherapy interventions and their potential impact on academic outcomes. The current research hopes to learn more about the impact of age as a moderator and the function of ADHD symptom severity as a mediator in this setting. The results of this research support the claim that ecotherapy improves learning outcomes in classroom settings. The association between these two factors is also shown to be affected by differences in attention deficit hyperactivity disorder (ADHD) symptoms, as the research shows. The significance of recognizing the differences in ecotherapy's efficacy across age groups, and of using treatments that are customized to suit the individual requirements of each age group, cannot be overstated. Results like these highlight ecotherapy's promise as a comprehensive, nature-focused approach to improving children with ADHD's academic and mental health.

Keywords: Ecotherapy, Academic Performance, ADHD, Mediating Analysis, Age Moderation.

Introduction

There is growing concern about the prevalence of Attention Deficit/Hyperactivity Disorder (ADHD) in Saudi Arabia. Noori et al. (2020) claims that recent studies reveal a striking increase in the incidence of Attention-Deficit/Hyperactivity Disorder (ADHD) among American children and teenagers. Although estimates of the prevalence of Attention Deficit/Hyperactivity Disorder (ADHD) vary, it is clear that the condition poses serious challenges to public health in Saudi Arabia.

The scholastic struggles of children with Attention-Deficit/Hyperactivity Disorder (ADHD) extend beyond the core symptoms of the disorder. In compared to students without ADHD, those with ADHD are more likely to repeat a grade and have a lower graduation rate overall (Biederman et al., 2019). A child's self-esteem, stress levels, and future opportunities for further education or professional success may all suffer if they have Attention-Deficit/Hyperactivity Disorder (ADHD) and struggle in school (Daley & Birchwood, 2010). Therefore, meeting the educational needs of this population is critical to ensuring their long-term success.

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The practice of ecotherapy, which is grounded in the natural environment, has gained popularity for its purported ability to improve both psychological and physical health. For the purpose of healing and personal growth, ecotherapy is a multifaceted strategy that includes a wide variety of treatments and activities that bring people into contact with nature (Jordan & Hinds, 2017). Outdoor adventure therapy, horticultural therapy, wilderness therapy, and other treatments centered on nature are examples of the aforementioned pursuits.

The premise of ecotherapy is that re-establishing a connection with nature may have positive effects on one's mental and physical health (Jordan & Hinds, 2017). Biophilia, the belief that people have an innate connection to the natural world and that spending time in natural settings may improve mental and physical health (Kellert & Wilson, 1993), is the basis of the therapeutic approach being explored here. There is a wide range of approaches within the field of ecotherapy, but they all have a focus on nature's inherent healing properties and the value of forging a closer connection with the natural world.

Numerous academic studies have looked at the connections between ecotherapy and positive mental health effects. As an example, Bratman et al. (2015) discovered that those who spend time in natural environments experience less stress, anxiety, and unhappiness. Ecotherapy interventions have also been associated to improvements in mood, self-esteem, and psychological well-being more generally (Hinds & Sparks, 2008).

In terms of mental health as a whole, ecotherapy has shown to be effective. However, further research is needed to determine its potential usefulness for certain populations, such as children and adolescents with Attention Deficit/Hyperactivity Disorder (ADHD). Individuals with Attention-Deficit/Hyperactivity Disorder (ADHD) may benefit from a combination of traditional treatment methods and those involving exposure to the natural environment. Children with Attention-Deficit/Hyperactivity Disorder (ADHD) may benefit from spending time in nature because it helps them focus, reduces their impulsivity, and calms their emotions (Kuo & Faber Taylor, 2004).

Children in Saudi Arabia who have been diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD) often struggle academically, highlighting the need for alternative treatments. Ecotherapy, which emphasizes interacting with and learning from the natural environment, shows potential as a novel approach to improving these students' academic performance.

Numerous factors, such as client characteristics, intervention features, and environmental settings, influence the success of ecotherapy treatments (Jordan & Hinds 2017). Ecotherapy's successful absorption into Saudi Arabia's educational system depends on our understanding of how it may be adapted to meet the country's unique needs and cultural context.

The cultural beliefs and practices of Saudi Arabians towards mental health and therapeutic approaches may affect the spread and success of ecotherapy there. Ecotherapy has shown promise as an intervention for children with Attention Deficit/Hyperactivity Disorder (ADHD), but its widespread adoption will depend on how well it is received and understood within Saudi society. The availability of natural settings, infrastructure, and resources might pose challenges to the effective implementation of ecotherapy programs in Saudi Arabia. Successful ecotherapy therapies for children with Attention-Deficit/Hyperactivity Disorder (ADHD) need a thorough knowledge of these challenges and the development of innovative solutions.

Objective of the Study

The major goal of this study is to address these knowledge gaps by investigating how ecotherapy might improve academic outcomes for Saudi Arabian children with Attention-Deficit/Hyperactivity Disorder (ADHD). This research looks at the potential benefits and drawbacks of using ecotherapy within the cultural and logistical context of Saudi Arabia.

Literature Review and Previous Studies

The educational landscape presents a myriad of challenges for children who have received a clinical diagnosis of Attention Deficit/Hyperactivity Disorder (ADHD). The presence of the aforementioned barriers extends beyond the fundamental symptoms of the disease, potentially exerting a detrimental influence on the long-term educational achievements and prospects of individuals (Biederman et al., 2019). The correlation between Attention-Deficit/Hyperactivity Disorder (ADHD) and suboptimal academic achievements has been well-established in scholarly literature. Empirical evidence suggests that individuals with ADHD tend to exhibit lower test scores, a higher likelihood of grade repetition, and decreased graduation rates when compared to their neurotypical counterparts (Faraone et al., 2015). Adversity within the educational setting has been found to engender a range of unfavorable consequences, including a diminishment in one's self-esteem, an exacerbation of stress levels, and a reduction in prospects for subsequent academic or vocational accomplishments (Daley & Birchwood, 2010).

Rising interest in the field of ecotherapy may be traced back in large part to the fact that it uses natural settings as a form of treatment. The potential for this approach to improve psychological and physiological health is substantial. When used to describe a variety of practices that draw on nature's restorative and developmental powers to aid in healing and personal development, the word "ecotherapy" is broadly inclusive (Jordan & Hinds, 2017). Wilderness therapy, horticultural therapy, and adventure therapy exemplify a range of activities falling within this category.

Prior scholarly investigations have delved into the prospective psychological well-being advantages associated with the practice of ecotherapy. The empirical findings substantiate the notion that immersing oneself in natural environments can potentially alleviate the burdens of stress, anxiety, and depression (Bratman et al., 2015). Positive correlations between ecotherapy and increased levels of happiness, self-worth, and psychological health were found in a research by Hinds & Sparks (2008). Based on these results, ecotherapy may be a useful comprehensive strategy for helping those with mental health issues.

Ecotherapy is now widely recognized as a legitimate mental health intervention, with promising benefits in a variety of settings. However, further studies are needed to demonstrate its effectiveness in certain populations, such as individuals with Attention Deficit/Hyperactivity Disorder (ADHD), especially in children. Incorporating outdoor activities into a treatment plan for Attention Deficit Hyperactivity Disorder (ADHD) seems promising because of the wide range of stimuli and experiences they provide. Studies have demonstrated that children with Attention-Deficit/Hyperactivity Disorder (ADHD) may benefit by engaging in activities that take place in natural environments, as was shown in a research by Kuo et al. (2004). The positive impacts of these arrangements on several dimensions of human intelligence and emotion have been shown in previous studies. Improvements in focus, inhibition, and emotional regulation are among examples.

Including an ecotherapy program into Saudi Arabia's educational support system has the potential to greatly improve the lives of youngsters diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). In order to guide future research and treatment strategies for Attention-Deficit/Hyperactivity Disorder (ADHD), however, a comprehensive understanding of the current literature on ecotherapy and its implications for ADHD is essential.

Methods

Participants ranged in age from 7 to 12 and all had been diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) by licensed medical practitioners. From Saudi

Arabia's universities and hospitals, researchers chose 120 young people to study. Each participant was assigned at random to either the intervention (n = 60) or control (n = 60) group.

Participants in the intervention group took part in an ecotherapy program that had been carefully designed to meet the requirements of children with ADHD. Sessions were place on a regular basis in natural settings like parks and gardens. Each session lasted around 90 minutes and included a variety of outdoor activities including hiking, gardening, and sensory exploration. The ecotherapy program ran for a full 12 weeks.

The comparison group did not participate in any ecotherapy activities but continued their regular study routines. All the regular academic resources and services available inside each school were made available to the kids.

Data were collected at three intervals: before the intervention was implemented (Time 1), in the midst of the intervention (Time 2), and after it was finished (Time 3).

Standardized tests and internal school grading systems were used to evaluate students in critical subjects including mathematics, reading, and writing. Specially trained evaluators conducted the aforementioned assessments. Importantly, these evaluators had no idea which group each participant was assigned to. The academic performance data was collected at three different times in time: Time 1, before the intervention began; Time 2, after six weeks of the intervention; and Time 3, after the intervention concluded.

Attention Deficit/Hyperactivity Disorder (ADHD) symptom severity was measured across all three time points using the ADHD Rating Scale and other validated diagnostic tools. Parents and instructors of the participants filled out the rating measures to provide a more comprehensive assessment of symptoms.

Parents or legal guardians of participants reported their ages, genders, and socioeconomic backgrounds at Time 1. Participants' engagement in ecotherapy activities, for example, was assessed as a possible mediating or moderating variable using self-report questionnaires administered at Time 3.

For quantitative data analysis, programs like SPSS and STATA were used. Means and standard deviations, along with other descriptive statistics, were calculated to examine academic success scores and ADHD symptom ratings across all time points. Repeated measures analysis of variance (ANOVA) was employed to determine whether or not ecotherapy improved academic performance and ADHD symptoms. In order to pinpoint the exact intervals in which statistically significant differences were spotted, post-hoc analyses were run using Bonferroni corrections.

Researchers performed mediating and moderating studies to identify factors that could have moderated the positive correlation between ecotherapy and improved grades. The purpose of the mediation analysis conducted in this research was to determine whether or not the reduction in ADHD symptoms mediated the positive effect of ecotherapy on students' academic outcomes. To further understand how demographic variables like age and gender could shape the strength and direction of the correlation between ecotherapy and learning outcomes, a moderation analysis was conducted.

Results

Table 1: Descriptive Statistics for Academic Performance Scores

	Time 1 (Baseline)	Time 2 (6 Weeks)	Time 3 (Post-Intervention)
Mean Math Score	72.4	75.8	79.2
Mean Reading Score	68.9	71.5	75.6

Mean Writing Score	70.3	73.2	77.8
Standard Deviation	8.2	7.6	6.5

Academic performance ratings showed a consistent uptick across the board for the length of the ecotherapy intervention, as seen by the data. An increase from a mean of 72.4 on the first math examination to a mean of 79.2 following the intervention is only one such example. Reading and writing scores both went up, but by about the same amount. Since a smaller standard deviation indicates less variation in scores over time, this trend suggests that the intervention improved students' grades.

Table 2: Descriptive Statistics for ADHD Symptom Ratings

	Time 1 (Baseline)	Time 2 (6 Weeks)	Time 3 (Post-Intervention)
Parent-Reported ADHD Rating	23.6	20.1	17.3
Teacher-Reported ADHD Rating	24.8	21.3	18.7
Standard Deviation	3.2	2.8	2.1

The findings of this study demonstrate a persistent decline in the severity of symptoms associated with Attention-Deficit/Hyperactivity Disorder (ADHD) throughout the duration of the ecotherapy intervention. As an illustrative instance, the ratings of ADHD as reported by parents exhibited a notable decline, decreasing from an initial value of 23.6 to a subsequent value of 17.3 subsequent to the implementation of the intervention. The ratings provided by teachers also exhibited a parallel trend of enhancement. The observed decline in standard deviations implies a notable decrease in the range of symptom ratings, thereby indicating that the implementation of ecotherapy has played a significant role in mitigating ADHD symptoms.

Table 3: Repeated Measures ANOVA for Academic Performance Scores

	Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Value	p-Value
Math Scores	Between Subjects	272.16	1	272.16	11.45	< 0.001
	Within Subjects	896.25	2	448.13		
Reading Scores	Between Subjects	195.84	1	195.84	9.25	< 0.001
	Within Subjects	542.29	2	271.14		
Writing Scores	Between Subjects	184.96	1	184.96	8.75	< 0.001
	Within Subjects	481.44	2	240.72		

There is a statistically significant difference in academic performance over time between the groups getting help and the control group, as shown by the F-values, which are highly significant in all three domains (mathematics, reading, and writing). All of the observed p-values are less than 0.001, thus it's safe to say that these changes are statistically significant. The results of this research suggest that ecotherapy may significantly improve learning outcomes in all three subject areas.

Table 4: Repeated Measures ANOVA for ADHD Symptom Ratings

	Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Value	p-Value
Parent-Reported	Between	29.16	1	29.16	14.22	<

ADHD Ratings	Subjects				0.001
	Within Subjects	127.80	2	63.90	
Teacher-Reported ADHD Ratings	Between Subjects	31.36	1	31.36	15.28 < 0.001
	Within Subjects	112.64	2	56.32	

There appears to be a statistically significant difference in the severity of ADHD symptoms over time between the groups receiving the intervention and the control group, as indicated by the F-values, which are highly significant for both parent-reported and teacher-reported assessments. Both computed p-values for the comparisons are less than 0.001, indicating that the differences between the groups are statistically significant. According to the results of this research, both parents and teachers noticed significant improvements in their children's attention and hyperactivity after the ecotherapy intervention.

Table 5: Post-Hoc Analyses for Academic Performance Scores (Mathematics)

Comparison	Mean Difference (Time 1 - Time 3)	Standard Error	95% Confidence Interval for Difference	p-Value
Intervention vs. Control	-6.8	1.2	(-9.2, -4.4)	< 0.001

According to the computed mean difference of -6.8, the intervention group showed a 6.8-point increase in their mean score in mathematics between Time 1 and Time 3. As the null hypothesis value of zero is beyond the 95% confidence range for the difference, it is reasonable to conclude that the improvement in mathematics scores was indeed statistically significant (p 0.001).

Table 6: Post-Hoc Analyses for ADHD Symptom Ratings (Parent-Reported)

Comparison	Mean Difference (Time 1 - Time 3)	Standard Error	95% Confidence Interval for Difference	p-Value
Intervention vs. Control	6.3	1.1	(4.2, 8.4)	< 0.001

With a mean difference of 6.3, the intervention group saw a decrease in ADHD symptoms as reported by parents. Between Times 1 and 3, this decline is equivalent to an average decrease of 6.3 points. Reducing ADHD symptoms is statistically significant (p 0.001), since the 95% confidence interval for the change does not include zero.

Table 7: Post-Hoc Analyses for ADHD Symptom Ratings (Teacher-Reported)

Comparison	Mean Difference (Time 1 - Time 3)	Standard Error	95% Confidence Interval for Difference	p-Value
Intervention vs. Control	6.0	1.0	(4.1, 7.9)	< 0.001

Teachers reported significant improvement in their students' ADHD symptoms from Time 1 to Time 3; the estimated mean difference of 6.0 demonstrates this improvement. Statistically, there is a substantial improvement in ADHD symptoms (p 0.001), since the 95% confidence interval for the difference does not include the null value of zero.

Table 8: Mediating Analysis Results

Path	Coefficient (b)	Standard Error	p-Value	95% Confidence Interval
Ecotherapy -> ADHD	-0.35	0.12	< 0.01	(-0.59, -0.12)
ADHD -> Academic	-0.50	0.08	< 0.001	(-0.66, -0.34)
Ecotherapy -> Academic	0.20	0.05	< 0.01	(0.11, 0.29)
Ecotherapy (Total Effect)	0.15	0.04	< 0.01	(0.07, 0.23)
Indirect Effect	-0.18	0.07	< 0.05	(-0.32, -0.03)
Direct Effect	0.33	0.06	< 0.001	(0.22, 0.44)

Ecotherapy is associated with a reduced occurrence of ADHD symptoms, as shown by a path coefficient of -0.35 (p 0.01). Indicating a negative association between elevated ADHD symptoms and academic achievement, the path coefficient between the two is -0.50 (p 0.001). Ecotherapy is positively associated with improved academic achievement, as measured by a path coefficient of 0.20 (p 0.01).

Total effect size for ecotherapy was 0.15 (p 0.01), suggesting a substantial influence on academic achievement. The direct impact of ecotherapy on academic performance is 0.33 (p 0.001), but this effect is much larger when the mediator variable of ADHD symptoms is included. This data implies that ecotherapy has a larger and more significant impact on academic achievement than the observed result would indicate. This study suggests that the existence of ADHD symptoms contributes to understanding the correlation between ecotherapy and academic success.

Table 9: Moderating Analysis Results

Moderator Variable	Coefficient (b)	Standard Error	p-Value	95% Confidence Interval
Age	-0.10	0.04	< 0.05	(-0.19, -0.01)

As shown by the coefficient of -0.10 (p 0.05) for the moderator variable "Age," age seems to have a moderating effect in the connection between ecotherapy and performance in the classroom. This discovery suggests that the effect of ecotherapy on academic performance varies with the age of the participants. For instance, it's possible that the effects of ecotherapy are not the same for children of various ages, or that older children respond differently to ecotherapy than their younger counterparts.

Discussion

Effects of Ecotherapy on Academic Performance

Children with Attention Deficit Hyperactivity Disorder (ADHD) have been shown to benefit from ecotherapy, a treatment approach with roots in nature, according to the findings of this study. These findings are in line with the growing corpus of research that shows how spending time in nature improves mental health and academic achievement. Wu et al. (2021) found that when children participated in nature-based therapy, their academic performance improved. This research demonstrates the promise of ecotherapy as a means of improving academic performance.

There might be a number of reasons why the ecotherapy program seems to be helping students succeed in the classroom. Ecotherapy, in particular, has been shown to improve mental health because it encourages a holistic interaction with the natural world (Kuo & Faber Taylor, 2004). It is well-established that time spent in natural settings has a positive effect on cognitive processes essential to learning, including attention, concentration, and problem-solving. It's impossible to exclude the possibility that the sensory stimulation

found in natural settings are responsible for the observed gains in cognitive abilities, especially in the areas of mathematics, reading, and writing.

It is also important to note that many ecotherapy programs include physical activities and exploration, allowing children with Attention Deficit Hyperactivity Disorder (ADHD) to release pent-up energy and agitation. Thus, these treatments may improve students' classroom behavior and motivation to learn (Barton & Pretty, 2010). The emergence of empirical evidence suggests that participating in ecotherapy sessions may elicit a wide range of positive feelings, such as the deep sense of success associated with agricultural endeavors or immersive exploration. There is a direct correlation between increased motivation and self-esteem and academic success, as shown by several studies (Jordan & Hinds, 2016).

The findings of this study illuminate the full breadth of ecotherapy approaches. The aforementioned programs were developed with great care to meet the needs of children with ADHD who are in need of regular physical activity while also providing the opportunity to cultivate cognitive and emotional benefits. There is a lot of value in studying how cognitive function and educational results could improve with regular exercise and time spent in natural settings. According to research by Hillman et al. (2008), consistent physical activity has the potential to improve working memory and cognitive control, two essential components of effective executive functioning. Our ability to digest information and make sound decisions relies heavily on our strengths in these areas of cognition. All educational efforts must prioritize the development of these mental abilities. There is great potential in enhancing students' cognitive aptitude and academic accomplishments via the incorporation of ecotherapy, a unique strategy that seamlessly integrates physical exercise with immersive interactions in natural habitats.

To fully grasp the significant effect ecotherapy has on academic achievement, an ecological viewpoint must be included. Chawla (1998) claims that there is strong evidence demonstrating how exposing children to nature helps them develop a sense of ecological responsibility and a deeper connection with the natural world. The growing ecological awareness has the potential to foster an in-depth comprehension of many fields of study, especially those concerned with the natural world and the scientific disciplines. Wells and Lekies's (2006) extensive body of work offers persuasive evidence that spending time in nature may increase one's knowledge of and respect for ecological concepts. Therefore, this expanded perspective is expected to lead to beneficial results in the learning of ecology-related material.

Ecotherapy's exceptional potential to produce major improvements in young people's social maturity while simultaneously establishing a culture of collaborative effort is of crucial importance. Ecotherapy is characterized by its emphasis on group participation and cooperative learning opportunities in natural settings (Jordan & Hinds, 2016). The capacity to listen attentively, work well with others, and make new friends are just a few of the many valuable skills that may be developed via participation in group projects. These results not only help people in general, but they may also have a positive effect on classroom dynamics, which in turn boosts students' ability to learn (Kuo & Faber Taylor, 2004).

Mediating Role of ADHD Symptom Severity

We found that the relationship between ecotherapy and academic success in kids was moderated by variations in the degree of Attention Deficit Hyperactivity Disorder (ADHD) symptoms, which was a fascinating result. Ecotherapy has the potential to improve academic performance, and our investigation sheds insight on the complicated interaction between mental health factors and accomplishments.

It is widely accepted that the presence of Attention-Deficit/Hyperactivity Disorder (ADHD) symptoms, such as inability to maintain attention, hyperactivity, and impulsive

behavior, is a significant determinant impacting academic achievement (Frazier et al., 2011). Children with Attention Deficit Hyperactivity Disorder (ADHD) often struggle in school because they lack the ability to focus for long periods of time, complete assignments on time, and plan out their day effectively—all of which are fundamental skills necessary for academic success. Ecotherapy programs that focus on reviving the senses and refocusing the mind may help alleviate these foundational symptoms. The significant improvement in ADHD symptoms shown in our study provides strong evidence for this.

Our findings corroborate the findings of previous studies that found ecotherapy to be effective in helping people with ADHD improve their focus and self-control (Kaplan, 1995). People with attention deficit hyperactivity disorder (ADHD) may develop and hone their ability to control their focus in a natural setting that has both a soothing and engaging atmosphere. Ecotherapy has been shown to be effective in reducing ADHD symptoms, and this has a knock-on effect of creating a more intellectually stimulating environment in the brain, leading to higher test scores and better grades (Langberg et al., 2016).

The intriguing potential of ecotherapy as a useful adjunct in the complete care of ADHD is further highlighted by the considerable role played by the severity of ADHD symptoms in modulating the effects of this therapeutic strategy. A child's life in general may benefit from ecotherapy's capacity to alleviate symptoms, not only in the classroom. Improvements in social interactions and behavior within educational settings and extracurricular contexts may result from the reduction of impulsive tendencies and the enhancement of emotional regulation, both of which are frequently linked to the reduction of symptoms related to Attention-Deficit/Hyperactivity Disorder (ADHD) (Pelham & Fabiano, 2008). Improved behavior and mental health have a multiplicative effect on academic success, leading to a virtuous cycle.

The findings of this research are in line with what is now known about ecotherapy, which is generally accepted as a practice based on nature that promotes overall health. The fact that ecotherapy may lessen the intensity of ADHD symptoms lends credence to the idea that it might be useful as an adjunct to more traditional therapies like medication and behavioral therapy. Much interest and enthusiasm surrounds the idea of integrating ecotherapy with evidence-based therapies for ADHD and related learning challenges (Frazier et al., 201Q). If successful, this method might provide a holistic and all-encompassing approach to solving the issue at hand.

The moderating role of ADHD symptom severity on different outcomes highlights the necessity for individualized and all-encompassing therapy approaches for children diagnosed with ADHD. In light of this finding, it is clear that we must also consider the child's psychological and emotional needs in addition to their cerebral development. Using ecotherapy therapies that focus on both mental health and education is a comprehensive and tailored way to help children with ADHD do better in the classroom .

Moderating Role of Age

Students of all ages benefited from the ecotherapy intervention, although those younger than 25 had a more pronounced effect due to the existence of an age-related moderating influence. This claim is consistent with research by Chawla (2015) that found that exposing kids to nature at a young age improved their happiness and their ability to feel a part of the natural world. Younger children may be more responsive to the sensory and experiencing aspects of ecotherapy, which might increase their engagement and improve their educational achievements in a classroom environment.

Possible developmental factors explain why ecotherapy has differing degrees of success with children of various ages. Children's needs and interests evolve in tandem with the maturation of their cognitive and emotional capacities across time. Ecotherapy programs

may need to evolve to accommodate these changes in development. It has been proposed, for instance, that younger children may benefit from ecotherapy exercises that place an emphasis on sensory exploration and play. However, older adolescents may benefit from therapy that are more structured and focused on cognitive development (Louv, 2005).

The findings also point to the need of early intervention and the potential long-term benefits of ecotherapy for younger children diagnosed with ADHD. Kellert (2005) argues that exposure to nature for the first time and involvement in ecotherapy treatments may foster a lifelong appreciation for the outdoors. In turn, this connection may lead to long-term improvements in mental capacity, emotional well-being, and academic performance. As a result, implementing ecotherapy treatments tailored to younger children might serve as a preventative measure, encouraging positive attitudes toward learning and the natural world from a formative age.

The moderating effect of age also has practical implications for teachers and healthcare providers. It is possible that the efficiency of ecotherapy treatments for raising academic performance might be improved by tailoring them to the specific needs of various age groups. For kids with Attention Deficit Hyperactivity Disorder (ADHD), for instance, schools and treatment facilities may choose to implement nature-based curriculum that align with their typical growth patterns (Nisbet et al., 2020). The benefits of ecotherapy in the home may be amplified by including parents and caregivers in a collaborative effort tailored to the patient's age.

Conclusion

Consistent with previous research, this study provides strong evidence that ecotherapy therapies may significantly improve academic outcomes for children with Attention Deficit Hyperactivity Disorder (ADHD). There is a growing body of research showing the mental and emotional benefits of spending time in nature, and our finding is consistent with that literature. Academic success in arithmetic, reading, and writing has been demonstrated to improve significantly after participating in ecotherapy activities. Engaging all of one's senses in a certain activity, refreshing one's mind, and forging a meaningful connection with one's surroundings all fall under this category of actions. This demonstrates the potential of ecotherapy as a holistic and significant method for improving academic outcomes in children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD).

More importantly, our in-depth research has shown that the varying degrees of ADHD symptoms play a critical role in supporting the complex connection between ecotherapy treatments and academic success. Having a healthy mind is crucial to succeeding in school, as this finding demonstrates. Those diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) after participating in ecotherapy programs have shown considerable improvement. In order to improve performance in school, the below-described therapy method fosters an internal atmosphere beneficial to cognitive growth. This highlights the need of taking children's social, emotional, and physical needs into account alongside their academic requirements when designing interventions.

A potential key to understanding the complex relationship between ecotherapy and academic success is the recognition of age as a moderating element. The results showed that students' academic performance improved when ecotherapy was introduced, and the effect was greatest for the youngest students. This finding highlights the need for ecotherapy therapies to be tailored to the ages and developmental stages of children with ADHD, increasing the possibility that these interventions will be personally important to these people. It is possible that educators and therapists might benefit from a deeper knowledge of the age-related nuances of ecotherapy if it allowed them to better tailor therapies to meet the varying needs of this population.

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