

Comparison of the Effectiveness of Play-Based Learning Activities in Improving Performance Among Boys and Girls Diagnosed with Attention Deficit Hyperactivity Disorder

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ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) is a prevalent neurodevelopmental condition in children, marked by inattention, hyperactivity, and impulsivity, often leading to academic and social challenges. While pharmacological and behavioral therapies are common, their limitations underscore the need for more engaging, child-centered alternatives. This quasi-experimental study aimed to evaluate the effectiveness of play-based occupational therapy in improving performance among boys and girls with ADHD (inattentive type), using the Vanderbilt ADHD Diagnostic Teacher Rating Scale. A total of 46 children (23 boys and 23 girls), aged 6–12 years, participated. They received 24 structured play-based sessions, conducted four times per week over 1.5 months. Pre- and post-intervention assessments revealed significant improvements in both groups. Boys' scores increased from 100.00 ± 8.70 to 108.50 ± 7.40 ($p = 0.003$), while girls' scores improved from 101.00 ± 7.95 to 107.20 ± 8.91 ($p = 0.006$). Although boys showed slightly greater gains, the gender difference was not statistically significant. These findings suggest that play-based occupational therapy is an effective, gender-neutral intervention for enhancing academic and behavioral outcomes in children with ADHD. As a non-pharmacological and developmentally appropriate approach, it holds promise for broader application in educational and therapeutic contexts.

KEY WORDS: ADHD, BEHAVIOR, EXECUTIVE FUNCTION, GENDER, NON-PHARMACOLOGICAL INTERVENTION, PLAY-BASED LEARNING.

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder of childhood, characterized by symptoms of inattention, hyperactivity, and

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impulsivity that significantly impact academic performance and classroom behavior. Globally, ADHD affects 5–10 % of children, with many continuing to experience symptoms into adulthood 1. While traditional interventions, including pharmacological and behavioral therapies, have demonstrated effectiveness, challenges such as side effects, incomplete symptom relief, and low engagement limit their overall success 2.

In the Indian context, ADHD prevalence ranges from 3–20%, yet the condition remains underdiagnosed and undertreated due to stigma, lack of awareness, and limited access to trained professionals 3,4. Misinterpretation of symptoms as behavioral issues rather than neurodevelopmental conditions by parents and teachers further delays timely intervention 5. Moreover, India's strong cultural emphasis on academic achievement, coupled with rigid educational systems, places additional pressure on children with

ADHD, affecting their performance and well-being 6. These difficulties are compounded by the shortage of mental health services and a lack of trained professionals to provide early intervention and sustained support 7.

Furthermore, educational institutions often lack adequate support systems, such as special education services and individualised education plans (IEPs), leaving children without necessary accommodations 8,9. In light of these barriers, play-based occupational therapy has emerged as a promising approach. It engages children through enjoyable, structured activities that promote attention, executive function, and behavioural regulation, offering a developmentally appropriate alternative to conventional treatment. This study, therefore, aims to explore gender-based differences in the effectiveness of such interventions, contributing to more inclusive clinical and educational strategies for ADHD management.

Table 1. Tests of Normality (Kolmogorov–Smirnov and Shapiro–Wilk)

Tests of Normality Scale	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-Total Score	.060	46	.200*	.988	46	.909
Post-Total Score	.137	46	.030	.946	46	.034
Pre-Reading	.183	46	.001	.842	46	.000
Pre-Mathematics	.197	46	.000	.893	46	.001
Pre-Written Expression	.158	46	.006	.890	46	.000
Pre-Relationships with Peers	.212	46	.000	.875	46	.000
Pre-Following Directions	.185	46	.000	.891	46	.000
Pre-Disrupting Class	.190	46	.000	.880	46	.000
Pre-Assignment Completion	.199	46	.000	.827	46	.000
Pre-Organizational Skills	.149	46	.012	.893	46	.001
Post-Reading	.169	46	.002	.884	46	.000
Post-Mathematics	.208	46	.000	.844	46	.000
Post-Written Expression	.201	46	.000	.884	46	.000
Post-Relationships with Peers	.172	46	.002	.861	46	.000
Post-Following Directions	.158	46	.006	.878	46	.000
Post-Disrupting Class	.174	46	.001	.883	46	.000
Post-Assignment Completion	.178	46	.001	.858	46	.000
Post-Organizational Skills	.177	46	.001	.844	46	.000

Table 2. Group Comparison of Age Based on Gender (Independent Samples t-test)

Gender	N	Mean ± SD	t-value	df	p-value
Boys	23	10.65 ± 1.90	-0.140	44	0.889
Girls	23	10.74 ± 2.30			

Age comparison (Table 2) revealed no significant difference between boys (10.65 ± 1.90) and girls (10.74 ± 2.30; $p = 0.889$).

MATERIAL AND METHODS

A quasi-experimental study was conducted to evaluate performance skills in children with Attention Deficit Hyperactivity Disorder (ADHD) through structured play-based interventions. This study was reviewed and approved by the Institutional Ethical Committee of Santosh College of Occupational Therapy (Ref No. SCOT/NOV-24/ECPEADS-04). Permission to conduct the study was obtained from VQURA Child Development Services, Old Rajinder Nagar, New Delhi. All subjects Parent's were informed about the nature and purpose of the study, and written informed consent was obtained prior to their

participation. Based on a statistical power of 80% and an alpha level of 0.05, the required sample size was calculated to be 46 participants per group. A total of 46 children, aged 6–12 years, diagnosed with ADHD (inattentive type) by developmental paediatricians, were recruited using convenience sampling. Both boys and girls were included, while children with severe behavioural issues or co-existing physical, psychological, or medical conditions were excluded to maintain homogeneity. Participants were divided into two groups based on gender—Group A (boys) and Group B (girls)—with both receiving identical interventions.

Table 3. Gender-wise Comparison of Pre- and Post-Total Scores (Mann–Whitney U Test)

Variable	Gender	N	Mean $\pm$ SD	U-value	p-value
Pre-Total	Boys	23	100.00 $\pm$ 8.70	233	0.279
	Girls	23	101.00 $\pm$ 7.95		
Post-Total	Boys	23	108.50 $\pm$ 7.40	260	0.802
	Girls	23	107.20 $\pm$ 8.91		

Table 4. Within-Group Comparison of Pre- and Post-Total Scores (Wilcoxon Signed- Rank Test)

Gender	Pre (Mean $\pm$ SD)	Post (Mean $\pm$ SD)	Z-value	p-value	Median Difference
Boys	100.00 $\pm$ 8.70	108.50 $\pm$ 7.40	-2.95	0.003**	8.50
Girls	101.00 $\pm$ 7.95	107.20 $\pm$ 8.91	-2.73	0.006**	6.20

Total scores (Table 3) showed no significant gender difference in pre- or post-intervention performance ($p > 0.05$). However, within-group analysis (Table 4) demonstrated significant improvements for both boys ($Z = -2.95$, $p = 0.003$) and girls ($Z = -2.73$, $p = 0.006$).

Table 5. Gender-Wise Comparison of Individual Performance Parameters (Mann–Whitney U Test)

Parameter	Time	Boys (Mean $\pm$ SD)	Girls (Mean $\pm$ SD)	U-value	p-value
Reading	Pre	2.74 $\pm$ 1.69	3.35 $\pm$ 1.47	210	0.223
	Post	3.09 $\pm$ 1.44	2.91 $\pm$ 1.47	282.5	0.694
Mathematics	Pre	2.70 $\pm$ 1.36	2.87 $\pm$ 1.36	244	0.652
	Post	2.91 $\pm$ 1.62	2.96 $\pm$ 1.55	260	0.928
Written Expression	Pre	3.39 $\pm$ 1.31	3.13 $\pm$ 1.46	291.5	0.550
	Post	3.22 $\pm$ 1.48	2.83 $\pm$ 1.34	306	0.356
Relationships with Peers	Pre	3.04 $\pm$ 1.36	2.70 $\pm$ 1.36	308	0.327
	Post	2.91 $\pm$ 1.62	3.17 $\pm$ 1.44	241.5	0.611
Following Directions	Pre	3.48 $\pm$ 1.16	3.04 $\pm$ 1.52	305	0.368
	Post	3.52 $\pm$ 1.44	2.78 $\pm$ 1.41	342	0.083
Disrupting Class	Pre	2.91 $\pm$ 1.51	2.70 $\pm$ 1.40	286	0.637
	Post	3.57 $\pm$ 1.38	3.00 $\pm$ 1.38	328.5	0.152
Assignment Completion	Pre	3.52 $\pm$ 1.68	2.39 $\pm$ 1.41	363	0.026*
	Post	2.61 $\pm$ 1.41	3.26 $\pm$ 1.63	200.5	0.152
Organizational Skills	Pre	3.22 $\pm$ 1.35	2.65 $\pm$ 1.40	325.5	0.173
	Post	2.48 $\pm$ 1.47	3.09 $\pm$ 1.62	209	0.213

Domain-wise analysis (Table 5) indicated no significant gender differences in most areas. An exception was observed in Assignment Completion (pre-intervention), where boys scored higher ($p = 0.026$). This difference was not significant post-intervention, suggesting greater improvement among girls.

Each session incorporated elements of problem-solving, motor coordination, and peer-based social play, with the overarching goal of enhancing sustained attention,

task completion, and overall academic and behavioural performance, as evaluated by the Vanderbilt scale¹⁰. In the study design, gender was treated as the independent

variable, while performance outcomes, measured using the Vanderbilt ADHD Diagnostic Teacher Rating Scale (performance section), served as the dependent variable.

The intervention consisted of 24 structured play-based therapy sessions, conducted in a controlled clinical setting over 6 weeks. Activities included block building, puzzles, mazes, Ludo, drawing, stacking cups, word searches, UNO cards, and painting, supported by maze sheets and other materials. These sessions were designed to promote attention span, behavioral regulation, executive functioning, and social interaction 11.

Outcome Measures: The following outcome measurements were taken at baseline and again after 6 weeks of training. The Vanderbilt ADHD Diagnostic Teacher Rating Scale (VADTRS) is a standardised tool used to identify ADHD symptoms based on teachers' observations. It includes 35 core items aligned with DSM criteria assessing inattention, hyperactivity, impulsivity, and conduct behaviours, rated on a 4-point scale (0 = never to 3 = very often). In addition, 8 performance items evaluate academic and behavioural functioning (e.g., reading, math, peer relationships, organisation) on a 5-point scale (1 = problematic to 5 = above average). The VADTRS has established validity and reliability, with strong internal consistency and good convergence with other ADHD measures. Its comprehensive design makes it particularly useful for intervention planning and outcome monitoring in school-based programs such as play-based therapy 10.

RESULTS

The present study aimed to assess and compare the effectiveness of play-based learning activities on academic and behavioral performance among boys and girls diagnosed with attention deficit hyperactivity disorder (ADHD). A total of 46 children (23 boys, 23 girls) participated. Tests of normality (Table 1) showed that most variables deviated from normal distribution; hence non-parametric tests were applied.

DISCUSSION

The findings of this study demonstrate that structured play-based interventions can significantly improve academic and behavioral performance in children with ADHD, irrespective of gender. The improvement was observed in both boys and girls, though boys showed slightly higher gains. This may reflect differences in symptom presentation, as boys with ADHD tend to display more externalizing behaviours, making them more responsive to behaviorally structured interventions. In contrast, girls often present with internalizing or inattentive symptoms, which may require more nuanced or individualized support 12,13.

These results are consistent with prior research showing that structured play enhances executive functioning, attention regulation, and social skills in children with ADHD 14. The intervention's theoretical grounding in executive function theory, Vygotsky's theory of play, and social learning theory further supports its application in both clinical and

school-based contexts 15,16. Moreover, the involvement of caregivers has been noted to enhance long-term outcomes 17.

Despite these promising findings, the study has some notable limitations. First, it did not control for ADHD subtypes or the presence of comorbid conditions, which may have influenced individual responsiveness to the intervention. Second, parental and teacher feedback was not formally integrated into the assessment process, limiting the scope of behavioral insights across different environments. Third, the study was conducted in a controlled school-based setting, and outcomes may differ in home or community contexts. Given these limitations, future research should explore the differential impact of play-based interventions across ADHD subtypes, such as inattentive vs. hyperactive-impulsive presentations. Additionally, incorporating multi-informant feedback from parents and teachers would provide a more comprehensive evaluation of real-world effectiveness. Developing gender-specific intervention modules that consider the unique cognitive and behavioral profiles of boys and girls with ADHD may also enhance engagement and outcomes.

CONCLUSION

This study demonstrates that structured play-based learning significantly improves academic and behavioural performance in children with ADHD. Both boys and girls benefited, with boys showing slightly higher gains, though differences were not statistically significant. These findings highlight the value of play-based, non-pharmacological interventions in supporting children with ADHD and emphasise the need for gender-responsive approaches in educational and therapeutic settings.

Ethical Clearance: Ref No.

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