ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25aug315

Effectiveness of Neurocognitive Exercises to Improve Attention Among Children with ADHD

Ganga Shaj S[1]; Abhipsha Biswal[2*]

[1]BOT Intern, College of Occupational Therapy, NIEPMD, Chennai, India
[2]Lecturer at the College of Occupational Therapy, NIEPMD Chennai, India

Corresponding Author: Abhipsha Biswal[*]

Publication Date: 2025/08/12

Abstract:

➢ ***Background***

ADHD is a common neurodevelopmental disorder impacting children's academic and social functioning. This study investigates the effectiveness of neurocognitive exercises as a complementary intervention to improve attention and reduce hyperactivity/impulsivity, assessed using the NICHQ Vanderbilt Assessment Scale.

➢ ***Methodology***

A Quasi-Experimental (single group pre-test and post-test design) was conducted to assess the effectiveness of neurocognitive exercise to improve attention among children with ADHD. Convenient sampling was used for the study on 15 children between age group 7–12 years meeting ADHD diagnostic criteria. Participants will complete neurocognitive exercises three days weekly for six weeks. Changes in attention, hyperactivity/impulsivity, and academic performance will be evaluated using the NICHQ scale, and paired t-tests will determine significance.

➢ ***Results***

The pre-test to post-test comparison showed significant improvements in attentional control, reduced hyperactive/impulsive behaviors, and enhanced academic performance following the intervention, with overall assessment scores indicating a statistically significant change ($p < 0.001$).

➢ ***Conclusion***

Neurocognitive exercises effectively improved attention in individuals with ADHD. Future research was suggested to investigate their long-term effects and broader applications.

Keywords: *Neurocognitive Exercises, ADHD, Attention, Academic Performance, NICHQ Vanderbilt Assessment Scale.*

How to Cite: Ganga Shaj S; Abhipsha Biswal (2025) Effectiveness of Neurocognitive Exercises to Improve Attention Among Children with ADHD. *International Journal of Innovative Science and Research Technology*, 10(8), 161-167. https://doi.org/10.38124/ijisrt/25aug315

I. INTRODUCTION

Neurodevelopmental disorders encompass conditions that affect how the brain functions and develops over time. These disorders, which usually present during the developmental period, often before a child enters school, are characterized by impairments in personal, academic, and social functioning (1). ADHD, or attention deficit hyperactivity disorder, is a leading condition classified under neurodevelopmental disorders. It is marked by persistent patterns of inattention, disorganization, and/or hyperactivity-impulsivity, with symptoms that interfere with functioning across multiple settings such as home, school, or the workplace.

➢ *Characteristics and Clinical Presentation of ADHD*

ADHD symptoms are typically grouped into two domains: inattention and hyperactivity-impulsivity. Inattention involves frequent careless mistakes, difficulty sustaining focus, forgetfulness, poor organization, and frequent loss of necessary items. Individuals may seem not to listen when spoken to directly or may avoid tasks requiring sustained mental effort. Hyperactivity-impulsivity manifests as excessive talking, fidgeting, inability to remain seated, difficulty playing quietly, interrupting others, and impatience. (1)

These symptoms exceed what is developmentally appropriate and result in substantial difficulties in daily life.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25aug315

ADHD often co -occuring with other externalizing disorders, such as oppositional defiant disorder and conduct disorder. The condition frequently persists into adulthood, with continued impairments in academic performance, occupational functioning, and interpersonal relationships. (2)

- *Etiological Factors: Genetic and Environmental Contributions*

Although the exact cause of ADHD remains unclear, research indicates a multifactorial etiology involving both genetic and environmental components. ADHD is known to have a strong hereditary componentAttention-Deficit/Hyperactivity Disorder (ADHD) has a significant genetic basis, with studies indicating that first-degree relatives of affected individuals are two to eight times more likely to be diagnosed with the disorder. Twin studies conducted globally estimate ADHD heritability at approximately 71% to 90%, with both inattentive and combined subtypes sharing similar genetic risks. These findings highlight the importance of both inherited traits and gene–environment interactions. (3) (4)

Environmental influences are also crucial, particularly during prenatal and early postnatal periods of brain development. Exposure to neurotoxic substances, low birth weight, premature birth, maternal smoking or stress during pregnancy, and early childhood trauma have all been associated with an increased risk of developing ADHD. The National Institute for Health and Care Excellence (NICE) recommends a nuanced clinical evaluation that considers the severity, pervasiveness, and functional impact of ADHD symptoms in light of individual and contextual factors.

- *Prevalence*

Epidemiological studies in India suggest variable prevalence rates of ADHD. One study reported a prevalence of 11.32% among primary school children, (5) while another found a rate of 6% among children aged 10 to 15 years (6). In a cross-sectional study in the Coimbatore region, which included 770 children aged 6 to 11, (7) ADHD was present in 11.32% of participants. The disorder was more prevalent among boys (66.7%) than girls (33.3%) and was higher in children from lower socioeconomic backgrounds. The highest rates were observed in children aged 9 and 10 years. (8)

- *Diagnostic Criteria and Subtypes*

According to the DSM-IV, for a diagnosis of ADHD, symptoms must be present before the age of 7, persist for at least six months, and be evident in two or more settings. The DSM-IV categorizes ADHD into three subtypes: predominantly inattentive, predominantly hyperactive-impulsive, and combined type. Diagnostic criteria include at least six symptoms of inattention or hyperactivity-impulsivity, depending on the subtype.

- *Attention and Its Role in ADHD*

Attention is a fundamental cognitive function that underlies a broad range of mental processes, including learning, memory, problem-solving, and executive control. It enables individuals to selectively process relevant stimuli while ignoring distractions. Attention is also crucial for emotional regulation and behavioral control. Cognitive psychologists have described attention as the ability to focus the mind on specific stimuli or tasks while filtering out irrelevant information.

Attention is not a unitary construct. (9) Sohlberg and Mateer's hierarchical model of attention describes five distinct forms: focused attention (the ability to respond to specific stimuli), sustained attention (the ability to maintain focus over time), selective attention (the ability to filter out distractions), alternating attention (the ability to shift focus between tasks), and divided attention (the ability to manage multiple tasks simultaneously). These components of attention are supported by different but interconnected brain regions, particularly within the frontal lobes. (10)

Children with ADHD often exhibit impairments across several domains of attention. Studies using neuropsychological tests have demonstrated deficits in sustained attention, shifting attention, and inhibitory control. These deficits are believed to stem from dysfunctions in the frontal-striatal circuitry and immaturity of brain development, rather than solely from learning disabilities.

- *Neurocognitive Exercises in ADHD Management*

Neurocognitive exercise programs (NEPs) are structured interventions that use a combination of cognitive and motor tasks, often involving visual and verbal stimuli, to enhance cognitive functioning. These interventions are structured to gradually enhance attention, working memory, and executive functioning skills. Tasks typically involve neuromuscular coordination, such as responding to visual cues with precise movements, while simultaneously performing mental operations.

A key feature of NEPs is their graded complexity, which begins with simple activities and gradually incorporates more challenging dual- or multi-task combinations. These tasks are deliberately varied to prevent automatization, ensuring continued cognitive engagement. Unlike conventional cognitive training, NEPs aim to stimulate multiple brain regions by integrating perceptual-motor and cognitive challenges simultaneously. The use of low-intensity physical movement helps maintain focus while minimizing fatigue, making it particularly suitable for children with ADHD. (11)

Research indicates that neurocognitive exercises support neural plasticity and can lead to improvements in attention regulation, task switching, and executive functioning. By involving multiple sensory modalities and increasing the working memory load, NEPs foster the development of cognitive flexibility and impulse control.

II. AIMS AND OBJECTIVES

- *AIM:*

To assess the effectiveness of neurocognitive exercises to improve attention among children with ADHD.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25aug315

➢ *Objectives:*

- To Assess children with ADHD's baseline attention levels with the NICHQ Vanderbilt Parent Assessment Scale.
- To Implement a neurocognitive exercise program that focuses on cognitive domains related to attention.
- To evaluate post-intervention attention changes, using the NICHQ Vanderbilt Parent Assessment Scale.
- To compare pre- and post-test findings to determine the neurocognitive training program's effectiveness in improving attention in ADHD children.

➢ *Hypothesis*

- *Null Hypothesis*

Neurocognitive exercise interventions have no significant effect on improving attention among children with ADHD.

- *Alternate Hypothesis*

Neurocognitive exercise interventions significantly improve attention among children with ADHD.

III. REVIEW 0F LITERATURE

The study by **Navratan Suthar et al.,** titled **"Prevalence of Attention-deficit Hyperactivity Disorder in Primary School Children: A Cross-Sectional Study**," This study looks into the prevalence, sociodemographic variables, and co-morbid disorders linked with ADHD in Indian children aged 6 to 12. The study discovered that the prevalence of ADHD was 5.7%, with higher rates in men (7.08%) than girls (3.80%), and a peak prevalence among children aged 9-10 years, particularly those from poorer socioeconomic backgrounds (11.47%). The most common subtype of ADHD was inattentive, with Depression Anxiety Disorder being the most frequently encountered comorbidity. The study stresses the of early detection and intervention in reducing the long-term detrimental impacts of ADHD, underlining the need for more awareness and better diagnostic methods in the Indian context. These findings are consistent with global trends, but highlight the need for greater research in India to enhance the identification and management of ADHD in youngsters (12)

The study conducted by **Sebastian Ludyga et al.,** is titled **"How children with neurodevelopmental disorders can benefit from the neurocognitive effects of exercise"**. Executive function, or top-down regulation of goal-directed behavior, is frequently disturbed in children with illnesses such as ADHD, autism spectrum disorder, and other neurodevelopmental problems. The study emphasizes that regular physical activity can enhance executive function, which may be especially advantageous for children with various illnesses, who typically share deficiencies in executive skills despite varied core symptoms. While the available evidence is limited, the researchers believe that exercise could be an effective additional or alternative treatment for executive dysfunction in this population. Further study is needed to understand the neurocognitive mechanisms, identify modifiers of exercise effects, and address crucial questions before recommending exercise as a treatment intervention for children with neurodevelopmental disorders (13)

The study by **Nurallah Buker et al.,** titled **"Neurocognitive training enhances the Outcomes of Children with ADHD: A Preliminary Study"** studies how neurocognitive training (NT) affects youngsters with ADHD. The study included 14 treatment-naïve children aged 7-12 years with ADHD who received a 10-week NT intervention. The intervention consisted of weekly sessions supplemented by a planned home fitness regimen run six days a week. The study assessed ADHD-related symptoms, attentional performance, and dynamic balance at multiple intervals, including pre-treatment, post-treatment, 6 months, and 12 months follow-up. To establish baseline normative values, a control group of 15 normally developing (TD) children was added, with age matching. The results demonstrated that the ADHD group improved significantly following the NT intervention, particularly in hyperactivity-impulsivity scores, oppositional-defiant behaviors, and dynamic balance when compared to the TD children. The ADHD group had substantial differences in these areas even after a 12-month follow-up, indicating long-term sustained gains. The data demonstrate that neurocognitive training has a beneficial and long-term effect on ADHD-related symptoms, notably hyperactivity-impulsivity, oppositional-defiant behaviors, and dynamic balance, providing promising evidence for NT as a viable treatment intervention for ADHD. (11)

Tribhuvan Srikanth et al., did a study titled **"To investigate the effectiveness of cognitive orientation of daily occupational performance (co-op)"** to increase attention in children with attention-deficit hyperactivity disorder (ADHD). The goal of this study was to see how well the Cognitive Orientation of Daily Occupational Performance (CO-OP) Approach improved attention in children with attention deficit hyperactivity disorder (ADHD). To identify children with ADHD. To investigate the impact of the COOP technique on inattention in ADHD children. Thirty children with attention deficit hyperactivity disorder were chosen using the selection criteria, with 15 assigned to each control and experimental group. The Vanderbilt ADHD Teacher Rating Scale was employed as an assessment tool in this study. The control group underwent conventional occupational therapy. The experimental group received both traditional occupational therapy and a CO-OP intervention. The scores acquired were statistically analyzed. The results state that statistical analysis revealed substantial changes in the experimental group. (14)

IV. METHODOLOGY

➢ *Research Design:*

Quasi-experimental (pre-test and post-test).

➢ *Setting of the Study*

The study was conducted at Occupation Therapy, Department of therapeutics, National Institute for

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25aug315

Empowerment of Person with Multiple Disability (NIEPMD), Chennai.

➢ *Sampling Technique*
Convenient Sampling

➢ *Ethical Issue*
Formal written consent was obtained from parents of children who participated in the study.

➢ *Sample Size*
15 Children.

➢ *Sample Population*
Children with Attention Deficit Hyperactive Disorder (ADHD).

➢ *Duration of Intervention*
6 Weeks, 18 sessions-Duration of 60 minutes.

➢ *Variables*

- Dependant variable- Attention.
- Independent variable- Neurocognitive exercise.

➢ *Selection Criteria*

- *Inclusion Criteria:*

✓ ADHD Children with inattentive and combined type
✓ Age 7-12 years
✓ Both the genders

- *Exclusion Criteria*

✓ ADHD and other comorbidity
✓ ADHD Undergoing medication

➢ *Tool Used*
The Vanderbilt ADHD Diagnostic Parent Rating Scale is a widely used tool for identifying Attention Deficit/Hyperactivity Disorder (ADHD) in children aged 6 to 12. It includes 55 items covering all 18 DSM criteria for ADHD and is completed by the child's parent. The scale assesses three ADHD subtypes—Inattentive, Hyperactive/Impulsive, and Combined—and also screens for common comorbid conditions like oppositional defiant disorder (ODD), conduct disorder (CD), anxiety, and depression.

- *Psychometric Properties*

The scale's validity was established by Mark et al. (2003) through comparisons of parent and teacher ratings with independent ADHD diagnoses. Factor analysis confirmed the scale's alignment with theoretical constructs for inattention, hyperactivity/impulsivity, ODD-CD, and anxiety-depression.

Later, Becker et al. (2011) validated the subscales further, updating the scoring for comorbid conditions to rely on total scores instead of individual item thresholds. The revised scoring suggests cutoff values (ODD <10, CD <4, Anxiety <5, Depression <5) to rule out comorbid diagnoses. The scale remains a reliable and clinically valuable tool for ADHD assessment.

➢ *Intervention Protocol*

- *Training Schedule (Weeks 1–6)*

The intervention was implemented over six weeks with twenty children diagnosed with ADHD. Each session was structured into five distinct phases aimed at improving attention, perceptual-motor coordination, and cognitive flexibility through neurocognitive exercises.

- *Warm-Up Phase (5 Minutes)*

Each session began with a preparatory warm-up consisting of bilateral coordination exercises, visual-motor activities, head and neck movements, and breathing regulation techniques. These exercises served to activate both hemispheres and prepare the participants for subsequent tasks.

- *Training Part 1 – Learning Phase (25 Minutes)*

This phase involved exposure to new perceptual-motor tasks using visual, auditory, and multisensory input to enhance attention and response accuracy.

✓ *Visual Stimuli*
Visual cues directed participants to carry out specific body movement. For example, colors or numbers were linked with tasks such as throwing with a specific hand, jumping, clapping, or hopping. This helped improve reaction time, color-number association, and motor planning.

✓ *Auditory Stimuli*
Children responded to verbal prompts embedded within background noise to simulate real-life distractions. Commands like "Clap three times" or "Snap seven times" were given with varying levels of auditory interference, targeting attention control and processing speed.

✓ *Multisensory Stimuli*
Participants engaged in activities requiring simultaneous processing of shape, color, movement, and spatial orientation. These tasks involved identifying visual elements and performing corresponding motor actions such as jumping, crawling, or hopping to a target location, integrating sensory input with gross motor output.

- *Break (5 Minutes)*

A brief interval was provided to reduce cognitive fatigue and maintain engagement throughout the session.

- *Training Part 2 – Loading Phase (20 Minutes)*

This part of the process involved a step-by-step increase in the complexity of perceptual and cognitive activities. The goal was to increase cognitive load and enhance sustained attention and task-switching abilities.

✓ *Visual Processing Task*
Children were asked to follow instructions for counting or identifying objects based on specific features

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25aug315

(e.g., color or quantity), requiring focused attention and visual discrimination.

✓ *Cognitive Motor Integration*

Tasks combined memory, number recall, and physical movements. For example, children were instructed to remember a multi-digit number and perform designated movements (e.g., stepping forward or raising a foot) while recalling the information aloud. This targeted working memory and coordination.

- *Cool Down Phase (5 Minutes)*

The session concluded with light, relaxing movements designed to promote physical and emotional calmness, integrating the gains of the session and preparing the child for transition out of the activity.

V. RESULTS

➢ *Statistical Analysis*

The data were analyzed using descriptive statistics, including frequency, percentage, mean, and standard deviation (SD). To compare pre- and post-test results of the NICHQ Vanderbilt assessment, a paired t-test was conducted. Statistical significance was defined as a p-value of less than 0.05. The analysis was performed using SPSS software, version 29.0.10 (SPSS Inc., Chicago).

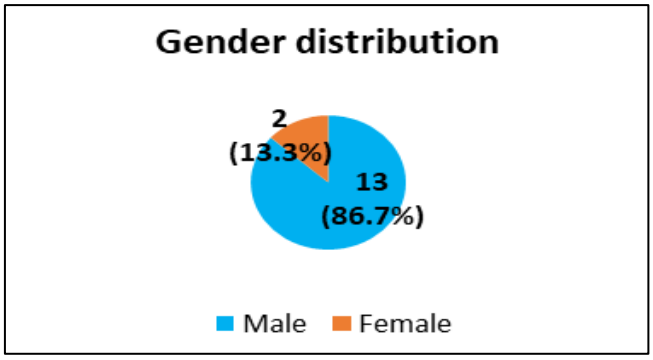

Fig 1 Among the 15 Participants, the Majority were Males (86.7%), while 13.3% Were Female

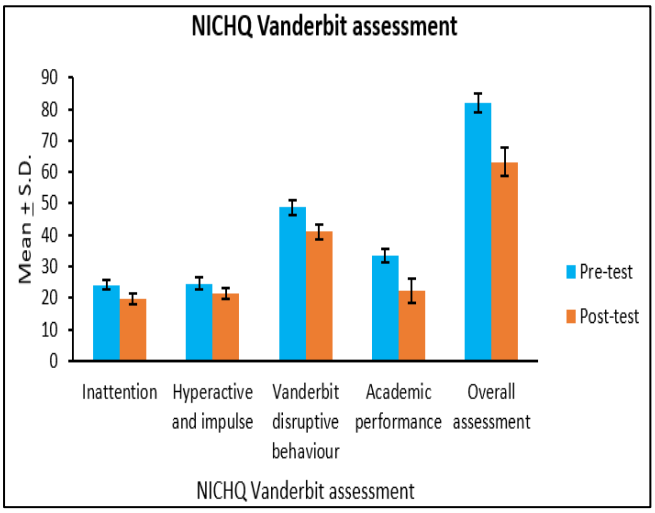

Fig 2 NICHQ Vanderbit Assessment

The Paired "t" test was used for the pre to post-test comparison of NICHQ Vanderbilt assessment. There was a difference ($p < 0.05$) in NICHQ Vanderbilt assessment: Inattention, hyperactive / impulse, disruptive behavior, academic performance, and the overall assessment from pre-posttest**.**

The comparison of pre-test and post-test mean scores (± standard deviation) across five domains of the NICHQ Vanderbilt Assessment. Following the six-week neurocognitive intervention, a reduction in scores was observed in all domains. Inattention scores decreased from approximately 25 to 20, indicating improved focus and sustained attention. Hyperactivity and impulsivity scores declined from about 23 to 19, suggesting better behavioral control and reduced impulsive actions. Disruptive behavior scores showed a marked improvement, dropping from 48 to 42, reflecting reduced oppositional and defiant behaviors. Academic performance scores reduced from 33 to 25, implying fewer difficulties in classroom functioning. Overall assessment scores showed a notable decline from nearly 80 to 65, demonstrating general improvement across behavioral and academic functioning. The consistent reduction in post-test scores suggests that the intervention had a positive effect on the core symptoms and associated challenges of ADHD.

VI. DISCUSSION

The present study examined the effect of a structured neurocognitive exercise intervention on attention, behavioral regulation, and academic performance in children diagnosed with attention deficit hyperactivity disorder (ADHD). The post-intervention results, measured using the NICHQ Vanderbilt Assessment, revealed significant reductions in scores across all domains, indicating improvements in inattention, hyperactivity, disruptive behaviors, and academic functioning.

The reduction in inattention scores suggests enhanced focus and sustained cognitive engagement, which may be attributed to the use of perceptual-motor and multisensory stimulation activities. Prior research has shown that such cognitive-motor interventions can improve executive functioning by enhancing working memory, attention shifting, and inhibitory control (15). The observed decline in hyperactivity and impulsivity may reflect improved self-regulation and motor inhibition, supported by findings that physical activity integrated with cognitive demands can improve impulse control in children with ADHD (16) (17).

A significant improvement in disruptive behavior was also noted, indicating better emotional regulation and behavioral adaptation. This aligns with studies suggesting that neurocognitive training enhances frontal-striatal circuits, which play a role in behavior modulation and emotional control (18).Furthermore, academic performance improvements are consistent with previous findings that cognitive engagement through structured tasks promotes classroom participation and academic readiness (19) .

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25aug315

The overall decrease in composite scores suggests a broad impact of the intervention on ADHD symptoms and functional outcomes. This supports the effectiveness of non-pharmacological approaches in managing ADHD, especially when they incorporate physical, cognitive, and sensory components (20).The use of progressive task difficulty, real-life auditory distractions, and dual-tasking elements may have further contributed to neuroplastic changes and adaptive behaviors (21).

Despite promising outcomes, this study had some limitations. The relatively small sample size and absence of a control group limit generalizability. The intervention was conducted over a six-week period; long-term effects remain unknown. In addition, reliance on teacher- and parent-reported measures may introduce subjectivity, though they provide meaningful insights into everyday functioning.

Nonetheless, the findings reinforce the value of neurocognitive exercises as a complementary intervention for children with ADHD. The structured and engaging nature of the program may offer occupational therapists, educators, and caregivers a practical tool to support both behavioral and academic improvement in this population.

VII. CONCLUSION

This study explored the effectiveness of neurocognitive exercises in improving attention among children with attention deficit hyperactivity disorder (ADHD), utilizing the Vanderbilt Parent Assessment Scale as a tool for evaluation. The results demonstrated significant improvements in attentional function, as reported by parents, highlighting the potential of neurocognitive exercises as a valuable intervention for children with ADHD. Given the role of occupational therapy in addressing cognitive and functional impairments, these findings suggest that neurocognitive exercises could be integrated into occupational therapy interventions to enhance attention and support the development of daily living skills in children with ADHD. The use of the Vanderbilt Parent Assessment Scale proved to be an effective means of capturing real-world changes in attention, providing important insights for occupational therapy practitioners. Future research should examine the long-term effects of neurocognitive exercises within occupational therapy frameworks and explore the integration of additional assessment tools to further enhance ADHD interventions in clinical practice.

LIMITATION AND RECOMMENDATION

➢ *Limitations*

- The Duration of the study was shorter
- The present study was done with limited sample size
- Study was done on a restricted age group of 7 to 12.
- The study focused only on children with ADHD in one institute NIEPMD, Chennai.

➢ *Recommendation*

- Study can be done on different age groups.
- Further study could recommend giving NEP as a group, and in a longer duration.
- Application of NEP in different pediatric populations
- Larger samples of ADHD children will help for better analysis in the future.

➢ *Declaration by Authors*

- *Ethical Approval:* Approved
- *Acknowledgement:* I sincerely thank my mentors for their invaluable guidance, expertise, and support, which greatly shaped this research. I'm also deeply grateful to my family and friends for their constant encouragement and unwavering support throughout this journey.
- *Source of Funding*: none
- *Conflict of Interest:* The authors declare no conflict of interest.

REFERENCES

[1]. Association AP. The DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, 5th edition); 2013.
[2]. Barkley) RAB (. ADHD in Adults: What the Science Says. In. New York: Guilford Press; 2008.
[3]. Stephen V. Faraone RHPAEDJWSJJGMAHSPP. Molecular genetics of attention-deficit/hyperactivity disorder. Biological Psychiatry. 2005.
[4]. Molly A. Nikolas SAB. Genetic and environmental influences on ADHD symptom dimensions of inattention and hyperactivity: A meta-analysis. Journal of Abnormal Psychology. 2010.
[5]. Panicker AS RV. Prevalence of attention deficit hyperactivity disorder in primary school children. Indian J Psychiatry. 2013.
[6]. Bansal PD BR. Psychopathology of school going children in the age group of 10–15 years. International Journal of Applied and Basic Medical Research. 2011.
[7]. Venkata Jyothsna Akam PA. Prevalence of attention deficit hyperactivity disorder in primary school children. Indian Journal of Psychiatry. 2013; 338–342.
[8]. Venkata Jyothsna Akam P PA. Prevalence of attention deficit hyperactivity disorder in primary school children. Indian Journal of Psychiatry. 2013.
[9]. Von Hecker U MT. Defocused attention in depressed mood: Evidence from source monitoring. American Psychological Association (APA). 2006.
[10]. Mirsky AF PDDCFL. A model of attention and its relation to ADHD. Mental Retardation and Developmental Disabilities Research Reviews. 1999.
[11]. Nurullah BÜKER DÖKŞT. Neurocognitive exercise program improves selectiveattention in children aged between 7-13 years:a pilot study. Journal of Exercise Therapy and Rehabilitation. 2020.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25aug315

[12]. Suthar N GVSSB. Prevalence of attention deficit hyperactivity disorder in primary school children: A cross-sectional study. Journal of Indian Association for Child and Adolescent Mental Health. 2018.
[13]. Ludyga S, Pühse U, Gerber M, Kamijo K. How children with neurodevelopmental disorders can benefit from the neurocognitive effects of exercise. Neuroscience & Biobehavioral Reviews. 2021.
[14]. Tribhuvan Srikanth DMAKaBF. To Investigate the Effectiveness of Cognitive Orientation to Daily Occupational Performance (CO-OP) in Children with ADHD. Indian Journal of Occupational Therapy, 52(1), 45-51. 2020.
[15]. Adele Diamond DSL. "Conclusions about interventions, programs, and approaches for improving executive functions that appear justified and those that, despite much hype, do not. Developmental Cognitive Neuroscience. 2016.
[16]. Verret C GMBCGPBL. A physical activity program improves behavior and cognitive functions in children with ADHD: an exploratory study. Journal of Attention Disorders. 2021.
[17]. Chang Y-K LSYHHLYH. Effect of acute exercise on executive function in children with attention deficit hyperactivity disorder. Archives of Clinical Neuropsychology. 2012.
[18]. Klingberg T. Training and plasticity of working memory. Trends in Cognitive Sciences. 2010.
[19]. Gapin JI LJEJ. he effects of physical activity on attention deficit hyperactivity disorder symptoms: The evidence. Preventive Medicine. Preventive Medicine. 2011.
[20]. Halperin JM BACLJ. Preventive interventions for ADHD: A neurodevelopmental perspective. neurotherapeutics.
[21]. JR B. Effects of physical activity on children's executive function: Contributions of experimental research on aerobic exercise. Developmental Review. 2010.