Section: Paediatrics

Original Research Article

EFFECTIVENESS OF 12 WEEKS OF PRACTICING VESTIBULAR EXERCISES IN THE MANAGEMENT OF MOTOR AND COGNITIVE FUNCTIONS IN CHILDREN WITH ADHD: A PILOT STUDY

Anita Tripathy[1], *Jitendra Nath Sarangi*[2]

[1]*Assistant Professor, Department of Paediatrics, NRI Institute of Medical Sciences, Visakhapatnam, Andhra Pradesh, India.*
[2]*Medical Head, Visakha Steel Plant Hospital, Visakhapatnam, Andhra Pradesh, India.*

Received *: 31/01/2025*
Received in revised form *: 04/04/2025*
Accepted *: 24/04/2025*

Corresponding Author:
Dr. Anita Tripathy,
Assistant Professor, Department of Paediatrics, NRI Institute of Medical Sciences, Visakhapatnam, Andhra Pradesh, India
Email: tripanita@yahoo.com.

DOI: 10.70034/ijmedph.2025.2.481

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (2); 2656-2658

ABSTRACT

Background: It was recommended that there would be a better outcome for the treatments offered if the ADHD is diagnosed at an early stage and starts the therapy immediately. Vestibular stimulation administered alone or in combination with the other therapies is reported to be highly effective. The studies related to the application of vestibular stimulation in the management of ADHD. Hence, the present study was undertaken. The present study was undertaken to observe the effectiveness of the vestibular exercises in the management of motor and cognitive functions in children with ADHD.

Materials and Methods: The present study was an experimental study recruited a total of 40 children with ADHD. The entire session is practiced twice a day, morning and evening, for 5 days a week for 12 12-week periods. All the children were trained by a senior physiotherapist for these exercises for 10 days, and then they were allowed to practice these exercises under the supervision of the physiotherapist.

Results: The age was not significantly different between the groups. There was no significant difference between the parameters before the intervention in both groups. There was a significant improvement in the spatial memory, verbal memory, and motor functions.

Conclusion: The study results support the effectiveness of the vestibular exercises in the management of ADHD. Further, detailed studies are recommended in this area to support the implementation of vestibular exercises in the management of ADHD.

Keywords: Cognition, Memory, Motor functions, Vestibular exercises, Children.

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a psychiatric disorder that affects children where characterized by hyperactivity, lack of attention, and impulsivity.[1] Throughout the world, the prevalence of ADHD is about 8%, and interestingly, boys are more susceptible than girls. This prevalence includes both boys and girls.[2] A combination of allopathy and alternative therapies, and lifestyle modifications was recommended in the management of ADHD. With a lack of attention and concentration, the children were not able to do their work in school. Due to hyperactivity, they may run or jump, or any other activity when the time for doing it is not at all appropriate. Cognitive behavioural therapies were found to be effective in the management of ADHD.[3] Some studies reported that the symptoms vary with gender, and other studies reported that there is no gender difference in the symptoms.[4-7] Vestibular Rehabilitation Therapy, which comprises vestibular stimuli that stimulate the components of the vestibular system, was shown to be effective in the management of ADHD.[8] It was recommended that there would be a better outcome for the treatments offered if the ADHD is diagnosed at an early stage and starts the therapy immediately.[9] Vestibular stimulation administered alone or in combination

with the other therapies is reported to be highly effective.[10] Vestibular stimulation can be activities like jumping, climbing, rotational movements, balance exercises, or electrical vestibular stimulation. The studies related to the application of vestibular stimulation in the management of ADHD. Hence, the present study was undertaken.

Aim and objectives: The present study was undertaken to observe the effectiveness of the vestibular exercises in the management of motor and cognitive functions in children with ADHD.

MATERIALS AND METHODS

The present study was an experimental study recruited a total of 40 children with ADHD after obtaining consent as advised by the Indian Council of Medical Research. The study protocol was approved by the institutional ethics committee. All the participants underwent the general examination to rule out any severe complications. Children with diagnosed ADHD from the past two years, whose parents are willing to allow their children to participate, were included in the study. Those with any severe complications were excluded from the study. After the recruitment, the participants were randomly assigned to two groups with twenty participants in each group. The randomization was done by generating the random numbers using the website Randomizer.org. The control group received the regular treatment and was not allowed to receive the vestibular stimulation. The experimental group received the vestibular exercises as an adjunctive therapy in addition to the regular therapy. The vestibular exercises include bending the head down and lift up 10 times, followed by shrugging the shoulders 20 times, followed by changing posture from sitting to standing for 20 times. The entire session is practiced twice a day, morning and evening, for 5 days a week for 12 12-week periods. All the children were trained by a senior physiotherapist for these exercises for 10 days, and then they were allowed to practice these exercises under the supervision of the physiotherapist. Spatial and verbal memory were assessed using spatial and verbal memory tests. A 100-pin test was used to assess the motor functions. After recording the baseline values of the outcome measures, vestibular exercises were practiced by the participants of the experimental group for 12 weeks. After the intervention, post-intervention values were recorded in both groups and compared. Data was analysed using SPSS 21.0 version. Student t-test was used to assess the significance of the difference between the groups. A probability value of less than 0.05 was considered significant.

RESULTS

The results were presented in Tables 1 and 2. The age was not significantly different between the groups. There was no significant difference between the parameters before the intervention in both groups. There was a significant improvement in the spatial memory, verbal memory, and motor functions.

Table 1: Comparison of the parameters before intervention.

Parameters	Control	Experimental	P value
Age (years)	7.80±0.92	8±1.34	0.6977
Spatial memory	2.73±0.79	2.66±1.2	0.8287
Verbal memory	1.42±0.51	1.55±0.62	0.4734
100-pin test time	9.17±1.27	8.92±1.11	0.5114

Data was expressed as mean and SD. *P<0.05 was significant.

Table 2: Comparison of the parameters after the intervention.

Parameters	Control	Experimental	P value
Spatial memory	2.73±0.79	4.18±0.60	0.0001*
Verbal memory	1.42±0.51	2.33±0.49	0.0002*
100-pin test time	9.17±1.27	8±1	0.0173*

Data was expressed as mean and SD. *P<0.05 was significant.

DISCUSSION

ADHD is a neuropsychiatric disorder that is more common in children and especially in boys. The present study was undertaken to observe the effectiveness of the vestibular exercises in managing motor and cognitive functions in children with ADHD. The age was not significantly different between the groups. Both groups had no significant difference in the parameters before the intervention. There was a significant improvement in the spatial memory, verbal memory, and motor functions. A combination of therapies is recommended in the management of ADHD. In allopathy, two types of medications are used, that is, stimulants and non-stimulants. However, both these drugs are associated with side effects. These side effects make to think of adopting non-pharmacological therapies in the management of ADHD.[11] Yoga was reported to be highly beneficial in the management of the majority of the symptoms of ADHD. Yoga therapy influences the muscular system, cardiovascular and nervous system, and improves attention and control the hyper hyperactivity. Interestingly, a study reported a significant decrease in distractibility in the children followed by yoga therapy.[12] Another important

therapy was cognitive behavioural therapy, when combined with pharmacotherapy, showed beneficial effects.[13] Vestibular system is called the sixth sense as it regulates the bodily functions from motor functions to the higher cognitive functions. Stimulation of the vestibular system can be done in humans by multiple modes that include caloric vestibular stimulation, motion simulators, electrical vestibular nerve stimulation, and vestibular exercises. Vestibular exercises are cost cost-effective and simple method of stimulating the vestibular system. In the present study, vestibular exercises were administered to the participants in the management of ADHD. Significant improvement of cognitive functions was observed following the administration of the vestibular stimulation. Further, lesions to the vestibular system cause a decline in cognitive functions. The vestibular system is well connected with the hippocampus, and normal functioning of the hippocampus needs a healthy vestibular system.[14] A study reported significant improvement in cognitive functions following the stochastic vestibular stimulation.[15] Improvement of attention and concentration was observed, followed by the application of the vestibular stimulation.[16] Improvement was observed in both cognitive functions and motor activities in children with ADHD, following the practice of vestibular exercises.[17] Significant improvements in the balance and reaction time were observed in the children with ADHD, following the vestibular rehabilitation therapy.[18] The study results are by the earlier studies. However, as the sample size of the study is less due to the pilot study, results may not be generalized. Further, detailed studies are recommended.

CONCLUSION

The study results support the effectiveness of the vestibular exercises in the management of ADHD. Further, detailed studies are recommended in this area to support the implementation of vestibular exercises in the management of ADHD.

REFERENCES

1. Gore M, Morgan J. Children with Attention Deficit Hyperactivity Disorder in India: Strengthening Diagnosis, Support, Training and Research. Journal of Indian Association for Child and Adolescent Mental Health. 2025;21(1):17-22.
2. Ayano G, Demelash S, Gizachew Y, Tsegay L, Alati R. The global prevalence of attention deficit hyperactivity disorder in children and adolescents: an umbrella review of meta-analyses. J Affect Disord. 2023;339(1):860–866.
3. Lopez PL, Torrente FM, Ciapponi A, Lischinsky AG, Cetkovich-Bakmas M, Rojas JI, Romano M, Manes FF. Cognitive-behavioural interventions for attention deficit hyperactivity disorder (ADHD) in adults. Cochrane Database Syst Rev. 2018 Mar 23;3(3):CD010840.
4. Davidson MA. ADHD in adults: a review of the literature. Journal of Attention Disorders 2008;11(6):628-41.
5. Torrente F, Lischinsky A, Torralva T, López P, Roca M, Manes F. Not always hyperactive? Elevated apathy scores in adolescents and adults with ADHD. Journal of Attention Disorders 2011;15(7):545-56.
6. Polanczyk GV, Willcutt EG, Salum GA, Kieling C, Rohde LA. ADHD prevalence estimates across three decades: an updated systematic review and meta-regression analysis. International Journal of Epidemiology 2014;43(2):434-42.
7. Simon V, Czobor P, Bálint S, Mészáros A, Bitter I. Prevalence and correlates of adult attention-deficit hyperactivity disorder: meta-analysis. British Journal of Psychiatry 2009;194(3):204-11.
8. Han BI, Song HS, Kim JS. Vestibular rehabilitation therapy: review of indications, mechanisms, and key exercises. J Clin Neurol. 2011; 7: 184-196.
9. Barbro Bruce. ADHD and language impairment : study of the parent questionnaire FTF., Europian child and adolescence psychiatry 2006 Feb;15(1):52-60.
10. Jane Case Smith.Occupational therapy for children and adolescents; 2014:1318-1321.
11. Nazarova VA, Sokolov AV, Chubarev VN, Tarasov VV, Schiöth HB. Treatment of ADHD: Drugs, psychological therapies, devices, complementary and alternative methods as well as the trends in clinical trials. Front Pharmacol. 2022 Nov 17;13:1066988.
12. Gunaseelan L, Vanama MS, Abdi F, Qureshi A, Siddiqua A, Hamid MA. Yoga for the Management of Attention-Deficit/Hyperactivity Disorder. Cureus. 2021 Dec 16;13(12):e20466.
13. Lopez PL, Torrente FM, Ciapponi A, Lischinsky AG, Cetkovich-Bakmas M, Rojas JI, Romano M, Manes FF. Cognitive-behavioural interventions for attention deficit hyperactivity disorder (ADHD) in adults. Cochrane Database Syst Rev. 2018 Mar 23;3(3):CD010840.
14. Smith LJ, Wilkinson D, Bodani M, Surenthiran SS. Cognition in vestibular disorders: state of the field, challenges, and priorities for the future. Front Neurol. 2024 Jan 18;15:1159174.
15. Jostrup E, Nyström M, Claesdotter-Knutsson E, Tallberg P, Gustafsson P, Paulander O, Söderlund G. Effects of stochastic vestibular stimulation on cognitive performance in children with ADHD. Exp Brain Res. 2023 Dec;241(11-12):2693-2703.
16. Wuehr M, Eder J, Keywan A, Jahn K. Noisy galvanic vestibular stimulation improves vestibular perception in bilateral vestibulopathy. J Neurol. 2023 Feb;270(2):938-943.
17. Rajendran V, Roy FG, Jeevanantham D. A preliminary randomized controlled study on the effectiveness of vestibular-specific neuromuscular training in children with hearing impairment. Clin Rehabil 2013; 27(5): 459-67.
18. Rassafian M, Akbarfahimi N, Hosseini SA, et al. The effect of the combination of active vestibular intervention and occupational therapy on balance in children with bilateral spastic cerebral palsy: A pilot randomized Controlled trial. Iran J Child Neurol 2020; 14(4): 29-42.