



Study to Find the Effect in Combined Protocol of Aquatic Therapy and Play Therapy in Attention Deficit Hyperactive Disorder in School Going Children from 7 – 10 Years to Improve the Quality of Life

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The Objective of the Study: The aim of this study is to see the effect of combined protocol on aquatic and play therapy for children with ADHD based on inattention, hyperactivity, impulsivity, and anxiety.

Background: Attention Deficit Hyperactivity Disorder (ADHD) is a severe threat to public health that affects a huge number of children and typically continues into adulthood. It is characterized by persistent lack of attention, hyperactivity, and impulsivity that impairs growth and performance. Children with ADHD are usually treated with a combination of pharmacological and non - pharmacological treatments, including academic, psycho-social, and behavioral aid, as well as

aquatic therapy and play therapy. Aquatic therapy and play therapy, on the other hand, are ways in which the kid is provided the chance to undergo growth in the most optimum conditions. The goal of this study is to see how effective aquatic therapy and play therapy are in raising the standard of living of children aged 7 to 10 who have attention deficit hyperactivity disorder.

Methods: The design of the present study is quasi-experimental. Tools used for the study: Data were collected through Conner's parent's rating scale, pediatric balance scale, and hand-eye coordination scale as pre and post-test and the treatment group received aquatic therapy and play therapy for eight sessions.

Results: Conner's parent rating scale, pediatric balance scale, and hand-eye coordination test were used to compare before and after results. Conner's parent rating scale had a difference between the means of 21, a standard deviation of 4.79, and a paired-t-test value of 23.98. The pediatric balance scale's mean difference was 19, the standard deviation was 3.82, and the paired-t significance level was 27.20. The average difference in the hand-eye coordination test was 11, with a standard deviation of 1.67 and a paired-t-test score of 36.02.

Conclusion: According to the findings, using aquatic therapy and play therapy to help children with ADHD pay close attention, reduce hyperactivity, and manage impulsive behavior was beneficial. Play therapy and aquatic therapy are also good ways to have some exercise. This increased energy utilization causes them to be less impulsive and hyperactive over the rest of the day.

Keywords: ADHD; play therapy; aquatic therapy; Conner's parent rating scale; pediatric balance scale and hand-eye coordination test.

1. INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a severe health concern that affects a huge number of children and can last well into adolescence. It's a long-term condition marked by persistent inattention, hyperactivity, and impulsivity that obstructs performance and growth. Limited attention span across activities, excessive activity, impulsivity, and restlessness are all prominent characteristics of this disorder [1]. Originally, ADHD was referred to as a hyperkinetic reaction in children. Sir Alexander Crichton, a Scottish doctor, noted around 1798 that certain people were easily swayed and couldn't focus on their tasks like others. These symptoms initially began in his childhood, according to him. The American psychiatric association recognized it as a psychological illness in the 1960s, and the diagnosis was renamed attention deficit disorder with or without hyperactivity in the 1980s [2]. As a result, ADHD is regarded as a cognitive disorder that typically manifests in childhood. Children with ADHD have difficulty paying attention, following instructions, and controlling their actions. Although ADHD has little effect on general IQ, children with the disorder require assistance in distinguishing words, letters, and symbols [3]. According to recent research, ADHD is currently the most frequent neurodevelopmental or neuropsychiatric illness among school-aged children and adolescents, with epidemiological studies of 5% and 7.2 percent, respectively, global [4].

According to a 2016 poll of parents, 6.1 million (9.4%) of children in the United States have mostly been diagnosed with ADHD. There are 1.7 million children between the ages 2 to 5 years and 2.4 million children aged 6 to 11. Boys are more likely than girls to be diagnosed with ADHD [5].

Although the origin of ADHD is undetermined, some variables play a significant influence, such as being born prematurely or with a low birth weight [6]. Several genetic and environmental factors, like as dietary preservatives, lead poisoning, smoking tobacco, liquor consumption, and maternal smoking during pregnancy, have been identified as adverse outcomes for ADHD [7]. According to existing research, biological relatives of ADHD people had a higher prevalence of the disorder than relatives of non-ADHD people. ADHD has a hazard ratio of 4.0 to 9.0 among first-degree relatives, making it more prevalent than Rheumatoid Arthritis but less prevalent than schizophrenia. Because of the social context and genetics, pathologies can cluster in families [8-9]. The actual etiology of ADHD remains a mystery. ADHD is thought to be caused by a complicated interplay of genetic and lifestyle variables. The cognitive hemisphere, hindbrain, basal forebrain, and autonomous nervous system are all affected by decreased neurotransmitter activity in the ADHD brain [10].

There have been reports that ADHD is linked to several physical health issues. Children with

ADHD, for example, have a 2.5-fold increased chance of having an unprovoked seizure. Seizures during childhood tend to raise the chance of ADHD by up to five times when compared to individuals who do not have seizures. Immunological dysregulations, such as asthma, allergic rhinitis, atopic eczema, obesity, and overweight, as well as altered gut microbiome functions, are all prevalent physical comorbidity in the ADHD population [11-12]. Certain parts of the brain that allow us to solve issues, plan, understand others' behaviors, and control our impulses may be affected by ADHD. Anxiety, sadness, insomnia, behavioral disorder, and substance misuse are all possible symptoms of ADHD.

In children with ADHD, emotional and behavioral issues are relatively common and troublesome. Social difficulties can manifest themselves in a variety of ways, including conflicts with parental and peer groups. Lack of emotional self-regulation, hostility, and a lack of empathy are all common emotional problems [13-14]. The functional impairment seen in children with ADHD is exacerbated by evidence of emotional and social issues [15-17].

The clinical evaluation is presently associated with factors from the DSM – IV, which contains nine behavioral traits (basically "global images" for the inattentive type and nine behavioral traits for the hyperactivity–aggressive form). Relevant clinical signs may also be persistent (lasting at least six months), maladjusted, practically detrimental in two or more contexts, incompatible with developmental stages, and distinct from other psychiatric illnesses [18]. For both children and adults, there are medication and non - medication training and treatment for ADHD. The most prevalent management for this condition is pharmacological. Although stimulant medications are often successful for many children with ADHD, about 42% of these children do not respond to the medications, and some children develop behavioral aggressiveness as a result. Play therapy and aquatic therapy are recent therapy for ADHD that can help with emotional and social issues [19].

Play therapy is an interpersonal process in which a professional pediatrics and health worker uses the therapeutic abilities of play to assist children to overcome current psychological challenges and avoid future ones [20]. Furthermore, play therapy is a method in which a child is allowed to enjoy and improve their activities [21].

As a result, play therapy can be used to help children with ADHD interact, study, provide pleasure, reduce anxiety, and boost self-esteem. On the other hand, play therapy techniques clearly state how to use play materials to successfully manage the therapeutic powers of play that are enjoyable, reasonably priced, and quick to set up, concentrating on a variety of play approaches appropriate for children aged 4 to 12 years old, including art and gameplay [22]. Children receive play therapy, whilst the elderly receive psychotherapy. It is harder for children to voice their problems since they lack the vocabulary and inner gear of grownups. It is a therapeutic option that is organized and theoretically based, and it relies on the children's natural learning and interaction processes. Toys, like children's words, are a form of work, and play is their language [23-24]. There have already been trials on the effectiveness of play therapy in treating ADHD, and the outcomes of using games in the diagnosis and prevention of ADHD children have been positive. Psycho-education, on the other hand, entails children acting out scenarios to teach them how to behave in social situations by recognizing how their actions affect others.

Aquatic therapy is a therapeutic program that takes place in water intended for a specific person to improve his or her functioning in all aspects of living. Qualified therapists provide the treatment in an aquatic therapy pool [25]. Aquatic treatment as a therapeutic success is limited, it has improvements in motor control and enjoyment can be transferred to participation in day-to-day activities and health-related quality of life [26]. Aquatic therapy also boosts the learner's interest and passion to participate and maximize fundamental skill and physical ability development [27]. The sensorimotor water exercise involves games that strengthen motor abilities by incorporating coordination and balance [28]. Aquatic treatment is one of the most efficient forms of exercise in general, and it is especially beneficial to ADHD sufferers [29]. Aquatic therapy helps the children burn off surplus energy and not only boosts the body and brain, but it also relieves a lot of the strain that most dryland cardio places on joints. It aids in concentration and makes creating varied reasonable goals that can help children with ADHD to stay focused and to remain motivated by providing them with a sense of accomplishment [29-30].

It could be completely re-creative as well as valuable learning for social relations, to increase the children's motivation, the workout plan highlighted fun and safety. The frequency of play therapy and aquatic therapy sessions required is governed by the ADHD child's challenges and how they respond to treatment using specific approaches vs how they interact, react to certain situations, and experience their environment. Change is impossible without awareness, which is why awareness is so vital in play therapy and aquatic therapy. Children are encouraged in becoming aware of their sentiments and provided opportunities to express them. Throughout play therapy and aquatic therapy sessions, the child is encouraged and motivated to communicate about things that are frightening to them, to build self-esteem, confidence, and become more self-regulatory, discover something about themselves, and explore new behaviors.

Play therapy and aquatic therapy are found to be excellent remedies for socioemotional issues associated with ADHD. Internalizing and externalizing behavioral problems, self-efficacy, and self-concept, stress, and depression all benefit from it. Attention deficit and hyperactivity symptoms in children aged 7 to 10 years were reduced as a result of this therapy. When compared to the patients who did not undergo aquatic therapy and play therapy, it has been found to provide considerable improvement in youngsters. This research was conducted to assist ADHD youngsters in learning strategies to help them manage many of the issues they face as a result of their condition.

1.1 Objectives of My Study

To have in-depth knowledge about ADHD, inattention, hyperactivity, impulsivity, anxiety and fine out the effectiveness of aquatic and play therapy in 7 to 10 years of school going children with Attention Deficit Hyperactive Disorder.

2. METHODS

2.1 Participation

A total number of 30 ADHD children were included in this study with the age group of 7 – 10 years diagnosed with ADHD, ability to follow instruction. ADHD with other neurological/ orthopedic/ cardiac conditions, children having a history of epilepsy, children having common cold and fever, post-surgical children are excluded.

2.2 Study Design

A Prospective Simple research study design of pre and post-test value with treatment and control groups was used. The two physiotherapists were got in charge of the participant's process. The first physiotherapist evaluated the children at baseline and immediately after the therapy program. The second physiotherapist applied the therapy program to the children.

4. Tools of Data Collection

4.1 Conner's Parents Rating Scale

The Conner's Parent Rating Scale-Revised is a parent-report scale designed for parents who have children aged 3 to 17. Conner's Parent Rating Scale (CPRS) was first designed in 1970 as a comprehensive questionnaire for obtaining parental reports of the predominant clinical problems for children referred to an outpatient psychiatric environment (Conner's, 1970). This scale served as the foundation for a thorough parental conversation concerning the child's issues. The CPRS included things grouped in terms of insomnia, diet issues, anger management issues, maintaining friendships, academic problems, and so on in its original version. Later, items covering the cardinal symptoms of attention deficit hyperactivity disorder (ADHD): hyperactivity, impulsivity, and inattention, were added to the "additional" issues group [31].

4.2 Pediatric Balance Scale

The Pediatric Balance Scale is a modified version of the Berg Balance Scale that is used to evaluate functional balance skills in school children. The scale has 14 items with scores ranging from 0 (lowest function) to 4 (highest function), with the highest point of 56 points. The Pediatric Balance Scale is designed for children in school who have mild - to - moderate motor deficits. Children aged 5 to 15 were used in the pilot study [32].

4.3 Hand to Eye Coordination Scale

The synchronized coordination of eye movement with hand responsiveness is known as hand-eye coordination (or eye-hand coordination). We created a mini-game for children to evaluate their hand-eye coordination aptitude. Two balls, on-

axis, and a white dashed sphere will appear in each round. The aim is to get the traveling balls to stop within the white dashed sphere as they move along the axis. When you click/tap, the balls stop moving. If both balls stop within the white sphere, the sphere turns green; if only one ball stops within the sphere, the sphere turns yellow. The sphere becomes red if both balls halt outside of it. There are 20 rounds in this examination, ranging from easy to difficult. To take the exam, you must finish all 20 rounds [33].

5. INTERVENTIONS

A performance enhancement program was carried out for 8 weeks for each child. Play therapy and aquatic exercise were performed a maximum of ninety minutes per session and a total of five sessions for a week for 8 weeks including warm-up and warm down.

5.1 Therapy Program

30 subjects were selected from the convenient sampling method. The subject was clearly explained about the study. The children were involved in pre and post-test assessments. Play therapy was done by two sessions per week, a total duration of 60 minutes, and aquatic therapy was done by three sessions per week, a total duration of 90 minutes.

5.2 Play Therapy

5.2.1 Procedure

Assessing children with ADHD before using play therapy: Identifying children at home who's been confirmed with ADHD by having the parents decide the children who've already ADHD in the previously indicated situation.

After consent forms and volunteers participated in the research, teachers, and parents of children were provided with a copy of the research tool of data collection, which included the Conner's parents rating scale and a hand-eye coordination test.

Preparing for the use of play therapy sessions: Gather all of the children's play therapy tools and toys, including Chinese checkers, Chess, Sudoku, Slime, Bubbles, Balloons, Cubes, and Skating shoes.

Applying to play therapy sessions: As a therapist, begin the play therapy session by

presenting yourself and allowing each child to do the same. Begin by implementing team play therapy sessions that last an hour each, plus 5 minutes for setup, twice a week for two months. Each session would include various types of play activities that are appropriate for a child with ADHD to improve their personal and mental abilities for enhancing children's attention, reducing hyperactivity, and attempting to control impulsivity, and indeed the therapist used at least two to three of these activities that were derived in each session, such as Chinese checkers, Chess, Sudoku, working Mary games, chair song game, and so on. The therapist employed a variety of toys that were deliberately chosen to allow children to share their emotions and interests in a way that was acceptable for their age, gender, and play preferences. The therapist collected comments from the children on the prior period at the start of each session.

By offering them simple reward symbolic and verbal feedback, the therapist employed encouraging and rewarding strategies also with researched children for their positive deeds and responding to motivate them to learn and gain knowledge and behavioral abilities which they lacked. The children were asked to gather, organize, and restore every piece of play equipment to its proper location at the end of each play therapy session.

Evaluating for applying play therapy sessions: Researchers were given another copy of the research instruments of data collecting for the children, parents, and teachers after concluding the 8 play therapy sessions, along with the Conner's parents' evaluation scale and hand-eye coordination test.

5.3 Aquatic Therapy

Assessing ADHD children before aquatic therapy: Identifying children in the house who have been diagnosed with ADHD by using the parents in the previously discussed environment and choosing the children with ADHD.

After verbal assent and active participation in the study, parents, and teachers of children were given a copy of the study guides for data collection, which included the Conner's parents rating scale, hand-eye coordination test, and pediatric balancing scale.

Preparing for applying aquatic therapy sessions: Assemble the children near the pool

and offer them and their parent's instructions on the therapy that is being provided. Well before therapy, teach the children how to take precautions.

Applying aquatic therapy: An instructor with professional experience in water exercise led the aquatic therapy program. A 1:10 instructor-to-student ratio was used to implement the program. At a neighborhood swimming pool, the program consisted of 8 weeks of two sessions per week (16 sessions total). Each session lasted 90 minutes and included four stages: a 5-minute warm-up, 40 minutes of moderate-intensity water aerobic activity, 40 minutes of perceptual-motor water exercise, and a 5-minute cool-down.

The moderate-intensity physical program was selected supported by evidence indicating the improvement of cardiovascular fitness, which is one of the potential activities about exercise and cognition, as well as the intensity's suitability for children with ADHD (Smith et al., 2013). The perceptual-motor water training featured games that reinforced several components of motor skills by incorporating coordination, balance. To increase the children's motivation and reduce impulsivity and anxiety, the exercise program is fun and safe.

Evaluation for the application of aquatic therapy sessions: The therapist gave another copy of the research instruments for collecting the data for the children's teachers and parents after performing the 8 sessions of aqua therapy sessions, along with the Conner's parents rating scale, pediatric balance scale, and hand-eye coordination test.

After analyzing the relevant literature, the researcher developed a play therapy recommendations booklet. It was created specifically for parents of educated children and their teachers using easy of both the languages Tamil and English. The booklet included the book's aims, an overview,

information about ADHD, the fundamental principle of ADHD, causes of ADHD, symptomatology of children with ADHD, the involvement of parents in raising ADHD children. Play therapy guidelines, play therapy sessions, and aquatic therapy sessions, are included with instructions and figures.

5.4 Statistical Analysis

The paired –t-test was used to examine the data for the experimental group. The statistical significance between pre-and post-test values of Conner's parent rating scale, Conner's teacher's rating scale, pediatric balance scale, and hand-eye coordination test was determined using the paired t-test.

6. RESULTS

Thirty children of both genders were included in the study. In addition, 30 patients screened positive for ADHD. The time interval between procedures Conner's parent rating scale, pediatric balance scale, and hand-eye coordination test applied before and after therapy for 8 weeks. They were treated with aquatic therapy and play therapy.

The pre and post value was assessed by Conner's parent rating scale, pediatric balance scale, and hand-eye coordination test. The mean difference of Conner's parent rating scale is 21, the standard deviation is 4.79, and paired –t-test value is 23.98. The mean difference of pediatric balance scale is 19, the standard deviation is 3.82, and paired test value is 27.20. The mean difference of the hand-eye eye coordination test is 11, the standard deviation is 1.67 and the paired test is 36.02.

Aquatic therapy and play therapy were found to be useful for children with ADHD based on the paired test values. The remarkable increases in their quality of life have been revealed by the paired t-test values.

Table 1. Mean difference, Standard deviation, and paired t-test of Conner's parent rating scale, pediatric balance scale, and hand-eye coordination test.

Scale	Mean Difference	Standard Deviation	T-test
Conner's parent's rating scale	21	4.79	23.98
Pediatric balance scale	19	3.82	27.20
Hand to eye coordination scale	11	1.67	36.02

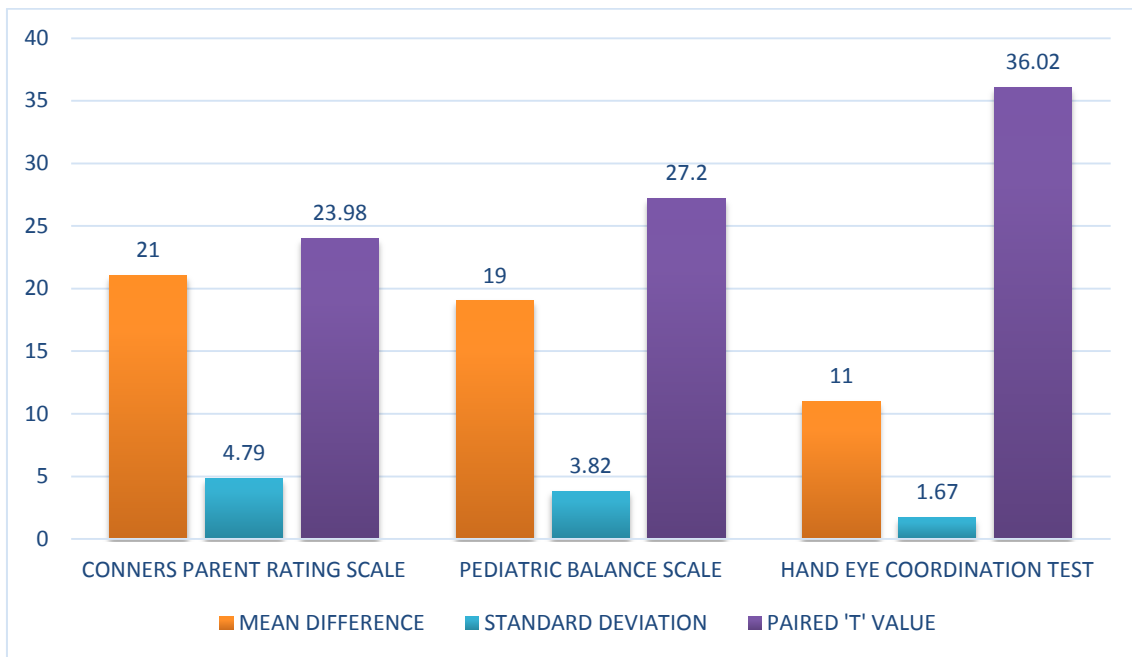


Fig. 1. Statistical Data Presentation for Mean difference, Standard deviation, and Pairedt-test in Conner’s parent rating scale, pediatric balance scale, and hand-eye coordination test

7. DISCUSSION

ADHD children aged 7 to 10. The purpose of this study was to see how beneficial play therapy and aquatic therapy are at treating inattention, hyperactivity, and anxiety.

The data for pretest and posttest values are of ADHD was calculated using the paired test. Consistent with the findings of the present study, various studies have used a variety of play activities and aquatic activities and supported the rouses on ADHD, including other activities

The research by Nahedsaied El – Nagger, Manal Hassan Abo –Elmagd, and colleagues found that using play therapy helped children with ADHD pay attention, reduce hyperactivity, and manage impulsive behavior. Also, substantial disparities in children’s behavioral and emotional disturbances in terms of fear and anxiety levels, nervousness, crying, and resting disruptions were found in the first article. Meanwhile, there were no significant differences between before and after play therapy sessions for children with ADHD in terms of despair, aggressiveness, or nail trimming.

This conclusion is shared by Xavier. Who provides play activities for hospitalized children to help them feel less anxious? Bubble play, Chess, Sudoku, and other games were included,

and these activities were supported by Kristina L. Amon et al, who taught children relaxation techniques.

The investigation of Dr. Heba Ibrahim Al-Ashkar, Dr/ Mona Sameh Abo Heshima shows the data and information both researchers attained, the results discussed and explained, the nature of this study’s objectives and participants and in the light of similar theoretic studies and research; both researchers were able to conclude the following: The aquatic therapy program limits attention deficit in ADHD children. The aquatic therapy program limits hyperactivity in ADHD children. The aquatic therapy program limits impulsivity in ADHD children. The aquatic therapy program allows ADHD children to gain some basic swimming skills.

According to M Parthiban and Dr. S Johnson Preamkumar, It was concluded that a person with ADHD Behavior – Hyperactivity & Impulsivity was significantly altered due to the influence of twelve weeks’ practices of aquatic therapy exercises when compared to the control group.

The final stage of my paperwork found that aquatic therapy and play therapy not only improves attention and concentration but reverse hyperactivity, impulsivity, and depression.

This study has proved that aquatic therapy and play therapy has an effect on school-going children with ADHD from 7 – 10 years.

8. CONCLUSION

ADHD is the most prevalent childhood illness, and there is ample evidence that it can have long-term negative consequences. As a result, pre-school therapies may mitigate the effects of ADHD on children in the short- and long term. Yet, with this demographic, some parent and teacher interventions have proven to be successful. As per the findings of this study, using play therapy and aquatic therapy can assist children with ADHD to pay attention, reduce hyperactivity, and control impulsive behavior was helpful. Play therapy and aquatic therapy are two other ways to get some exercise. This increase in energy expenditure causes them to be less impulsive and hyperactive over the rest of the day.

CONSENT

Written informed consent was obtained from the parents.

ETHICAL APPROVAL

This study was conducted in accordance with ethical procedures and policies as per ICH Guideline for Good Clinical Practice-E6(R2)" and approved and given permission to initiate the research study titled "Study To Find The Effect In Combined Protocol Of Aquatic Therapy And Play Therapy In Attention Deficit Hyperactive Disorder In School Going Children From 7 – 10 Years To Improve The Quality Of Life" by the Institutional ethical committee (IEC) of Nandha College of Physiotherapy. Subjects were selected from our own outpatient department of Nandha College of Physiotherapy, Nandha Central School in erode, Bharani Park matriculation higher secondary school in karur, Tamilnadu. After completion of the study, the publication of results data could be stored in our college data repository."

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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