

Effects of Structured Physical Activity in Improving Memory Among School Going Underachievers

Vishnupriya.R¹, Srividya.G², Kannan.D³, K. Anantharaj⁴

¹PhD Scholar, Annamalai University, Chidambaram, Tamil Nadu and Professor, JKKMMRF College of Physiotherapy, Komarapalayam, Namakkal, Tamil Nadu, India

²Research Guide, Department of PMR, Annamalai University, Chidambaram, Tamil Nadu, India

³Professor/Principal, JKKMMRF College of Physiotherapy, Komarapalayam, Tn Dr. MGR medical University, Chennai

⁴Professor, JKKMMRF College of Physiotherapy, Komarapalayam, Tn Dr. MGR medical University, Chennai

Corresponding Author: R.Vishnupriya

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ABSTRACT

Background of the Study: Memory plays a major role in establishing a solid base for learning, both in school and beyond. Having a strong memory helps children perform better in school, do well in exams and secure better grades. Under achievement occurs when child's performance is below what is expected based on the child's ability and pertaining to the age. A healthy memory is important for child's development. This study aimed to identify the effect of Structured physical activity in improving memory skill among school going children.

Methodology: The study is an experimental study design and it was conducted among forty children after obtaining ethical clearance and written consent from the schools and parents of these children. All children were selected based on the selection criteria. All forty children were randomly allocated into 2 equal groups The children in group A underwent structured physical Activity for 30minutes per day for 3 days a week for a period of five months. The children in group B were given relaxed indoor activities for 30 minutes for 3 days a week for 5 months. The pre and post therapy assessment was done using Bhatia Battery of intelligence test. Immediate memory test was used for assessing the memory. The SPSS statistical package 20.0 was used to analyze and compare the collected data.

Result: Bhatia battery of performance test was used to test the immediate memory. The pre and post therapy assessment was done using an immediate memory test showed an improvement in their academic performance. The result revealed a mean score of 13.58 for Group A and 2.516 for Group B with the p-value of 0.0001 which is highly significant.

Conclusion: This study concludes that structured physical activity aids in improving the memory skill of school going under achievers which has shown a marked improvement in their academic performance when compared with the children who underwent relaxed indoor activities.

Keywords: Structured physical activity, memory skill, school going underachievers

INTRODUCTION

Underachievement in school children is one of the common problems in main stream education. Underachievement is described as a discrepancy between the actual performance and potential¹ expected for that age. Many strategies reduce the differences between the school children, including a

positive environment, encouragement from teachers, self-evaluation by the students, and a good endurance relaxation through exercises².

Cognition is a multifaceted mental ability that enables people to organize and develop behaviors based on their cognitive structures and behavioral controls³. Brain health in

children can be measured by the successful development of attention, on-task behavior, memory, and academic performance⁴. Cognition in Children and adults is the key to personal growth, and it is the main reason for success in schools⁵.

Physical activity is beneficial to human growth and development, providing physiological and psychological benefits⁶. Physical activity of a low-intensity exercise or short-term aid in improving neurocognitive functions in children⁷. Multiple studies have shown that there are various effects of exercises which are shown in the children, which include an increase in blood flow⁸, increased release of neurotrophic factors like brain-derived neurotrophic factor and insulin-like growth factor⁹, increased arousal levels¹⁰ and increased brain activity¹¹. Various evidence suggests that increasing physical activity and improving fitness improve academic performance^{12,13,14}.

The attention and memory were facilitated by enhancing physical activity and aerobic fitness⁴. Several systematic reviews and meta-analyses indicated that single 10-minute bouts of moderate to intense exercise could have minor to moderate acute favorable impacts on children's classroom behavior^{15,16}.

Bhatia battery of performance test is a well-standardized and reliable tool for assessing the intelligence concerning the Indian context¹⁷. Bhatia CM developed this test in 1955. This test was designed to determine the cognitive skills of children belonging 11-16 years of age group¹⁸. This test has got good reliability and validity. Bhatia battery of intelligence test includes 5 subtest such as 1. Koh's block design, Alexander pass along, Pattern drawing test, Immediate memory test, Picture construction test. Among these I have taken immediate memory test to test the memory of the selected children for the study. Each subtest can be used independently to test the various cognitive skills. The scoring of each test does not influence other sub test.

Multiple types of research widely acknowledge physical exercise improves physical and mental health. Studies about the improvement of the cognitive domain in school children are few. So, this study is aimed to identify the effect of structured physical activity in improving memory among school-going underachievers.

METHODOLOGY

Sample size consists of 20 children each group. These children were selected based on inclusion criteria these children fall in to the category of under achievers in school land they were made to identify for the study, who were classified as an underperformer in school and gave a statistical power greater than 0.85. The selection criteria for the study consists of 1) Children attending mainstream education regularly, 2) Students were studying in the same school for the past five years without break, 3) student who is not suffering from cardio-vascular, neurological or orthopaedic, or psychiatric illness, 4) age group of 11years to 14 years 5) both genders 6) Those children who are not involved in active sports 7) Those students who are willing to attend the physical activity sessions were selected for the study. The ethical approval was obtained from the Institutional Ethical Committee, JKK Munirajah Medical Research Foundation College of Physiotherapy, Komarapalayam, Namakkal Dt. Tamil Nadu, A good explanation was given to the parents of the selected children, and written consent was obtained from individual parents before initiating the study. After a detailed description of the study's objectives, procedures, risks, and benefits, parental informed consent was acquired. Obtained permission from the principals of the schools in which these children are undergoing education for this study. All these tests were done under the supervision of the psychologist.

IMMEDIATE MEMORY TEST:

Digits are recited, which are immediately repeated by the subject. Letters start with 2digits and ends by 9. We have 3 alternative sets. If failure is recorded in the first set, try to second and third alternative sets. If failure is recorded in all the 3 alternatives a final failure is recorded and we stop.

Scoring:

Direct 1 mark for each correct number of digits (maximum possible score-9)

Reverse 1 mark for each correct number of digits in reverse reproduction (maximum possible score 6)

Maximum score :15

Forty children were selected for the study, and they were all divided into two equal groups, twenty in each group. The children were randomly allocated to each group using the computer-assisted randomization method. Group A children underwent a structured physical activity for 30 minutes over five months and three days per week. Structured physical activity (SPA) such as walking at an average pace, walking at a maximum speed, slow jogging, slow running, and skipping was given to the Group A children¹⁹. The Intensity of exercises was designed to be 50% to 70% of maximum heart rate²⁰. Warm-up exercises and cool-down activities were administered prior to structured physical activity²¹.

Group B children participated in relaxed indoor activities for 30 minutes each day over five months and three days per week. Bhatia battery of performance test was used as an outcome measure for this study. The analyses of the pre-test and post-test values were collected between the first day of treatment and following the fifth month of treatment.

STATISTICAL ANALYSIS

The SPSS statistical package of 26.0 was used to analyze the test values. A parametric test was used to analyze the collected data. Descriptive statistics were used to analyze the demographical variables used in the study. The variables like the food habits, sleeping hours, and hours of using electronic gadgets were also taken for the analysis. All the values were obtained with the p-value of 0.05, which shows a significant difference between the pre and post-test values.

The collected data were analyzed using SPSS 20.0. t-test was administered to analyze the value obtained by the students in variables of Bhatia battery of performance tests. The p values were set as $p < 0.05\%$. This study identifies that $p < \alpha$, H_0 is rejected. The observed effects in all the parameters are more significant.

Table I Demographic Descriptions

Age	Number of participants	Male	Female
11 years	7	2	5
12 years	9	4	5
13 years	11	5	6
14 years	13	6	7
Total	40	17	23

Table II

No of hours sleeping	No of Participants	Mean ± S.D of Male children	Mean ± S.D of Female children
6-8 hrs	14	12.67 ± 1.21	12.63 ± 1.30
9- 10 hrs	19	13.0 ± 0.756	12.72.9 ± 1.10
>10 hrs	7	13.0 ± 1.73	12.5 ± 1.29

Table III

No of hours watching electronic Gadgets			
2-4 hrs	10	11.75 ± 0.957	11.33 ± 0.516
4-6 hrs	19	13.00 ± 0.926	12.82 ± 0.982
6-8 hrs	11	13.60 ± 0.548	13.67 ± 0.516

The details are shown in Table I, Table II, and Table III. Demographical analysis was conducted in table I. Table II and III datas are collected from the students and their parents.

Table IV Within group analysis of the Bhatia battery performance test

Group	Pre-test	S.D	Post-test	S.D	Paired 't' value
Group A SPA	8.65	0.93	10.20	0.95	13.58
Group B RIA	7.70	0.86	7.95	0.76	2.516

Table IV shows a marked difference between the pre and post-test values of group A. The paired 't' value is 13.58 for group A and 2.516 for group B shows a significance when compared with the tabulated 't' value.

Table V Within group analysis of the Bhatia's Bhatia battery performance test

Group	Post- test	S.D	Mean Differences	Unpaired 't' value
Group A SPA	10.20	0.51	1.55	8.5916
Group B RIA	7.95	0.44	0.25	

Table V shows a marked difference between the post-test values of the groups. The unpaired 't' value is 8.59 which is greater than the tabulated 't' value.

Memory was evaluated using the Bhatia battery of the performance test; both groups showed a significant difference between the pre-test and post-test values. When the post-test values were compared with the groups, it was observed that the post-test values of the structured physical activity group showed a marked significance when compared to Group B. Group A has shown more improvement than Group B ($p=0.005$). So, the analysis of this study findings proves that there is a significant difference in memory skill of pre intervention and post intervention memory score of Group A children.

DISCUSSION

This study aims to identify the effect of the structured physical activity in improving memory skill of underachievers in school. Children who are not able to meet their cognitive skills as per with their age group are usually categorized as underachievers²². The most defined characteristic of the underachievement is the discrepancy between the potential and the ability²³. Physical exercises and sports are found to produce a significant positive effect on improving memory in children²⁴. Structured physical activity is a widely accepted method technique that aids in improving the

performance in athlete's rehabilitation¹¹. Although there is strong evidence of the beneficial effect of physical activity on students' academic performances, the results and the current evidence are inconclusive²⁵. Physical activity produces a various positive significant effect such as increased blood flow⁸, increased release of neurotrophic factors, such as brain-derived neurotrophic factor (BDNF) and insulin-like growth factor-1⁹, increased arousal levels, and increased activity in specific brain areas¹¹. Physical activity has shown a positive impact on visuospatial memory²⁶. The classroom-based activity like aerobics activity which integrated with the mathematical practices found to be improved²⁷. Studies have identified that physical activity intensity in children between the ages of 12-14 years shows positivity in cognitive flexibility and operational memory²⁸. Studies also showed that tennis or football are associated with the development of the working memory^{29,30}.

A positive effect of aerobic exercises on long-term memory was found in various studies^{31,32}. Evidence identified that physical activity has substantially improved school students' performance like memory. Diamond 2018, reported that the physical activity program has much better results in advancing cognitive behavior than the other approaches²⁴. Physical activity has improved the cognitive function in children

from 3-5 years of age and has a strong positive correlation between physical activity and memory in 8-12 years of age^{31,32}.

Analysis of this study has concluded that structured physical activity has produced a significant improvement in memory in underachievers in school compared with relaxed indoor activities. This study also shows a significance of $p < 0.05\%$ with 85% confidence intervals between the groups on memory. This study has firmly rejected the null hypothesis.

Limitations of the study noted in the study include children are not well adapted to the exercises, monitoring the individual children are needed during training, and home programs are not well monitored.

CONCLUSION

Structured physical activity plays a significant positive impact in improving the memory among the underachievers in school children. On analysis of Bhatia's battery of performance test, marked signs of improvement between the groups were shown. So, this study strongly recommends that structured physical activity is the most effective in improving the memory of school children who are underachievers.

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