Effects of Integrative Neuromuscular Training Combined with Yoga and Stretching Exercises on Abdominal Strength Endurance of Primary School Children

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Abstract

Background: Abdominal strength endurance is used to stabilizing the core muscles. Poor core muscle strength leads to the poor posture. It affects to the motor skills in children. The integrative neuromuscular training can enhance the abdominal muscle strength and used to avoid bad posture in children. This is a training to improve the physical fitness in children and lead them to live healthy life style.

Purpose: To know the sixteen weeks of training effects of integrative neuromuscular training combined with yoga and stretching exercises on abdominal strength endurance of primary school children.

Method: Sixty primary school children with the age of seven to ten years were selected as subjects from Alagappa Fitness Foundation, Karaikudi, Tamilnadu, India. They were randomly allocated to integrative neuromusculartraining (n=15, INT), integrative neuromuscular training combined with yoga (n=15, INT-Y), integrative neuromuscular training combined with stretching exercises (n=15, INT-S) and control participants (n=15, CP). The subjects performed their scheduled training for the period of 16 weeks, three alternative days in a week. The three selected trainings were chosen as independent variables and abdominal strength endurance was chosen as a dependent variable. It was tested by sit up test, performance recorded in numbers.

Results: After the sixteen weeks training, the experimental groups showed that significant differences ($p<0.05$) on abdominal strength endurance. The control participants did not show any significant difference ($p>0.01$) on abdominal strength endurance.

Conclusion: The integrative neuromuscular training combined with yoga group produced greater improvement on abdominal strength endurance than the other trainings.

Keywords: *Neuromuscular, Training, Yoga, Stretching, Abdominal Strengthen durance.*

Introduction

Physical activity is a behavior, whereas physical fitness is an attribute.[1–3] Physical activities that is planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness. Physical fitness is a groups of individual character attained from usual physical activity. These characteristics include cardio respiratory endurance, muscular endurance, muscular strength, body composition and flexibility.[4-6]

The growth prototype of a child is the consequence of a constant interaction among the child's environment and genes. This comprises the socioeconomic surroundings of the family and school as well as the environmental of the district and country. Changes in the growth pattern, therefore, reflect changes in one or more of this factors.[7]

During infancy and preschool age, movement is an integral part of children's life. In the first six years of life, children discover themselves and the world through movement and captivate their surroundings, through their body and their sensations.[8] Thus, especially in that period of human life, the study of a child's motor performance can significantly contribute to the full

understanding of his/her entire personality.[9]

Physical activity in different forms is important to health and development during childhood.[10] Children need regular physical activity for normal growth and development, maintenance of good health and fitness and development of physical activity skills and behaviors that carry into adulthood.[11]. Organs grow at different rates and these rates can differ from the growth rate of the human body as a whole.[12-15]

The integrative neuromuscular training(INT) is a conception to apply a versatile type activity which integratespecific (exercise targeted to motor control) and general (fundamental movement), strength and conditioning activities namelycore focused strength, resistance dynamic stability, agility and plyometric. These are planned to improve a skill and health related fitness.[16] More recently, integrative neuromuscular training (INT) which includes general and specific physical activities that are intentionally designed to enhance both health (e.g., muscular strength and cardio respiratory endurance) and skill-related (e.g., agility and balance) components of physical fitness has been recognized as an innovative approach for school-age youth.[17]

Children and young people are now recommended to take part in at least 60 minutes of moderate to vigorous physical activity daily to promote and protect healthy heart function, increase bone and muscle strength, improve mood and lower the risk of depression and reduce the risks of obesity, osteoporosis and diabetes.[18] The abdominal muscles are made up of four layers of powerful elastic bands. These muscle fibers crisscross to form an anatomical girdle. They lie across each other at various angles. The abdominals work together as a unit to produce movement.[19] The abdominal muscle strength provides core muscles stability to carry out daily work with minimum effort and avoid the strain in the body.

Method

Samples: Sixty primary school children (N=60) with the age of 7-10 years were selected from Alagappa Fitness Foundation, Karaikudi, Tamilnadu, India. Features about the study were informed to the children's parents and required to sign an informed consent form. The study protocol was approved by Departmental Research Committee of the Department of Physical Education and Health Sciences, Alagappa University.

Training Approaches: The chosen children were divided into four equal groups, i.e., three experimental and one control group. The experimental group-I practiced integrative neuromuscular training (INT), the experimental group-II practiced integrative neuromuscular training combined with yoga (INT-Y), the experimental group-III practiced integrative neuromuscular training combined with stretching exercises (INT-S) and group-4 acted as control participants, they did not practiced any particular training. The chosen subjects were participated in this study for the period of sixteen weeks i.e., three alternative days per week.

Data Collection: The abdominal strength endurance was tested before and after the 16 weeks of training program. It was tested by sit ups test and scored were recorded in numbers.

Statistical Application: To observe the pre and post test differences between the groups, the paired sample t test was applied. To find the adjusted post test mean differences among the group, the analysis of co variance was applied. The Scheffe's Post Hoc Test was applied to find the pair wise comparisons between the groups.

Results

Abdominal Strength Endurance:

Table 1: Demonstrates the paired sample 't' test on abdominal strength endurance (Measures in numbers)

Group	Pre test (M±SD)	Post test (M±SD)	't'-Test	P Value
INT (n=15)	10.46±0.63	12.6±0.5	9.02*	0.00
INT-Y (n =15)	10.53±0.99	14.4±0.5	15.12*	0.00
INT-S (n =15)	10.4±0.73	13.46±0.63	10.8*	0.00
CP(n =15)	10.4±0.82	10.26±0.79	1.46	0.97

INT-Integrative neuromuscular training, INT-Y- Integrative neuromuscular training combined with yoga, INT-S- Integrative neuromuscular training with stretching, CP-Control participants, M-Mean, SD-Standard Deviation, *- significant, Significant at $p<0.01$, Insignificant at $p>0.05$

Table-I shows the results of mean + standard deviation of abdominal strength endurance of integrative neuromuscular training (INT), integrative neuromuscular training with yoga (INT-Y), integrative neuromuscular training with stretching exercises (INT-S) and control participants. There was a significant increase ($p<0.01$) in abdominal strength endurance in INT, INT-Y and INT-S. There was no significant increase ($p>0.05$) in abdominal strength endurance in control participants (CP). These results indicate that the sixteen weeks of training intervention produced improvement on abdominal strength endurance in experimental groups. In control participants, there were no significant improvement was found.

Table 2: Demonstrates the analysis of covariance on abdominal strength endurance (Measures in numbers)

	INT	INT-Y	INT-S	CP	F	p value
Adjusted post test Mean	12.59	14.38	13.47	10.28	125.05*	0.00

INT-Integrative neuromuscular training, INT-Y- Integrative neuromuscular training combined with yoga, INT-S- Integrative neuromuscular training with stretching, CP-Control participants, M-Mean, SD-Standard Deviation, *- significant, Significant at $p<0.01$, Insignificant at $p>0.05$

Table-2 shows the results of analysis of covariance on abdominal strength endurance of integrative neuromuscular training (INT), integrative neuromuscular training with yoga (INT-Y), integrative neuromuscular training with stretching exercises (INT-S) and control participants. There was a significant difference ($p<0.01$) in abdominal strength endurance among INT, INT-Y INT-S and control participants (CP).

The superiority effects among the selected groups were found by the application of Scheffe's Post Hoc Test. It is illustrated.

Table 3: Pair wise comparisons on abdominal strength endurance

Groups	Mean Differences	Scheffe's (p value)
INT and INT-Y	1.78*	0.00
INT and INT-S	0.88*	0.00
INT and CP	2.32*	0.00
INT-Y and INT-S	0.9*	0.01
INT-Y and CP	4.1*	0.00
INT-S and CP	3.2*	0.00

The table-3 shows the pair wise comparisons on abdominal strength endurance of selected groups.

From the above table significant differences was found between the pairs were INT and INT-Y, INT and INT-S, INT and CP, INT-Y and INT-S, INT-Y and CP, INT-S and CP.

Discussion on Findings

After the completion of the sixteen weeks effects of integrative neuromuscular training combined with yoga and stretching exercises have enhance the capacity of abdominal strength endurance. The integrative neuromuscular training combined with yoga (INT-Y) produced greater improvement on abdominal strength endurance than the other training groups. The control group did not show any significant improvement on criterion variable.

From the statistical end results we can confirm that, 16 weeks of integrative neuromuscular training combined with yoga and stretching exercises significantly enhanced the capacity of abdominal strength endurance in primary school children. The percentage of improvement on abdominal strength endurance of integrative neuromuscular training (INT), integrative neuromuscular training combined with yoga (INT-Y) and integrative neuromuscular training with stretching exercises (INT-S) were 20.45%, 36.75% and 29.42 %respectively. These results indicate that the INT-Y produced greater improvement on abdominal strength endurance than the other trainings. Hence, the integrative neuromuscular training with yoga is suitable for the development of abdominal strength endurance.

The present study findings were in line with certain results of earlier research, while slightly contrasting with other results of relevant studies. The integrative neuromuscular training is a time efficient and cost effective training. It improves the skill and health related fitness in children.[20]Integrative neuromuscular training is an effective and time-efficient addition to PE for enhancing motor skills and promoting physical activity

in children.[21] The implication of plyometric training can improve strength among football players.[22] Plyometric training with resistance training is more beneficial than the resistance training with static stretching for improving upper and lower body strength in boys.[23] There was a significant improvement in health related physical fitness in students with intellectual impairment owing to the jump rope training.[24] The inclusion of rope-jump programs in physical education and sports lesson prospectus and in sports training intervention may give to the growth of children's motor skills and speed up the growth of the children.[25] There was a significant improvement in muscular strength due to the calisthenics, using different progressive variations.[26]. Study findings from effects of strength training on speed leg explosive power and muscular endurance of college men students showed that speed, leg explosive power and muscular endurance were significantly improved due to the influence of strength training.[27] Twelve weeks of low intensity of land and aquatic plyometric training enhanced muscular endurance. Between the trainings the effect was similar on abdominal muscular endurance.[28]

Conclusion

In conclusion, we compared the effects of integrative neuromuscular training combined with yoga and stretching exercises on abdominal strength endurance in primary school children. These training regimens appeared sufficient to enhance the abdominal strength endurance. The greatest improvement was found in integrative neuromuscular training with yoga than the other training groups.

The study protocol is most advantageous for primary school going children in the way to improving the health fitness. At this age, a children well adopted in healthy aspects it lead them to live healthy lifestyle and suitable for sporting performances in future.

Conflict of Interest: Nil

Ethical Clearance: The study protocol was approved by Departmental Research Committee of the Department of Physical Education and Health Sciences, Alagappa University

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