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Impact of isometric strength training on selected physical parameters of school level adolescent basketball players

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Abstract
Purpose: This study was designed to investigate the impact of isometric strength training on selected physical parameters of school level adolescent basketball players.
Experimental design: Thirty adolescent boys aged between 14 to 16 years served as subjects for test validation. The subjects completed field test to determine arm explosive power, leg explosive power and muscular power.
Methods: The subjects was randomly assigned to two equal groups (n=15). Group- I underwent isometric strength training (ISTG) and Group - II was acted as control group (CG). The respective training was given to the experimental group for 3 days per week (Monday, Wednesday and Friday) for the period of eight weeks. The control group was not be given any sort of training except their routine work. The physical parameters were arm explosive power (medicine ball throw), leg explosive power (standing broad jump) and muscular power (sit-ups) were measured before and after training period. The data collected from the subjects was statistically analyzed with't' ratio to find out significant improvement if any at 0.05 level of confidence.
Results: The results of the vertical jump, leg explosive power and muscular power improved significantly due to impact of isometric strength training with the limitations of (diet, climate, life style) status and previous training the result of the present study coincide findings of the investigation done by different experts in the field of sports sciences. Isometric strength training significantly improved vertical jump, leg explosive power and muscular power of school level adolescent basketball players.

Keywords: Isometric strength training, vertical jump, leg explosive power and muscular power

Introduction
Strength Training Strength training requires athletes to use resistances to build strength, muscular endurance, and size. Barbells, resistance bands, machines, and other types of equipment that offer resistance can build strength--even the athlete's own body weight.

Isometric Training
When you push against a closed door, your arm muscles contract but stay the same length. This is called an isometric contraction. Isometric contractions produce static strength. This is the strength you need to push or pull a very heavy object or hold up a heavy load. You need it in sumo wrestling, a rugby scrum, gymnastics and weightlifting. In this contraction tension is developed in the muscle working against resistance, but there is no change in the length of the muscle. The literal meaning of the word isometric is constant length i.e., iso means constant and metric means length. The reason why the muscle does not shorten in this contraction is because the external resistance against which the muscle pulling is much higher than the maximum tension (internal force) the muscle can produce. Isometric training uses isometric contractions to strengthen your muscles. It can help for these sports.
The hypothesis argued in this paper is that school level adolescent basketball players can significantly increase the physical parameters of arm explosive power, leg explosive power and maximum power by combining normal technical and tactical sessions with an isometric strength training over a consecutive 12 weeks period. Therefore, the object of this study was to investigate the changes in the parameters produced during 12 weeks of isometric strength training in 15 inter collegiate football players.

Methods

Experimental Approach to the Problem

In order to address the hypothesis presented herein, we selected 30 school boys ELGI Matriculation Higher Secondary School, Vellalore road, Coimbatore. The subjects were randomly assigned in to two equal groups, namely, isometric strength training (ISTG) group (n=15) and control group (n=15). The respective training was given to the experimental group the 3 days per week (alternate days) for the training period of twelve weeks. The control group was not given any sort of training except their routine.

Design

The evaluated physical parameters were arm explosive power was assessed by medicine ball throw and the unit of measurement was in meters, leg explosive power was assessed by standing broad jump the unit of measurement was in meters, muscular power was assessed by sit-ups the unit of measurement was in count for 30 second. The parameters were measured at baseline and after 8 weeks of isometric strength training were examined.

Training programme

The training programme was lasted for 45 minutes for session in a day, 3 days in a week for a period of 8 weeks duration. These 45 minutes included 10 minutes warm up, 25 minutes isometric strength training and 10 minutes warm down. Every three weeks of training 5% of intensity of load was increased from 65% to 80% of work load. The volume of isometric strength training is prescribed based on the number of sets and repetitions. The equivalent in isometric strength training is the length of the time each action in total 3 day per weeks (Monday, Wednesday and Friday).

Statistical Analysis

The collected data before and after training period of 8 weeks on the above said variables due to the influence of isometric strength training was statistically analyzed with‘t’ test to find out the significant improvement between pre and post test. In all cases the criterion for statistical significance was set at 0.05 level of confidence. (P<0.05)

Table 1: Computation of ‘T’ Ratio on Physical Parameters of School Level Adolescent Basketball Players on Experimental Group and Control Group (Scores in numbers)

Group	Variables		Mean	N	Std. Deviation	Std. Error Mean	T ratio
Experimental Group	AEP	Pre test	4.75	15	1.25	0.007	5.81*
		Post test	4.81	15	1.25		
	LEP	Pre test	1.83	15	0.13	0.19	4.52*
		Post test	1.86	15	0.24		
	MP	Pre test	2.68	15	0.11	0.002	4.93*
		Post test	2.71	15	0.11		
Control group	AEP	Pre test	4.70	15	0.98	0.44	1.21
		Post test	4.66	15	0.89		
	LEP	Pre test	1.85	15	0.94	0.15	1.40
		Post test	1.83	15	0.15		
	MP	Pre test	2.55	15	0.22	0.09	1.61
		Post test	2.51	15	0.30		

*significant level 0.05 level degree of freedom (2.14, 1 and 14)

Table I reveals the computation of mean, standard deviation and ‘t’ ratio on selected strength parameters namely arm explosive power, leg explosive power, and muscular power of experimental group. The obtained‘t’ ratio on arm explosive power, leg explosive power, and muscular power were 5.81, 4.52 and 4.93 respectively. The required table value was 2.14 for the degrees of freedom 1and 14 at the 0.05 level of significance. Since the obtained‘t’ values were greater than the table value it was found to be statistically significant.

Further the table reveals the computation of mean, standard deviation and‘t’ ratio on selected strength parameters namely arm explosive power, leg explosive power, and muscular strength of control group. The obtained‘t’ ratio on arm explosive power, leg explosive power, and muscular power were 1.21, 1.40 and 1.61 respectively. The required table value was 2.14 for the degrees of freedom 1and 14 at the 0.05 level of significance. Since the obtained‘t’ values were greater than the table value it was found to be statistically not significant.

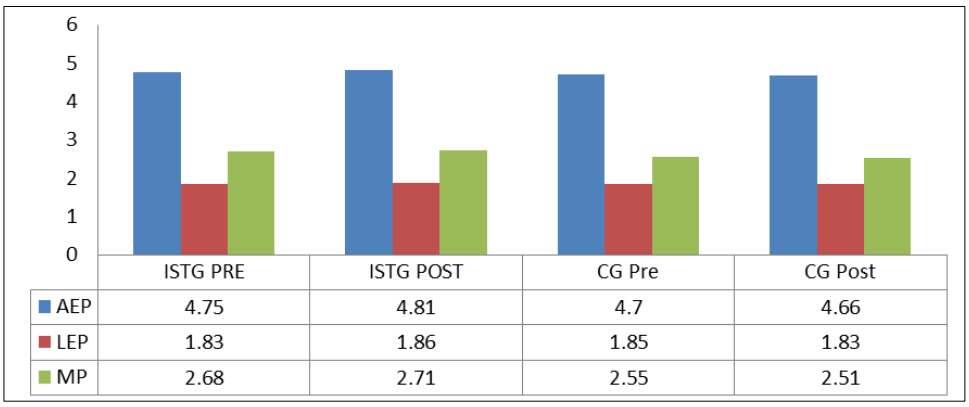

Fig 1: Bar diagram showing the mean value on physical parameters of school level adolescent basketball players on experimental and control group (Scores in numbers)

Discussion and Findings

The present study experimented the effect of isometric strength training on physical variables of school level adolescent basketball players. The result of this study indicated that the isometric strength training improves the physical parameters such as arm explosive power, leg explosive power and muscular power. The findings of the present study had similarity with the findings of the investigations referred in this study. Hall *et al.,* (1980) the muscle strengthening occurs in all joint ranges achieved during the exercise and results in a functionally more efficient muscle joint complex. Folland *et al.,* (2005) isometric strength increases were significantly greater for isometrically trained basketball player. Ylinen *et al.,* (1994) there is significant improvement in arms shoulder and neck muscle due to isometric strength training. Kumar *et al.,* (2013) the results of the study stated that the abdominal strength training had significantly improved the strength endurance and explosive power of women players. Hakkukinen *et al.,* (1985) the effect of explosive type strength training on isometric force- and relaxation-time, electromyography and muscle fibre characteristics of leg extensor muscles. kallinen *et al.,* (1996) the effects of 12 weeks of progressive resistance strength training on the isometric strength, explosive power, and selected functional abilities of healthy women aged 75 and over.

The results of the present study indicates that the isometric strength training is effective method to improve arm explosive power, leg explosive power and muscular power of school level adolescent basketball players. The discrepancy between the results and the results of previous studies might be attributed to several reasons, such as the training experience level of the subjects, the training programme, the intensity used and the duration of the training programme.

Conclusions

1. It was concluded that eight weeks of isometric strength training produced significant improvement in arm explosive power, leg explosive power and muscular power of school level adolescent basketball players.
2. Eight weeks of isometric strength training produced significant improvement in arm explosive power, leg explosive power and muscular power of school level adolescent basketball players.

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