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Original Research Article

Effects of Circuit Training and Circuit Weight Training on Muscular Strength Endurance

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Abstract

The Purpose of the present study was to find out the effects of circuit training and circuit weight training on Muscular strength endurance. To achieve this purpose, thirty men kabaddi players from Alagappa University College of physical education, karaikudi, were randomly selected as subjects. The age of the subjects ranged between 21 to 28 years. The selected subjects were divided into three groups of ten subjects each. The experimental group – 1(n=10 CT) underwent circuit training, the experimental group – 2 (n = 10 CWT) underwent circuit weight training and control group-3 (n= 10, CG) did not participate in any special training programme apart from their regular activities. The data was collected at prior to and after the training programme of nine weeks. Muscular strength endurance was chosen as a criterion variable. The analysis of co variance (ANCOVA) was used to analyze the data. The results of the study showed that the Muscular strength endurance was significantly improved due to the circuit and circuit weight training.

Keywords: 1. Circuit Training, 2. Circuit Weight Training, 3. Muscular strength endurance, 4. Bent knee sit ups test, 5. ANCOVA.

INTRODUCTION

Physical training entails exposing the organism to a training load or work stress of sufficient intensity, duration and frequency to produce a noticeable or measurable training effect, that is, to improve the functions for which one is training. Although toddler and young children nearly always seem to be rushing about, it does not take long for them to develop the habit of slumping in front of the television as soon as they get home from school. In addition, many schools are now devoting less time to sports due to lack of staff with proper physical education training, especially in primary schools. In some schools, there has been a tendency to concentrate on the minority who are good at sport, while neglecting the rest (Maniazhagu and Malar 2021). In other schools, there have been moves to reduce the amount of competitive sport; because some educationalists believe that children who constantly lose may suffer long term psychological harm. The increased levels of violence in society have also led to many children not being allowed to play unsupervised in urban areas. The combined effect of all these various factors is that today's youngsters are involved in less day-to-day physical activity than previous generations (Maniazhagu, Soniya James and Malar 2017). The in active life style of many of today's children is likely may suffer as a result. All children should take regular exercise because of it reduces their risk of developing heart disease in later life.

Activity produces many other benefits too. Fit children have strong muscles, which are very important for good posture and stable joints; they have better balance, coordination, flexibility, and excel in skill related fitness components; and they are less likely to fracture bones, as exercise increases bone density. Apart from the obvious physical benefits, regular exercise produces many more subtle skills. Children who take part in physical activities learn how to interact and cooperate with other children. They also develop their own self –esteem by creating a strong sense of purpose and self – fulfillment. Their initial circuit training routine consisted of several stations arranged in

a circle so as to work muscle groups alternately from station to station. As circuit training grew in popularity, other authors began to provide additional information (Maniazhagu, and Sudha, 2020). conditioning or resistance training. It is easy to follow and targets strength building as well as muscular endurance. In this study an attempt is made to find out the effects of circuit training and circuit weight training on Muscular strength endurance of male kabaddi players.

METHODOLOGY

During the training period, the experimental groups underwent their respective training programme, three days per week for nine weeks. Each day the training schedule was conducted only in the morning session that lasted for 90 minutes. Prior and after every training session subjects of experimental groups had fifteen minutes of warm-up and fifteen minutes of warm down exercises involving jogging, mobility and stretching exercises. Muscular strength endurance measured by Bent knee sit ups test and unit of measurement was scores in numbers. The detailed training programme as follows.

TRAINING SCHEDULE – EXPERIMENTAL GROUP I (CT) CIRCUIT TRAINING

Exercise	Intensity	Repetition	Set	Recovery In-between Sets
1-3 WEEKS				
Half squats	30 sec	3	1	3 min
Push- ups	30 sec	3	1	3 min
Bent – knee sit –ups	30 sec	3	1	3 min
Two-legged low hops on spot	30 sec	3	1	3 min
Back extensions	30 sec	3	1	3 min
Pull- ups	30 sec	3	1	3 min
Burpees	30 sec	3	1	3 min
Skipping	30 sec	3	1	3 min
4-6 WEEKS				
Half squats	45 sec	3	1	3 min
Push- ups	45 sec	3	1	3 min
Bent – knee sit –ups	45 sec	3	1	3 min
Two-legged low hops on spot	45 sec	3	1	3 min
Back extensions	45 sec	3	1	3 min
Pull- ups	45 sec	3	1	3 min
Burpees	45 sec	3	1	3 min
Skipping	45 sec	3	1	3 min
7-9 WEEKS				
Half squats	60 sec	3	1	3 min
Push- ups	60 sec	3	1	3 min
Bent – knee sit –ups	60 sec	3	1	3 min
Two-legged low hops on spot	60 sec	3	1	3 min
Back extensions	60 sec	3	1	3 min
Pull- ups	60 sec	3	1	3 min
Burpees	60 sec	3	1	3 min
Skipping	60 sec	3	1	3 min

TRAINING SCHEDULE – EXPERIMENTAL GROUP II (CWT) CIRCUIT WEIGHT TRAINING

Exercise	Intensity	Repetition	Set	Recovery In-between Sets
1-3 WEEKS				
Bench press	45%	8	3	5 min
Bent-knee curl-up	45%	8	3	5 min
Leg extension	45%	8	3	5 min
Lateral pull- down	45%	8	3	5 min
Back hypertension	45%	8	3	5 min
Standing press	45%	8	3	5 min
Arm curl	45%	8	3	5 min
Toe raise	45%	8	3	5 min
4-6 WEEKS				
Bench press	50%	8	2	5 min

Bent-knee curl-up	50%	8	2	5 min
Leg extension	50%	8	2	5 min
Lateral pull- down	50%	8	2	5 min
Back hypertension	50%	8	2	5 min
Standing press	50%	8	2	5 min
Arm curl	50%	8	2	5 min
Toe raise	50%	8	2	5 min
7-9 WEEKS				
Bench press	55%	8	1	5 min
Bent-knee curl-up	55%	8	1	5 min
Leg extension	55%	8	1	5 min
Lateral pull- down	55%	8	1	5 min
Back hypertension	55%	8	1	5 min
Standing press	55%	8	1	5 min
Arm curl	55%	8	1	5 min
Toe raise	55%	8	1	5 min

Intensity fixed with (1-RM)

TABLE – A: ANALYSIS OF COVARIANCE OF PRE-TEST POST TEST AND ADJUSTED POST TEST ON MUSCULAR STRENGTH ENDURANCE OF DIFFERENT GROUPS (Scores in numbers)

10	EXP G-I	EXP G-2	CG	SV	SS	df	MS	F Value
Pretest								
Mean	19.10	19.70	19.80	Between	2.87	2	1.43	0.40
S.D.	2.08	2.11	1.40	Within	96.60	27	3.58	
Post test								
Mean	21.10	22.90	19.90	Between	45.60	2	22.80	8.96*
S.D.	1.40	1.79	1.19	Within	68.70	27	2.54	
Adj-Post test								
Mean	21.34	22.81	19.76	Between	46.63	2	23.31	15.05*
				Within	40.28	26	1.55	

* Significant at .05 level of confidence. G-Group, SV-Source variances-Sum of squared-degrees of freedom, MS-Means square (The table values required for significance at .05 level of confidence for 2 and 27 and 2 and 26 are 3.35 and 3.37 respectively).

Table (A) shows the analyzed data on muscular strength endurance. The pre-test means of muscular strength endurance were 19.10 for experimental group I, 19.70 for experimental group II and 19.80 for control group. The obtained "F" ratio of 0.40 was lesser than the table F-ratio 3.35.Hence the pre-test was not significant at 0.05 level of confidence for the degrees of freedom 2 and 27.The post-test means of muscular strength endurance were 21.10 for experimental group I, 22.90 for experimental group II and 19.90 for control group. The obtained "F" ratio of 8.96 was higher than the table F-ratio 3.35. Hence the post-test was significant at 0.05 level of confidence for the degrees of freedom 2 and 27. The adjusted post-test means of muscular strength endurance were 21.34 for experimental group I, 22.81 for and experimental group II and 19.76 for control group. The obtained "F" ratio of 15.05 was higher than the table F-ratio 3.37. Hence the adjusted post-test was significant at 0.05 level of confidence for the degrees of freedom 2 and 26.Since, three groups were compared, and whenever they obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table (B).

Table - (B): Scheffe's Post Hoc Test Mean Differences on Muscular Strength Endurance among Three Groups (Scores in numbers)

Experimental Group I	Experimental Group II	Control Group	Mean Differences	Confidence Interval Value
21.34	22.81	-	1.47*	1.44
21.34	-	19.76	1.58*	1.44
-	22.81	19.76	3.05*	1.44

* Significant at .05 level of confidence.

Table - (B) shows the scheffe's post-hoc test results. The ordered adjusted final mean difference for muscular strength endurance of experimental groups I, II and control group were tested for significance at 0.05 level of confidence against confidential interval value. The mean differences between experimental group I and experimental group II, experimental group I and control group and experimental group II and control group were 1.47, 1.58 and 3.05 respectively and it was seen to be greater than the confidential interval value of 1.44. Hence all the comparisons were significant.

DISCUSSION ON FINDINGS

The major findings of earlier studies were given briefly here for comparison with the present findings.

Moran, Blagrove, Drury, Fernandes, Paxton, Chaabene, Ramirez-Campillo (2019) nvestigated a study on effects of small-sided games vs. conventional endurance training on endurance performance in male youth soccer players: a meta-Analytical Comparison. Small-sided games are as effective as conventional endurance training for increasing aerobic endurance performance in male youth soccer players. Buchheit M *et al.*, (2008) investigated a study on cardio respiratory responses during running and sport-specific exercises in handball players. They found that cardio respiratory responses during small handball games are inversely related to fitness level, coaches are invited to add specific rules to increase the activity of the fittest players. (Hemambara Reddy, D Maniazhagu, 2015) D. Maniazhagu (2019) found that the low and moderate intensities of aquatic plyometric training combined with yogic practices have improved the anaerobic capacity of junior athletes. James Zachariah, D Maniazhagu (2014) conducted a study on comparative effects of different sprint training on anaerobic power. They found that the acceleration sprinting influenced to a great extent on anaerobic power performance. Sridhar, Maniazhagu and Revathi, (2011) found that agility is the key components of the performance of sprint, middle and long distance performance. Study findings from effects of asana practices and stretching exercises combined with neuromuscular drills on cardio respiratory endurance of school girls revealed that the capacity of cardio respiratory endurance was better in asana practices combined with neuromuscular drills. (Maniazhagu, Soniya James, Malar, 2018) Susana *et al.*, (2018) examined a study on Short-Term Recreational Team Handball-Based Programme on Physical Fitness and Cardiovascular and Metabolic Health of 33-55-Year-Old Men. They found that Recreational team handball practice shows positive physical fitness and health-related adaptations, with high attendance, which may contribute to the reduction of the risk of developing lifestyle diseases. In another research findings individual and combined interventions of Tai Chi pilates and yogic practices on cardio respiratory endurance of B.Ed trainees showed that the above training produced significant improvement on cardio respiratory endurance. (S Leo Stanly, Maniazhagu Dharuman, 2020).In another study findings shows that handball coaching program had significant improvement than control group in selected Physical Fitness and Skills performance variables (T. Madhankumar and Mebaratu, 2016) A study findings showed that the circuit resistance training have imporved motor fitness variables in men foot ball players. (V Senthil Kumar and D Maniazhagu, 2014) Study results of effects of integrative neuromuscular training on fitness performance in children indicate that integrative neuromuscular training is an effective and time-efficient addition to PE as evidenced by improvements in health- and skill-related fitness measures in children. Schmidt W, Anderson K, Graff M, Strutz V. (2015), they found that the high intensity circuit training may improve muscle endurance in moderately fit populations. Slight improvements that are gender specific may also be observed in muscle strength as well as aerobic fitness. Atul Meethal* and Dr. A. M. Najeeb (2013) their study proved that the mud circuit training group had improved the speed, agility, leg explosive power, pulse rate, blood pressure, and aerobic capacity to a greater degree than concrete circuit training group. Taşkin, Halil (2009) conducted a study on effect of circuit training on the sprint-agility and anaerobic endurance. Their study shows that the circuit training, which is designed to be performed 3 days a week during 10 weeks of training, improves sprint-agility and anaerobic endurance. Physical activities are systematic, planed rhythmic bodily movements aimed to improve physical fitness. (S. Malar, D. Maniazhagu, 2019) Plyometric exercises consist of speedy prevailing movements that involve counter movements or pre stretch. It also called stretch shortening cycle.

CONCLUSIONS

There was a significant differences were found between the experimental groups and control group. Due to both the training have improved the muscular strength endurance performance, However higher development focused on circuit weight training than circuit training and control group. The lesser developmence showed in circuit training. No development was found in control group.

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