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Influence of the combination of aerobic training with explosive strength training and resistance training on muscular strength endurance of college level female football players

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Abstract

The purpose of this study was to examine the effect of twelve weeks of combined aerobic with explosive strength training and aerobic with resistance training in enhancing the muscular strength endurance of female football players. To achieve the purpose of the study sixty female football players from various colleges affiliated to Calicut University, Kerala Sate, were selected as subjects and their age ranged from 18 to 22 years. The selected subjects were randomly assigned to either combined aerobic with explosive strength training (n=20), combined aerobic with resistance training (n=20), or control (n=20) groups. The training regimen lasted for twelve weeks. The selected dependent variables were assessed using standard tests and procedures, before and after the training regimen. Analysis of covariance was used to determine the significant difference existing between pretest and posttest on selected dependent variables. The results suggest that both the combined aerobic with explosive strength training and combined aerobic with resistance training are significantly improved the muscular strength endurance of female football players. However, no significant differences were found between them in improving muscular strength endurance.

Keywords: Combined aerobic with explosive strength training and aerobic with resistance training, muscular strength endurance, female football players

Introduction

Trainers and coaches from all over world seem to have varying opinions on the topic of conditioning for soccer. Many believe that continuous running is the death to the speed of a soccer athlete. Others believe that it is best to do continuous running for soccer. While many others might think it appropriate to do shuttle running. Soccer is an intermittent sport consisting of sprints followed by periods of walking or jogging. It applies to movement, muscles and energy systems. This means that if we do 3 mile continuous runs, which focus on the aerobic part of the equation, we are missing a couple key components, movement and muscles specific soccer.

Sports specific aerobic training are very popular in as that of social and rugby, where players use smaller play area and less number of participants during games. Each player comes into contact with the ball and deals with common game situation more often (Capranica, 2001) [4]. These situations require good technical skills such as passing, dribbling, feinting, and shooting as well as tactical skills such as running without the ball, unmarking and cooperation with other players. Prestwick improvement of on court fitness and skill is the advantage of sports specific aerobic training that might ensure the players to perform optimally during a game (Carmeli *et al.*, 2002) [5].

Strength endurance is one of the most important components in bio-motor fitness and a vital necessity for football players. Resistance training as an exercise programme where free or stationary weights are used for the purpose of increasing muscular strength, muscular endurance and power, through which skills can be improved (Moran & Mchlynn, 1996) [9]. When properly performed, resistance training can provide significant functional benefits and improvement in overall health and well-being, including increased bone, muscle, tendon and

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ligament strength and toughness, improved joint function, reduced potential for injury, increased bone density, a temporary increase in metabolism, improved cardiac function, and elevated HDL (good) cholesterol.

Building strong leg, arm and abdominal muscles along with other muscle groups will assist in the execution of sports fundamentals and the enjoyment of the game. All strength training involves the microscopic tearing of the muscle fibers by exceeding their capacity to move a weight or resist a force. As the body rebuilds the fibers, strength increases. Strong leg and arm muscles will increase a player's ability to maintain balance on their skates and increase the force exerted while skating. Strength is also useful in the games when they are pushing an opposing player in order to get the tackle.

Athletes from a wide range of sports use plyometric training to help them reach peak physical condition. Used correctly, it can be a highly effective form of power training, especially when combined with a suitable strength training program. Plyometric refers to exercise that enables a muscle to reach maximum force in the shortest possible time (Baechle, 1994) [2]. Plyometric drills can be used to convert an athlete's maximal strength training into sport-specific power helping to further improve performance. To know the efficacy of combined aerobic with explosive strength training and aerobic with resistance training and its significant contribution to football players level of fitness, it was decided to take up this study.

Methodology

Subjects and Variables

For the purpose of this study, sixty female football players from various colleges affiliated to Calicut University, Kerala Sate, India were recruited as subjects with their consent and their age ranged from 18 to 22 years. The selected subjects were randomly assigned to combined aerobic with explosive strength training, aerobic with resistance training and control groups of 20 each. The selected dependent variable muscular strength endurance was assessed by sit and reach test, before and after the training regimen.

Training Protocol

Before starting the training programme, first few weeks were given priority for improving the general fitness qualities of the participants. The duration of the study was restricted to 12 weeks and the number of sessions per week was confined as six. The subject performed combination of aerobic with explosive strength training and aerobic with resistance training in alternative days with moderate intensity. All the

participants were from the various colleges affiliated to Calicut University and they were female football players. The intensity of the training was fixed according to the consideration of the heart rate of the individuals. Two training groups were engaged in the practice of different combination of aerobics with explosive training and aerobics with resistance training with moderate intensity. The participants were continued their practice for forty minutes duration and they were gone for walking in between the rest period for relaxation. The intensities and the load of the training were increased, according to the adaptation conditions of the subjects. After each three weeks the intensity of the experimental groups were increased.

The general warming up was given to all the training groups in a similar way. The stretching exercise and the dynamic movements were involved in the warming up activities. The ultimate aims of these skills were increased the core temperature of the body and prepare the subjects for further activities as well as lead to reduce the chance of injuries. All the participants were strictly involved in cooling down process and it was extended up to ten to fifteen minutes duration. The total training was concluded with a five minutes 'Shavasana' programme as a part of the whole body relaxes.

Experimental Design and Statistical Procedure

The experimental design used for the study was random group design involving sixty subjects, who were divided at random into three groups such as combination of aerobics with explosive training and aerobics with resistance training groups and control group of twenty each. The data collected from the three groups prior to and after experimentation on muscular strength endurance was statistically examined for significant differences, if any, by applying the analysis of covariance (ANCOVA) with the help of SPSS package. Since three groups were involved, whenever the obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In determining the significance of 'F' ratio the confidence interval was fixed at 0.05 level. In determining the significance of 'F' ratio the confidence interval was fixed at 0.05 level.

Results

The data were collected before beginning the training as well as after the completion of the training for the aerobics with explosive strength training and aerobic with resistance training groups and the control group were analyzed by ANCOVA and the obtained results are presented in table-1.

Table 1: ANCOVA on Strength Endurance of Experimental and Control Groups

Test		ESTG	RTG	CG	SoV	SS	df	MS	F ratio
Pre-test	Mean	32.60	32.9	32.30	B	3.03	2	1.51	0.30
	SD	1.9	1.53	3.04	W	287.55	57	5.04	
Post test	Mean	35.60	35.80	32.80	B	112.53	2	56.3	10.11*
	SD	1.9	1.54	3.3	W	317.20	57	5.4	
Adjusted Post test	Mean	35.60	35.54	33.07	B	81.81	2	40.90	50.10*
					W	45.71	56	0.816	

*Significant at 0.05 level of confidence

It is clear from the table-1 that, the pre test mean for the combination of aerobics with explosive strength training and resistance training groups and the control group are 32.60, 32.9 and 32.30. The obtained 'F' value of 0.30 which is lower than the table value of 3.18 for the df 2 and 57. Hence, there was no significant difference among the groups during pre

test period on muscular strength endurance.

The post test mean for the combination of aerobics with explosive strength training and resistance training groups and the control group are 35.60, 35.80 and 32.80. The obtained 'F' value 10.11 which is higher than the table value of 3.18 for the df 2 and 57. The adjusted post test 'F' value of 50.10 also

higher than the table value of 3.19 for 2 and 56. Hence the result of the study highlights that there was a significant difference on muscular strength endurance among the selected

groups. Further, to find out the paired mean differences Scheffe's test was applied as a statistical tool for post hoc test.

Table 2: Scheffe's Test for Paired Mean Differences on Muscular Strength Endurance

Combination of Aerobics with Explosive Strength Training Group	Combination of Aerobics with Resistance Training Group	Control Group	Mean Differences	Confidence Interval
35.6	35.54		0.06	0.70
35.6		33.07	2.53*	0.70
	35.54	33.07	2.47*	0.70

*Significant at 0.05 level of confidence

It is clear from the table-2. That, the mean differences of explosive strength training group and control group was 2.53 which was higher than the CI of 0.70. So there was a significant difference between explosive strength training group and control group on muscular strength endurance. The mean differences of resistance training group and control group was 2.47 which was higher than the CI of 0.70. So there was a significant difference between resistance training and control group on strength endurance. And also the mean differences of explosive strength training group and resistance training group are 0.06 which was lower than the CI of 0.70. So there was no significant difference between explosive strength and resistance training group on strength endurance at 0.05 level of confidence.

It was concluding from the result of the study that both the combined aerobic with explosive strength training and combined aerobic with resistance training are significantly improved the muscular strength endurance of female football players. However, no significant differences were found between them in improving muscular strength endurance. The mean values of pre, post and the adjusted post test are graphically represented in figure- 1.

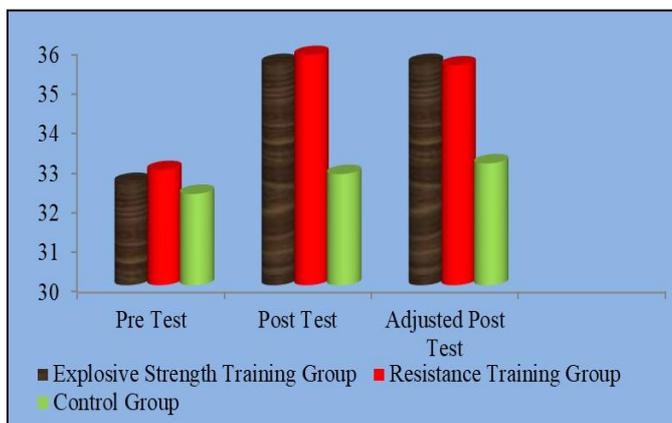


Fig 1: Mean Values of Experimental and Control Groups on Muscular Strength Endurance

Discussions

Previous studies have reported the beneficial effects of combined aerobic with explosive strength training and combined aerobic with resistance training on strength endurance. The results of the present study are also in line with the observation by Mazzetti *et al.*, (2000) [8] that the changes in maximal strength, power and muscular endurance after 12 weeks of periodized resistance training and found greater strength gain. Other studies demonstrate an enhancement of motor performance associated with plyometric training combined with weight training or the superiority of plyometrics, compared to other methods of training (Adams *et al.*, 1992) [1].

A wide variety of training studies shows that plyometric can improve muscular strength. It appears also that a relatively small amount of plyometric training is required to improve performance in these tasks. Just one or two types of plyometric exercise completed 1-3 times a week for 6-12 weeks can significantly improve motor performance (Blackey, Gehri, *et al.*, 1998; Matavulj, *et al.*, 2001) [6, 7]. Plyometric exercises can be used to develop power in any sport that involves sprinting, jumping, quick changes of direction and kicking etc. They are most effective when completed in conjunction with a suitable strength and aerobic training program.

Conclusions

The result of this study demonstrated that, combined aerobic with explosive strength training and combined aerobic with resistance training has significant impact on muscular strength endurance of female football players. However, no significant differences were found between them in improving muscular strength endurance. Hence, it is suggested that physical fitness components are very important for higher performance in football game, depending upon the demand of the game each factor of physical fitness should be optimally developed. It is also suggested that combined training should be given due importance when designing training programme for the football players.

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