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Mary Varghese Kundukulam

Ph. D Research Scholars,
Dept. of Physical Education,
Annamalai University,
Tamil Nadu, India

Dr. R Muthueleckuvan

Assistant Professor, Dept. of
Physical Education, Annamalai
University, Tamil Nadu, India

Efficacy of the combination of aerobic training with explosive strength training and resistance training on cardio respiratory endurance of female football players

Mary Varghese Kundukulam and Dr. R Muthueleckuvan

Abstract

The intention of this study was to investigate the effect of twelve weeks of combined aerobic with explosive strength training and aerobic with resistance training on cardio respiratory 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 cardio respiratory endurance of female football players. However, combined aerobic with resistance training was found better than combined aerobic with explosive strength training in improving cardio respiratory endurance.

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

Introduction

Football is one of those sports that require the athlete to be fit in all areas. Strength, speed, agility and stamina are all qualities and abilities that a football player must possess. As such, football training drills are designed to get the football player in optimal shape. By using the principles of training as a framework we can plan a personal training programme that uses scientific principles to improve performance, skill, game ability and physical fitness. A successful training programme will meet individual needs which are personal fitness needs based on age, gender, fitness level and the sport for which we are training. A successful training programme will also include exercise in the correct heart-rate target zone. The key principles when planning a programme are specificity, overload, progression and reversibility. Muscular power and muscular strength are two different things. Muscular strength refers to how much force can be applied. Strength alone is not indicative of speed. Although muscle strength is correlated to sprint performance, research has shown that combining both resistance training and plyometric training will have better effects on training. While plyometric assists in rapid force development (power), weight training assists in maximal force output (strength). Power refers to the combined factors of speed and strength. Performance in many sports is based on different types of power.

In American Football, a lineman and a receiver may have the same power, but they have different limitations in how their power is delivered. The lineman would be speed-limited, whereas the receiver would be strength-limited. The purpose of plyometric is to emphasize speed-based power. One activity that requires speed-favoured power is high jumping: ultimately, jump height is determined by how fast one is moving once one's legs have left the ground. Good jumpers may not have exceptional leg strength, but they can produce it at exceptional speeds.

Correspondence

Mary Varghese Kundukulam

Ph. D Research Scholars,
Dept. of Physical Education,
Annamalai University,
Tamil Nadu, India

Working on strength and endurance at the same time, whether be in the same session, alternative days, alternative sessions, etc. Countless numbers of recreational workout enthusiasts complete their strength and endurance training workouts during the same training session, or within hours of one another. Many people, athletes and non-athletes, take part in a combination of resistance and endurance training. These people are expecting to experience the benefits that these two different types of training have to offer. A number of studies have shown that performing these two types of training simultaneously can be detrimental to the gains that might be made in performing one type of training alone (Bell *et al.*, 2000) [1].

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 cardio respiratory endurance was assessed by Cooper’s 9 minutes run/walk test, before and after the training regimen.

Training Protocol

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.

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 cardio respiratory 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-I.

Table 1: ANCOVA on Cardio Respiratory Endurance of Experimental and Control Groups

Test		ESTG	RTG	CG	SoV	SS	df	MS	F ratio
Pre-test	Mean	1757.5	1745.5	1767.0	B	4643.33	2	2321.67	0.89
	SD	46.67	39.53	63.83	W	148490.0	57	2605.09	
Post test	Mean	1922.5	1946.5	1762.5	B	74880.0	2	37440.0	13.30*
	SD	45.64	40.04	68.97	W	160405.0	57	2814.12	
Adjusted Post test	Mean	1922.0	1956.0	1754.0	B	105958.5	2	52979.2	60.00*
					W	49446.08	56	882.97	

*Significant at 0.05 level of confidence

It is clear from the table-I that, the pre test mean for the combination of aerobics with explosive strength training and resistance training groups and the control group are 1757.50, 1745.5 and 1767.0. The obtained 'F' value of 0.89 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 cardio respiratory endurance.

The post test mean for the combination of aerobics with explosive strength training and resistance training groups and

the control group are 1922.5, 1946.5 and 1762.5. The obtained 'F' value 13.30 which is higher than the table value of 3.18 for the df 2 and 57. The adjusted post test 'F' value of 60.00 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 cardio respiratory endurance among the selected groups. Further, to find out the paired mean differences Scheffe’s test was applied as post hoc test.

Table 2: Scheffe’s Test for Paired Mean Differences on Cardio Respiratory Endurance

Combination of Aerobics with Explosive Strength Training Group	Combination of Aerobics with Resistance Training Group	Control Group	Mean Differences	Confidence Interval
1922.0	1956.0		34.0*	23.62
1922.0		1754.0	168.0*	23.62
	1956.0	1754.0	202.0*	23.62

*Significant at 0.05 level of confidence

It is clear from the table-II that, the mean differences of explosive strength training group and control group was 34.0 which was higher than the CI of 23.62. So there was a significant difference between explosive strength training group and control group on cardio respiratory endurance. The mean differences of resistance training group and control group was 168.0 which was higher than the CI of 23.62. So there was a significant difference between resistance training and control group on cardio respiratory endurance. And also the mean differences of explosive strength training group and resistance training group are 202.0 which was greater than the CI of 23.62. So there was significant difference between

explosive strength and resistance training group on cardio respiratory 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 cardio respiratory endurance of female football players. However, combined aerobic with resistance training was found better than combined aerobic with explosive strength training in improving cardio respiratory endurance.

The mean values of pre, post and the adjusted post test are graphically represented in figure- I.

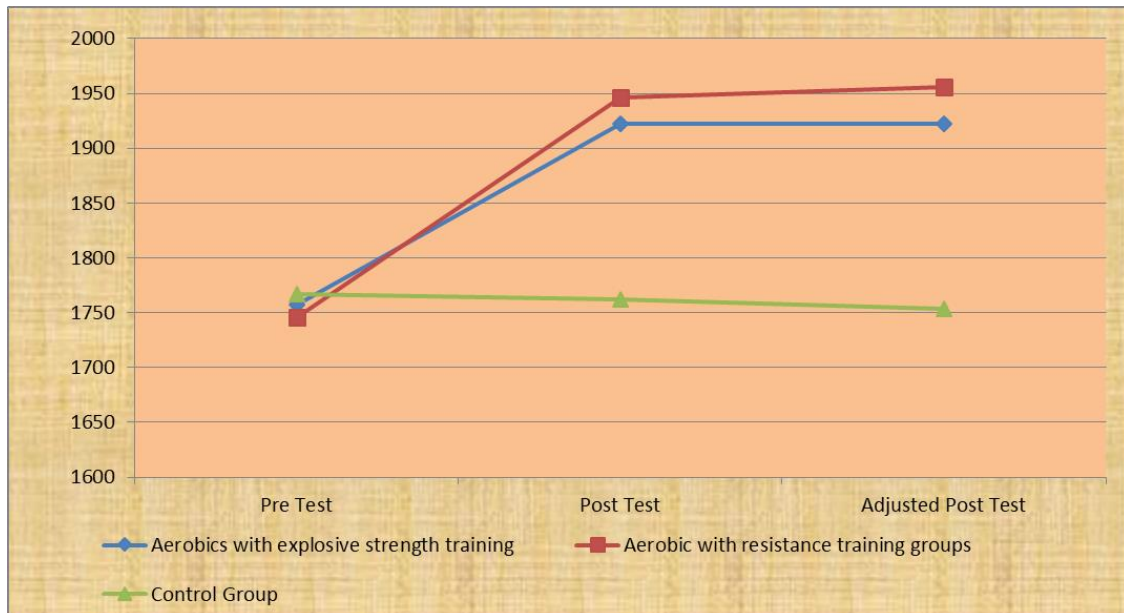


Fig 1: Mean Values of Experimental and Control Groups on Cardio Respiratory Endurance

Discussions

Previous studies have reported the beneficial effects of combined aerobic with explosive strength training and combined aerobic with resistance training on cardio respiratory endurance. Combined training is more effective in improving body composition, strength, and some indicators of cardiovascular fitness (Marzolini, Oh & Brooks, 2012) [4]. Combination exercise gave greater benefits for weight loss, fat loss and cardio-respiratory fitness than aerobic and resistance training modalities (Ho, Dhaliwal, Hills & Pal, 2012) [3]. Concurrent training improves endurance performance, both with trained cyclists (Paton & Hopkins, 2005) [7] and other trained athletes (Millet *et al.*, 2002; Paavolainen *et al.*, 1999) [5, 6].

It has been well documented by Senthil *et al.*, (2011) [8] that the effects of concurrent strength and endurance training significantly improved the Cardio-respiratory endurance. Circuit training immediately after individualized endurance training in the same session (endurance + strength) produced greater improvement in the 4 km time trial and aerobic capacity than the opposite order or each of the training programmes performed separately (Chtara *et al.*, 2005) [1].

Conclusions

The result of this study demonstrated that, combined aerobic with explosive strength training and combined aerobic with resistance training has significant impact on cardio respiratory endurance of female football players. However, combined aerobic with resistance training was found better than combined aerobic with explosive strength training in

improving cardio respiratory endurance. Hence, it is suggested that the combination of training could be used for an overall development of the physical capacities of the football players.

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