IMPACT OF RESISTANCE AND COMPLEX TRAINING ON ANAEROBIC POWER AND LUNG CAPACITY AMONG WOMEN KABADDI PLAYERS

Mrs. C. Dhanalakshmi, Ph.D Research Scholar, Department of Physical Education, Tamil Nadu Physical Education and Sports University Chennai, TN, India.

Dr. P. K. Senthilkumar, Associate Professor, Department of Exercise Physiology and Biomechanics, Tamil Nadu Physical Education and Sports University Chennai, TN, India.

ABSTRACT

The purpose of the study was to find out the impact of resistance and complex training on anaerobic power and lung capacity among women kabaddi players. To achieve the purpose of the study, forty five women kabaddi players were selected from Queen Mary's College Chennai. The subject's age ranged between 18-23 years. The selected subjects were divided into three equal groups of fifteen each. Experimental Group – I (n = 15) underwent Resistance Training (RT), Experimental Group – II (n = 15) underwent Complex Training (CT) and Group– III (n = 15) acted as control. The collected data from the three groups prior and post experimentation on anaerobic power and lung capacity were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). 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. The result of the study revealed that twelve weeks of resistance and complex training had a significant impact in terms of improvement on anaerobic power and lung capacity of women kabaddi players. It was concluded that from the results of the study both resistance and complex training is essential for the development of functional ability of cardiorespiratory and muscular system. Further, it improves the anaerobic power and lung capacity of women kabaddi players.

Key words: Resistance, complex training, anaerobic power and lung capacity.

INTRODUCTION

Regular resistance training or Strength training has become established as a key component of physical preparation for the majority of sports. For the majority of sports it is suggested that athletes require optimal levels of strength as opposed to maximal levels of strength in order to successfully compete in their sport (Murray and Brown, 2006). It is therefore important to recognize that 'optimal strength' may be a more important training goal than maximal strength.

A resistance training program can affect almost every system in the body and is used in a wide variety of populations. The benefits of resistance training are numerous and include increases in strength, muscle mass, and bone density. Common program goals in resistance training are related to improvements in function, such as increased muscular strength, power, and local muscular endurance, or decreased body fat. Other functional gains such as increased coordination, agility, balance, and speed are also commongoals of a program. Other goals may relate to physiological changes related to increased body mass through muscle hypertrophy, improved blood pressure, decreased body fat, and increased metabolic rate for caloric expenditure (Barbara Bushman and Rebecca Battista (2014).

Regular resistance training offers many benefits; here some of the benefits are brought for the related to the study. Strength training increases bone density and reduces the risk of osteoporosis. It help us to control our body weight at the same time we can gain the muscles power, when gaining muscles power our body muscles efficiently burns more calories. Strength training builds the muscles it protects the body joints from injury. Strength training boosts our stamina when we grow stronger and we won't fatigue as easily. It helps us to maintain our flexibility and balance and helps us remain independent as in our aged stage. It can also boost our self-confidence, improve the body image and reduce the risk of depression. People who regularly take part in strength training they will

get better night's sleep. It can reduce the sign and symptoms of many chronic conditions including arthritis, back pain, depression, diabetes and obesity.

The combination of traditional weightlifting movements followed by plyometric movements is termed complex training. Complex training is considered a very effective training program for developing power, since it alternates high load weightlifting movements with biomechanically similar plyometric movements in the same workout. The theory of complex training is that the stimulus for the plyometric movements will be higher when a resistance movement is performed prior because of the heightened motor neuron excitability brought on by the weight lifted (May, Cipriani and Lorenz, 2010). Kabaddi is the team game where seven players in the court will play as a unit. Kabaddi is basically an outdoor team game, played in the tropical countries of Asia.

METHODOLOGY

Subjects and Variables

The purpose of the study was to find out the impact of resistance and complex training on anaerobic power and lung capacity among women kabaddi players. To achieve the purpose of the study, forty five women kabaddi players were selected from Queen Mary's College Chennai. The subject's age ranged between 18-23 years. The selected subjects were divided into three equal groups of fifteen each. Group – I (n = 15) underwent Resistance Training (RT), Group – II (n = 15) underwent Complex Training (CT) and Group– III (n = 15) acted as control. The anaerobic power was measured by Margaria Kalamen Power test. Lung capacity was measured by wet-spirometer.

Training Protocol

Group I underwent resistance for three days per week for twelve weeks with 2-4 sets: 8-10 repetitions, and group II underwent complex training for three days per week for twelve weeks with 2-4 sets: 8-10 repetitions along with 2 min rest. In every day training

session, the work out lasted approximately between 45 minutes, which included warming up and limbering down.

Experimental Design and Statistical Technique

The experimental design in this study was random group design involving 45subjects. The collected data from the three groups prior to and post experimentation on anaerobic power and lung capacity were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). 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.

Results

The data collected before and after the experimental period on anaerobic power of experimental and control group were analysed and presented in table – I.

Table - I

Analysis of Covariance on Anaerobic Power of Resistance and Complex Training and Control Groups

	Resistance Training	Complex Training	Control Group	SOV	Sum of Squares	df	Mean squares	'F' ratio
Pre test Mean	229.20	230.06	229.73	B	5.73	2	2.86	0.22
SD	4.05	2.52	3.89	W	532.26	42	12.68	
Post test Mean	259.20	279.13	231.46	B	17192.93	2	8596.46	358.23*
SD	5.45	4.37	4.80	W	1007.86	42	23.99	
Adjusted Post test Mean	259.34	279.01	231.44	B	17120.72	2	8560.36	367.36*
				W	955.38	41	23.30	

**Significant at .05 level of confidence (The required table value for significance at 0.05 level of confidence with degree of freedom 2 and 42 is 3.22 and degrees of freedom 2 and 41 is 3.23)*

Table shows that the pre test means and standard deviation (SD) on anaerobic power of resistance and complex training and control groups are 229.20 ± 4.05, 230.06 ± 2.52 and 228.73 ± 0.89 in that order. The attained 'F' ratio assessment of 0.22 was not as much of the essential table score of 3.22 for the quantity of freedom 2 and 42 at 0.05 level of pledge, which shows that the informal mission of the subjects were a success because the pre check scores on anaerobic power among groups didn't vary drastically.

The post take means and SD on anaerobic power of resistance and complex training and control groups are 259.20 ± 5.45, 279.13 ± 4.37 and 231.46 ± 4.80 in that order. The attained 'F' ratio assessment of 358.23 on anaerobic power was as much of the essential table score of 3.22 for the quantity of freedom 2 and 42 at 0.05 level of pledge. It implies that important variation existed between the groups on the post test phase on anaerobic power.

The adjusted post-test means on anaerobic power of resistance and complex training and control groups are 259.34, 279.01 and 231.44 respectively. The attained 'F' ratio assessment is 367.36 of anaerobic power was as much of the essential table score of 3.23 for the quantity of freedom 2 and 41 at 0.05 level of assurance. The outcome of the study tells that, major differences be presented among experimental and control groups on anaerobic power.

Since, the adjusted post test mean 'F' value was found to be considerable, the data on speed is subjected to post hoc analysis using Scheffe'S test and the results are offered in table–II.

Table – II

Scheffe'S Test for the Differences between the Adjusted Post Test Paired Means on Anaerobic Power

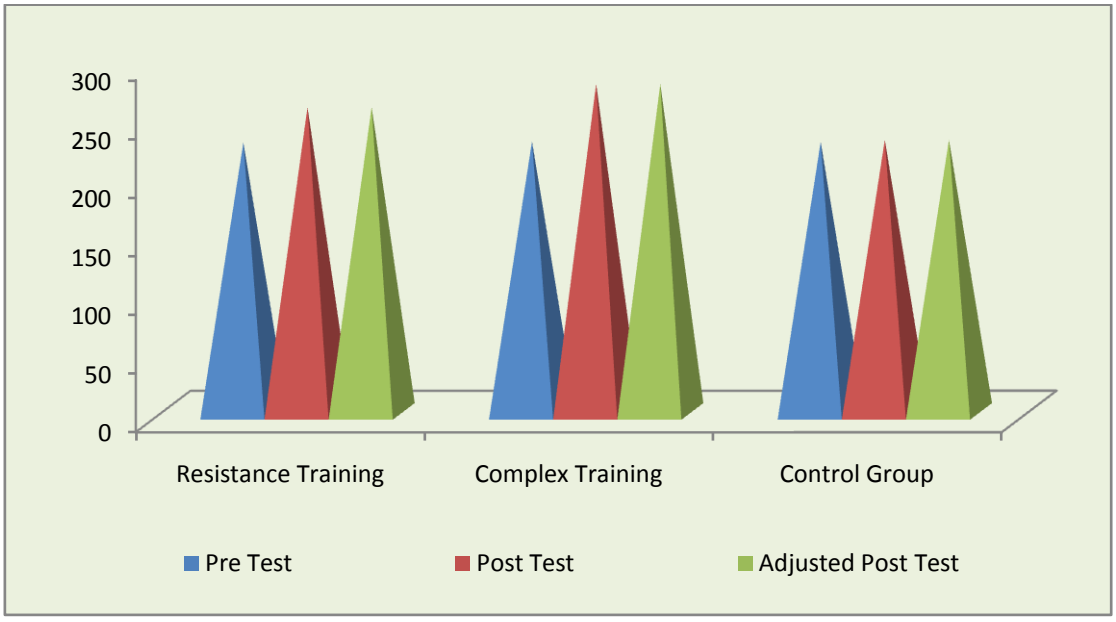
Adjusted Post Test Mean			Mean Differences	Confidence Interval
Resistance Training	Complex Training	Control Group		
259.34	279.01		19.67*	4.47
259.34		231.44	27.90*	4.47
	279.01	231.44	47.57*	4.47

**Significant at .05 level.*

Table–II shows that the adjusted post test mean differences on anaerobic power between resistance and complex training groups; resistance and control groups; complex training and control groups. The result indicates that there were significant difference among the experimental and control groups on anaerobic power of the women kabaddi players. Hence, complex training had better stimulation to increase on anaerobic power of women kabaddi players.

Figure -1

PYRAMID DIAGRAM ON ANAEROBIC POWER OF EXPERIMENTAL AND CONTROL GROUPS



The data collected before and after the experimental period on lung capacity of experimental and control group were analysed and presented in table – 3.

Table - 3

Resistance & Complex Training and Control Groups

Analysed by ANCOVA on Lung Capacity

	Resistance Training	Complex Training	Control Group	SOV	Sum of Squares	df	Mean squares	'F' ratio
Pre test Mean SD	2.80	2.85	2.85	B	0.011	2	0.006	0.21
	0.14	0.18	0.16	W	1.09	42	0.026	
Post test Mean SD	3.02	3.15	2.86	B	0.64	2	0.32	12.85*
	0.14	0.17	0.15	W	1.05	42	0.02	
Adjusted Post test Mean	3.03	3.14	2.85	B	0.660	2	0.330	31.82*
				W	0.425	41	0.010	

**Significant at .05 level of confidence (The required table value at 0.05 level of confidence with df 2 and 42 is 3.22 and df 2 and 41 is 3.23)*

Table–3 shows that the pre test means and standard deviation (SD) on vital capacity of resistance & complex training and control groups are 2.80 $\pm$ 0.14, 2.85 $\pm$ 0.18 and 2.85 $\pm$ 0.16 in that order. The attained 'F' ratio assessment of 0.21 was not as much of the essential table score of 3.22 for the quantity of freedom 2 and 42 at 0.05 level of pledge, which shows that the informal mission of the subjects were a success because the pre check scores on vital capacity among groups didn't vary drastically.

The post-take means and SD on vital capacity of resistance & complex training and control groups are 3.02 $\pm$ 0.14, 3.15 $\pm$ 0.17 and 2.86 $\pm$ 0.15 in that order. The attained 'F' ratio assessment of 12.85 on vital capacity was as much of the essential table score of 3.22

for the quantity of freedom 2 and 42 at 0.05 level of pledge. It implies that important variation existed between the groups on the post test phase on vital capacity.

The adjusted post-test means on vital capacity of resistance & complex training and control groups are 3.03, 3.14 and 2.85 respectively. The attained 'F' ratio assessment is 31.82 of vital capacity was as much of the essential table score of 3.23 for the quantity of freedom 2 and 41 at 0.05 level of assurance. The outcome of the study tells that, major differences be presented among experimental and control groups on vital capacity.

Since, the adjusted post test mean 'F' value was found to be considerable, the data on vital capacity is subjected to post hoc analysis using Scheffe'S test and the results are offered in table–4.

Table – 4

Scheffe'S Test on Lung Capacity

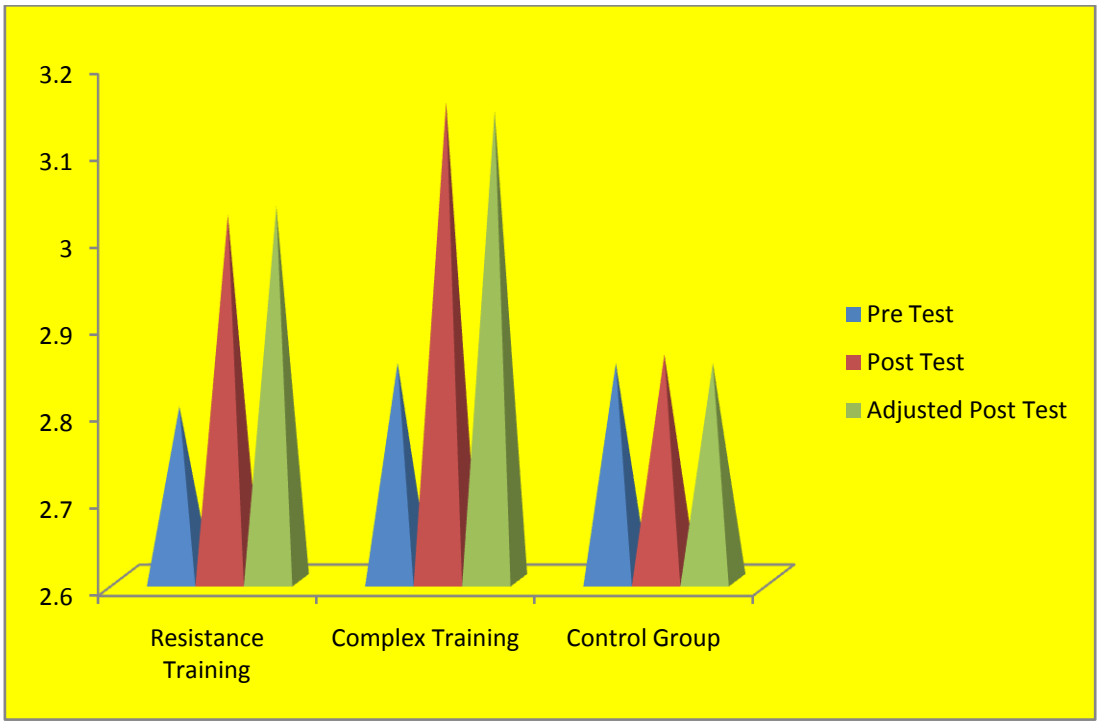
Adjusted Post Test Mean			Mean Differences	Confidence Interval
Resistance Training	Complex Training	Control Group		
3.03	3.14		0.11*	0.09
3.03		2.85	0.18*	0.09
	3.14	2.85	0.29*	0.09

**Significant at .05 level.*

Table–4 shows that the adjusted post test mean differences on vital capacity between resistance and complex training groups; resistance training and control groups; complex training and control groups. The result indicates that there were significant difference among the experimental and control groups on vital capacity of the women kabaddi players. Hence, complex training had well increase on lung capacity of women kabaddi players.

Figure -2

PYRAMID DIAGRAM ON LUNG CAPACITY



Discussion on Findings

Anaerobic Power

The result of the study inform that twelve weeks of resistance, complex training induced to increase on anaerobic power of women kabaddi players when compared to the control group players. Hence, complex training had better stimulation to increase on anaerobic power of women kabaddi players. The following studies are strengthening the present results. Rumpf and others (2016), examined the effect of different sprint training methods on sprint performance over various distances. The implementation of nonspecific training methods (e.g., strength and power training) could also benefit speed and athletic performance. Wong and others (2010) found that combined strength and power training significantly improved vertical jump height of young soccer players. Hawkins and others (2009) results did indicate that high-velocity and high-force training programs, consisting of weightlifting and plyometrics, improved lower-body performance, especially in the areas of jump height and power. Gomez-Perez and others

(2008), who studied the effects of a training program consisting of weight lifting combined with plyometric exercises on kicking performance was examined in 37 male physical education students, the result found that enhanced performance in vertical jump**.** Fatouros and others (2000) compared the effects of 3 different training protocols plyometric training, weight training and their combination selected parameters of vertical jump performance and leg strength. This study provides support for the use of a combination of plyometric drills and weight training to improve vertical jumping ability and muscular power in general. Ganesan and Muthuraj (2020) conducted a study on effect of weighted vest and weighted sled running on anaerobic power of sprinters. The result of the study stated that twelve weeks of weighted vest and weighted sled running induced to increase an anaerobic power of male school sprinters. Mihri and others (2016) examined the effects of plyometric training on anaerobic power capacity and motor skills in female fustal players. The results of the study showed that plyometric training significantly increased anaerobic capacity. Abdul, *et al*., (2014) investigated the effect of 8 weeks of strength and plyometric training on anaerobic power, explosive power and strength quadriceps femurs muscle in Soccer Players. The results of the study showed that plyometric training improves anaerobic power in soccer players.

Lung Capacity

The result of the study informed that twelve weeks of resistance and complex training induced to increase on lung capacity of the women kabaddi players, when compared to control group women kabaddi players. Among experimental training groups complex training had well increase on vital capacity of women kabaddi players. The following studies are supporting the current result. Kanniyan, & Ibrahim., (2013) find out effect of complex and contrast training on selected physiological and bio-motor variables of men soccer players. The results of the study indicate that there are significant differences among complex training group and contrast training group and the control

group in all of the physiological and bio-motor variables selected for the study. Muthuraj and Wise (2011) determined the effect of concurrent strength and endurance training and detraining on vital capacity. The concurrent strength and endurance training improved vital capacity (5.91%) all training induced gains had been abolished after thirty days of detraining.

Conclusions

The conclusion of the study inform that twelve weeks of resistance, complex training induced to increase on anaerobic power and lung capacity of women kabaddi players when compared to the control group players..

REFERENCES

Abdul Rahim Khodajo., Asghar Nikseresht., and Ebrahim Khoshnam., (2014). The effect of strength and plyometric training on anaerobic power, explosive power and strength quadriceps femoris muscle in soccer players. *European Journal of Experimental Biology*. 4(1):448-451.

Barbara Bushman, Rebecca Battista (2014). ACSM's resources for the personal trainer — 4th ed. Lippincott Williams & Wilkins.

Fatouros I.G., *et al*., (2000). "Evaluation of Plyometric Exercise Training, Weight Training and Their Combination on Vertical Jumping Performance and Leg Strength", *Journal of Strength and Conditioning Research*, 14:4.

Ganesan, S., and Muthuraj, M., (2020). Effect of weighted vest and weighted sled running on anaerobic power of sprinters. *Proteus Journal*. 11 (10): 248-252.

Gomez Perez- J, et al (June 2008), "Effects of weight lifting training combined with plyometric exercises on physical fitness, body composition, and knee extension velocity during kicking in football", *Applied Physiology, Nutrition and Metabolism.* 33(3):501-10.

Kanniyan, Abdussalam & Ibrahim, Syed. (2013). Effect of complex and contrast training on the physiological and bio-motor variables of men soccer players.. British journal of sports medicine. 47. e3. 10.1136.

May, C.A., Cipriani, D., Lorenz, K.A.,(2010), "Power Development Through Complex Training for The Division I Collegiate Athlete," *Strength and conditioning Journal*, 32 (4). 30-43.

Mihri Baris Karavelioglu., Halit Harmanci., Metin Kaya and Mustafa Erol., (2016). Effects of plyometric training on anaerobic power capacity and motor skills in female fustal players. *Anthropologist*. 23 (30): 355-360.

Murray, D.P. and L.E. Brown (2006) 'Variable Velocity Training in the Periodized Model', *Strength & Conditioning Journal* 28(1): 88–92.

Muthuraj, M., and Wise Blesses Singh, Y., (2011). Effect of concurrent strength andendurance training and detraining on vital capacity. *International. Journal.Physical. Education*. 4 (1) : 77-80.

Rumpf, M. C., Lockie, R. G., Cronin, J. B., and Jalilvand, F., (2016). Effect of Different Sprint Training Methods on Sprint Performance Over Various Distances: A Brief Review. *J Strength Cond Res*. 30 (6):1767-85.

Wong, P.L., *et. al*., (2010). Effects of 12-week on-field combined strength and power training on physical performance among U-14 young soccer players. *Journal of Strength and Conditioning Research*. 24(3):644-52.