EFFECT OF STRENTGH ENDURANCE AND CONCURRENT TRAINING ON SELECTED PHYSIOLOGICAL VARIABLES OF COLLEGE WOMEN PLAYERS

G.Redempta Nishanthi*, C.Sugumar**

**Director of Physical Education, Govindammal Aditanar College for Women, Tiruchendur.*

***Head, Physical Education and Yoga Centre, Gandhigram Rural Institute - Deemed University, Gandhigram, Dindigul*

ABSTRACT

The purpose of the study was to find out the effect of strength, endurance and concurrent training on selected physiological variables of college women players. To achieve the purpose, 60 female students were randomly selected from Govindammal Aditanar College for Women, Tiruchendur and divided into four groups as three experimental groups and one control group. Physiological variables namely fat free mass and body fat were assessed from each subject before and after training period. The collected data were statistically analysed by using dependent 't' test and ANCOVA. It was found that there was a significant improvement on fat free mass and body fat percentage due to the influence of strength, endurance and concurrent training among college women players.

***Key Words**: Endurance training, strength training, concurrent training, physiological variables, Fat free mass and body fat.*

INTRODUCTION

Fat-free mass is known as lean body mass, refers to all of our body components except fat. It includes one's body's water, bone, organs and muscle content. However, when it comes to weight management and body composition, fat-free mass refers primarily to muscle mass. Human body consists of over 600 muscles, all serving as a vital reservoir for amino acids, which one's tissue and organs require for survival. Muscle mass is dense and requires more energy to maintain than fat, making it a preferential component of one's body composition, since muscle mass burns more calories than fat mass. Therefore, the higher one's muscle mass, the higher one's metabolism the amount of calories burned each day. Maintaining a healthy amount of lean mass contributes to weight management and helps to keep one's body functioning well overall. The composition of one's weight is just as an important as how much one weigh and a vital part of maintaining optimal health is having a balanced ratio of lean mass to fat. Be aware that some fat is essential to one's health. The minimum amount of essential fat needed to remain healthy is around 3 percent for men and 12 percent for women, according to the American College of Sports Medicine (ACSM). Non-essential fat is anything above this estimated amount and serves as extra fat stored primarily in one's fat cells and the tissue directly beneath one's skin, known as subcutaneous fat. It's acceptable to have some non-essential fat, but too much can cause or contribute to health problems. A healthy body fat percentage ranges from 10 to 22 percent for men and 20 to 32 percent for women, according to ACSM. This means a healthy percentage of lean mass is 78 to 90 percent for men and 68 to 80 percent for women (Renee, 2016).

In the words of Renee (2016) it's important to get enough amino acids from protein sources in one's diet, especially if one are following a reduced-calorie meal plan to lose weight. Without enough amino acids coming from food, one's body is forced to break down muscle mass as a source of amino acids. This can cause one to lose a significant amount of muscle mass during weight loss, especially if one follows a starvation or fad diet to drop weight quickly. Getting enough protein helps maintain the lean mass one have and encourages one's body to preferentially break down fat for energy, thus minimizing the amount of lean mass one lose and increasing the amount of fat burn. Physical activity plays a pivotal role in maintaining and building lean mass. When one don't get enough physical activity, the body is more likely to break down muscle for energy. The old saying that if "you don't use it, you lose it," rings true when it comes to muscle mass. In addition to helping control one's weight, physical activity has a number of other health benefits such as helping to lower blood pressure, improving mood, and reducing the risk of chronic diseases such as diabetes and heart disease.

Endurance training will allow preferential loss of central fat in other populations of subjects at risk for obesity-related metabolic complications and might produce impressive improvement in metabolic abnormalities, despite only a small loss of weight and fat (Schwartz, 1991). Most of us know that strength training (with free weights, weight machines, or resistance bands) can help build and maintain muscle

mass and strength. What many of us don't know is that strong muscles lead to strong bones. Combined aerobic and resistance training is the best program to treat obesity (Hill et al., 1987). As an exercise specialist, one play an important role in combating this major health problem by encouraging a physically active lifestyle and by planning exercise programs and scientifically sound diets for one's clients, in consultation with trained nutrition professionals. Based on the above information, investigator planned to study the effect of strength, endurance and concurrent training on selected physiological variables of college women players.

OBJECTIVES

The following are the specific objectives of this study.

1. To find out the effect of endurance, strength and concurrent (i.e., combination of strength and endurance) training on fat free mass and body fat percentage.
2. To find out the best training method to enhance the fat free mass and to decrease the body fat percentage among college women players.

METHODOLOGY

To achieve the purpose of this study, 60 Women College students were selected from Govindammal Aditanar College for women, Tiruchendur, Tamilnadu, India, at random and their age ranged from 18 to 21 years. The selected subjects were divided into three experimental groups and a control group with 15 subjects (n=15) each. Group I (STG) underwent strength training, Group II (STG) underwent endurance training, Group III (CTG) underwent concurrent training (Combination of strength and endurance training). The training period was eight weeks with three days per week. Group IV (CG) served as control group. However, control group was not exposed to any specific training but they participated in the regular scheduled work. Strength, endurance and concurrent training group's women player's fat free mass and body fat percentage were tested two days before and after the training period.

ANALYSIS OF DATA

The data pertaining to the variables in this study were examined by using dependent t-test to find out significant changes and analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any among the adjusted post test means. Whenever 'F' ratio for the adjusted post-test was found to be significant, the Scheffe's test was used as post-hoc test to determine the three paired mean differences. The level of significance was fixed at 0.05 level of confidence in all the cases.

Table-I: Summary of Mean Standard Deviation and Dependent 'T' Test for the Pre Post and Adjusted Post Tests on Selected Variables of Experimental and Control Groups

Variables	Test		Group			
			STG	ETG	CTG	CG
Fat Free Mass	Pre Test	Mean	25.71	25.73	25.75	25.76
		SD	0.28	0.32	0.32	0.48
	Post Test	Mean	26.48	26.90	27.75	25.85
		SD	0.41	0.39	0.60	0.37
	't' Test		9.79*	12.30*	12.78*	1.07
Body Fat	Pre Test	Mean	28.70	28.72	28.76	28.73
		SD	0.28	0.30	0.31	0.40
	Post Test	Mean	27.45	26.89	26.30	28.69
		SD	0.40	0.43	0.77	0.36
	't' Test		10.81*	16.67*	14.09*	1.32

***Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.*

Table-II: Analysis of Covariance on Selected Criterion Variables of Experimental and Control Groups

Varia-bles	Adjusted Post-test Means				SoV	SS	df	MS	F-ratio
	STG	ETG	CTG	CG					
Fat Free Mass	24.38	24.47	23.50	25.68	B	36.277	3	12.092	60.045*
					W	11.076	55	0.201	
Body Fat	27.47	26.89	26.28	28.69	B	47.512	3	15.837	75.498*
					W	11.538	55	0.210	

** Significant at 0.05 level.*
Table value required for 0.05 level of significance with df (3,55) is 2.78.

Table-III: Scheffe's Test on Criterion Variables of Experimental and Control Groups

Variable	STG vs ETG	STG vs CTG	STG vs CG	ETG vs CTG	ETG vs CG	CTG vs CG	CI Value
Fat Free Mass	0.086	0.994*	1.191*	0.908*	1.278*	2.185*	0.452
Body Fat	0.579*	1.189*	1.223*	0.610*	1.802*	2.412*	0.483

** Significant at 0.05 level.*

RESULTS AND DISCUSSION

The results of the study indicates that significant difference exist among the post and adjusted post test means of experimental and control groups on fat free mass (FFM) and body fat (BF) among college women players. The result of the study indicates that all the experimental groups significantly differed when compared to the control group on FFM and BF.

The results of the study confirmed by the following experts: an aerobic endurance training in particular leads to numerous health benefits, and there is great evidence for its favorable influence on weight (Donnelly et al., 2009). Abazar, et al., (2015) concluded in his study 12 weeks of aerobic exercise programme significantly reduce the BMI, WHR, fate rate, weight and fat mass. Bilsborough, et al.,2016, compared the development and variations in body composition of early, mid and late career professional Australian Football (AF) players over three successive seasons. Bilsborough et al., (2016) concluded that early career players may benefit from greater emphasis upon specific nutrition and resistance training strategies aimed at increasing FFSTM, whilst all players should balance training and diet towards the end of season to minimize increases in FM. Moreover, doing a combination of strength and endurance training is more beneficial for weight loss and change in body composition (Hendrickson, et al., 2010). In addition, the significant decrease of subcutaneous fat, body fat percentage and waist-to-hip ratio after performing eight weeks of combined strength and endurance training (Maiorana et al., 2002; Akbarpour, Assarzadeh and Sadeghian, 2011). Dolezal, and Potteiger (1998) study indicated that concurrent training can significantly increase basal metabolism and decrease body fat relative LDL to the obtained amounts in the before-training period.

CONCLUSIONS

The current study highlights on strength, endurance and concurrent training among college women players. The present study revealed that strength, endurance and concurrent training had increase the FFM and reduce body fat percentage.

When comparing concurrent training had increased FFM and reduced FM better than the strength and endurance training. At the same time endurance training is better than that of STG on FFM & BF.

REFERENCES

[1] Abazar E, Taghian F, Mardanian F, Forozandeh D. (2015), " Effects of Aerobic Exercise on Plasma Lipoproteins in Overweight and Obese Women with Polycystic Overy Syndrome. *Adv. Biomed. Res*. 4, P.68.

[2] Akbarpour, M.B., Assarzadeh, M. and Sadeghian, H., (2011), "The Effect of Combined Strength-Endurance Training on the Improvement of Cardiovascular Disease Risk Factors of Obese Middle-aged Men", *Annals of Biological Research*, 2(6): 123-129.

[3] Bilborough JC, Kempton T, Greenway K, Cordy J and Coutts AJ., (2016), "Longitudinal Changes and Seasonal Variation in Body Composition in Professional Australian Football Players", *International Journal of Sports Physiology and Performance*, http://dx.doi.org/10.1123/ijspp.2015 - 666.

[4] Bridger, T., (2009), "Childhood obesity and cardiovascular disease", *Paediatr Child Health*, 14(3), PP. 177-82.

[5] Dolezal, B.A. and Potteiger, J.A., (1998), "Concurrent Resistance and Endurance Training Influence Basal Metabolic Rate in Non Dieting Individuals", *Journal of Applied Physiology*, 85(2), PP. 695-700.

[6] Donnelly JE, Blair SN, Jakicic JM, Manore MM, Rankin JW, Smith BK: (2009), "Appropriate Physical Activity Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults. *Med Sci Sports Exerc* 41, PP.459-471.

[7] Hendrickson, N.R., Sharp, M.A., Alemany, J.A., Walker, L.A., Harman, E.A., Spiering, B.A., Hatfield, D.L., Yamamoto, L.M., Maresh, C.M., Kraemer, W.J. and Nindl, B.C., (2010),

"Combined Resistance and Endurance Training Improves Physical Capacity and Performance on Tactical Occupational Tasks", *European Journal of Applied Physiology*, 109(6), PP. 1197-1208.

[8] Heyward Vivian, H., (2002), "Advanced Fitness Assessment and Exercise Prescription*"*, (4ED), *Champaign Illinois: Human Kinetics Publishers Inc*.

[9] Hill, J.O., Sparling, P.B., Shields, T.W. and Heller, P.A., (1987) "Effect of Exercise and Food Restriction on Body Composition and Metabolic
Rate in Obese Women", *Am J Clin Nutr*, 46, PP.
622–630.

[10] Maiorana, A., O'Driscoll, G., Goodman, C., Taylor R. and Green, D., (2002), "Combined Aerobic and Resistance Exercise Improves Glycemic Control and Fitness in Type 2 Diabetes", *Diabetes Res. Clin Pract*., 56(2), PP. 115-123.

[11] McLennan, F., (2004). "Obesity in children",
Australian Family Physician, 33(1/2), PP. 33-36.

[12] Morrow James, R., Jackson Allen, W., Disch James, G. and Mood Dale, P., (2005), "Measurement and Evaluation in Human Performance*"*, (3rd Edition), *Champaign Illinois: Human Kinetics Publishers Inc.*, PP. 371- 373.

[13] Raj, M., (2012), "Obesity and Cardiovascular Risk in Children and Adolescents", *Indian Journal of Endocrinology and Metabolism*, 16(1), PP. 13-9.

[14] Renee J., (Oct.2016), "What Is Fat-Free Body Mass?",
http://www.livestrong.com/article/128552- fat-body-mass/.

[15] Schwartz Robert, S., Shuman William, P., Larson, V., Cain Kevin, C., Fellingham Gilbert, W., Beard James, C., Kahn Steven, E., Stratton John, R., Cerqueira Manuel, D., Abrass Itamar, B., (1991), "The Effect of Intensive Endurance Exercise Training on Body Fat Distribution in Young and Older Men", *Metabolism*, 40(5), PP.
545-551.

[16] Warburton Darren, E.R., Nicol Whitney, C. and Bredin Shannon, S.D., (2006), "Health Benefits of Physical Activity: The Evidence",
Canadian Medical Association Journal,
174(6), PP. 801–809.