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ORIGINAL ARTICLE

IMPACT OF CARDIO-RESPIRATORY ENDURANCE TRAINING RESISTANCE TRAINING AND CORE STRENGTH TRAINING ON SELECTED PHYSIOLOGICAL VARIABLES AMONG COLLEGE ATHLETES

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Abstract:

The purpose of this investigation is to examine the impact of cardio-respiratory endurance training, resistance training and core strength training on selected physiological variables among college athletes. To achieve the purpose of this study 50 male athletes were selected from various Colleges in Coimbatore who had represented their college level athletic competition. The subjects were selected in to the age group of 18 to 25 years. Experimental group-I underwent cardio-respiratory endurance training. Experimental group-II underwent resistance training. Experimental group-III underwent core strength training. Experimental group-IV underwent combined cardio-respiratory endurance, resistance and core strength training. Control group (group-IV) was restricted to participate in any specific training programme. The training regimen lasted for twelve weeks for 3 days per week and 1 session of 90 minutes in the morning. 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 data on selected dependent variables. The analysis of data revealed that due to the impact of twelve weeks of cardio-respiratory endurance training, resistance training, core strength training and combined training the selected physiological variables of college athletes have significantly changed.

KEYWORDS:

Cardio-respiratory endurance training, resistance training and core strength training,

INTRODUCTION

Sportsmen and women must participate in year round conditioning programs to have the utmost efficiency, consistent improvement and balanced abilities. For that they must put their bodies under a certain amount of stress to increase physical capabilities. Physical exercise is extremely important for maintaining physical fitness including healthy weight; building and maintaining healthy bones, muscles, and joints; promoting physiological well-being; and strengthening the immune system. To improve or maintain a desired level of physical fitness, there is a need to constantly administer an adequate training intensity while exercising.

The endurance training holds a very conspicuous place in the field of training methods, because it is one of the most powerful methods that ensure and improve the physiological functions. Endurance is the ability to exert through aerobic or anaerobic exercise for relatively long periods of time. The definition of 'long' varies according to the type of exertion – minutes for high intensity anaerobic exercise, hours or days for low intensity. Training for endurance can have a negative impact on the ability to exert strength unless an individual also undertakes resistance training to counteract this effect. Also, the ability to deliver oxygen and nutrients to tissues, and to remove wastes, over sustained periods of time. Long runs and swims are among the methods employed in measuring this component (Singh et al., 2004).

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Resistance training is fast becoming the most popular exercise today. For centuries, resistance training was primarily used only for the strengthening and conditioning of a group of certain athletes. Even in athletics, many athletes and coaches did not emphasize the importance of resistance training if their sports activity does not require having high level of muscular strength in order to be competitive. However, in recent years the amount of information and research on resistance training has exploded. Athletes of all types, from the professional athlete to the weekend enthusiast how understand the potential benefits of partaking in a resistance training program (Purvis & Aaberg, 1999). The amount and form of resistance used as well as the frequency of resistance exercises are determined by specific program goals. Based on the available literature, the investigator has designed the training programme to improve the physiological functions of athletes.

METHODOLOGY

Subjects and Variables

To achieve the purpose of this study 50 male athletes who represented their college level athletic competition from various Colleges in Coimbatore, Tamilnadu state, India were selected as subjects. The subjects were selected in to the age group of 18 to 25 years. The selected subjects were randomly assigned to experimental and control groups of 10 each. Experimental group-I performed cardio-respiratory endurance training. Experimental group-II performed resistance training. Experimental group-III performed core strength training. Experimental group-IV performed combined cardio-respiratory endurance, resistance and core strength training. Group-V (Control) was restricted to participate in any specific training programme. The selected dependent variables were assessed using standard tests and procedures, before and after the training regimen. The instruments used for testing the dependent variables were standard and reliable as they were purchased from the reputed companies. The variables and tests used are presented in table-1.

Table 1: Criterion Variables and Test

SL. No.	Variables	Tests / Instruments	Unit of Measurement
1.	Resting pulse rate	Blood pressure monitor	Bpm
2.	Systolic blood pressure	Sphygmomanometer Stethoscope	mmHg
3.	Diastolic blood pressure	Sphygmomanometer Stethoscope	mmHg
4.	Vital capacity	Wet spirometer	Cub.ml
5	VO_2 Max	One mile run	l/min

TRAINING PROTOCOL

The training regimen for the four experimental groups lasted for twelve weeks for 3 days per week and 1 session of 90 minutes in the morning session. Experimental group-I underwent cardio-respiratory endurance training. Experimental group-II underwent resistance training. Experimental group-III underwent core strength training. Experimental group-IV underwent combined cardio-respiratory endurance training, resistance training and core strength training. The cardio-respiratory endurance training consists of 20-40 minutes running with 65- 80% HRR. The running intensity was determined by a percentage of heart rate reserve (HRR). The resistance training program was a total body workout consisting of 3 sets of 6-10 repetitions on 5 exercises that trained all the major muscle groups. The core strength training consisting of 3 sets of 6-10 repetitions on 5 exercises that trained only core region. A percentage of each subject's one-repetition maximum for each exercise was used to determine the intensity of training. The intensity and number of repetitions performed for each exercise was progressively increased.

EXPERIMENTAL DESIGN AND STATISTICAL TECHNIQUE

The experimental design used in this study was random group design involving 50 subjects, who were divided at random into five groups of ten subjects each. The data collected from the five groups prior to and post experimentation on selected dependent variables were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since five 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 all the cases the level of confidence was fixed at 0.05 for significance.

RESULTS

The data collected on selected physiological variables before and after twelve weeks of cardio-respiratory endurance training, resistance training, core strength training and combined training is statistically analyzed by analysis of covariance and the results are presented in table-II.

Table – II: Analysis of Covariance on Selected Physiological Variables of Experimental and Control Groups

	CRET Group	RT Group	CST Group	CT Group	Control Group	S o V	SS	Df	Mean Squares	'F' ratio
Resting pulse rate	60.24	62.58	62.80	59.28	70.11	B	684.40	4	171.10	57.68*
						W	130.52	44	2.97	
Systolic blood pressure	121.7	122.8	122.1	120.6	128.5	B	366.02	4	91.51	86.50*
						W	46.54	44	1.06	
Diastolic blood pressure	78.27	79.42	78.86	78.53	80.52	B	29.79	4	7.45	1.31
						W	250.21	44	5.69	
Vital capacity	3097.0	3076.0	3081.0	3085.0	2881.0	B	335530.84	4	83882.71	11.31*
						W	326395.71	44	7418.08	
VO_2 Max	3.45	3.26	3.28	3.38	3.09	B	0.70	4	0.17	5.34*
						W	1.44	44	0.03	

(The required table value for significance at 0.05 level of confidence with degrees of freedom 4 and 44 is 2.59)*Significant at .05 level of confidence
(CRET-cardio-respiratory endurance training, RT- resistance training, CST-core strength training, CT-combined training, CG- control group)

The obtained 'F' ratio value for the adjusted post-test means on resting pulse rate, systolic blood pressure, diastolic blood pressure, vital capacity and Vo2 max of cardio-respiratory endurance training, resistance training, core strength training and combined training and control groups are 57.68, 86.50, 11.31 and 5.34 respectively which are greater than the required table value of 2.59 for the degrees of freedom 4 and 44 at 0.05 level of confidence. However, the obtained 'F' ratio value (1.31) for the adjusted post-test means on diastolic blood pressure of experimental and control groups is less than the required table value. Hence, it was concluded that significant differences exist between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on resting pulse rate, systolic blood pressure, vital capacity and Vo2 max however, no significant differences exist between the experimental and control groups on diastolic blood pressure.

Since, the obtained 'F' ratio value in the adjusted post test means is found to be significant, the Scheffe'S test is applied as post hoc test to find out the paired mean difference, and it is presented in table-III.

Table –III: Scheffe's Post Hoc Test for the Differences among Paired Means of Experimental and Control Groups

Variables	Mean differences										Confidence Interval
	CRET & RT	CRET & CST	CRET & CT	CRET & CG	RT & CST	RT & CT	RT & CG	CST & CT	CST & CG	CT & CG	
Resting pulse rate	2.34	2.56*	0.96	9.87*	0.22	3.30*	7.53*	3.52*	7.31*	10.83*	2.48
Systolic blood pressure	1.10	0.40	1.10	6.80*	0.70	2.20*	5.70*	1.50*	6.40*	7.90*	1.48
Diastolic blood pressure	1.15	0.59	0.26	2.25	0.56	0.89	1.10	033	1.66	1.99	3.43
Vital capacity	21.0	16.0	12.0	216.0*	5.0	9.0	195.0*	4.0	200.0*	204.0*	123.98
Vo_2 max.	0.19*	0.17*	0.07*	0.36*	0.02	0.12	0.17*	0.10	0.19*	0.29*	0.15

*Significant at .05 level
(CRET-cardio-respiratory endurance training, RT- resistance training, CST-core strength training, CT-combined training, CG- control group)

Table-III shows the mean differences between the experimental groups and also between the experimental and control groups on resting pulse rate, systolic blood pressure, diastolic blood pressure, vital capacity and Vo2 max. The Scheffe's post hoc analysis proved that when comparing the experimental groups with control group significant mean differences exists between them on resting pulse rate, systolic blood pressure, vital capacity and Vo2 max. Since, the mean differences were higher than the confident interval values at .05 level of significance. When comparing the experimental groups it shows significant mean differences between them in some comparisons and insignificant differences on other comparisons. In the case of diastolic blood pressure no significant differences were found among the five groups

DISCUSSION

Physical activity causes beneficial changes in the functioning of all internal organs, particularly, the heart, lungs and circulatory system. It is a physiological fact that the human organism needs stimulating exercise. When the whole body is subjected to regular muscular activity, requiring vigorous stress on the heart, lungs and muscles, the general efficiency of physiological functions is being improved. Research now strongly has the theory that regular and vigorous exercise helps to keep the heart healthy and may prevent cardio-vascular diseases. A physically fit person's heart beats at a lower rate and pumps more blood, which denotes the substantial increase of ability to do more physical work.

The benefits of resistance/strength training include greater muscular strength, improved muscle tone and appearance, increased endurance, enhanced bone density, and improved cardiovascular fitness (Abernethy, 1997). Alcaraz and others (2008) found that heavy-resistance circuit training may be an effective training strategy for the promotion of both strength and cardiovascular adaptations. Hargreaves and others (1998) suggested that, exercising at a high intensity results in an elevation of oxygen uptake and blood lactate concentration and is non-sustainable. During a resistance exercise bout, systolic and diastolic blood pressures may show dramatic increases (Stone et al., 1991). The extent of the increase in blood pressure is dependent on the time the contraction is held, the intensity of the contraction, and the amount of muscle mass involved in the contraction (Fleck, 1988). More dynamic forms of resistance training, that involve moderate resistance and high repetitions with short rests are associated with reductions in blood pressure.

Performing strength and endurance training simultaneously can be detrimental to the gains that might be made in performing one type of training alone (Bell et al., 2000). Substantial and beneficial gains in physiological performance have been reported in most of the training studies conducted previously. Senthil & others (2011) findings indicated that the effects of combined strength and endurance training significantly reduced resting pulse rate Davis and others (2008) evaluated the effects of combined strength

and aerobic endurance training and observed reduced resting heart rate. Wood & others (2001) conducted a study on combined cardiovascular and resistance training in healthy older adults, their result revealed lower resting heart rate. Davis and others (2008) evaluated the effects of concurrent strength and aerobic endurance training, and found that serial concurrent exercise reduced systolic and diastolic blood pressure. According to the NSCA (2000), including strength training in an endurance training program can improve the ability of the heart, lungs and circulatory system to perform under conditions of high pressure and force production.

CONCLUSIONS

The result of this study demonstrated that, cardio-respiratory endurance training, resistance training, core strength training and combined training has significant impact on resting pulse rate, systolic blood pressure, vital capacity and Vo2 max. of college athletes. However, diastolic blood pressure is not significantly changed due to experimental treatment. It is also concluded that combined cardio-respiratory endurance, resistance and core strength training is better than isolated cardio-respiratory endurance training, resistance training, and core strength training in altering the selected physiological parameters.

REFERENCES

Abernethy, et al., (1997). The Biophysical Foundations of Human Movement, Human Kinetics, Champaign, p.225-28.

Alcaraz, PE, et al., (May 2008), Physical performance and cardiovascular responses to an acute bout of heavy resistance circuit training versus traditional strength training, Journal of Strength and Conditioning Research, 22(3):667-71.

Bell, G. J., D. Syrotuik, T.P. Martin, R. Burnham, and H.A. Quinney. Effects of Concurrent Strength and Endurance Training on Skeletal Muscle Properties and Hormone Concentrations in Humans. Eur J.Appl Physiol 81: 418-427, 2000.

Davis, W. J., Wood, D. T., Andrews, R. G., Elkind, L. M., Davis, W. B., (2008). Concurrent training enhances athletes' strength, muscle endurance, and other measures: Journal of Strength and Conditions Research. 22(5): p. 1487-502.

Fleck, S. J. (1988). Cardiovascular adaptations to resistance training,Medicine and Science in Sports and Exercise, 20 (Suppl.), S146-S151.

Hargreaves, M. et al., (1998). "Muscle Metabolites and performance during High Intensity, Intermittent Exercise," J Appl Physiol, p. 84.

Purvis, Tom and Everett Aaberg,, (1999). Resistance Training Institution, Human Kinetics, USA, p.1.

Senthil, P., Arul, S. and Karthikeyan, P., (2011). Effect of concurrent strength and endurance training on selected physiological variables. Asian Journal of Science and Technology. 1(4): p.64-66.

Singh, Ajmer, Dr. Jagdish Bains and Dr. Jagtar Singh Gill,(2004). "Endurance" Essential of Physical Education, Kalyani Publishers, Ludhiana, New Delhi, p. 276.

Stone, M. H., Fleck, S. J., Triplett, N. T., & Kramer, W. J. (1991). Health- and performance-related potential of resistance training, Sports Medicine, 11, 210-231.

Wood, R.H., Reyes, R., Welsch, M. A., Favaloro-Sabatier, J., Sabatier, M., Matthew Lee, C., Johnson, L. G., Hooper, P. F., (2001). Concurrent cardiovascular and resistance training in healthy older adults. Med Science Sports Exercise. 33(10): p. 1751-58.