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PHYSICAL EDUCATION

EFFECT OF AEROBIC RUNNING AND SWIMMING ON SELECTED PHYSIOLOGICAL PARAMETERS OF COLLEGE MALE STUDENTS

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Abstract

The purpose of the study is to investigate the relative effect of aerobic running verses swimming training on selected physiological parameters of college male students. To achieve the purpose of the study, forty five male students from St. Peters Engineering College, Avadi, Chennai, Tamilnadu, India were selected as subjects. Their age ranged from 18 years to 23 years. The selected subjects were randomly assigned into three equal groups of 15 subjects each. Group-I underwent aerobic running, group-II underwent swimming training and group-III acted as control. The research design of the study was pre and post test random group design. In order to nullify the initial mean differences the data collected from the three groups prior to and post experimentation on selected physiological parameters were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since, three groups are involved, whenever the obtained 'F' ratio value in the adjusted post test mean is found to be significant, the Scheffe's test is applied as post hoc test to determine the paired mean differences, if any. The result of the study reveals that due to the effect of aerobic running and swimming training the selected physiological parameters of the subjects was significantly improved. It was also concluded that swimming training is significantly better than aerobic running in improving resting pulse rate and breath holding time however no significant differences existed between aerobic running and swimming training in improving maximum oxygen consumption.

Keywords: Aerobic running, Swimming and Physiological parameters.

Introduction

Present mode of day to day life of man seems to be responsible for a remarkable decline in his health, physical work ability and capacity. This has created much concern in the scientific field and steps are being taken for finding out better ways and means to put up an end to the deterioration in health, performance and physical fitness. The daily habits of people have a great deal more to do with what makes them sick than all the influences or medicine. Broadly, the factors that promote one's health may be classified as heredity factors, environmental factors, and personal factors. Aerobic activities have been found to be of high value for maintenances of organic health for increasing the general resistance against infection and for use of treatment of various diseases and metabolic disorder. No other motor activity depends so much on the working capacity of complete psycho-physical apparatus of human, as aerobic.

The focus of aerobic training is to progressively overload the cardio respiratory system and not the musculoskeletal system. This focus provides explanation as to why aerobic training induced muscle fiber area changes are inconsistent. In response to an aerobic training program, Type I and II muscle fibers have been shown to remain the same (Bell *et al*., 2000; McCarthy *et al*., 2002), increase (Nelson, 1990), and decrease in size (Kraemer *et al*., 1995). More consistent and well documented adaptations to aerobic training include increases in capillary and mitochondrial densities (Crenshaw, 1991) as well as oxidative enzyme activity (Bell, 2000; Nelson, 1990) all of which contribute to the enhanced delivery, extraction, and utilization of oxygen by skeletal muscle.

Swimming has a long history and is currently one of the largest Olympic sports, with 16 pool events. Competitive swimmers are suggested to have specific anthropometrical features compared with other athletes, but are nevertheless dependent on physiological adaptations to enhance their performance. Swimmers thus engage in large volumes of training in the pool and on dry land. Training of various forms is widely used, and the energetic systems are addressed by aerobic and swimming training. The aquatic environment presents specific challenges for humans. Hence, researchers are constantly willing to have a deeper insight into human performance in water.

The aerobic running and swimming has become highly structured training for health improvement. It has vastly different training effects depending upon the intensity and duration of the work and rest period. The applicability of these methods of training to develop physiological parameters is not yet completely known. Hence, there is a need to find out whether aerobic running and swimming training are the helpful training methods in improving the selected physiological

parameters.

Methodology

Selection of Subject and Variable

To achieve the purpose of the study, forty five male students from St. Peters Engineering College, Avadi, Chennai, Tamilnadu, India were selected as subjects. Their age ranged from 18 years to 23 years. The selected subjects were randomly assigned into three equal groups of 15 subjects each. Group-I underwent aerobic running, Group-II underwent swimming training and group-III acted as control. The selected dependent variables such as resting heart rate, breath holding time and maximum oxygen consumption were assessed by using digital blood pressure monitor, electronic stop watch and one mile run test respectively.

Training Programme

After the initial measurements the specially designed training programme was given to the subjects of the experimental groups named as aerobic running and swimming training. The training sessions were conducted six days a week over a period of twelve weeks. Each experimental session was of 30-45 minutes duration excluding warm-up and warm-down. Group-I underwent aerobic running and group-II underwent swimming training. Sessions were progressively structured to gradually increase intensity over each of the 12 weeks. To fix the training load for the aerobic running and swimming training groups the subjects were examined for their exercise heart rate in response to different work bouts, for proposed repetitions and sets, alternating with active recovery based on work-rest ratio. The subject's training zone was computed using Karvonen formula and it was fixed at 70%HRmax to 95%HRmax for aerobic running and swimming training groups.

Collection of the Data

The pretest data was collected prior to the training programme and posttest data was collected immediately after the twelve weeks of aerobic running and swimming training, from the experimental groups and a control group.

Statistical Technique

The data collected from the three 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 three groups are 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 pre and posttest data collected from the experimental and control groups on selected physiological parameters is statistically analyzed by ANCOVA and the results are presented in table-I.

Table I.Analysis of Covariance on Selected Physiological Parameters of Experimental and Control Groups

Variables	Aerobic Running Group	Swimming Training Group	Control Group	S o V	Sum of Squares	Df	Mean squares	'F' ratio
Resting pulse rate	67.31	64.33	70.12	B	580.47	2	290.23	16.50*
				W	721.07	41	17.58	
Breath Holding Time	34.38	38.51	30.15	B	523.74	2	261.87	15.39*
				W	697.80	41	17.02	
Maximum oxygen consumption	3.23	3.18	2.96	B	0.625	2	0.313	11.65*
				W	1.100	41	0.027	

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

The obtained adjusted post-test means 'F' values of 16.50, 15.39 and 11.65 respectively on resting heart rate, breath holding time and maximum oxygen consumption is greater than the required table value of 3.22 for the degrees of freedom 2 and 41 at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of aerobic training, swimming training and control groups on resting heart rate, breath holding time and maximum oxygen consumption.

Since, the obtained 'F' 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-II.

Table II. Scheffe's Post Hoc Test for the Differences among Paired Means of Experimental and Control Groups on Selected Physiological Parameters

Variables	Aerobic Running Group	Swimming Training Group	Control Group	Mean Difference	Confidence Interval
Resting pulse rate	67.31	64.33		2.98*	2.74
	67.31		70.12	3.81*	2.74
		64.33	70.12	6.79*	2.74
Breath Holding Time	34.38	38.51		4.13*	3.83
	34.38		30.15	4.23*	3.83
		38.51	30.15	8.36*	3.83
Maximum oxygen consumption	3.23	3.18		0.05	0.15
	3.23		2.96	0.27*	0.15
		3.18	2.96	0.22*	0.15

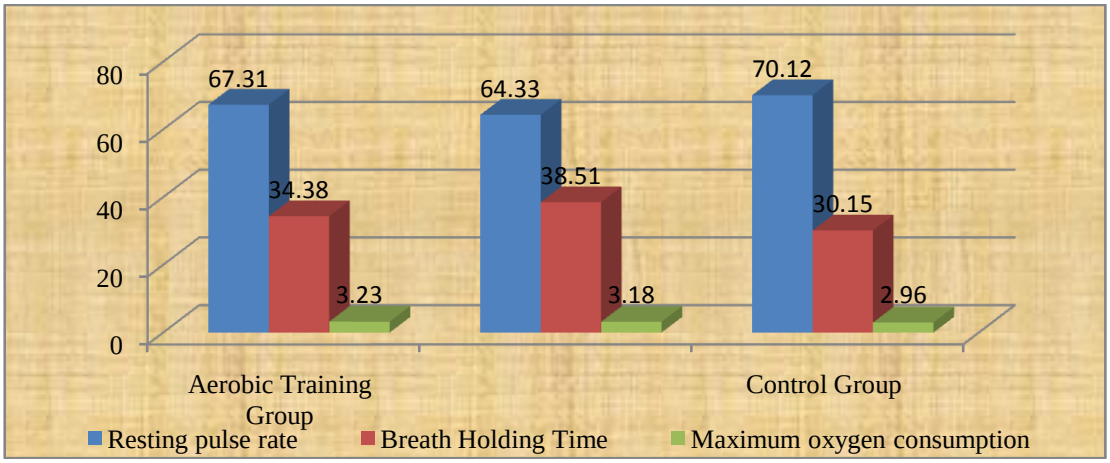
*Significant at 0 .05 level

As shown in table-II the Scheffe's post hoc analysis proved that significant mean differences existed between experimental and control groups since, the mean differences were higher than the confident interval values 2.74, 3.83 and 0.15 respectively at 0.05 level of significance. However, when comparing the experimental groups significant mean differences existed in the case of resting pulse rate and breath holding time whereas no significant mean differences existed between the experimental groups in the case of maximum oxygen consumption

Hence, it is concluded that due to the effect of aerobic running and swimming training the resting pulse rate, breath holding time and maximum oxygen consumption of the subjects was significantly improved. It is also concluded that swimming running is significantly better than aerobic training in improving resting pulse rate and breath holding time however no significant differences existed between aerobic running and swimming training in improving maximum oxygen consumption.

The adjusted post test mean values on selected physiological parameters of the experimental and control groups is graphically represented in figure–I..

Figure-I. Diagram Showing the Adjusted Post Test Mean Scores of Experimental and Control Groups on Selected Physiological Parameters



Discussion

Regular aerobic training improves physical fitness and recovery rate (Sloan et al., 2011). Previous studies have reported substantial improvements in endurance performance and changes in related physiological measures as athletes progress from the base training to competitive phases (Barbeau, Serresse & Boulay, 1993; Lucia et al., 2000; Galy et al., 2003). Depending on intensity the load can vary from some seconds to several minutes, followed by a few minutes of rest or an exercise phase at low intensity (Gibala, 2009). The focus of aerobic training is to progressively overload the cardio respiratory system and not the musculoskeletal system. More consistent and well documented adaptations to aerobic training include increases in capillary and mitochondrial densities (Crenshaw, 1991)

as well as oxidative enzyme activity (Bell, 2000; Nelson, 1990) all of which contribute to the enhanced delivery, extraction, and utilization of oxygen by skeletal muscle. Gillett and Elsenman (1987) in their study determined the effect of 16 weeks aerobic dance programme and was concluded significant improvement in the physiological variables such as breath holding time and heart rate. Sayed (1996) concluded that high, but not low, intensity physical conditioning significantly enhances the cardio respiratory fitness and reduces the resting level of plasminogen activator inhibitor activity which may be linked with the favourable effects of exercise conditioning.

Earlier studies have also demonstrated that exercise training by swimming increases the heart weight to BW ratio to values ranging from 12 to 31%. Cardiac hypertrophy is known to occur in response to various stimuli such as pressure and volume overload. Also, the association between LV structure at rest and cardiac performance during physical effort has been emphasized by several studies performed on trained subjects. Swimming training, used here as a training mode, is mainly related to volume overload-induced cardiac eccentric hypertrophy with predominant longitudinal myocyte growth. Moreover, the cardiac hypertrophy observed in swimming-trained is a physiological and beneficial cardiac adaptation, usually associated with increased cardiac performance.

Conclusion

It is concluded that due to the effect of aerobic running and swimming training the resting pulse rate, breath holding time and maximum oxygen consumption of the subjects was significantly improved. It is also concluded that swimming training is significantly better than aerobic running in improving resting pulse rate and breath holding time however no significant differences existed between aerobic running and swimming training in improving maximum oxygen consumption.

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