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ANALYSIS OF AEROBIC VERSUS ANAEROBIC TRAINING INDUCED ADAPTATIONS ON SELECTED HEALTH RELATED PHYSICAL FITNESS COMPONENTS OF PHYSICALLY UNTRAINED MEN

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Abstract

The purpose of this study was to investigate the relative effect of aerobic versus anaerobic training on selected health related physical fitness components. To achieve the purpose of this study, the investigator selected thirty physically untrained men as participants in the age group of 18 to 22 years. They were divided into three groups of fifteen subjects each. Group-I underwent aerobic training, group-II underwent anaerobic training and group-III acted as control. The selected health related physical fitness components were assessed by standard test and procedure. During the training period, the experimental groups underwent their respective training six days per week for twelve weeks. The data collected from the three groups prior to and post experimentation on selected dependent variables was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). It was concluded that both aerobic and anaerobic training groups have significantly improved the health related physical fitness components.

Key words: Health Related Physical Fitness Components, Aerobic And Anaerobic Training, Untrained Men

INTRODUCTION

Physical exercise is a capsule for better living. With regular exercise, coronary arteries that supply blood to the heart enlarge and new blood capillaries develop within the organ larger, stronger and more efficient. Exercise increases strength and efficiency of the muscles of rib cage and diaphragm. This causes an increase in the lung volume, enabling a person to take in more air and thus absorb more oxygen. A person who exercises regularly breathes more slowly at rest than one who does not work out. But, when required, he or she can breathe deeply and oxygenate a given volume of blood, spending less energy. Exercise increases the size of existing blood vessels and makes them more elastic. It promotes the formation of new blood vessels not only in the heart, but also in the skeletal muscles, thus improving the oxygen supply to all parts of the body. Exercise increases the total blood volume in the body, the density of red blood cells and the hemoglobin content. This increases efficiency of the body's oxygen transport system as well as the waste disposal mechanism, leading to improved muscular endurance and efficiency. Exercise helps to burn calories not only when exercising, but burns calories at a higher rate even after finished exercising and converts them into muscle tissues. Regular exercise will lower cholesterol levels. Exercise brings down high blood pressure; reduces body fat and increases muscle mass; helps reduce weight; keeps blood sugar under control; relieves muscle and joint pains; reduce stress; prolongs life; exercise improves feeling of well being.

Muscles require energy to function and will acquire that energy from different chemical sources within the body depending on the intensity and volume of work. How quickly and efficiently these energy sources are mobilized can be changed through a proper training regime. It's all a matter of calibrating or recalibrating ones physiology to adapt to the energy demands of a specific event; which is not necessarily need take a long time if there is a good fitness base. Exercise helps us lose weight, eliminate and manage stress, stimulates the immune system and reduces the risk of certain diseases. There are many forms of exercise. These can be classified into two main categories, the aerobics and anaerobic exercises. In particular, the aerobic exercise refers to any low-intensity activity that increases the heartbeat rate while the high-intensity physical activity is called anaerobic exercise (e.g. body building).

Aerobic exercises are powerful, and aerobic exercise needs to be a part of our fitness program. Aerobic exercise (also known as aerobics, cardiovascular exercise or cardio) is any sustained rhythmic activity that primarily uses of larger muscles, such as quadriceps and hamstrings, and challenges heart and lungs. Aerobic means "with oxygen," so when the exercise aerobically body uses oxygen to help produce energy during the exercise. Heart and lungs have to work harder to

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continuously deliver oxygen to body during aerobic exercise, and this strengthens the heart and lungs. The focus of aerobic training is to progressively overload the cardiorespiratory system and not the musculoskeletal system. A typical aerobic fitness workout lasts about 45 minutes to an hour. The intensity of an aerobic workout is measured in terms of the heart rate and exertion level. Adequate warming up and cool down exercises should be part of any aerobic fitness workout.

Anaerobic training involves exercise that is intense enough to trigger anaerobic metabolism. It greatly increases the body's functional capacity for development of explosive strength and maximization of the short-term energy systems. Non-endurance sports athletes using anaerobic training to promote speed, strength, power and muscle mass. This leads to greater performance in high intensity, short duration activities. Anaerobic energy is produced without the use of oxygen. The anaerobic energy system can provide great amounts of energy but this system fatigues quickly. People participating in sprinting, speed or power events are very familiar with this form of energy production. By-products of the anaerobic energy system cause us to breathe rapidly, our legs to burn and our heart to pound when we forcefully exert ourselves. The present scientific study is one of the efforts to explore and suggest a best scientific method for the development of health related physical fitness components of physically untrained men.

METHODOLOGY

Selection of the Subjects

To achieve the purpose of this study, the investigator selected forty five physically untrained men as participants in the age group of 18 to 22 years from Sree Vivekananda college, Kunnamkulam Thrisssur district, Kerala, India. They were divided into three groups of fifteen subjects each. Group-I underwent aerobic training, group-II underwent anaerobic training and group-III acted as control. The selected subjects were medically examine by a qualified physician in order to check whether they are medically and physically fit enough to undergo the training programme.

Selection of Variables

In this experimental study aerobic and anaerobic training were selected as independent variables and the selected health related physical fitness components such as muscular strength and muscular endurance were selected as dependent variables for this study. The muscular strength was assessed by leg press test and muscular endurance of the physically untrained men was assessed by conducting bent- knee sit-ups test.

Training Programme

In this study, the experimental groups underwent their respective training six days per week for twelve weeks. The experimental group-I performed aerobic running and experimental group-II performed anaerobic training. To fix the training load for the aerobic training group the subjects were examined for their exercise heart rate in response to different work bouts, by performing continuous running of two minutes duration 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. To fix the training load for the aerobic training group the subjects were examined for their exercise heart rate in response to different anaerobic work bouts by the anaerobic exercise of 50 metres sprinting was performed for proposed repetitions and sets, alternating with rest time that enables complete recovery. The subject's training zone was computed using Karvonen formula and it was fixed at 70%HRmax to 95%HRmax. The work rest ratio of 1:1 between exercises and 1:3 between sets was given.

Statistical Technique

The data collected from the three groups prior to and post experimentation on selected dependent variables was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA).

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Since three groups are involved, whenever the obtained 'F' ratio for adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to determine the paired mean differences. In all the cases level of confidence was fixed at 0.05 for significance.

RESULT

The data collected during the pre and post test period among aerobic and anaerobic training groups and control group on selected health related physical fitness components such as muscular strength and muscular endurance have been statistically analyzed and the details are presented in table –I.

Table – I: Analysis of Covariance on Health Related Physical Fitness Components of Aerobic and Anaerobic Training Groups and Control Group

Variable	Aerobic Training Group	Anaerobic Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	'F' ratio
Muscular strength	64.79	64.94	61.94	Between	83.47	2	41.74	16.82*
				Within	101.72	41	2.48	
Muscular endurance	34.59	32.60	28.14	Between	322.70	2	161.35	37.29*
				Within	177.39	41	4.33	

(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 adjusted post-test means on muscular strength of aerobic training, anaerobic training and control groups are 64.79, 64.94 and 61.94 respectively. The obtained 'F' value of 16.82 on muscular strength was greater than the required table value of 3.23 of 2, 42 df at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of aerobic training, anaerobic training and control groups on muscular strength.

The adjusted post-test means on muscular endurance of aerobic training, anaerobic training and control groups are 34.59, 32.60 and 28.14 respectively. The obtained 'F' value of 37.29 on muscular endurance was greater than the required table value of 3.23 of 2, 42 df at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of aerobic training, anaerobic training and control groups on muscular endurance.

The result of the study shows that, significant differences exist among the adjusted post-test means of aerobic, anaerobic training and control groups. Since the 'F' ratio is found to be significant, the Scheffe's post hoc test has been applied to find out the significant paired mean differences, and it is presented in table-II.

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Table II: Scheffe's Test for the Differences between the Adjusted Post Test Paired Means on Health Related Physical Fitness Components

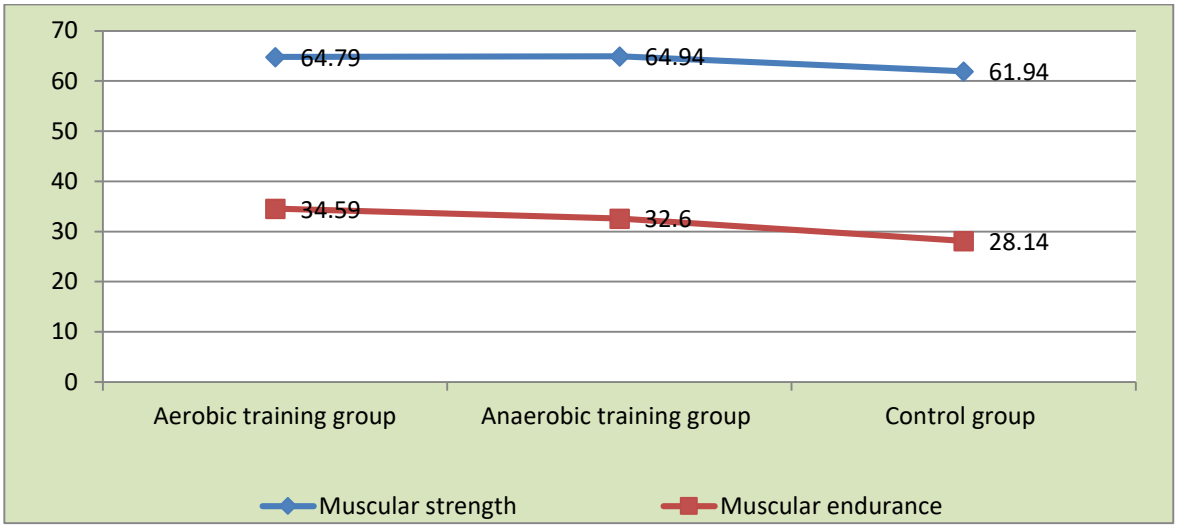
Variable	Adjusted Post Test Mean			Mean Differences	Confidence Interval
	Aerobic Training Group	Anaerobic Training Group	Control Group		
Muscular strength	64.79	64.94		0.15	1.46
	64.79		61.94	2.85*	1.46
		64.94	61.94	3.00*	1.46
Muscular endurance	34.59	32.60		1.99*	1.93
	34.59		28.14	6.45*	1.93
		32.60	28.14	4.46*	1.93

**Significant at .05 level.*

The Scheffe's post hoc analysis proved that significant mean differences existed between aerobic training and control groups, anaerobic training and control groups on muscular strength. Since, the mean differences 2.85 and 3.00 are higher than the confident interval value of 1.46 at 0.05 level of significance. However, no significant differences existed between aerobic training and anaerobic training groups, since, the mean differences 0.15 is lesser than the confident interval value of 1.46 at 0.05 level of significance. Hence, it is concluded that due to the effect of aerobic training and anaerobic training the muscular strength of the subjects was significantly improved. It is also concluded that no significant differences existed between aerobic training and anaerobic training groups in improving muscular strength.

The Scheffe's post hoc analysis proved that significant mean differences existed between aerobic training and anaerobic training groups, aerobic training and control groups, anaerobic training and control groups on muscular endurance. Since, the mean differences 1.99, 6.45 and 4.46 are higher than the confident interval value of 1.93 at 0.05 level of significance. Hence, it is concluded that due to the effect of aerobic training and anaerobic training the muscular endurance of the subjects was significantly improved. It is also concluded that aerobic training is better than anaerobic training in improving muscular endurance.

Figure- I: **Diagram Showing the Adjusted Post Test Mean Values of Experimental and Control Groups on Health Related Physical Fitness Components**



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DISCUSSION

There are two main types of exercises: aerobic exercise and anaerobic exercise. Aerobic and anaerobic training focuses on very different results on the body, it is easy to assume there are many different adaptations the body must make if one were to choose to only exclusively train aerobic or anaerobic. The focus of aerobic training is to progressively overload the cardio respiratory system and not the musculoskeletal system. Anaerobic exercise is used by athletes in non-endurance sports to build power and by body builders to build muscle mass. Muscles that are trained under anaerobic conditions leads to greater performance in short duration-high intensity activities. Anaerobic training involves exercise that is intense enough to trigger anaerobic metabolism. It greatly increases the body's functional capacity for development of physical fitness and maximization of the short-term energy systems.

Aerobic and anaerobic training leads to significant cardiovascular and respiratory changes at rest and during steady state exercise at both submaximal and maximal rates of work. Dawson et al., (1998) found significant improvement in speed and repeated sprinting performance among male subjects, after six weeks of short sprint training sessions. The training distance sprinted were 30-80m at 90-100% maximum speed and 20-40 sprints were performed in each session. They also suggested that increases in the proportion of type-II muscle fibers are also possible with this type of training. The performances in anaerobic types of sports are improved by high intensity interval running interspersed with periods of active recovery are used as the training stimulus.

Aerobic training causes the heart and lungs to work harder. The aerobic training increased peak aerobic power by 12% decreased the heart rate and increased all heart rate variability indices at absolute submaximal exercise intensities, but not at rest (Martinmaki et al., (2008). The effects of high intensity endurance training not only improve endurance capacity but also on underlying changes in the aerobic energy system. Endurance therefore refers to sustained high-intensity events powered mainly by aerobic metabolism. Such events last ~30 s or more (Greenhaff & Timmons, 1998). Miller, Laurance and Austin (1971) stated that repeated and continuous physical exercises may produce extensive change in the respiratory system. Regular aerobic training improves physical fitness and recovery rate (Sloan et al., 2011). Short-term daily conditioning protocol of aerobic exercise program induces significant improvements in both aerobic capabilities and anaerobic performance (Sartorio et al., 2003).

It has been reported by Sebastian (1998) that, progressive training and alternative high and low intensity training improved speed. Majdell and Alexander (1991); and Sharin et al., (1997) have found an increase in speed performance following sprint training. Satheeskumar (2012) suggested that anaerobic interval exercises can be imparted in order to improve the bio motor abilities. In addition, Dawson et al., (1998) found significant improvement in endurance performance following six weeks of short sprint training sessions. The magnitude of these adaptations may be due to the person's initial fitness level, intensity, duration, and frequency of exercise; and on the length of training. Thus, in analyzing such dominance of aerobics and anaerobic training in the development of health related physical fitness components both in the scientific and logical aspects, it was found that the findings are based on its scientific structure.

CONCLUSION

The aerobic and anaerobic training groups have significantly improved the selected health related physical fitness components such as muscular strength and muscular endurance of the untrained men. However, aerobic training is significantly better than anaerobic training in improving muscular endurance whereas insignificant differences found between aerobic and anaerobic training in improving muscular strength.

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