ORIGINAL RESEARCH PAPER

Sports Sciences

EFFECT OF ISOLATED AND COMBINED TRAINING OF AEROBIC AND YOGA ON CREATINE KINASE AMONG WOMEN PLAYERS

KEY WORDS: creatine kinase, aerobic training, yogic training, combined training, women players

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ABSTRACT

The purpose of the study was to find out the effect of isolated and combined training of aerobic and yoga on creatine kinase among women players. To achieve this purpose of the study, sixty female students were selected as subjects who were from the various games inter collegiate players, St. Cyril's college, Adoor, Kerala. The selected subjects were aged between 18 to 25 years. They were divided into four equal groups of fifteen each, Group I underwent aerobic training, Group II underwent yogic training, Group III underwent combined training and Group IV acted as control that did not participate in any special training apart from their regular curricular activities. The subjects were tested on selected criterion variable such as creatine kinase prior to and immediately after the training period. The selected criterion variable such as creatine kinase was assessed by Wurzburg method. The analysis of covariance (ANCOVA) was used to find out the significant differences if any, between the experimental group and control group on selected criterion variable. In all the cases, 0.05 level of confidence was fixed to test the significance, which was considered as an appropriate. The result of the present study has revealed that there was a significant difference among the experimental and control group on creatine kinase.

INTRODUCTION

The primary objective of sports training is to stress various bodily systems to bring about positive adaptation in order to enhance sporting performance. To achieve this objective, coaches and athletes systematically apply a number of training principles including overload, specificity and progression, organized through what is commonly termed periodisation. The application of these principles involves the manipulation of various programme design variables including choice of exercise, order of training activities/exercises, training intensity (load and repetition), rest periods between sets and activities/exercises and training frequency and volume in order to provide periods of stimulus and recovery, with the successful balance of these factors resulting in positive adaptation (1). Aerobic exercise is vigorous, oxygenated large muscle exercise, which stimulates heart and lungs activity for a specific period of time to bring about beneficial changes in the cardiovascular system. The main objective of aerobic dance, like any others form of aerobics is to increase the maximum amount of oxygen that the body can process in a given amount of time. The aerobic effect depends on the body's ability to (a) rapidly breathe large amounts of air, (b) forcefully deliver large volumes of blood, and (c) effectively deliver oxygen to all parts of the body. In simplest terms, the aerobic effect is large muscle activity that brings about a reduction in resting heart rate. Aerobic conditioning is synonymous with the first component of health-related fitness: cardiovascular efficiency. Improved cardio respiratory endurance is one of the most important benefits of aerobic training programs (2). The Sanskrit word "Prana" means "vital force" or "cosmic energy". It also signifies "life" or "breath". "Ayama" means 'control'. Hence, Pranayama means the control of the vital force through concentration and regulated breathing. Prana is not the supply of a particular volume of oxygen-nitrogen mix when we inhale. Nor is prana the volume of carbon dioxide mixed with the residual air that comes out when we exhale. Of course, the physico-chemical actions are there, but the prana sits at the root of the two processes -- exhalation and inhalation. It is the vital invisible force that enables us to breath out or to breath in.

Numerous recreational exercisers complete their cardiovascular and strength training workouts either during the same training session or within hours of each other. This sequential exercise regime is referred to as "concurrent training. The "fatigue hypothesis," which theorizes that strength performance is reduced due to fatigue caused by the prior cardiovascular work. Muscle fatigue is a multifactorial phenomenon, however, caused by an increase in cellular protons (due to acidosis), a decrease in energy-providing substrates and neural drive, and structural damage to the muscle cells (3).

In the context of physical fitness, 'exercise' refers to any activity involving a fairly high degree of physical movements that makes one breathless and sweaty if it is done vigorously. During physical exercise one has to breathe more deeply to get more oxygen into the lungs and the heart must beat harder and faster to pump blood to the muscles. The physical benefits of exercise are unarguable but there are physiological benefits also. Many people have sound sleep after exercise, wake up more refreshed and are more alert and better able to concentrate than when they are unfit. Exercise of the right sort should make one feel better, live longer and have less illness (Tony Smith, 1983).

Primarily on increased or enlargement of chemical factories (mitochondria) in muscle, endurance training helps to raise the level of some enzymes, increase the capacity to generate ATP and increase or enlarge the chemical factories (mitochondria) in muscles. Some researchers have reported that endurance exercise can adaptively change anaerobic type muscle tissue to an aerobic variety by increasing the size and number of the components. However, this interpretation is still under investigation. The endocrine system includes all tissues or glands that secrete hormones. Endocrine glands secrete their hormones directly into the blood. The hormones secreted by the specialized endocrine cells are transported through the blood to specific target cells. Hormones act as chemical signals throughout the body. Upon reaching their destinations, they control the activity of the target tissue. A unique feature of hormones is that they travel away from the cells that secrete them and specifically affect the activities of other cells and organs. Some affect many body tissues, whereas others affect only specific target cells.

During physical activity the body's nutrient need increases, consequently its chemistry changes. Endocrine system and hormones are key players in managing the body's chemistry. During physical activity some hormone levels increase and others decrease. Elevation and depression of hormone levels depend upon various factors such as nature of exercise, gender and age. Androgens are male hormones that women

have too. They have an anaerobic action, helping the body to build strong bones and muscles. DHEA and testosterone are both androgens and both respond to exercise. The response, however, can vary depending on gender and type and duration of exercise. Testosterone levels increase in men during most forms of exercise, weight lifting has shown increased testosterone level by as much as forty percent.

Body demands more fuel for energy when physically active, therefore it recognizes exercise as stress. Thirty minutes of cycling results in higher cortisol level in men. In women, an intense game of handball elevates cortisol. It seems the more strenuous the exercise the more dramatic increase in cortisol production. Once exercise has stopped, cortisol goes down. But, cortisol is a good positive and bad negative kind of hormone.

Cortisol help, to cope with the stresses of life, chronically high levels can affect the body in negative ways. Too much cortisol in circulation for too long can suppress immunity mask symptoms of inflammation and infection, elevate blood pressure and increase blood sugar problems, fat accumulation, memory loss and the risk for heart disease and osteoporosis. Increased cortisol can also slow down the body's production of testosterone. Low testosterone due to aging, exercise routines that elevate cortisol may not be the best choice. Success in competitive sports requires continual excessive training. This may produce elite athletes, but it can also have detrimental effects, including elevated cortisol. Studies have shown that at aging moderate exercise can raise cortisol levels, and that sustained exercise programs keep them elevated.

Creatine kinase (CK) is a protein that is found almost exclusively in muscle tissue. When skeletal muscle damage or disruption of muscle fibre occurs as a result of acute exercise, CK gets leaked into the blood stream. Hence it is considered as the most common plasma marker of muscle damage.

The biological system is endowed with protective mechanisms which tend to control the free radical mediated reactions and minimize the damage caused by the reactive oxygen species (ROS). These are the antioxidants which convert ROS either to oxygen by oxidation or water by reaction. The antioxidants are either enzymatic or non enzymatic in nature. Enzyme which can catalase the dismutation of $-2O$ and removal of H_2O_2 from the first line of defence against oxidising radicals by limiting their tissue concentration. Other enzymes and a wide range of trapping agents form a second line of defence to limit the interaction of tissue oxidants with essential tissue components.

METHODOLOGY

In the present study all the students studying in various department of University of Kerala were considered as population for the study. A representative sample of 60 women participated various games inter collegiate tournaments, St. Cyril's college, Adoor, Kerala in the age of 18-25 years was chosen as sample for the study. The selected participants were divided into four groups. Group I underwent aerobic training, group II underwent yoga training, group III underwent combined training and group IV act as control group. The experimental groups underwent twelve weeks of training in their particular workout. For this study dependent variable is creatine kinase.

Estimation of Creatine Kinase (CK)

Venous blood was collected in the early morning after the subjects were abstained from all food and drink except water for 8 hours and from vigorous activity for at least 24 hours to estimate the selected enzyme and hormonal variables.

Five ml of blood was drawn from the subject's antecubital vein by venous puncture method and the blood was immediately transferred into sterilized small bottles. Blood samples were drawn on two occasions i.e. 24 hours before the commencement of training (pre) and 48 hours after the completion of 12 weeks training programme (post).

CK-MB was estimated by the method of Wurzburg (1976) using reagent kit. CK-MB is composed of two molecules, CK-M and CK-B. A specific antibody inhibits the CK-M without affecting CK-B. The CK-B fraction accounts for one half the activity of CK-MB.

Reagents

1. Enzyme/antibody
2. Buffer
3. Working reagent: the contents of one bottle of (1) was mixed with 2.5 ml of buffer.

Procedure

0.1 ml of plasma was added to 2.5 ml of the working reagent, mixed and incubated at 37C for 10 minutes. The absorbance was read at 340 nm and then exactly after 5 minute, the absorbance was again noted. The difference in the absorbance was taken to determine CK-MB activity.
The values were expressed as 'iu/l'.

Analysis of Data

The data obtained were analyzed by analysis of covariance (ANCOVA). Analysis of covariance was computed for any number of experimental groups, the obtained 'F' ratio compared with critical F value for significance. When the F ratio was found to be significant, scheffe's post hoc test was used to find out the paired mean significant difference (8).

RESULTS

The analysis of covariance on the data obtained for creatine kinase of the pre and post-test of aerobic, yoga, combined training groups and control group have been presented in Table I.

Table I Analysis Of Covariance Of Data On Creatine Kinase Between Pre-test And Post-test Of Aerobic, Yoga, Combined Training Groups And Control Group

Test	Aerobic Training	Yoga Training	Combined Training	Control Group	Obtained 'F' Ratio
Pre Test Mean	230.23	230.42	230.58	229.94	1.14
Post Test Mean	227.54	220.47	225.46	229.12	15.83
Adjusted Post Test Mean	227.63	219.68	225.31	229.34	85.42

*Significant at 0.05 level of confidence.

The table value for significance at 0.05 level with df 3 and 56 and 3 and 55 are 3.16 and 3.03 respectively.

The table I shows that the pre-test means of aerobic, yoga, combined training groups and control group are 230.23, 230.42, 230.58 and 229.94 respectively. The obtained 'F' ratio of 1.14 for pre-test means is less than the table value of 3.16 for df 3 and 56 required for significance at 0.05 level. The post-test means of aerobic, yoga, combined training groups and control group are 227.54, 220.47, 225.46 and 229.12 respectively. The obtained 'F' ratio of 15.83 for post-test mean is more than the table value 3.16 for df 3 and 56 required for significance at 0.05 level.

The adjusted post-test means of aerobic, yoga, combined training groups and control group are 227.63, 219.68, 225.31 and 229.34 respectively. The obtained 'F' ratio of 85.42 for adjusted post-test means is more than the table value of 3.03

for df 3 and 55 required for significance at 0.05 level.

The results of the study indicates that there is a significant difference among adjusted post-test means of aerobic, yoga, combined training groups and control group. To determine the significant difference among the four-paired means, Scheffe'S post-hoc test was applied and the results are presented in Table II.

Table II Scheffe's Test For The Difference Between The Adjusted Post-test Paired Means Of Creatine Kinase

Adjusted Post-test Means				Mean Differences	Confidence Interval
Aerobic Training	Yoga Training	Combined Training	Control group		
227.63	219.68			7.95*	1.82
227.63		225.31		2.32*	1.82
227.63			229.34	1.71	1.82
	219.68	225.31		5.63*	1.82
	219.68		229.34	9.66*	1.82
		225.31	229.34	4.03*	1.82

*Significant at 0.05 level of confidence.

Table II shows that the adjusted post-test mean difference in creatine kinase between aerobic and yoga training, aerobic and combined training, yoga and combined training, yoga and control, and combined and control groups are 7.95, 2.32, 5.63, 9.66 and 4.03 respectively, which are higher than the confidence interval value of 1.82. But aerobic and control groups mean difference is 1.71, which is lesser than the confidence interval value of 1.82.

DISCUSSION ON FINDINGS

In many cases, exercise training and yogic training is more an art than a science. The success of different conditioning programs is usually evaluated by individual achievements or won-loss records rather than by scientific inquiry and discovery. Training the aerobic capacity of endurance athletes, on the other hand, would be wasteful because the contribution of anaerobic energy to successful performance is minimal. Rather, these activities demand a well-conditioned heart and vascular system capable of circulating large quantities of blood as well as a high capacity of muscle cells to generate ATP aerobically.

With a clear understanding of energy transfer and the effects of specific training on the system of energy delivery and utilization, it should be possible to construct a sound training program to achieve optimum performance.

The major objective in training is to cause biological adaptation in order to improve performance in a specific task. This requires adherence to carefully planned and executed activities. Attention is focused on factors such as frequency and length of workouts, type of training, speed, intensity, duration and repetition of the activity.

Creatine kinase level was decreased significantly by yoga and combined training groups when compared with control group. Further it reveals that yoga group was significantly reduce creatine kinase level when compared with combined and aerobic training groups. It also found significant difference in favour of combined group compared with aerobic group. But fails to have significant difference between aerobic and control groups.

Creatine kinase, a protein that is found almost exclusively in muscle tissue gets leaked into the blood stream as a result of skeletal muscle damage or disruption of muscle fibre due to exercise. Creatine kinase is considered as the most common plasma marker of muscle damage.

Unaccustomed exercise has been shown to result in temporary, repairable skeletal muscle damage. Extensive disruption of muscle fibres also occurs after short-term concentric and eccentric exercise. Damage of muscle fibres causes leakage of muscle proteins like creatine kinase into the blood stream. Because creatine kinase is found almost exclusively in muscle tissue, it is the most common plasma marker of muscle damage.

It is clear that elevation of creatine kinase is the result of muscle damage. Muscle damage might have occurred due to lipid peroxidation by the free radicals that might have been produced due to exercise. It may be inferred that oxidative stress occurs as a result of exercise. The results of the study also show insignificant difference between aerobic and control groups.

Plasma creatine kinase activity, in index of muscle damage increased after exercise in trained athletes**.** The results of the study also reveal the same in conformity with the following studies (Nicholson and others, 1986, Manabu Totsuka and others, 2002, Pourvaghar and Shahsavar, 2009, Tin-Chang and Shu-Ling, 2010 and **Baird** and others, 2012).

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