

The Effect of Rest Duration and Vitamin C Consumption on Serum Lactate Dehydrogenase and Creatine Phosphokinase Concentration of Men Athletes during Interval Trainings

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ABSTRACT

The purpose of this investigation is to study the effect of rest duration in interval training and consumption of vitamin C supplement on serum lactate dehydrogenase (LDH) and creatine phosphokinase (CPK) enzyme concentration. To this end, three groups were selected. The first group had one minute rest between two sets of 400 meters run, the second group had three minutes rest between two sets of 400 meters run and the final group had three minutes rest between two sets of 400 meters run with consumption of vitamin C supplement. The data of the research were analyzed using spss10 software. To test research hypothesis, descriptive statistics with 0.05 significant level and deductive statistics were used. Statistic tests applied were T-test and ANOVA. Each group consisted of ten participants. Results of the investigation indicate that serum CPK and LDH enzymes increasing significantly due to physical activity. Also rest duration did not have significant effect on concentration of serum CPK. The result also showed that the group with more rest time had lower concentration of these enzymes. Vitamin C consumption caused a significant decrease in serum CPK level.

Key words: Intermittent Training, Exercise intensity, lactate dehydrogenase, creatine phosphokinase

INTRODUCTION

In an interval training plan, applying proper time for rest duration between two training cycles could be a very important factor to prevent extreme tiredness and reduce injury possible hurt. During vigorous physical activity creatine kinase (CK) and lactate dehydrogenase (LDH) can increase and during recovery they return to normal levels^{1,2}. This phenomenon occurs during intensive anaerobic exercise that causes damage to the muscle that is evident up to 24 hours post exercise³. Cell injuries causing enzymes to leak out of cell are not always morphologically recognizable; and although they would be weaker than necrosis, they still increase serum levels of CP and LDH¹. We can say that the factors such as concentration of hematocrit, lack of

plasma water, concentration of blood's protein, blood concentration, environment temperature, changes in blood circulation, and decrease in PH and especially increase in secretion of cortisol⁴ can cause major changes in thyroid gland's hormones.

LDH is an enzyme found in skeletal muscle sarcoplasm responsible for clearing lactate caused by quick consumption of glucose released by muscle spasm while exercising anaerobic. In natural conditions, serum LDH function expresses body lactate metabolism level and extent of basal cells damage. Increasing activity of lactate dehydrogenase sodium may indicate enzyme spreading from muscle cells which damaged in per oxidative or some other disorders indicators⁵. This enzyme overly found in all tissues (even in red cells

of blood) (1, 5). Serum CPK concentration is a muscle destruction indicator in response to one set of training or continuing muscle spasm in low intensity. This enzyme usually can not be found in red cells of blood^{1,5}. Changes in enzyme lactate dehydrogenase appear slower than creatine kinase. Ascorbic acid plays an important role in body. Function mechanism of this vitamin is not completely obvious, but it participates in oxidation and regeneration reactions and it has a significant effect on antioxidants^{1,5}. Studies have showed that ascorbic acid could function as a filter for decreasing free fat radicals⁶. Vitamin C consumption causes plasma maximum antioxidant to increase⁷.

Vigorous exercise on ergometer bicycle and enzyme CPK and LDH measurement in blood during three times, 2, 6 and 24 hours after trainings showed that anaerobic exercise cause quick and changeable increase in plasma LDH function and bring more stabilized and extended increase in CPK function range⁸.

The study of changes level in serum LDH and CPK concentration during 100 meter swimming plane demonstrate that there will be a significant difference in serum LDH and CK concentration after training plane⁹.

Based on research findings, eccentric exercise activities cause more serious damage than other muscle activities^{10,7}.

The results of zhang investigation (1991) indicated that after vigorous exercises, examinee's LDH and CK level significantly increases, while regular exercises cause muscular coordination to increase and hurts to decrease¹¹.

Tiidus and Lanuzzo (1983) studies concentric and eccentric contractions of leg extensor muscles. Results acquired from blood samples during 8 to 48 hours after performing activities indicate the highest increase in serum LDH and CPK enzymes function and muscle spasms¹². Highly vigorous exercises in relation to less vigorous ones cause serum enzymes function to increase more and their amount will reach the highest point by increasing muscle spasm¹².

Vitamin C supplement consumption would be effective in recovery of not trained examinees after one set of intensive training¹³.

DingChao and cooperators (1994) by studying effects of high ascorbic acid consumption (250 mg/kg) on the myocardium of patients who had by pass operation, came to the result that changes in serum LDH and CPK in ascorbic acid receiver, while heart operation and after it, was lower than instance group⁶.

A serious inflammation model in human persist that temporary consumption of vitamin C supplement immediately after injury increases tissue injuries and oxidative tension⁷.

The purpose of performing this investigation is to study the effect of rest duration in interval on physiological enzymes spreading from muscles and tissues busy in maximum exercises which is an indicator of exercise intensity and possible tissue injury and also the effect of vitamin C on these enzymes and study their role in preventing tissue injury.

MATERIAL AND METHODS

The method of research was semi-experimental. Subjects have been divided into three groups. First and second group were present in location (Department of Physical Education) in proper time (At 3 P.M) to perform the test, But the third examinee group was given 1500 mg of vitamin C tablet one day before test to consume three doses of 500 mg in 10 P.M, 8 A.M, and tomorrow 2 P.M.

At 3 P.M, the first blood sample for all three groups was taken. After that, all groups were warmed up by stretching and jogging of equal intensity. Then, the test was performed as two sets of 400 meter interval running during 60 seconds on a track for all three groups. Two hours after second activity, second blood sample was taken.

Training protocol for first group includes: two sets of 400 meter run and one minute rest between activities.

Training protocol for second group includes: two sets of 400 meter run and three minute rest between activities.

Training protocol for third group includes: two sets of 400 meter run and three minute rest between activities and consumption of vitamin C supplement.

(all three groups ran with an equal intense).

Thirty men athletes purposely were selected and participated in this research. The measure of height, weight and age of all Subjects registered and they were participated after the body mass index (BMI) and assimilating were appointed. These individuals were in (21.63±1.24) age, (175.89cm±5.82) height, (66.81kg±8.19) weight and (21.55±2.15) body mass index were placed respectively from first to third group.

The collected blood samples were transferred to laboratory with refrigerator to measure the serum LDH and CPK enzymes. These enzymes were measured by auto analyzer device and CK-MB and LDH (DGCK) quantities assessment kit in photometric method.

This investigation is semi-experimental and pre tests and post tests were used to compare variances and investigating the results. The applied statistical test is paired samples T-test and ANOVA which are analyzed by spss.10 software.

T-test is used for in-groups studies and ANOVA for inter group studies. Significant level is 0.05.

RESULTS

For examining research hypothesis, descriptive and inferential statistics are used in this investigation. Independent variables in investigation consist rest duration and consumption of vitamin C supplement and dependent variables are serum CPK and LDH enzymes' variations. Significant level is 0.05.

Exam of research hypothesis states that:

There is a significant variance between LDH in pre test and post test in all three groups, and this variance had been toward increasing serum LDH level.

There is a significant variance between CPK in pre test and post test in all three groups, and this variance had been toward increasing CPK level.

The exam of the variance analysis on concentration of serum CPK and LDH enzyme also illustrated that there is a significant variance between three groups (Tables 1 & 2).

Results of ANOVA on concentration of LDH indicate that; F critical = 12.114, P value = 0.0001, df for Between group = 2 & for Within group = 27.

Results of ANOVA on concentration of CPK indicate that; F critical = 32.079, P value = 0.0001, df for Between group = 2 & for Within group = 27.

Table 1: Results of paired-T test on LDH in subjects

The study group	Mean difference	T value	P value
Group 1	116.778	9.379	0.0001
Group 2	98.668	12.472	0.0001
Group 3	224.250	17.287	0.0001

Table 2: Results of paired-T test on CPK in subjects

The study group	Mean difference	T value	P value
Group 1	328.889	11.879	0.0001
Group 2	241.444	10.521	0.0001
Group 3	84.625	6.398	0.0001

But the results from LDH₂ TUKY examination indicated that there is a more significant variance in third group (Table 3). And the results

from CPK₂ TUKY examination indicated that all three groups have significant variance with each other (Table 4). (P = 0.0001)

Table 3: Unplanned multiple comparison with TUKY test

Dependent variable	Group I	Group J	Mean difference	p value
LDH ₂	Group 1	Group 2	16.556	0.879
		Group 3	155.847*	0.001
	Group 2	Group 1	16.556	0.879
		Group 3	172.403*	0.001
	Group 3	Group 1	155.847	0.001
		Group 2	112.403*	0.0001

Table 4: Unplanned multiple comparison with TUKY test

Dependent variable	Group I	Group J	Mean difference	p value
CPK ₂	Group 1	Group 2	89.556	0.879
		Group 3	155.847*	0.001
	Group 2	Group 1	89.556	0.879
		Group 3	197.917*	0.001
	Group 3	Group 1	287.472*	0.001
		Group 2	197.917*	0.0001

DISCUSSION

The main goal of research was to investigate the effect of rest duration in intermittent training on concentration of lactate dehydrogenase and creatine kinase. Comparing pre test and post test results was analyzed as follow:

- Rest duration did not have a significant effect on concentration of serum LDH, but it had on CPK.
- Consumption of vitamin C supplement caused a significant increase on concentration of serum LDH, but significantly decreased the concentration of serum CPK.

As the result of this investigation, rest duration did not have a significant effect on concentration of serum LDH enzyme, but exercising itself caused LDH enzyme to increase. Moreover, increasing rest duration caused concentration of CPK enzyme to decrease but vigorous exercise increased enzyme concentration. Results of investigations in the effect of physical activity and

enzyme concentration increase, done by Pourvaghar and Shahsavari (2009), Vaile and cooperators (2008), Costa and cooperators (2007), Tiidus and Lanuzzo (1983), Piliis and cooperators (1988) and Roberts and cooperators (1982), confirm to present investigation (3, 14, 15, 12, 8, 16). Anaerobic exercise stages and equal exercise intensity applied in this research could be a reason to this agreement.

Research findings of Thomas and Song (1990), Karamizrak and cooperators (1987) and Ohkuwa and cooperators (1984) disagreed with present investigation (17, 18, 19). Rest applied in this investigation is the reason for disagreement.

Most of the investigators believe that mechanical and metabolic provocations cause muscle injury and spread creatine kinase enzyme. In this research, LDH high concentration which continued for 24 hours after exercise, agreed with most investigators³.

As the result of this investigation, consumption of vitamin C supplement cause relative increase in concentration of LDH enzyme to those two groups which did not consume vitamin C. Investigations of Child and Jacob (2001) agreed with present investigation results⁷. But investigations of DingChao and coordinators (1994) disagreed with present investigation⁶.

Results of this investigation indicate that vitamin C cause relative decrease in CPK enzyme to two other groups which didn't consume vitamin C. Research findings of DingChao and cooperators

(1994) agreed with present investigation⁶. Thampson and coordinators (2004) and Thampson and cooperators (2001) and Child and Jacob (2001) research disagreed with present investigation (13, 20, 15). In these investigations vitamin C supplement didn't have any effect on physiological index, sign of muscle hurt or muscle function. Exercise intensity and also duration and kind of rest applied in present trainings could be a reason of disagreement. Also the amount of vitamin C consuming doze which advised 1500 mg per day in this research was another reason of disagreement.

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