



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

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**THE EFFECT OF VERY SHORT 60 AND 120 SEC RESTING PERIODS DURING
HEAVY RESISTANCE TRAINING ON CORTISOL DENSITY IN ELITE ATHLETES**

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ABSTRACT

Nowadays, resistance training is the inseparable part of different fields of sport exercise, and in most of sport fields, resting periods with different duration among sets of resistance exercises are used. Now, there are lots of studies on optimization of resistance exercises.

Ten volleyball players with the age amplitude of 25.53 ± 1.93 have been chosen voluntarily and randomly, and have been put in a group purposely. The attendances did up very heavy resistance training in seven stations with intensity of 70 percent of one maximum repeat. At the session, they used 60 sec rest among sets and stations. In order to measure the variables, blood samples have been taken just after doing exercises and 30 min after exercises, and also on an exercising day and non-exercising day in the morning. In the three steps of measurements with 60 sec rest, cortisol had an increasing raise from before exercise up to 30 min after exercise, which had 33.19 percent increases immediately after exercise and 58.77 percent increases 30 min after exercising ($P=0.001$).

As for the results of the search, we can say that if we have more rest time, cortisol density will decrease 30 min after exercise. Of the probable differences of this study and other studies we can

point out probable mechanisms such as: the population of this study, the seven numbers of stations in the protocol and also the combination of bust and lower movements of body and intensity of exercises and the implementation place of the protocol.

Keywords: Heavy Resistance Training, Cortisol, Elite Athletes

INTRODUCTION

Special physical fitness of each sport is formed by paying attention to the general physical fitness and with the purpose of physical fitness, physical improvement of athletes and physiological characteristics of slightly sport field .In the case of special fitness improvement, there will be much adoptions in athletes' ability and more activity in exercise and finally in the competition.

It has been defined that athletes who have passed a proper physical fitness stage simply, can act at high level. So at the specific physical fitness stage, those targets that have a close relation with technical, tactical and psychological skills in the slightly sports, should have been taken into consideration.

Specific physical fitness is going to be achieved only when exercise intensity is high and its volume is low. With emphasis on exercise intensity, central nerve system and the whole organism have been exposed high pressure. In such situation, nerve cell and the whole organism become powerless and then lead to decrease working capacity of the athletes. Improvements of the capabilities

such as speed, strength, endurance, which is scientifically so-called "existence movements capabilities, have been started at the end of physical fitness stage. It is clear that the purpose of exercise, according to doing exercises in heavy or high situations, will be continued. I n the first position (heavy exercises), strength and power will be improved, while in the second position (light exercise), the speed of players would be increased [1].

Nowadays, resistance exercises are the inseparable parts of different sports, and in most sports, resting gaps with different times among resistance sets of exercises are used. Now, there are lots of investigations about optimizing resistance exercise, some of the variables which have been studied in these investigations pertain to intensity, duration, volume and type of the exercises [2, 3]. It seems like; changing in these variables causes biological and hormonal changes and also some changes in result of exercises [3, 4]. On the other hand, there are many evidences that the T/C ratio is as an index of exercise pressure and changes at this ratio of resistance

and strength exercise type is effective by hypertrophy exercise [5, 6].

Past studies indicated that, changes in testosterone and cortisol in resistance exercises are affected by different variables such as duration, volume and involved mass of muscle and resting periods among sets [7, 8]. changing of resting periods among sets in strength exercises, leads to changes in exercise performance and metabolic and hormonal changes in response to sport exercise and adoption with sport [9, 10]. Strength exercise with different protocol can change secretion of testosterone and cortisol hormones. Resistance exercise is an effective way to increase density of anabolic hormones which in fact lead to stimulate volume increase and strength of muscles [11, 12].

Juorima *et al.*, (1990) investigated the effect of an strength exercise circular session on cortisol and testosterone respond , and concluded that on session of circular strength exercise increase testosterone and cortisol significantly .And also there was a reduction in the ratio of these two(testosterone and cortisol) which is index of exercise pressure , which shows the stimulation methods of decomposition of energy resources .At the time of recovery, this ratio has been increased which is the sign of energy resources reconstruction. At the end of the exercise

cortisol increase had been continuing up to one hour which had been parallel to ACTH increase.24 hours after exercise, cortisol density has been reduced. Testosterone and cortisol after exercise at the first hour of recovery period had increased, but in next hours the increase speed of cortisol had been reduced and only testosterone increase had been continued [13].

Kraemer *et al.*, (1996) investigated the effect of resistance exercise with low volume and maximum repeat on cortisol respond and beta Endorphins in another study. They conclude that resistance exercise in low volume but high intensity cause blood lactate increase without any changes in beta endorphins and cortisol [14].

Grostitina *et al.*, (1999) studied the effect of heavy resistance training on eruptive strength and hormonal responses in handball players. After 6 weeks of heavy resistance training, no meaningful change in testosterone and cortisol level was discovered, but tendency for disorientation of these two hormones was discovered, and the fluctuation of these two was accompanied with overtraining syndrome [15].

Bottaro *et al.*, (2009) didn't find any difference in T/C ratio in response to short resting periods 30, 60 and 120 second in exercised women [16]. Rahimi *et al.*, (2011)

indicated a resistance in exercised men, which T/C Ratio of resistance exercised men during resting periods of 120 second is higher than those resting periods of 30 and 60 second. So, the purpose of exist study, is to investigate affect of very short periods of resting of 60 and 120 second along the heavy resistance exercise on cortisol density in elite athletes [17].

SUBJECTS AND METHODS

The population is consist of then elite male volleyball player of Orumieh with volleyball exercise background of 10.98 ± 1.8 with reputation of weight training of 7 ± 2.4 . Subjects of this project were the ten volleyball player with the age range of 25.53 ± 1.93 , who were in one group. The subjects attended in two highly intensity resistance exercises with one week interval, and in each session, blood sample were taken pre-test, post-test and 30 second after each exercise. 3 cc Blood samples at the time 15:30 as pre-test and immediately after exercise and 30 minutes after exercise, were collected. Due to hormones circadian rhythm has been recognized, one week before performance of protocol, after 8 hours of night sleep at 8 o'clock and 12 hours fasting also one sample had been collected.

All the subjects did two session of exercise in order to get familiar with exercise plan before

starting exercise period, and their 1RM has been measured in these sessions indeed. Both two sessions of heavy resistance exercise have been starting with general warming-up, and also to warm-up special muscles had been practicing each of the movements with one set of 15 repeats or with very light work load.

Resistance practical movements were bench press; pull over, shoulder press, squat, and machine leg extension, machine leg curl and triceps extension which were done in the case of cycle exercise. Between each set and each station, 60 second of rest had been considered. Each strength practical movement was done in 3 sets with 10 repeats and 70 percent of one maximum repeat. To investigate the studied variables, analysis of variance (ANOVA) with repeated measurements was used.

For all the population exams a meaningful level of 0.05 was considered, and the statistical software SPSS version 16 was used for doing statistical calculation.

RESULTS

General specifications of the participants in the research according to the variance and average have been shown in **Table 1**.

As it is shown in the Table, subjects consist of age, weight, height, exercise reputation and natural body mass index, which this

investigation has been verified by Smirnov-Kolmogorov test.

The average density of athletes' cortisol in the resting protocol of 60 and 120 second, before exercise, immediately after exercise and 30 minutes after morning exercise has been shown in **Table 2**.

Table 2 shows that:

- The minimum rate of cortisol density, in 60 second resting, is 275.17 nmol/lit before exercise. Maximum cortisol density rate, in 60 second resting group is 436.9 nmol/lit relevant to 30 minutes after exercise.
- Minutes mum cortisol density rate, in 120 second resting group, is 264.68 nmol/lit relevant to 30 minutes after exercise. Maximum cortisol density rate, in 120 second resting group, is 300.84 nmol/lit immediately after exercise. Maximum total cortisol density is

504.804 nmol/lit relevant to fasting cortisol.

At 3 terms of measurements with 60 second resting ,we had increased rising of cortisol before exercise up to 30 minutes after exercise, which included an increase of 33.19 percent immediately after exercise and an increase of 58.77 percent just 30 minutes after exercise (P=0.001).

The cortisol quantity in 3 stage of 120 second exercising session measurements was different so that after exercise, we had low rate increase of 5.8 percent, and 30 second after exercise the increased rate was less than of 6.8 that of before the exercise (P=0.000).

In comparison with the rate of fasting, up to before exercise, cortisol rate had a descending process, and was less than its fasting rates even at maximum of its increasing rate after exercise. In comparison between two sessions, the maximum quantity of cortisol, was 30 minutes after the session with 60 second rest, which was shown an increase of 58.77 percent (P=0.033)

Table 1: General Specifications of the Subjects

Variables	The ten elite man volleyball player
Age (year)	25.53±1.38
Weight(kg)	91.04±6.46
Height(cm)	191.85±4.72
Volleyball practice reputation(year)	10.68±1.8
Resistance exercise reputation(year)	7±2.4
Body mass index	24.72±1.02

Table 2: Statistic Explanation of Average and Standard Variance of Cortisol Density

Variable		fasting	before exercise	immediately after exercise	30 minutes after exercise
cortisol					
60 second resting group	Average ± standard variance	504.804±78.36	275.17±42.14	366.52±144.39	436.9±233.18
120 second resting group	Average ±standard variance	504.804±78.36	284.28±55.56	300.84±87.53	264.68±69.96

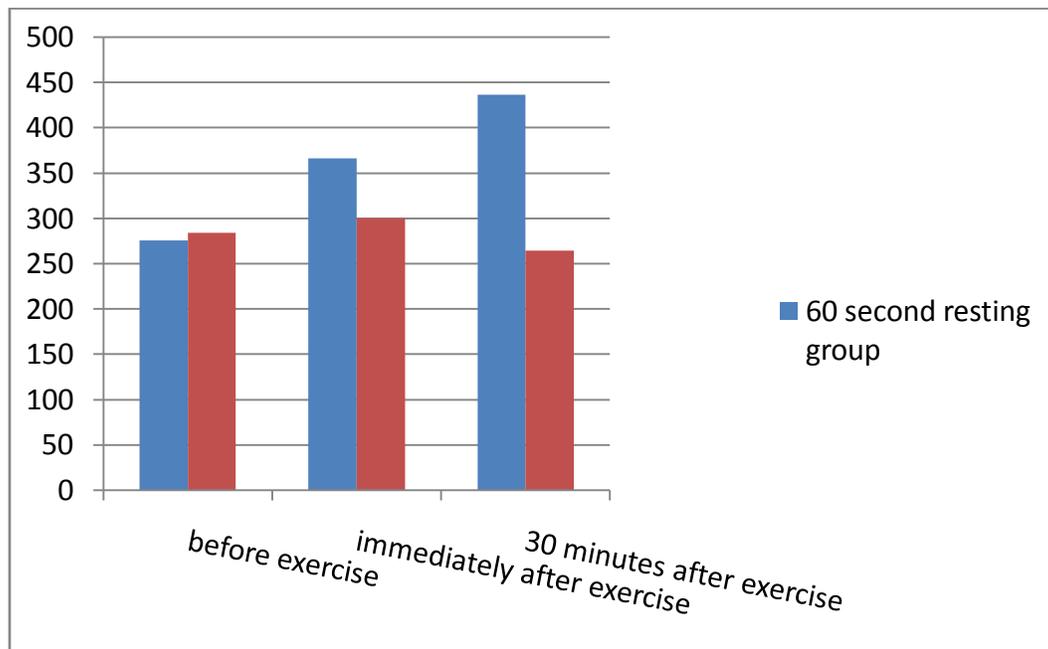


Chart 1: Cortisol Density in 60 and 120 sec Resting Periods

DISCUSSION

At the 3 measurement stages of exercising sessions with 60 second rest, cortisol had a rising increase before exercise up to 30 minutes after exercise, which had an increase of 33.19 percent immediately after exercise and had 58.77 percent increase just 30 minutes after exercise (P=0.001), while Rahimi *et al.*, (2011) with a different training protocol and same resting time, had been observing a linear increase,

immediately after exercise, up to 30 minutes after that.

The quantity of cortisol in the 3 measurement stages of exercising sessions with 120 second rest were so different that after exercise, only a low increase of 5.8 percent was observed, and was less than that quantity of before exercise 30 minutes after exercise and showed 6.8 percent increase (P=0.000) while Rahimi *et al.*, (2011), with a different exercising protocol

and same resting time had been observing very low increase of testosterone immediately after exercise and its rising increase after 30 minutes.

In comparison with quantity in fasting time, cortisol had a descending process up to before exercise and was less than its fasting time quantity even at its maximum increase after exercise. In comparison between 2 sessions, maximum quantity of cortisol was 30 minutes after session with 60 second rest which indicated an increase of 58.77 percent ($P=0.033$).

CONCLUSION

According to this research we can say that, the much resting time there will be much reducing cortisol density 30 minutes after exercise. On the probable differences of this research and other studies, below probable mechanism can be pointed out and being into consideration: the population of this study, the 7 stations number in this protocol, and also combination of body movements and exercise intensity and time and the performance location of the protocol.

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