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The effect of resistance training on thyroid hormones

Eskandar Rahimi[1*], Younes Mohammad Zadeh[2] and Mohammad Ali Boostani[1]

[1]*Department of Physical Education, Science and Research Branch, Islamic Azad University, Fars, Iran*
[2]*Department of Physical Education and Sports Sciences, Faculty of Physical Education and Sports Sciences, Islamic Azad University, Arsanjan Branch, Fars, Iran*

ABSTRACT

The purpose of the present study was to determine the acute and chronic effects of 8 weeks of resistance training periodically on levels of T3, T4 and TSH levels in young men in physical education field. 20 subjects were examined in this study were randomly divided into experimental and control groups. Experimental group at 8 weeks of resistance training increased cyclic, participated. Before, immediately after and two hours after the first test (48 hours before the start of training) and final exam (48 hours after the end of exercise), blood samples were taken from subjects. Control group, only the beginning and the end of 8 weeks, blood samples were. To investigate the changes of variables in the experimental group, a repeated-measures analysis of variance was used. Comparisons between cyclic resistance experimental group and the control group, independent T-test was used. To ensure the attainment of the control variables, paired T-test was used. Levels of TSH, T4 and T3 levels, periodic resistance experimental group during the study period, no significant change (P>0.05). It seems to be intermittent resistance training resulted in significant changes in thyroid hormones, active young men (levels at rest and in response to exercise) and thus no significant change in metabolism occur. However, more research is needed to evaluate the effects of resistance training, is.

Keywords: Thyroid Hormones, Resistance Training, T3, T4, TSH.

INTRODUCTION

The thyroid gland is one of the largest endocrine glands in the body, is, that the normal weight adults is 15 to 20 grams, and immediately below the larynx, and the sides and front of the trachea, placed. These glands are two main hormones thyroxin (T4) and triiodotyronine (T3), the release said. Both these hormones increase the metabolic rate, and the performance is very important, although the pace and severity of the effect varied. These two hormones for normal brain and nervous system development and function, and to maintain body temperature, and energy necessary are [1]. Increase the basic metabolism of the body, one of the most important biological functions, the gland is important to know, so that a complete lack of thyroid secretion, decreased from 40 to 50 percent of basic metabolism, and excretion of excessive, it can cause 60 to 100 percent increase in metabolism is. This gland secretes more thyroid-stimulating hormone or thyrotropin, or by TSH, which is secreted from the anterior pituitary, which regulates and also the TSH, in turn, by the thyrotropin-releasing hormone, or TRH secreted by the hypothalamus, is set. The central axis of the hypothalamic - pituitary - thyroid gland is known thyroid axis influence the hypothalamic - pituitary - thyroid is regulated [1]. This is driven by many factors including temperature, stress, hormones and

other chemicals and circadian oscillations, undergoing addition, other physical factors such as training appears to be central to the challenges, and regulatory changes in order to maintain homeostasis, it is. Controversial issues in exercise physiology, exercise effects on the HPT axis in general, and specifically on the thyroid gland, is [1]. Physical exercise, stressful, and stress is a condition in which the body's haemostatic challenges. One of the devices that will be affected by physical activity, driven hypothalamic - pituitary - thyroid [2].

Metabolic demand during exercise increases with higher temperatures, by a mechanism that is designed to distribute heat, such as a dilation (expansion) of blood vessels are activated, is regulated [2]. Axis hypothalamus - pituitary - thyroid, by vigorous exercise are affected, but the mechanisms of thyroid function changes after exercise, more attention is needed [3]. Exercise is a form of physical stress, followed by some changes in order to balance the effects on the endocrine and metabolic heat generation occurs [4]. The effect of exercise on thyroid function is controversial, and it seems, the severity and duration of the training protocol, depends on [5]. According to sports and physical activity, an inevitable event has become. In this respect, at all levels of society, and with different goals there. Physical activity and exercise, physiological adaptation is associated. Identify and assess the adaptations, especially hormonal system, which plays an important role in vital reaction is very important because, in a variety of sports activities and training, hormones have many variations, understand the changes in the interpretation of the physiological mechanisms of the body are affected. However, resistance training, has recently attracted the attention of many people, especially youth, health goals, is located. The exercises, which are composed of various types, which may lead to structural changes and physiological adaptation by which it can be most pronounced in the nervous system - muscle and hormonal can find. Biochemical and hormonal parameters measured following various training programs can better understand the acute and chronic effects of resistance training, can help.

Pakarinen et al (1988), following resistance training, no change in T3, as well as a significant decrease in thyroxin (T4), and free thyroxin (T4), show [6]. Simsch et al (2002), decreased free T3, and thyroid stimulating hormone (TSH), after resistance training, with no change in thyroxin (T4), reported [7]. Pakarinen et al (1991), a significant decrease in T3, T4 and TSH, within a week of intense resistance training (two sessions per day), the professional weightlifters, reported [6].

Alen et al (1993), a significant decrease in T3, T4 and TSH, within a week of intense resistance training (two sessions per day), the professional weightlifters reported. It is clear that resistance training may alter thyroid function [8]. A review of the research literature shows that, in relation to the impact of resistance training on thyroid hormones, little research has been done. In this small study, the results are conflicting, there is. Given the important role of thyroid hormone metabolism during and after exercise and physical activity, extensive research in this regard is needed to resolve the ambiguity.

Therefore, this study intends to 8 weeks of resistance training on thyroid hormones, stimulating hormone in young men in physical education field, the study said.

MATERIALS AND METHODS

Subjects

The study population included all male students activist in Shiraz-Iran universities (in physical education field), respectively. Of 30 men 22 to 27 years old, students physical education field of Shiraz-Iran universities, with a mean age of 23.13 ± 3.40 years, height 167.29 ± 3.21 cm, weight 61.29 ± 8.36 kg, which recalled its readiness to participate in the study said, the targeted chosen and randomly divided into two groups, consisting of a periodic RT group (10 patients), and a control group (10 patients), respectively. All subjects, from full health, had (confirmed by a doctor).

Methods of data collection

One week before the study, at the briefing, participants, protocols, training, and research methods were introduced. In this session, in addition to familiarize participants with the resistance movement, height, weight, and maximal strength (1RM), for each movement were measured. Then, 48 hours before the start of practice, the test session, were present before, immediately after and two hours after a resistance exercise session interval, blood samples, were collected. The meeting, with 20% of one repetition maximum was held. Then, subjects, 8 weeks, their training programs, increasingly, they do. Control group, did not do any exercise, or just your everyday normal activities, began was performed. Before, immediately after and two hours after the session, blood samples were taken.

Training

Resistance training, increasingly, and includes 8 weeks and 3 days a week (every other day), respectively. Percentages of one repetition maximum speed and performance, as exercise intensity and volume of training was considered. Total training was kept constant, and the intensity of training is increasingly increased. Times added to escalating acts, so that the subjects during the 8 weeks of your training respectively 20%, 25%, 30%, 35%, 40%, 45%, 50% and 55% of one repetition max, for eight weeks did. Resistance exercise as a circle, and was designed to periodic manner. Each circle, including bench press, leg press, biceps curl, front legs, back, arm, back, leg and side stretch or state, that the performance also had the same shape. Duration of each station, two minutes and thirty seconds, was considered. Periodic training group, 10 seconds per station at a speed of 2V, and 20 seconds at a speed of ½ V, alternatively, put up in two minutes and thirty seconds of each station to finish. Moving quickly through the metronome was controlled. Rest interval between each station, one minute, and between the two circles, two minutes. In each session, two circles, was considered. Resistance activities before and after the training period, a hearing test and a biopsy were considered, the same fee and 20% of one repetition maximum were determined. Every person, all meetings of its activities in its own time and the time started and finished, it's time for all training sessions they were identical. Control subjects at the time, did not do any exercise, and perform your normal daily activities and issues.

Blood sampling and hormone analysis

Before, immediately then and 2 hr after the first test (48 hr before trainings beginning) and the final one (48 hr after trainings ending) bloods sample we taken from middle veins of the subjects in amounts of 5 cc. The control group only gave bloods samples at the beginning and ending of 8 weeks period (companion with experimental group). Serums of collected samples were separated from plasma by centrifuge pump in duration of 10 min and with revolution of 3500 RPM. All of bloods samples had been preserved in frozen condition and at -20°C temperature until arrived to laboratory and there, lab examination started, immediately. For each sample, T3 serum was measured by immunochemiluminescence assay and using T3 kit of Auto bio Diagnostic Co. with sensitivity of 0.4 (*ngr/ml*), T4 serum was gauged by immunochemiluminescence assay utilizing T4 kit utilizing T4 kit of Auto bio Diagnostic Co. with sensitivity of 0.2 (*μgr/dl*) and TSH serum was measured by immunochemiluminescence assay using TSH kit of Auto bio Diagnostic Co. with sensitivity of 0.08 (*μIU/ml*).

Statistical methods

First, the values of each variable in each sampling time, using the mean and standard deviation, were described. Then, to determine the normal distribution of Kolmogorov–Smirnov test was used. To investigate changes in training variables, analysis of variance with repeated measures, and post hoc test LSD, were used. Also, to ensure the achievement of the control variables, paired T-test was used. For all statistical tests, a significance level equal to 5/0, was considered, and the SPSS statistical software, version 16, for statistical analysis, were used.

RESULTS

Levels of TSH, T4 and T3 serum in table 1 have been reported. Values, the mean and the standard deviation are.

Table 1: Levels of TSH, T4 and T3 serum

Variable	Group	Pre test	Post test 1	Post test 2	Post test 3	Post test 4	Post test 5
TSH	Experimental	1.62±0.91	1.71±0.82	1.34±0.69	1.29±0.61	1.22±0.51	1.37±0.61
	Control	2.79±1.63			2.77±1.62		
T4	Experimental	14.43±2.42	14.75±3.22	13.36±2.59	14.19±3.26	15.22±3.44	14.51±4.08
	Control	9.77±2.09			9.75±1.99		
T3	Experimental	0.99±0.26	0.98±1.47	0.82±0.26	0.98±0.38	0.75±0.39	0.82±0.66
	Control	1.15±0.22			1.05±0.35		

The results of inferential statistics TSH, T4 and T3, in Table 2, are presented.

Serum TSH levels in the RT group, periodic, and the period of the study, no significant change (P = 0.13). Serum T4 levels in the RT group, periodic, and the period of the study, no significant change (P = 0.83). Serum T3 levels, fee and periodic resistance experimental group during the study, no significant change (P = 0.22).

Table 2: Results of inferential statistics TSH, T4 and T3

Variable	Group	F/T	P
TSH	Experimental	1.65	0.13
	Control	1.09	0.24
T4	Experimental	0.18	0.83
	Control	0.97	0.36
T3	Experimental	1.48	0.22
	Control	0.37	0.61

DISCUSSION

Based on the findings of the present study, serum TSH levels in the RT group, periodic, and the period of the study, no significant change. Simsch et al (2002), decreased thyroid stimulating hormone (TSH), after resistance training reported [7]. Pakarinen et al (1991), a significant decrease in TSH, within a week of intense resistance training (two sessions per day), the professional weightlifters, reported [6]. Alen et al (1993), a significant decrease in TSH, within a week of intense resistance training (two sessions per day), the professional weightlifters, reported. Anyway, in the course of a year in athletic training, no changes in thyroid hormones, TSH, as well as pre-competition was observed [8].

It is clear that resistance training, thyroid function, perhaps, change. The present agreement (no change in TSH), in contrast to previous findings (reduced TSH), perhaps in different training protocols, or during exercise, may lie. In case of disagreement, the differences in the study population, should not be overlooked. Also, based on the findings of the present study, serum TSH concentrations, followed by a work session before the start of training, no significant change. Many researchers, a significant decrease in serum TSH, observed, and explained that the decrease of TSH response to TRH is [9,10]. Wilber and Yamada (1990), a reduction of TSH, thus justifying that, intense and exhausting physical exercise, reduction of TRH, resulting in a decrease in TSH, is [11]. Some believe that physical exercise increases TSH, is [12,13]. It seems that chronic intense exercise, different effects on thyroid hormones in rats have serum thyroid hormone levels after intense exercise increases, whereas most studies of chronic exercise protocols, the increase not seen [9]. What is most apparent contradiction between the findings of the previous limit is.

Based on the findings of the present study, serum T4 levels in the RT group, periodic, and the period of the study, no significant change. In contrast with the present findings, Pakarinen et al (1988), followed by resistance training, a significant decrease in thyroxin (T4) and free thyroxin (fT4), as indicated [6]. They fall within a week of intense resistance training (two sessions per day), the professional weightlifters reported [6]. But Simsch et al (2002), the findings are consistent with the findings of the present study, no change in thyroxin (T4) after resistance exercise, and reported [7]. But Alen et al (1993), a significant decrease in T4 in a week of intense resistance training (two sessions per day), the professional weightlifters reported [8]. However, in their study, the athletes are training courses a year, no change in thyroid hormones, so the pre-match was found. If you reduce the size of the practice, where a significant increase in free T4 was observed [8]. Seems to be a lack of agreement found earlier, the intensity and duration of exercise, and in general, the training protocol, is involved. A review of the research literature shows that the effect of resistance exercise on thyroid hormones, little research has been done. Also, in this small study, the results are conflicting, there is. Research in different circumstances, perhaps the results would be the same. Training protocol may have an important role in the observed different plays. Kraemer (1988), he set several variables on the response to acute and chronic hormonal influences. His intensity, volume, duration and training period of rest, and muscle mass involved in the exercise, along with the characteristics of participants, such as age, level of fitness and training status, as important [14]. Further investigation to determine the reason for the conflicting findings is necessary. However, following resistance exercise in the present study, no significant change in T4, was observed. Given the important role of thyroid hormone metabolism during and after exercise and physical activity, extensive research is needed in this regard to uncertainty, is removed.

Based on the findings of the present study, serum T3 levels, the RT group, periodic, and the period of the study, no significant change. Unlike the findings Pakarinen et al (1988), followed by resistance training, showed no change in T3 [6]. Them, the meaningful reduction in the T3, within a week of intense resistance training (two sessions per day), the professional weightlifters, reported [8]. Simsch et al (2002), free T3 decreased after resistance exercise, reported [7]. Allen and colleagues (1993) also found that the findings are inconsistent, the significant decrease in T3,

within a week of intense resistance training (two sessions per day), the weightlifters, professional report. However, in their study, the athletes are training courses a year, no change in thyroid hormones, so the pre-match was found. If you drill down that far, a significant increase in free T3, have been reported [8]. The present findings are consistent with previous findings of limited, perhaps due to differences in training protocols (intensity and duration of exercise), and training status of the subjects (young women in the professional weightlifters) is. Therefore, considering the recent cases, more controlled studies with larger numbers of subjects, is needed to allow a precise conclusion, reached, and a clear statement presented. A review of the research literature suggests that, in relation to the impact of resistance training on thyroid hormones, little research has been done. Also, in this small study, there are conflicting results. Given the important role of thyroid hormone metabolism during and after exercise and physical activity, is clearly still a need for further evaluation until the uncertainty is resolved.

CONCLUSION

Based on the present findings, it is concluded that the 8 weeks of resistance training resulted in significant changes in thyroid hormones, active young men, it is not. However, given the lack of research in this regard, and sometimes contradictory, is proposed to achieve accurate results, and presenting a clear statement, further studies with larger numbers of subjects, be done.

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