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# Effect of Eight Weeks Continuous Resisting Trainings on Relaxation Levels and Responses of Active Young Women's Thyroid Hormones to One Turn Sport

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## ABSTRACT

The purpose of the present study was determining acute and chronic effects of 8 weeks continuous resisting trainings on level of T3, T4, TSH serums of active young women. Fourteen under investigation subjects of this study were divided to 2 groups (training and control). Experimental group participated in 8 weeks increasing continuous resisting training. Before, immediately then and 2 hr after first test (48 hr after trainings ending), bloods samples were taken from the subjects. Bloods samples were taken from control group only at the beginning and ending of 8 weeks period. In order to investigate changes of under study variants in training group, variance analysis test with repeated measurement was utilized. To compare between continuous resisting training group and control one independent T test was used. In order to confide nonbeing changes of under study variants in control group, T paired test was implemented. There wasn't any significant variation in levels of T3, T4, TSH in continuous resisting trainings during study period (P>0.05). It's appears, a continuous resisting training period doesn't cause any significant variation in active young women's thyroid hormones (relaxation levels and in response to sport ones), so any significant change in body metabolism wouldn't occur. However, to investigate effects of various resisting trainings, rather researches are required.

**KEYWORDS**: Thyroid Hormones, T3, T4, TSH, resisting training, continuous training.

## INTRODUCTION

It's certain that physical activity affects on various body systems and causes adaptation of these systems with particular requirements of organism during physical activity and work. Among, the knowledge of these effects and also their controlling mechanism are important to design and set training schedules of sport activity types. Also, because of stressful essences, sport activities and competitions, beside their useful profits, leads to disturb homeostasis temporarily, which might be accompanied with destructive consequences, if training science fundamentals aren't abided.

Thyroid glance is one of the largest endocrine glands of body which secrets two basic hormones, called Thyroxine (T4) and Triiodothyronine (T3). Thyroid hormones influence on multiple metabolic processes, concentrations and activities of numerous enzymes, metabolisms of vitamin and mineral materials and response of target tissue to several hormones (1). Also, thyroid hormones have crucial roles in cellular differences, growth, oxygen consumption regulations and heat release (2). Both of these hormones cause increase in metabolism speed and are very important in aspect of performance, although they are different in sight of effect speediness and influence intensity. These two hormones are essential for evolution and natural performance of brain and neural system, also primary for preserving body temperature and energy. Increase in basic metabolism of body is assumed as one of the most important biological tasks of this vital gland, in a manner that total lack of thyroid secretion leads to 40-50% decrease in basic metabolism and excess of secretion could cause around 60-100% increase in metabolism. The secretions from this gland are mostly set by thyroid stimulating hormone (TSH) or thyrotropin, which secretes from frontal hypophyse. Although, numerous researches have done in the field of sport

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endocrinology, all around the world during recent years, but unfortunately thyroid hormones and their stimulating ones haven't sufficient share in these researches. The disappointing matter appears when in these few performed investigations, incongruous results have reported. The disagreement in understandings maybe has been caused by differences in used training schedule in aspects of intensity, time span and kind of training. Researchers have concluded that variations of T3 and T4 during training correlate with intensity and span of work, and cause sympathetic stimulation of thyroid gland (3). Significant relaxation reductions of Thyroxin (T4), free Thyroxin (fT4), free T3 (5) and thyroid stimulating hormone (TSH) (1) have been reported in intermediate trained men and sophisticated trained boatmen. Whereas, nonbeing changes of T3 (9) or t4 (5) have been reported, too. In contrast resisting trainings have well-known influences on fitness which have paid attention by many women, recently. Roles of thyroid hormones during resisting trainings aren't clear, yet. Pakarinen et al (6) reported significant decrease in T3, T4 and TSH of professional weight lifters, during one week intense resisting trainings (2 daily sessions). However, during 1 year periods of trainings of athletes, nonbeing changes of the whole thyroid hormones were observed until the period of before match. In a manner that mass of training decreased, when significant increase in free T4 and free T3 have been reported (6). When intensity of training increased, these hormonal variations would return to the basic levels, during next stages of trainings. It's appeared, resisting training probably change thyroid performance, although intensities of these variations remain as a matter of thought in the present time. Also, because of accurate control of homeostasis on thyroid hormones, no increment during resisting training is expected.

The purpose of the present study was determination of acute and chronic effects of 8 weeks continuous resisting trainings on thyroid hormones and their stimulating hormone in active young women.

## MATERIALS AND METHODS

### Subjects

The statistical society of this study consisted of the whole active student girls of Tehran city. Fourteen 20-25 years old girls of Tehran city with averages age of 22.571±1.804 years old, 161.19±4.094 cm height, 56.904±6.533 Kg weight, maximal oxygen consuming of 38.428±1.567 (ml/Kg (body weight)/min) and body mass index (BMI) of 21.879±1.999 Kg/height$^2$ declared their readiness to participate in research, following the announcement. They were purposefully chosen and divided to 2 groups including a continuous resisting training group (7 persons) and a control group (7 persons), randomly. All of the subjects had perfect physical healthiness (physician approval).

### Data Collecting Method

One week before research execution, the subjects became familiar with training protocol and method of study in explanation meeting. In this session, besides making familiar the subjects with resisting movements, characteristics of heights, weights, body mass indices (BMI), maximal oxygen consuming and also maximal power (IRM) for each movement were measured. Then, 48 hr before trainings beginning, the subjects attended in test session and before, immediately after and 2 hr after a continuous resisting activity, bloods samples were taken. This session conducted with 20% intensity of a maximal repetition. Thereafter, the subjects did increasingly their training schedule in span of 8 weeks. Control group didn't perform any training and only carried out their natural daily activities. After ending of 8 weeks trainings and after 48 hr rest, proportional to rest interval between the first samples collecting day and trainings beginning (48 hr), last session of resisting training activity conducted just like the first day with the same 20% intensity of a maximal repetition. Before, immediately then and 48 hr after this session bloods samples were taken, too.

### Trainings Schedule

Resisting trainings were in increasing manner and consisted of 8 weeks (3 days weekly (1 day on/1 day off)). A percentage of a maximal repetition and execution speed considered as intensity and mass of trainings. Training masses were kept constant and intensities of trainings increased in an increasing manner. The implemented increasing overload was in a manner that the subjects performed their trainings with 20, 25, 30, 35, 40, 45, 50 and 55 percents of a maximal repetition from the first week to eighth one, during these eight weeks, respectively. Resisting trainings were designed in circular forms and continuous schemes. Each circle contained chest press, feet press, fore-arms, fore-feet, rear-arms, rear-feet and sidelong tension (or length), which order of movements execution was in the same way, too. Span of each station considered as 2 min 30 sec. The subject were doing 2 min 30 sec of each station with speed of V. Speeds of movements were controlled by metronome. Relaxation interval between 2 successive stations was 1 min and between 2 circles was 2 min. In each training session, 2 circles were considered. Resisting activities also performed with 20% of a maximal repetition, before and after trainings period which counted as test and samples collecting sessions. Each person started and finished her entire activity session at particular times which were the same for her during the whole training sessions. The subjects of control group didn't

carry out any sport and physical training during activities period of the research and performed their daily usual activities.

**Bloods Samples Collecting and Hormonal 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 Method**

At first, values of under study variables at each samples collecting time were described by average and standard deviations. Then, in order to determine neutrality of distribution, Smirnov-Kolmogorov test was used. In order to investigate changes of under study variants in control group, variance analysis test with repeated measurement and Fisher's LSD test were utilized.

Also, Sphericity of data was also investigated simultaneously with execution of variance analysis test, to carry out Greenhouse-Giggs modification on degree of freedom, in necessary cases. Also, in order to investigate variations of control group, T paired test was used. To compare hormones relaxation levels between the training and control groups, independent T test was utilized, too. Level of significance considered as 0.05 for all of statistical tests. And, the statistical software SPSS v.16 was used for performing statistical calculations.

## RESULTS

Values of TSH, T4 and T3 serums were reported in table 1. The values represented as averages and standard deviations. Correspondent results to variance analysis test with repeated measurement for investigating TSH, T4 and T3 in training group presented in table 2. Table 3 reported results of T paired test concern to variations of control group and table 4 reported results of independent T test concern to comparison of relaxation levels of training group and control one.

**Table 1**: Values of TSH, T4 and T3 serums

| Variables | Sampling Times | Training Groups | Control Groups |
|---|---|---|---|
| TSH (µIU/ml) | Pre | 1.61±0.82 | 2.83±1.60 |
| | Post 1 | 1.76±0.89 | |
| | Post 2 | 1.32±0.63 | |
| | Post 3 | 1.41±0.70 | 2.73±1.51 |
| | Post 4 | 1.32±0.51 | |
| | Post 5 | 1.31±0.64 | |
| T4 (µg/dl) | Pre | 14.72±2.52 | 8.67±1.92 |
| | Post 1 | 13.10±2.13 | |
| | Post 2 | 13.13±1.32 | |
| | Post 3 | 13.63±3.14 | 8.44±2.40 |
| | Post 4 | 14.80±4.68 | |
| | Post 5 | 13.92±3.43 | |
| T3 (ng/ml) | Pre | 1.03±0.66 | 1.16±0.25 |
| | Post 1 | 0.81±0.25 | |
| | Post 2 | 0.81±0.20 | |
| | Post 3 | 0.86±0.26 | 1.14±0.20 |
| | Post 4 | 0.96±0.40 | |
| | Post 5 | 0.88±0.22 | |

**Table 2**: Statistical results of variance analysis test with repeated measurement in order to investigate changes of under study variants in training group

| Group | Variables | Sum of Squares | df | Mean Squares | F | P |
|---|---|---|---|---|---|---|
| Training Groups | TSH | 1.23 | 5 | 0.24 | 1.71 | 0.16 |
| | T4 | 19.58 | 5 | 3.91 | 1.10 | 0.37 |
| | T3 | 0.25 | 1.91 | 0.13 | 0.67 | 0.52 |

**Table 3**: Statistical results of T paired test concern to variations of control group during 8 weeks

| Variables | T | df | P |
|---|---|---|---|
| TSH | 1.20 | 6 | 0.27 |
| T4 | 0.90 | 6 | 0.40 |
| T3 | 0.45 | 6 | 0.66 |

Levels of all 3 hormones (TSH, T4 and T3) in continuous resisting training group and control one hadn't any significant variation during research period (P>0.05). Before and after 8 weeks training, relaxation levels hadn't any significant difference with control group (P>0.05). But, relaxation levels of T4 in training group were significantly more than control group, both before and after training (P<0.05).

**Table 4**: Statistical results of independent T test concern to comparison of relaxation levels of variants of 2 groups

| Variables | Time of Training | T | df | P |
|---|---|---|---|---|
| TSH | Before Training | 1.78 | 12 | 0.1 |
| | After Training | 2.09 | 12 | 0.059 |
| T4 | Before Training | 5.04 | 12 | 0.000 * |
| | After Training | 3.47 | 12 | 0.005 * |
| T3 | Before Training | 0.50 | 12 | 0.62 |
| | After Training | 2.16 | 12 | 0.051 |

** The mean difference is significant at the 0.05 level*

## DISCUSSION

According to founds of the present study, levels of TSH serum in continuous resisting training group hadn't any significant variation, during research. Simsch et al (2002) reported decrease in thyroid stimulating hormone (TSH) after resisting trainings (5). Pakarinen et al (1991) reported significant decrease in TSH during one week intense resisting trainings (2 daily working sessions) in professional weight lifter (4). Alen et al (1993) reported significant TSH during one week resisting trainings (2 daily working sessions) in professional weight lifters, too. However, in one year trainings periods of athletes, nonbeing change of the whole thyroid hormones and also TSH observed until the period of before competition (7). It has appeared that resisting trainings probably change thyroid performance, but intensities of these variations remain as a matter of thought at the present time. Because of accurate control of homeostasis on thyroid hormones, the increment during resisting training isn't expectable. Lack of compliance of the present founds (nonbeing change of TSH) and previous understandings (decrease in TSH) maybe hidden in various training protocols or durations of trainings. About inconsistency of understandings, the differences in under study societies shouldn't be ignored. Also, according to understandings of the present study, concentration of TSH serum hadn't any significant change, following an activity session before period of trainings. Many researchers observed significant decrease in concentration of TSH and stated this decrease arisen from TSH response to TRH (8, 9). Wibler et al (1990) justified reduction of TSH in manner that an arduous and intense physical training causes decrease in TRH and consequently decrease in TSH (10). Somebody believes physical trainings lead to increase in TSH (11, 12). It seems, acute and chronic trainings have various effects on thyroid hormones of desert rats. Levels of thyroid hormones serums increase after training. In contrast, this increment isn't observed in most studies with chronic training protocols (2). Contrarieties between few previous founds are the most evident issues. According to founds of the present study, levels of T4 serums hadn't any significant change in continuous resisting training group, during the activities period. Against founds of the present study, Pakarinen et al (1988) showed significant decrease in thyroxin (T4) and free thyroxin (fT4) after resisting training (4). They reported this decrease during one week intense resisting trainings (2 daily working sessions) in professional weight lifters (4). But, Simsch et al (2002), in consistent understandings with founds of the present study, reported nonbeing change of thyroxin (T4) after resisting trainings (5). Though, Alen et al (1993) reported significant decrease in T4 during one week intense resisting trainings (2 daily working sessions) in professional weight lifters (7). However, nonbeing changes of the whole thyroid hormones, during one year periods of athletes' trainings, were observed in

their study, until the period of before competition. In a manner that masses of trainings were decreased when significant increase was observed in fT4 (7). It appears lack of compliance of previous founds concerns to intensities and durations of trainings and generally training protocols. It has been arisen, probably resisting trainings change thyroid performance, but intensities of these variations remain as a matter of thought at the present of time. Because of accurate control homeostasis on thyroid hormones, increase during training isn't expectable. Reviewing literature indicates that few researches have been carried out, about influence of resisting trainings on thyroid hormones. Also, in these few researches, incongruous results are observed. In various study situations, the results aren't likely the same. Training protocol probably plays an important role about observation of different founds. Kraemer (1988) stated a collection of several variables influences on acute and chronic hormonal responses. He considered intensity, mass, duration, training rest period and also engaged muscular mass in training companion with subjects' properties like age, fitness level and training situation are important (13). Further investigations are necessary to determine reasons of contrary founds. However, there wasn't any significant change observed in T4 following resisting training, in the present study. Attention to importance and role of thyroid hormones in metabolism, during and after trainings and physical activities, vast researches in this relation are required to erase existing ambiguities. According to founds of the presents study, levels of T3 serum in continuous resisting training groups hadn't any significant change, during research period. Despite the present founds, Pakarinen et al (1988) showed decrease in T3 after resisting training (4). They reported this significant reduction of T3 in professional weight lifters, during one week intense resisting trainings (2 daily working sessions) (4). Simsch et al (2002) reported decrease in free T3 after resisting trainings (5), Also, Alen et al (1993) reported significant reduction of T3, in understandings which are opposed to the present ones, during one week intense resisting trainings (2 daily working sessions) in professional weight lifters. However, the lack of change in the whole thyroid hormones, during one year period of athletes' trainings was observed in their study, until the period of before competition. In a manner that mass of training decreased when significant increase was observed in free T3 (7). It has been arisen, perhaps resisting trainings change thyroid performance, but intensities of these variations remain under study at the present time. Because of accurate control of homeostase on thyroid hormones, increments of these hormones aren't expectable, during resisting training. Inconsistency of the present founds with previous understandings perhaps concerns to differences of training protocols (intensity and duration of sport) and the subjects' training situations (active young women in contrast of professional weight lifters). Therefore, in consideration of recent issues, rather controlled researches with more subjects are needed to earn an accurate conclusion and declare a clear statement. Reviewing the literature shows that, few researches have done on thyroid hormones in relation with resisting trainings. Also, in these few studies, incongruous results are observed. In attention to importance and role of thyroid hormones on metabolism during and after trainings and physical activities, it's obvious that rather investigations should be carried out to erase the existing ambiguities.

## CONCLUSION

According to the founds of the present study, it's concluded that 8 weeks continuous resisting trainings wouldn't lead to any significant change in thyroid hormones of active young women. However, in attention to research shortage in this field and partly incongruous results, in order to obtain an accurate conclusion and represent a clear statement, rather studies with more subjects are recommended.

## REFERENCES

1. Yen, PM. 2001 Physiological and molecular basis of thyroid hormone action. Physiological Reviews, 81: 1097-1126.

2. Fortunato, R.S., D. Lea˜o Igna´cio, A.I.S. Padron, R. Pec anha, M.P. Marassi, D. Rosenthal, J.P.S. Werneck-de-Castro, and D.P. Carvalho, 2008. The effect of acute exercise session on thyroid hormone economy in rats. J. Endocrinology., 198: 347–353

3. Mateey, G., B. Zaharieva, and T. Djarova, 1981. Triiodothyronine, thyroxin and thyrotropin and changes during bicycle training and ergometer endurance test. Tur. J. Sport Med., 16: 99-133.

4. Pakarinen A., M. Alen, K. Ha¨kkinen, et al, 1988. Serum thyroid hormones, thyrotropin and thyroxin binding globulin during prolonged strength training. Eur. J Appl. Physiol., 57: 394-398.

5. Simsch C., W. Lormes, K.G. Petersen, et al, 2002. Training intensity influences leptin and thyroid hormones in highly trained rowers. Int. J Sports Med., 23: 422-427.

6. Pakarinen A., K. H¨akkinen and M. Alen, 1991. Serum thyroid hormones, thyrotropin, and thyroxin binding globulin in elite athletes during very intense strength training of one week. J. Sports. Med. Phys. Fitness., 31: 142-146.

7. Alen M., A. Pakarinen and K. H¨akkinen, 1993. Effects of prolonged training on serum thyrotropin and thyroid hormones in elite strength athletes. J. Sport. Sci., 11: 493-497.

8. Boyden, T.W., R.W. Pamenter, T.C. Rotkis, P. Stanforth and J.H.H. Wilmore, 1982. Evidence for mild thyroidal impairment in women undergoing endurance training. J. Clin. Endocrinology and Metabolism., 54: 53-56.

9. Hackney, A.C., J.A. Hodgdon, R.J. Hesslink and K. Trygg, 1995. Thyroid hormone to military winter exercise in the Arctic region. Arctic, Med. Res., 54: 82-90.

10. Wilber, J.F. and M. Yamada, 1990. Thyrotropin releasing hormone: Current concept, In M.A. Green (Eds), the thyroid gland, New York: Raven press, pp: 129-795.

11. Refsum, H.E. and S.B. Stromme, 1979. Serum thyroxin, triidothyronine and thyroid stimulating hormone after prolonged heavy exercise. Scand. J. Clin. Lab. Inves., 39: 455.

12. Kraemer, R.R., M.S. Blair, R. Mc Caferty and V.D. Castracane, 1993. Running-induced alterations in growth hormone, prolactin, triiodothyronine and thyroxine concentration in trained and untrained men and women. Research Quarterly for Exercise and Sport., 64: 69-74.

13. Kraemer, W.J., 1988. Endocrine responses to resistance exercise. Med. Sci. Sports Exer., 5: S152–S157.