The Effect of 8 Weeks Aerobic Exercise on Cortisol Secretion

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ABSTRACT: The aim of this study was to investigate the effect of 8 weeks aerobic exercise on secretion of thyroid hormones and cortisol hormone. The research method is quasi-experimental and applicable. Its subjects included 12 female athletes with at least 3 years' experience and titles in national and provincial level and 12 non-athletes female who were selected randomly. Both groups performed aerobic exercise for 8 weeks, 3 sessions per week. Their cortisol levels were measured in pre-test and post-test times. The collected data was analyzed using descriptive and inferential statistical methods in significance level of 0.05. The results showed a significant change to reduce blood cortisol because of aerobic exercise program for 8 weeks. There was no significant difference between athletes and non-athletes in terms of reducing cortisol levels.

KEYWORDS: Aerobic Exercise, Cortisol Hormone.

INTRODUCTION

Today, human beings are exposed by threat of cardiovascular disease, cancers, endocrine and mental disorders, dangers of drug abuse, environmental pollution etc. the diseases are caused by urbanization and so called civilization diseases. Recently, number of committed specialists and scientists realize dangers of the diseases and seek to prevent and treat them. For this purpose, there are recommended principles of physical, mental and nutrition health as well as sport and physical activities. In this regard, the role of sport and mobility has been considered more than other preventive factors that have caused interesting and detailed discussions (Daryaei, 2005). One of the controversial issues is the effect of exercise on adrenal glands generally and endocrines particularly. Adrenal is a yellow cap that locates on top of each kidney's pole. Each of them contains two distinct parts: central and cortical. Adrenal cortex secretes a hormone called cortisol that is included on steroid hormones, which only 7% of the hormone is in the blood freely. The biological effects of the hormone are made by the small percent. Some studies have shown that cortisol plays an important role to reduce anxiety and stress (Rasaei, 2002). Its high level stops inflammatory responses and affects metabolism of carbohydrates and lipids (Gaeini, 2004). Exercise intensity is important to determine the hormone response. Cortisol level will be decreased and increased in sports with intensity of 40% and 80% respectively (Maestu et al., 2005). Currently, there are little information on whether aerobic exercises effect on secretion of the hormone and what and how much work must be done to alter secretion of hormone. Due to importance of secreting adrenal hormones to prevent and treat different diseases and limitation of scientific studies on the impact of physical activity on secretion of these hormones in different people in our country, as well as comparing the effect of aerobic exercise in secretion of the hormones on female athletes and non-athletes, the researcher examined the effect of aerobic exercise on secretion of adrenal hormones in female athletes and non-athletes. It is hoped that results of this study will help people to understand the benefits of physical activity in preventing and treating various diseases and choosing right activities show strategies and a little of myriad benefits of physical activities.
MATERIALS AND METHODS

The research method is quasi-experimental and applicable containing pre-test and post-test with two groups of athletes and non-athletes. It attempts to investigate the effect of physical activities (to point of fatigue) on secretion of adrenal hormones of female athletes and non-athletes.

Describing the Used Equipment’s

Treadmill: (Proenergy) made by Thailand. The device displays steep, heart rate, distance, energy, speed and time digitally. Steep and speed of the device can be 2-14 km/h and 1-25 km/h respectively.

Sphygmomanometer and stethoscope to measure blood pressure at rest.

Blood supplies (Garo, syringe 5 cc, sterile needle No. 22, test tubes, alcohol cotton, bed and special white glue).

Digital chronometer with hundredths of a second to measure time of total activity accurately.

CASIO calculator: (Fx-3600 D) made by Japan for statistical calculations

Fixed bicycle for warm-up.

Implementing Exercises

Bruce maximal graded exercise test: speed and incline of treadmill are increased every three minutes until subject cannot continue to operate due to inability. Although Bruce test increases steep every three minutes relatively and because of its high workload some people have criticized it, but there is obtained very good maximum data from this test as which it is widely used. In maximum test, during the test first phase (to minute 3) the subjects speed with speed of 1.7 mph (2.7 km/h) in gradient of 10%. At beginning the second stage (minutes 4-6) gradient and speed will increase up to 2% 3.5 mph (4 km/h) respectively. In later stages, gradient and speed will increase up 2% and 0.8-0.9 respectively for every step until the subject reaches to inability.

The Used Statistical Methods

Descriptive statistics include frequency, average percent, standard deviation etc.; while inferential statistics include t-test of independent groups and t-test of correlated groups. In the research, data was analyzed using SPSS software and significant level is 0.05.

The Research Sample Community

The community includes all non-athlete women (N=48) who recently registered in clubs of Estahban and 22 female athletes with at least 3 years continuous sport exercise with at least 3 sessions per week and titles in national and provincial championships. Statistical sample of 12 volunteer female athletes include: 7 karate, 2 volleyball players and 3 women in physical fitness. Based on available data, mean age of the subjects was 24±6.9 years old. Meanwhile, 12 non-athletic women without history of sport were randomly selected.

RESULTS

Table 1. Average, standard deviation, minimum, maximum, number of subjects and cortisol level among athletes and non-athletes groups in pre-test, posttest and difference (pre-test, posttest).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Phase</th>
<th>Group statistic index</th>
<th>Average [ng/ml]</th>
<th>SD</th>
<th>Min score</th>
<th>Max score</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortisol</td>
<td>pre-test</td>
<td>Athlete</td>
<td>253.60</td>
<td>132.296</td>
<td>102</td>
<td>480</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-athlete</td>
<td>171</td>
<td>52.164</td>
<td>110</td>
<td>250</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>posttest</td>
<td>Athlete</td>
<td>97.60</td>
<td>47.528</td>
<td>26</td>
<td>155</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-athlete</td>
<td>112.10</td>
<td>50.271</td>
<td>54</td>
<td>180</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>difference (pre-test, posttest)</td>
<td>Athlete</td>
<td>-138</td>
<td>136.554</td>
<td>-371</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-athlete</td>
<td>-58.90</td>
<td>20.157</td>
<td>-83</td>
<td>-26</td>
<td>10</td>
</tr>
</tbody>
</table>
As seen in Table 3, cortisol level was high before exercises difference is significant in one ten thousandth level (p=0.0001 & t=4.3). Therefore, 8 weeks aerobic exercise has a positive effect on cortisol secretion.

Figure 2. Mean of difference (pre-test & posttest) scores of cortisol, before and after training on both athletes and non-athletes groups.

As seen in Chart 6, there is a significant difference on cortisol level of athletes and non-athletes in level of 0.04 (p=0.04 & t=108). Therefore, 8 weeks aerobic exercise has increased cortisol secretion on athletes.

DISCUSSION AND CONCLUSION

There was seen a significant difference in results of dependent t-test of cortisol before and after exercise in athletes and non-athletes (p= 0.0001 & t= 4.3). To justify the matter, it should be noted that level of secreting cortisol hormone is controlled and reduced by corticotrophin (CRH), which is secreted from hypothalamus, and Adornocorticotropine hormones (ACTH), which is secreted from anterior pituitary gland. Also, it is likely that internal opium peptides are effective in reducing secretion of cortisol during moderate and short-term intensity exercises. In the conditions, the secreted cortisol from plasma will be more than its excretion during exercise and thus reduce cortisol amount. Findings of the present research show that 8 weeks aerobic activities will reduce cortisol secretion. The findings are consistent with the obtained findings by many studies including Brooks A et al (2006), Tin P (2002), Corneille (2002), Sutten et al (2002), Hill et al (2001), which they have confirmed increasing amount of cortisol because of physical activity. Findings of the present research are inconsistent with the obtained findings by some researchers such as Sharifi et al (2004), Zabo et al (2004), Huttunen et al (2006),
Maestu (2005), Davis and Few (2002), Urhausen A (2004) and Sutten (2001). To justify this discrepancy, some factors can be mentioned including type and intensity of exercise, duration of training, and cortisol secretion in day and night, test time after eating, number of exercises weekly and time of each session, subjects' age, hereditary factors, rest time of subjects, their motivation and mental state, skilled and non-skilled subjects etc.

There were seen a significant difference in results of independent t-test by comparing cortisol levels before and after exercise in athletes and non-athletes ($p=0.04$ & $t=108$). To justify the matter, it should be noted that increasing amount of cortisol may be reason of increasing cortisol among athletes compared with non-athletes (CRH affects pituitary secretions and functions of the targeted tissue). Especially, before exercise, less cortisol levels are probably because they have a Hypercortisolism mode (increasing cortisol) (Sutten et al., 2002). The results of the present research are inconsistent with the obtained findings by some researchers such as the study by Huttunen et al (2006) and Brooks A et al (2006). To justify this discrepancy, some factors can be mentioned including type and intensity of exercise, subjects' age and gender, hereditary factors, their level of physical fitness etc.

REFERENCES


