

## The Effects Of Endurance Exercise On Serum Cortisol Increasing In A Warm Environment, Heart Rate, Blood Pressure And Exhaustion In Physical Education Girl Students

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**Abstract:** The aim of this study was to determine the effect of increasing endurance exercise in a warm environment on serum cortisol, heart rate, blood pressure and exhaustion in physical education students. The study is quasi-experimental. The sample size was determined using simple random sampling of 15 subjects to a group of 15 subjects that endurance training increased the range of 34-30 ° C in a hot environment, increasing endurance training in the range of 24-22 ° C as the environment natural with an average age of 28.00 ± 4.49, average height 1.0 ± 61.04, the average weight of 67.27 ± 7.04, mean body mass index 25.98 ± 3.31 and waist to hip ratio 0.80 ± 0.7 were divided. In this study, the subjects for an endurance training session on the treadmill conducted separately. Increasing endurance exercise test Bruce maximal test was conducted up to seven stages and each stage, three minutes. The first stage mph speed 1.7 or 2.7 km per hour and a gradient of 10% was initiated and the speed and incline with a constant ratio in each stage were added. The method of collecting information is based on clinical trials. Thus, cortisol, blood pressure, heart rate after exercise test was performed using blood tests and blood pressure measuring equipment. Data analysis using repeated measures analysis of variance was performed using SPSS software, statistical analysis of data showed an increasing endurance training session in a hot environment on serum cortisol levels, heart rate and blood pressure and there is a significant difference  $p < 0.05$ . Statistical analysis also showed that endurance training increased a meeting in a hot environment on blood pressure and heart rate recovery and 0.05 there is no significant difference  $p < 0.05$  Based on the results of this study can be concluded, increasing endurance exercise in a hot environment can serum cortisol levels, blood pressure, heart rate and time to exhaustion is changed.

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**Keywords:** Endurance Activities Increased, Cortisol, Blood Pressure, Heart Rate, Time to Exhaustion, Warm Environment

### 1. Introduction

Patterns of everyday life, most people lead to a sedentary lifestyle. Despite the many services the industrial life of humans, but also for her to have side effects, most notably poverty movement. As you know, the human body is designed for movement and physiological point of view, is not consistent with a sedentary lifestyle. Sedentary lifestyle risk of obesity associated (Nora Mehdi, et al., 2011). Some evidence suggests that the lack or low level of physical activity is an important factor in the prevalence of overweight and obesity (Agha Alinezhad and Gharakhanlou, 2005). Several stimuli such as fitness exercises in front of inactivity, dietary habits, body composition, age, ambient temperature affect the performance of blood hemostasis system (Jahangard, 2009). During exercise, the body must be imposed quickly led to growing needs, respond to. In other words, muscle activity planning requires coordination of many

physiological and biochemical devices, such integration by the complex interaction between the autonomic nervous system and specialized tissues of the body (glands) that secrete hormones, are possible. Organize hormonal responses to exercise are known in sporting activities are important biological functions for the ability to withstand pressure (Rasaei, 1994). Hormone cortisol in stressful situations (environmental impacts emotional stress, exercise) changes. Natural concentration of cortisol in humans had fluctuated throughout the day. In other words, cortisol is released periodically, and every day through circadian rhythm set. Aderno Corticotropine Hormone (ACTH) cortisol secretion and subsequently subjected to regulate the central nervous system. Suprachiasmatic nucleus under the influence of factors such as time, darkness and light sleep and wake up with corticotropin-releasing hormone secretion of hypothalamic nerve wave Send placed and

subsequently pituitary adrenal cortical hormones in the form of a fixed and regular hours of the day its regulation. Cortisol secretion is affected by the shock of physical and emotional, so that factors such as pain, fear, anxiety, each with the impact of the inert core messages with negative regulator of the system and the secretion of cluttering the app boarding, leading to a rapid increase in cortisol secretion and the body needs are urgent (Shahbazi, 2000). Cortisol secretion is not performed for uniform flow permanently, but for pulsatile release of the frequency and amplitude is higher in the morning hours. Thus, approximately 70% of cortisol secretion is done between midnight and 8 am and after 8 hours gradually adrenal cortical hormones and the same proportion of plasma cortisol concentration is reduced until about 6 pm until midnight at least its concentration is about 6 micrograms per deciliter (Shahbazi, 2000). One of the mechanisms involved in immune function change in exercise, stress hormones such as cortisol and epinephrine change is concerned. Based on the findings, vigorous exercise increases cortisol content in serum and saliva are athletes, it remains elevated for longer after stopping activity (Okutsu, 2008). Cortisol, a hormone with anti-inflammatory effect as a regulator of the immune system is nervous. Also, reports of increasing testosterone levels in physical activity there. Endurance training with the increase in cortisol can cause unusual variations and disturbances in the growth of skeletal muscle (Gorzi, 2012). Rajabi (2005) in a study of the impact of a severe two training sessions a day on the concentrations of IgA and cortisol in elite female swimmers assessed at 200 meters. The subjects of this study were number eight elite swimmers in swimming. Swimmers, the first day in 16 hours, three rounds with a maximum distance of 200-meter crawl speed and distance one-minute rest between each swim participated in the exercise protocol. Saliva samples of subjects in three stages: before practice and two hours of practice were collected for not stimulated. Analysis of the findings showed that a double training sessions are intense and do not lead to significant differences in salivary IgA and cortisol levels in elite female swimmers. Hosseini and Agha Alinezhad (2007) in their study that examines the effect of eight weeks of endurance training program on Cortisol levels have a significant change in the index after the eight-week training program have observed. In this study, the frequency of exercise three times a week, 30-16 minutes per session with an intensity of 65-80% of maximum heart rate is done. Taher et al (2011) study entitled Impact of a medium and heavy resistance exercise on acute and delayed leptin, insulin, cortisol, testosterone and energy expenditure in healthy men performed after exercise. In this study, 13 healthy men with an

average age of  $1.6 \pm 37.4$  in one of three control modes (13 cases), moderate resistance exercise at 70% of repetition maximum ( $n = 13$ ) and heavy resistance exercise at 80% of one repetition maximum ( $n = 13$ ) participated for 90 minutes. Blood samples taken before, immediately after the test run 5.3 hours after the test were collected. He concluded that generally moderate and heavy resistance exercise on acute and delayed leptin, insulin, cortisol and serum testosterone and energy expenditure in healthy men no significant effect after 24 hours. Based on the results of studies regarding changes in blood pressure during exercise, type and duration of which is somewhat clear. So that by increasing the intensity of the activity, increased blood pressure, increased blood pressure in addition of resistance exercise, systolic blood pressure, which is also far higher than endurance. The intensity and duration of exercise is still associated with changes in blood pressure after exercise is not a good expression and the results confirm the intensity and duration of activity in this area so far have not been rectified after exercise on blood pressure. The results of some research have shown that high compared to low intensity exercise, more blood pressure reduction has created (Faraji, 2008). This study tries to answer this question is basically that a meeting increasing endurance training (running on a treadmill), moderate (65 to 75 percent of maximum oxygen consumption) in a warm environment, the effect on serum cortisol, heart rate, pressure blood and exhaustion young girls?

## 2. Material and Methods

The study is quasi-experimental. The sample size was determined using simple random sampling of 15 people to a group of 15 people that endurance training increased in the range of 34 -30 degrees Celsius as warm environments, exercise endurance increased in the range of 24-22 ° C as the environment natural with an average age of  $28.00 \pm 4.49$ , were divided into average height  $1.61 \pm 0.04$ , the average weight of  $67.27 \pm 7.04$ , mean body mass index  $25.98 \pm 3.31$  and waist to hip ratio  $0.80 \pm 0.07$ . In this study, the subjects for an endurance training session on the treadmill conducted separately. Increasing endurance exercise test Bruce maximal test was conducted up to seven stages and each stage, three minutes. The first stage mph speed 7.1 or 7.2 km per hour and a gradient of 10% was initiated and the speed and incline with a constant ratio in each stage were added. The method of collecting information is based on clinical trials. Thus, cortisol, blood pressure, heart rate after exercise test was performed using blood tests and blood pressure measuring equipment. Data analysis using repeated measures analysis of variance was performed using SPSS software.

### 3. Results

#### Investigating the normal data distribution

To investigate the normality of data distribution in each of the measured variables, Kolomogrov-

Smirnov was used. In Table 1 due to the significant level achieved in each test, normal or non-normal distribution of data was found.

Table 1. Result of Kolomogrov-Smirnov test

Heart Rate Training		Recovery of blood pressure (mmHg)		Practice blood pressure (mmHg)		Z
natural environment	Warm environment	natural environment	Warm environment	natural environment	Warm environment	
1.182	1.264	1.277	1.097	1.291	0.904	
0.122	0.082	0.081	0.180	0.071	0.388	significance level
Cortisol (micrograms per liter)		Time to exhaustion (s)		Heart rate recovery		Z
natural environment	Warm environment	natural environment	Warm environment	natural environment	Warm environment	
1.342	1.303	1.075	0.848	0.904	1.033	
0.054	0.067	0.198	0.468	0.388	0.236	significance level

\*No normal distribution  $P < 0.05$

According to Table 1, all variables had normal distribution.

#### Testing research hypothesis

##### First hypothesis

Increasing endurance exercise in a hot environment has a significant effect on serum cortisol female students.

Repeated measures analysis of variance to test this hypothesis (Table 2) was used.

Table 2. Results of analysis of variance with repeated measures of serum cortisol female students

significance level	F	DF	Mean $\pm$ SD	
0.000*	119.75	1	natural environment	Warm environment
			79.41 $\pm$ 30.49	199.55 $\pm$ 71.25

$P < 0.05$

The results in the above table shows that increasing endurance exercise in a hot environment had a significant effect on serum cortisol female students.

##### Second hypothesis

Increasing endurance exercise in a hot environment has a significant effect on heart rate training female students.

Repeated measures analysis of variance to test this hypothesis (Table 3) was used.

Table 3 results of analysis of variance with repeated measures heart rate training female students

significance level	F	DF	Mean $\pm$ SD	
0.000*	439.45	1	natural environment	Warm environment
			32.79 $\pm$ 150.73	30.64 $\pm$ 169.00

$P < 0.05$

The results of the above table show that increasing endurance exercise in a hot environment had a significant effect on heart rate training female students.

##### Third Hypothesis

Increasing endurance exercise in a hot environment female students has a significant effect on heart rate recovery.

Repeated measures analysis of variance to test this hypothesis (Table 4) were used.

Table 4. Results of analysis of variance with repeated measures heart rate recovery female students

significance level	F	DF	Mean $\pm$ SD	
			natural environment	Warm environment
0.000*	457.98	1	150.73 $\pm$ 32.79	30.64 $\pm$ 169.00

P < 0.05

The results of the above table show that increasing endurance exercise in a hot environment female students have had significant effects on heart rate recovery.

#### Fourth Hypothesis

Increasing endurance exercise in a hot environment has a significant effect on blood pressure exercise female students.

Repeated measures analysis of variance to test this hypothesis (Table 5) was used.

Table 5. Results of analysis of variance with repeated measurements of systolic blood pressure, exercise, female students

significance level	F	DF	Mean $\pm$ SD	
			natural environment	Warm environment
0.000*	567.76	1	4.29 $\pm$ 88.60	6.42 $\pm$ 96.40

P < 0.05

The results of the above table show that increasing endurance exercise in a hot environment female students have had significant effects on blood pressure in practice.

#### Fifth hypothesis

Increasing endurance exercise in a hot environment female students has a significant effect on blood pressure recovery.

Repeated measures analysis of variance to test this hypothesis (Table 6) were used.

Table 6. Results of analysis of variance with repeated measures of blood pressure recovery female students

significance level	F	DF	Mean $\pm$ SD	
			natural environment	Warm environment
0.000*	511.12	1	13.34 $\pm$ 137.00	15.68 $\pm$ 140.67

P < 0.05

The results of the above table show that increasing endurance exercise in a hot environment female students had no significant effect on blood pressure recovery.

#### Sixth hypothesis

Increasing endurance exercise in a hot environment has a significant effect on the time to exhaustion female students.

Repeated measures analysis of variance to test this hypothesis (Table 7) was used.

Table 7. results of analysis of variance with repeated measures time to exhaustion female students

significance level	F	DF	Mean $\pm$ SD	
			natural environment	Warm environment
0.000*	253.42	1	13.34 $\pm$ 117.00	15.68 $\pm$ 120.67

P < 0.05

The results of the above table show that increasing endurance exercise in a hot environment had a significant effect on the time to exhaustion female students.

#### 4. Discussions

This study aimed to determine the effect of increasing endurance exercise in a warm environment on serum cortisol, heart rate, blood pressure and

exhaustion city Branch was in the girls' physical education students. Ludmila research findings et al (2011), endorsed the comments of Peter and colleagues (2010), who believes cortisol levels after exercise in both environments significantly increased at 15 and 35 degrees and no significant difference between there were two conditions.

The results of this study are consistent with the results of Ludmila et al. 2011, Patrmn et al. 2011,

Gardner et al. 2011, Cooper et al., 2010, Peter et al., 2010; Hill et al. 2008, Hanshni et al. 2007, H. Su et al. 2007, Handzsiki et al. 2006, Stark et al. 2005, Ling et al. 2005, Nice 2003. The results indicated that increased levels of cortisol. Statistical analysis of this study showed that increasing endurance exercise on serum cortisol in a warm environment there is a significant relationship between female students and the null hypothesis is confirmed. The findings Naserkhani and colleagues in 2015 showed that a training session on the treadmill with limited blood flow, causing a significant increase in serum cortisol level (42), which are consistent with results of Rezai et al., 2013, Mirghani et al., 2013 et 2013, Qadiri, Tartibian et al., 2013, Framri and Khorshidvand 2012, Syrians et al. 2012, mace and fellow 2011, Suri et al., 2011, Syfvryan et al., 2011, applies to mental and colleagues in 2011, Ġrāt et al. 2009. The results of this study with the results of Thomas 2009, Bosida 2009, the peak in 2008, Nieman 2005, Gorvstakia 2005, in conflict. They concluded that the short-term effects of intense exercise on serum cortisol showed no significant change. The results of this study are inconsistent with the results of Moradi et al., 2013, memorabilia, et al., 2011, T. et al., 2011, lime et al in 2011, Sinai et al 2011, Hosseini and Qalinezhad 2009, Rajabi et al. 2005. They had come to the conclusion that an intense training day, causing no significant difference in levels of cortisol. Catabolic hormone cortisol and anti-stress hormones in the body is most important, the increase in the long term it is causing problems, most notably problems related to the immune system and Nkhryb protein. Studies have shown that cortisol doing, depends on the intensity and duration of exercise (Naserkhani). The combination of intensity, volume and repeat the exercise for functional and morphological adaptations, in order to maintain and develop muscle, is proposed. The importance of adaptation to exercise, despite its dependence on individual experience and level of physical fitness training, according to training stimuli (Nasserkhani et al. 2015).

Statistical analysis of this study showed there is a significant relationship between an increasingly endurance exercise training on heart rate in the hot environment female students and the null hypothesis is confirmed.

The results indicated that increased heart rate. The results of the research findings are consistent with results Satarifard et al. 2013, Gaini et al. 2011, Hosseini and Agha Alinezhad (2009).

Statistical analysis of this study showed that there is a significant relationship between endurance exercise training on blood pressure in a warm environment female students increasingly and the null hypothesis is confirmed, the results of the study

showed that increased blood pressure. The results of the research were consistent with results of the findings of Cinar 2001, Land et al 2013, Mousavi Nasl Khamenei 2010, Amirkhizi et al 2008.

Statistical analysis of this study showed that there is a significant relationship between the endurance exercise training on heart rate increased in a warm environment female students and the null hypothesis is confirmed,

The results indicated that increased heart rate. The results of the research findings are consistent with the results of Satarifard et al 2013, Gaini et al 2011, Hosseini and Qalynzhad 2009.

Statistical analysis of this study showed that there is no significant effect on increasing endurance exercise in a hot environment blood pressure recovery female students and the null hypothesis cannot be confirmed. The results showed that endurance training increased between and there is no significant change in blood pressure recovery. The results of the research findings were consistent with Matin Homaie 2011 and Brojini 2007.

The results showed that cortisol levels drop with exhaustion directly related to the results of this study are consistent with results of Shakeri 2001.

Statistical analysis of the present study showed that there is a significant relationship between increased exercise endurance time to exhaustion female student in a warm environment and the null hypothesis is confirmed. The results of Shakeri (2001) Serum immunoglobulin levels after strenuous activity until exhaustion on a cycle ergometer significant changes in serum cortisol concentrations increased and serum will not increase but decreases. There is also a significant correlation between plasma cortisol before and after practice there (Shakeri et al 2011).

According to the findings in the conclusion: for all relationships between all variables significant and negative.

The exposure and increasing endurance activities in each of the hot environment and natural cause the increase in cortisol levels, blood pressure, heart rate and time to exhaustion. This change results showed that the rates are variable. However, the increase in hot environments more natural environment.

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