Effect of stress training to exhaustion on Psychobiologic variables of track and field Athletics

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Abstract: This research aims to find out the effect of stress training to exhaustion on Psychobiologic variables of track and field athletics. The researchers used the descriptive method and choose the research sample through random method from sedentary students and track and field players of different clubs. The research sample consisted of twenty healthy men, aged 20-22y. Volunteered to this study, they were divided to control group (n = 10) and experimental one (n=10). All subjects performed an exhaustive exercise test, after a warming up of 3m, they performed on tread mill, increasing the speed every 3 m. until the signs of fatigue and inability to continue. They was followed by cooling dawn 3m., then 5 ml of blood was drawn before and after the test. The following variables were determined in a special lab. Testosterone, cortisol, prolactin together with lactate and pulse rate, by using Elisa technique, Accusport and pulse meter, kits for hormones were used The researchers conducted the sample homogeneity in age, height, weight by finding skewness coefficients. The researchers reach the conclusions: (1) Stress training indicated that atheletics have higher anabolic hormone (testosterone) and lower stressor hormones (prolactin, cortisol). (2) Exhaustive training revealed that athletic group develop higher fitness level and personality. (3) Exhaustion affect both physiological an psychological variables known as psychobiology.
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Key worlds: Psychobioloty, blood hormones, Lactate, Pulserate, Exhaustive exercise.

1. Introduction

Blood hormones are essential for physiological reactions and adaptations during physical work and influence the recovery phase after exercise by modulating anabolic and catabolic processes. Testosterone, cortisol and prolactin are playing a significant role in metabolism of different types of energy producing substances (Lin et al, 2008).

Testosterone, is secreted by the leidig cells of testis, cortisol from the cortex of suprarenal glands and prolactin secretion by the anterior pituitary gland (Barret et al, 2010).

Testosterone could increase muscle mass, strength, erythropoietin and elevated aerobic power and glycogen synthesis in muscle. The main function of cortisol is catabolism and promote the decomposition of protein from skeletal muscle, the amino acid from decomposition of protein can become material of gluconeogenesis. Prolactin hormone affect gonadotrophic hormones, hence, affect reproduction and sexual behavior of both males and females. (Guyton and Hall, 2006).

Harries et al (2008) reported that in training stresses the history involves an increase or change in training. Intensive interval work: many athletes breakdown when they switch from low intensity training to high intensity training with intensive interval work.

Fast athletes: some athletes are going faster than ever before, as training seven days a week instead of four or five.

Slow atheltes: some athletes are trying to keep up with peers who are faster, so the stress of training is greater and they become fatigued. Sudden increase their training in order to catch up after a break due to illness or injury. They also added that there are other stresses such as exams and other life event, glycogen depletion and dehydration.

Salah (2000) added the track and field sport is one of sport field related to aerobic and anaerobic exercise and numerical level are affected by endocrine system and fuel production. Also training affect both physiology and psychology.

Kicman et al (1991) claimed that some athlete might use cortisol directly or indirectly as ACTH produced by the anterior pituitary which in turn stimulates production of corticosteroid which have anti-inflammatory affects as well as possible mood effects to reduce lethargy and creates positive mood effects during training and competitions. But, taking ACTH lowers the body ACTH production and degenerates adrenal glands, making the athlete more vulnerable to infection, testosterone concentrations have been shown to increase after an acute bout of resistance exercise (McMurray et al, 1995, Pullinen et al 2002) or endurance exercise (Hackney et al, 1995). Other studies have been reported to increase cortisol

and prolactin concentrations in either resistance exercise or endurance exercise (Tremplay et al, 2004, Volpe et al, 2007). There is no information about the hormonal responses before and after acute exhaustive exercise which denote the response of hormones to highly stressors till exhaustion.

Viviany (2006) stated, the psychobiology (PB) is the branch of Psychology studying the relationships existing between behaviour and the body, focusing its efforts mainly on the brain, and movement has less appeal than other topics covered by (PB), despite the great number of nervous areas implies in it, and the historical fact that the first motions on the functioning of the brain rise from the study of movement control. He added that PB relates behaviour with body processes, in particular with brain activities, and the umbrella covered by PB is quite wide.

The present paper aims in understanding the relationship of some hormones affecting the body during training stress of tracks and fields players, so as to reveal the relation of the behaviour and the body.

Research objective:

This research aims to find out the effect of stress training to exhaustion on psychobiologic variables of track and field athletics.

Hypothesis:

1) There would be statistically significant differences between pre and post test of the control group in psychobiologic variables in favour of post tests.
2) There would be statistically significant differences between pre and post tests of the experimental group in psychobiologic variables in favour of post tests.
3) There would be statistically significance differences between the post tests of both control and experimental groups in psychobiologic variables in favour of post test of the experimental group.

2. Methods:

Twenty healthy male students aged 20-22 y. volunteered to this study. They were divided to: 1) control group (n=10). 2) The athletic group (n=10) of runners of different clubs. The control group are not involved in any regular exercise for at least 6 months. The athletic group was training 3 days per week, they were not injured. All subjects gave written informed consent to continue the experiment.

All subjects were performing an exhausting exercise test after a warming up of 3m, the test was performed on a tread mill which was increased the speed every 3m until fatigue of the candidate. This was followed by cooling down for 3m. Blood samples were drawn before and after the end of the exhaustive exercise. Testosterone, cortisol, prolactin together with lactate concentration and pulse rate using Elisa technique, accusport apparatus and pulse meter, and kits for hormones.

Sample homogeneity:

The researchers conducted the sample homogeneity in the variables of age, height, weight by finding out skewness coefficients. It was found that all values of skewness coefficients were between (±3), which shows the homogeneity of the two group members in the variables of age, height, weight. The results showed no significant differences between the control and experimental group, indicating their homogeneity.

The researchers used the descriptive method using to identical group (n = 10) of male sedentary students and track and field athletics for the academic year 2013-2014. For inducing exhaustion signs:

1-incapable to complete exercise
2-increased anxiety and irritability
3-excessive sweating
4-signs of dehydration
5-signs of thirst
6-Loss of energy
7-Fatigue to exhaustion

All blood samples were taken between 8 and 9 a.m. so as to prevent circardian rhythm. From both groups, control and experimental before and after the test. 5 ml of blood were drawn from the anticubital veins and lactate was performed in the blood collected. The hormones were performed using serum after centrifuge and stored at (-20˚C) until analysis. Elisa technique was used for hormonal assays.

Tests and analysis were performed 15/11/2013 to 22/11/2013.

Statistical Analysis

All statistical analysis were performed by using SPSS. All data were presented as means ± SD and statistical significance was set at $P < 0.05$. T test was used to compare means of groups.

3. Presentation and discussion of the results

Presentation of the first hypothesis results.

4. Discussion of the first hypothesis results:

The researchers attributes the differences between pre and post tests of the control group in the favour of the pos test to the responses of the body and nervous system affecting the different variables, cortisol, prolactin, testosterone, lactate and pulse rate. As all variables were elevated due to action of training stress to exhaustion leading to the increased levels of these parameters due to action of stress on the

hypothalamus which led to increased secretion of the neural connection between the hypothalamus and pituitary leading to release of ACTH which stimulate cortisol, also gondotropin hormone leading to testosterone increase, also prolactin stimulation hormone to secretion prolactin. As for lactate increase was due to increased glycolysis and production of pyruvate than lactate due to action of lactate dehydrogenase enzyme, pulse rate increase due to the action of sympathetic nervous system on the heart leading increased pulse rate.

These results are consistent with the finding of: Mougios (2006), Robergs and Roberts (2000), Jacobs (2003) also with Borgosh (2015), Thomas et al (2012).

Thus, we find that the first hypothesis stating "There would be statistically significant differences between pre and post tests of the control group in psychobiologic variables in favour of post tests" has been realized.

b) Presentation of the second hypothesis results:

Table (2): Significance of differences between pre and post tests for the experimental group in psychobiology variables:

Table (1) significance of differences between pre and post tests for the control group in psychobiology changes.

Variables	Pre Test		Post Test		Tcal
	M	SD	M	SD	
Cortisol (µg/dl)	13.9	1.1	26.5	2.4	S
Prolactin (µg/dl)	5.1	0.7	11.3	1.2	S
Testosterone (µg/dl)	6.2	0.8	8.4	0.9	S
Lactate (Mmol/L)	1.4	0.3	3.9	0.5	S
Pulse rate (Count/m.)	76	3.4	146	6.3	S

$P < 0.05$ T_{cal} were higher than T_{tab}. S = Significant

Table (2) Significance of differences between pre and post tests for the experimental group in psychobiology variables.

Variables	Pre Test		Post Test		Tcal
	M	SD	M	SD	
Cortisol (µg/dl)	14.2	1.3	22	2.2	S
Prolactin (µg/dl)	5.3	0.8	9.2	1.1	S
Testosterone(µg/dl)	6.8	0.9	14.4	1.3	S
Lactate(Mmol/L)	1.2	0.4	3.2	.4	S
Pulse rate()Count/m.	72	3.6	134	6.4	S

$P < 0.05$ T_{cal} were higher than T_{tab}.

Discussion of the second hypothesis results

The researches attribute the differences between pre and post tests of the experiment group in favour of the post test to the fitness and psychobiologi states of the participants of this study. As the changes in the different parameters denotes the levels of the athletics in response to the training tresses, the psychobiologic changes due to the exercise training until exhaustion indicated that the changes in cortisol, prolactin, testoserone, lactate and pulse rate increased in post tests but in different assays compared to control group. Mougios (2006) stated that the fit person respond differentially compared to non fit person. The present results are consistent with the finding of Salzano et al (1994), Gabriel and Kidnermn (1997) Pederssen (1997) and Weicker and Werle (2001).

From the above discussion, it is clear that the second hypothesis stating "There would be statistically significant differences between pre and post tests of the experimental group in psychobiologic variables in favour of post tests" has been realized.

Presentation of the third hypothesis results:

Table (3) significance of differences in the post tests for both control and experimental group in psychobiology changes.

Variables	Post control group		Post Exp. group		Tcal
	M	SD	M	SD	
Cortisol (µg/dl)	26.5	2.4	22	2.2	S
Prolactin (µg/dl)	11.3	1.2	9.2	1.1	S
Testosterone (µg/dl)	8.4	0.9	14.4	1.3	S
Lactate (Mmol/L)	3.9	0.5	3.2	0.4	S
Pulse rate (Count/m.)	146	6.3	134	6.4	S
Exh.time/m.	22.3	2.3	29.4	2.6	S

$P < 0.05$

The researchers attribute the results of both post tests of the control group and experimental group in psychobiology changes in favour of the post tests of the experimental group.

The data presented in our study revealed decreased concentration of stress hormones (prolactin and cortisol) post exhaustion exercise in experimental group, which indicated that training decrease stressor, but in the contrary testosterone concentration was higher in case of the experimental group which indicated that training induced anabolic effect. These results were in accordance with Mougios (2006) and Manninen (2005) and Malm et al (2004).

Lactate decreased post test in experimental groups compared to control, which indicated a higher fitness state of experimental group. Also in case of pulse rate decreased after test in experimental compared to control group.

These results were confirmed by Mohamed Shalaby (2012) and Fitts (2004) also Robergs and Roberts (2000). They stated that sport's training is done to improve performance, and the personality of a person has several dimensions of physical, physiological, social and psychic. Sports training therefore, directly and indirectly aims at improving the personality and fitness of the sport man and induce positive effect on psychobiology changes of the body.

From the above discussion, it is clear that the third hypothesis stating that "There would be statistically significance differences between the post tests of both control and experimental groups in psychobiologic variables in favour of post test of the experimental group" has been realized.

Conclusions:

1- Stress training indicated that athletics have higher anabolic hormone (testosterone) and lower stressor hormones (prolactin, Cortisol).
2- Stress training revealed that athletic group develop higher fitness level and personality.
3- Stress training to exhaustion affect both physiological and psychological variables known as psychobiology.

Recommendation

1- Application of physical activity for the sake of physiological and psychological benefits.
2- To conduct similar studies on other sports activities.
3- Physical activities are important tools for males and females in fitness and psychology personality.

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