International Journal of Science Culture and Sport
December 2017 : 5(4)
ISSN : 2148-1148
Doi : 10.14486/IntJSCS697

Field *: Coaching*
Type *: Research Article*
Received: *07.11.2017* ***- Corrected:*** *03.12.2017* ***- Accepted:*** *07.12.2017*

Analyzing the before and after Effects of Endurance Training on ACTH Hormone

Süleyman GÖNÜLATEŞ[1], Sibel TETİK[2], Uğur DÜNDAR[1], Tansu YAAN[1], Kerim DÜNDAR[3]
[1] Pamukkale University Faculty of Sport Sciences, Denizli, TURKEY
[2] Erzincan University School of Physical Education and Sports, Erzincan, TURKEY
[3] Dokuz Eylül University Fine Arts Faculty, İzmir, TURKEY
Email: sgonulates@hotmail.com, s_tetik55@hotmail.com, udundar60@hotmail.com, tyaan@hotmail.com, krmdndr@gmail.com

Abstract

This study was conducted with the aim of determining whether there is any difference between ACTH hormone before and after endurance training. 38 students volunteered to participate in the study. Subjects were divided into morning, evening and control groups, and hormone levels were measured with blood samples given in the morning and evening. In the evaluation of durability, "Conconi Test" was applied as exercise protocol. After 6 weeks of exercise protocol, blood samples were taken and the "conconi test" protocol was reapplied. SPSS 21.0 package program was used to analyze the data. Pearson Correlation analysis was used to examine relations between variables, and Anova was used to determine differences between groups. The results are presented as mean and standard deviation, with a $P < 0.05$ significance. As a result, it is thought that the necessary balance is achieved when the relationship between the Cortisol hormone and the ACTH hormone is thought to be decreased after the endurance training and when the level of the ACTH hormone is decreased. In conclusion, there was no significant difference between the groups. It was determined that the first measurement of ACTH showed a significant relationship with Gender, Height, Weight, Bme, ACTH 's 2nd measurement with Gender, Bme, Weight, AnaHr, AnaHr b.

Keywords: hormone, ACTH, endurance training

Introduction

Physical activity and training cause the increase and decrease of some hormones in blood levels. These increases and decreases occur due to the regulation of the endocrine glands. These different blood levels also indicate metabolic changes (Hakkınen et al., 1989; Fox et al, 1999). Hormonal systems seem to be associated with both short-term hemostatic control and long-term cellular adaptations. Some studies have also considered the effects of aerobic and anaerobic sporting practices to determine the hormonal effects of different training variables on the organism (Dağlıoğlu and Hazar, 2009). The response of cortisol to physical activity differs according to the severity and duration of activity (Fox et al., 1999). As it is known, in reality the cortisol hormone is a necessary hormone for the body. Some elite athletes use cortisol pills to improve their performance. Durability can provide an advantage by blocking pain in sports. In fact, there is no objection to increasing cortisol during exercise. However, if the cortisol levels remain high level after the exercise, then a problem may arise. When some hormones are compared with exercise, training, and rest values, there is an increase or decrease in the proportions. These increases and decreases, which are the underlying cause of exercise, usually reflect adjustments in the amount of hormone secreted by the endocrine gland (Erdemir and Tüfekçioğlu, 2008). This study was conducted with the aim of determining whether there is any difference between ACTH hormone before and after endurance training.

Materials and Methods

39 students who studied at Denizli Pamukkale University Sports Science and Technology High School have voluntarily participated in the research. Subjects were divided into morning, evening and control groups. The blood tests were taken before and after the subjects started working in the morning and evening. Blood collection and examination were carried out at the central laboratory of Pamukkale University Medical Faculty Hospital. Skin fold thickness from biceps, triceps, supsapapula and suprailiac regions was measured using Skinfold calipers (Holtain Ltd. UK) and lengths Holtain anthropometry set (Holtain Ltd. UK) at body fat percentages of subjects. Determination of body fat percentages of subjects; Skin fold thickness from biceps, triceps, supscapula and suprailiak regions was measured using the Skinfold caliper (Holtain Ltd. UK) and thier lengths were measured using a Holten anthropometry set (Holtain Ltd. UK). The Body fat measurements were calculated using the formula of Durnin and Womersley (Durnin, 1974). The ConConi test was carried out to determine the durability performance. During the application of the test; This test, which was carried out circularly with the help of 5 signs at 20 m between each other, was started at a speed of 8.5 km / h and an increase of 0.5 km / h was carried out at a running speed of 200 m. The test was continued until the athletes voluntarily terminated the test or until they missed two more signals at two successive 20 m. The signal sound is set using a laptop and a CD (Conconi, 1982; Conconi, 1996). During the Conconi test, sportsmen were given to watches RS 800 (Polar Vantage NV, Polar Electro Oy, Finland) that recording the heart rate, and Sportsmen's HR (Heart Rate) values were recorded during the test, and after the test, the mean CAD corresponding to each speed was determined by passing it to the computer. By going out of these speeds; in order to improve the durability performances of the sportsmen, They did extensive durability training as every 3x10 min 2 min resting and their pulse was 150; Intensive durability as 1x20 min the pulse 165, 3x6-8 min 3-5 min resting and the pulse was 178; Widespread intervertebral extreme durability for 3 days a week for 6 weeks, and 1 day is

intense endurance and extensive interval endurance training. The blood samples of the subjects taken before the study were analyzed and after 6 weeks the same tests were repeated at the end of the study. IBM SPSS (Statistical Package for the Social Sciences) 21.0 package program was used to analyze the data. Descriptive Statistics were used to determine the distributions of the data. Pearson Correlation analysis was used to examine relationships between variables, and Anova (post-hoc / Tukey) was used to determine differences between groups. The results have been presented as mean (X) and standard deviation (SS), with a P <0.05 significance.

Findings

Table 1. The comparison of intergroup variables

	1st Group(Morning)		2nd Group(evening)		3rd Group(control)		F
	X	**SS**	**X**	**SS**	**X**	**SS**	
Gender	1,36[a]	,497	1,33[a]	,492	1,17[a]	,389	,622
Age	22,36[a]	1,499	23,33[a]	2,964	22,33[a]	2,605	,699
Height	168,43[a]	8,501	169,00[a]	6,537	169,50[a]	7,845	,063
Weight	63,54[a]	12,830	58,33[a]	9,036	59,02[a]	8,918	,950
Bme	22,17[a]	3,158	20,34[a]	2,008	20,44[a]	1,573	2,441
Fat a	15,05[a]	6,037	15,45[a]	6,109	15,68[a]	5,114	,040
Fat b	14,66[a]	5,417	13,87[a]	4,443	15,93[a]	4,934	,528
Running Speed a	11,64[a]	1,550	11,08[a]	1,428	11,54[a]	1,157	,570
Topmes a	1807,14[a]	886,188	1666,67[a]	732,782	1850,00[a]	524,838	1,632
Running speed b	11,80[a]	1,541	11,20[a]	1,276	11,09[a]	1,113	,204
AnaHr a	183,29[a]	6,342	186,92[a]	5,696	184,25[a]	2,667	1,081
AnaHr b	181,57[a]	6,394	186,83[a]	5,937	184,58[a]	3,423	3,034
Topmes b	2098,57[a]	907,794	1805,83[a]	701,874	1791,67[a]	446,111	,760
ACTH	23,65[a]	15,663	22,88[a]	16,371	15,89[a]	9,609	1,111
ACTH 2	24,70[a]	24,079	24,75[a]	12,914	16,24[a]	4,927	1,072

[a,b] *The difference between groups with different letters in the same line is significant (p<0.05)*

When the table is examined; there was no significant difference between the groups in Gender, Age, Height, Weight, Body Mass Index, Fat a, Fat b, Running Speed a, Topmes a, Running Speed b, AnaHr (Anaerobic Heart Rate), Anahr b, Topmes b , ACTH, ACTH 2 variables.

Table 2. Examining the relationship between variables

	Group	Gender	Age	Height	Weight	Bme	Fat a	Fat b	Running Speed a	AnaHr a	Topmes a	Running Speed b	AnaHr b	Topmes b	ACTH
Group	1	-,170	,004	,060	-,185	-,299	,047	,103	-,038	,088	,020	-,225	,232	-,183	-,222
		,307	,980	,722	,266	,069	,778	,539	,820	,600	,904	,174	,161	,273	,180
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Gender	-,170	1	,044	,552**	,689**	,566**	-,495**	-,527**	,691**	,198	,631**	,727**	,194	,646**	,574**
	,307		,795	,000	,000	,000	,002	,001	,000	,234	,000	,000	,244	,000	,000
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Age	,004	,044	1	-,140	-,031	,053	-,030	-,061	-,209	,023	-,172	-,203	,129	-,175	,052
	,980	,795		,401	,852	,751	,859	,716	,208	,893	,303	,221	,440	,294	,758
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Height	,060	,552**	-,140	1	,777**	,362*	-,208	-,240	,470**	-,005	,383*	,402*	-,063	,356*	,423**
	,722	,000	,401		,000	,026	,211	,146	,003	,976	,018	,012	,706	,028	,008
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Weight	-,185	,689**	-,031	,777**	1	,864**	,015	,004	,445**	,004	,292	,422**	-,107	,305	,602**
	,266	,000	,852	,000		,000	,930	,981	,005	,981	,075	,008	,522	,062	,000
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Bme	-,299	,566**	,053	,362*	,864**	1	,216	,224	,274	,013	,116	,289	-,112	,154	,570**
	,069	,000	,751	,026	,000		,193	,177	,096	,940	,487	,079	,505	,356	,000
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Fat a	,047	-,495**	-,030	-,208	,015	,216	1	,974**	-,519**	-,148	-,585**	-,549**	-,292	-,589**	-,120
	,778	,002	,859	,211	,930	,193		,000	,001	,376	,000	,000	,076	,000	,472
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Fat b	,103	-,527**	-,061	-,240	,004	,224	,974**	1	-,495**	-,183	-,582**	-,554**	-,322*	-,603**	-,145
	,539	,001	,716	,146	,981	,177	,000		,002	,270	,000	,000	,049	,000	,385
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Running Speed a	-,038	,691**	-,209	,470**	,445**	,274	-,519**	-,495**	1	,069	,904**	,946**	,022	,881**	,157
	,820	,000	,208	,003	,005	,096	,001	,002		,679	,000	,000	,896	,000	,347
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
AnaHr a	,088	,198	,023	-,005	,004	,013	-,148	-,183	,069	1	,179	,047	,881**	,155	,320
	,600	,234	,893	,976	,981	,940	,376	,270	,679		,281	,781	,000	,354	,050
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Topmes a	,020	,631**	-,172	,383*	,292	,116	-,585**	-,582**	,904**	,179	1	,878**	,181	,970**	,051
	,904	,000	,303	,018	,075	,487	,000	,000	,000	,281		,000	,276	,000	,760
	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38

Runing Speed b	-,225 ,174 38	,727** ,000 38	-,203 ,221 38	,402* ,012 38	,422** ,008 38	,289 ,079 38	-,549** ,000 38	-,554** ,000 38	,946** ,000 38	,047 ,781 38	,878** ,000 38	1 38	,024 ,884 38	,904** ,000 38	,195 ,241 38
AnaHr b	,232 ,161 38	,194 ,244 38	,129 ,440 38	-,063 ,706 38	-,107 ,522 38	-,112 ,505 38	-,292 ,076 38	-,322* ,049 38	,022 ,896 38	,881** ,000 38	,181 ,276 38	,024 ,884 38	1 38	,146 ,383 38	,222 ,180 38
Topmes b	-,183 ,273 38	,646** ,000 38	-,175 ,294 38	,356* ,028 38	,305 ,062 38	,154 ,356 38	-,589** ,000 38	-,603** ,000 38	,881** ,000 38	,155 ,354 38	,970** ,000 38	,904** ,000 38	,146 ,383 38	1 38	,095 ,569 38
ACTH	-,222 ,180 38	,574** ,000 38	,052 ,758 38	,423** ,008 38	,602** ,000 38	,570** ,000 38	-,120 ,472 38	-,145 ,385 38	,157 ,347 38	,320 ,050 38	,051 ,760 38	,195 ,241 38	,222 ,180 38	,095 ,569 38	1 38
ACTH 2	-,208 ,211 38	,496** ,002 38	-,085 ,612 38	,103 ,538 38	,384* ,017 38	,492** ,002 38	-,079 ,638 38	-,115 ,493 38	,010 ,951 38	,357* ,028 38	-,063 ,707 38	,090 ,589 38	,325* ,046 38	-,004 ,982 38	,580** ,000 38

*** Correlation is significant at the 0.01 level (2-tailed).*

When the table is examined, the Gender variable has a significant relationship at 0.01 level with Height, Weight, Bme, Fat a, Fat b, Running Speed a, Topmes a, Running Speed b, Topmes b, ACTH, ACTH 2. The relationship of height variable is significant at 0.01 level with Gender, Weight, Running Speed a, ACTH; and is significant at 0.05 level with Bme, Tompes a, Running Speed b, Topmes b. The relationship of Weight variable is significant at 0.01 level with Gender, height, Bme, Running Speed a, Running Speed b, ACHT; and is significant at 0.05 level with ACHT 2. The relationship of Bme variable is significant at 0.01 level with Gender, Weight, ACHT, ACHT 2; and is significant at 0.05 level with Height. The Fat a variable has a significant relationship at 0.01 level with Gender, Fat b, Running Speed a, Topmes a, Running Speed b, topmes b. The Fat b variable has a significant relationship at 0.01 level with Gender, Fat a, Running Speed a, Topmes a, Running Speed b, Topmes b; at 0.05 level with AnaHr. The Running Speed a variable has a significant relationship at 0.01 level with Gender, Height, Weight, Fat a, Fat b, Topmes a, Running Speed b, Topmes b. The relationship of AnaHr variable is significant at 0.01 level with AnaHr b and at 0.05 level with ACHT 2. The relationship of Topmes a variable is significant at 0.01 level with Gender, Fat a, Fat b, Running Speed a, Running Speed b, Tompes a; and at 0.05 level with height. The relationship of Running Speed b variable is significant at 0.01 level with Gender, Weight, Fat a, Fat b, Running Speed a, Tompes a, Tompes b; and at 0.05 level with height. The relationship of AnaHr b variable is significant at 0.01 level with AnaHr a; and at 0.05 level with Fat b, ACTH 2. The relationship of Tompes b variable is significant at 0.01 level with Gender, Fat a, Fat b, Running Speed a, Tompes a, Running Speed b; and at 0.05 level wşth height. The relationship of ACHT variable is significant at 0.01 level with Gender, height, Weight, Bme, ACHT 2. The relationship of ACHT 2 variable is significant at 0.01 level with Gender, Bme, ACHT; and at 0.05 level with Weight, AnaHr a, AnaHr b.

Discussion and Conclusion

Hakinen and his colleagues have examined the sudden changes in total testosterone, free testosterone, growth hormone, cortisol and sex hormones by performing six-month endurance and explosive strength training on middle-aged women and men, older women and men and They could not find any changes in hormones during training (Hakinen et al., 2000). Buono et al. (1991) have found that ACTH and Cortisol parameters show parallel and significant increases in the amount of oxygen used with the work produced as a result of the exercises which were applied at 27 years of age, 50 watt for 2 minutes and 40-100% VO2max. While Schulz et al. (2000) found significant increases in ACTH and cortisol after anaerobic exercise applied to various male athletes aged 26 years, Farrell et al. (1983) found a significant increase in ACTH and cortisol parameters as a result of submaximal (80% max VO2) and maximal (100% max VO2) acute exercises applied to sedentary volunteers aged 26 years and they found that ACTH and cortisol increased in parallel with increasing VO 2 max. Ünal (1998) have pointed out that there is a significant relationship between the amount of VO2max consumed in lactate produced during exercise and ACTH and cortisol increases. Wittert et al. (1996) have reported that sedentaries were significantly lower in ACTH and cortisol parameters in control sedanter groups than in chronic exercise-athletes. Gozansky et al. (2005) have reported a significant increase in serum cortisol levels after exercise in 10 female subjects exposed to 90% maximal heart rate for 10 min. Maimoun et al. (2006) found that cortisol levels in the samples taken from 7 male cyclists who were subjected to 50 minutes bicycle exercise after 15 min of exercise and after exercise showed a significant increase ($p < 0.05$) compared to pre-exercise values. Thomas et al. (2003) reported that there was no significant increase in cortisol levels after exercise in 32 boys and girls, aged 10-11 years, who were running 20 m. ; and Güneş (1995) reported that cortisol did not increase or decreased very little in low-intensity exercises, and cortisol also accompanies this increase as exercise intensity increases.

To conclude, this research has found that there was a significant relationship between the first measurement of ACTH and Gender, Length, Weight, Bme and between ACTH's 2nd measurement and Gender, Bme, Weight, Mother's, AnaKah b, while there was no significant difference between the groups. Therefore, it is thought that this type of regular exercise has many positive effects on the organism, such as struthenic disturbance, elevation of blood sugar, not gaining weight, and acts as a balance and also the cortisol level could decrease.

Conflicts of Interest

The authors have no conflicts of interest to acknowledge.

REFERENCES

Buono MJ, Yeager JE (1991). Increases in Aldosterone Precede Those of Cortisol During Graded Exercise. *J. Sports Med. Phys. Fitness 31, 48-51.*

Conconi F, Ferrari M, Ziglio PG, Droghetti P, Codeca L (1982). Determination of the Anaerobic Threshold by a Noninvasive Field Test in Runners. J.Appl. Physiol., 52, 869–873.

Conconi F, Grazzi G, Casoni I (1996). The Conconi Test: Methodology After 12 Years of Application. Int J Sports Med., 17, 509-519.

Dağlıoğlu Ö, Hazar M (2009). Yüksek Hız Koşu Yüklemesinin Bazı Vücut Hormonlarının Ani Değişimine Etkisi. *Atabesbd 11 (2), 35-45.*

Durnin JVAG, Womersly J (1974). Body Fat Assessed From Total Body Densityandits Estimation From Skinfold Thickness: Measurements on 481 Men and Women Aged from 16 to 72 years. *Br. J. Nutr., 32, 77-97.*

Erdemir İ, Tüfekçioğlu E (2008). Kortizol Sirkadiyen Ritmini Etkileyen Bazı Fiziksel Ve Fizyolojik Parametrelerin Karşılaştırılması. *Balıkesir Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 11 (20), 1-10.*

Farrell PA, Garthwaite TL, Gustafson AB (1983). Plasma Adrenokorticotropin and Cortisol Responses to submaximal and Exhaustive Exercise. *J. Apply Physiol., 55 (5), 1441-1444.*

Fox EL, Bowers RW, Foss ML (1999). Beden Eğitimi ve Sporun Fizyolojik Temelleri. *Bağırgan Yayımevi Ankara.*

Gozansky WS, Lynn JS, Laudenslager ML, Kohrt WM (2005). Salivary Cortisol Determined by Enzyme Immunoassay is Preferable to Serum Total Cortisol for Assessment of Dynamic Hypothalamic-PituitaryAdrenal Axis Activity. *Clin Endocrinol (Oxf), 63, 336-341.*

Güneş R (1995). Egzersiz Hormonal Uyumlar. *I. Klinik Spor Hekimliği Sempozyumu Ankara, 76-97.*

Hakkinen K, Keskinen KL, Alen M, Komi PV, Kauhanen H (1989). Serum Hormone Concentrations During Prolonged Training in Elite Endurance-trained and Strength-trained Athletes. *Eur J Appl Physiol Occup Physiol., 59 (3), 233-8.*

Hakkinen K, Pakarinen A, Kraemer WJ, Newton RU, Alen M (2000). Basal Concentrations and Acute Responses of Serum Hormones and Strength Development During Heavy Resistance Training in Middle-Aged and Elderly Men and Women. J Gerontol A Biol Sci Med Sci., 55(2), B95-105.

Maimoum L, Manetta J, Couret I, Dupuy AM, Mariano-Goulart D, Micallef JP, Peruchon E, Rossi M (2006). The Intensty Level of Physical Exercise and the Bone Metabolisim Responge. *Int J Sports Med, 27, 105-111.*

Schulz A, Harbach H, Katz N, Geiger L, Teschemacher H (2000). βEndorphin İmmunoreactive Material and Authentic β-Endorphin in the Plasma of Males Undergoing Anaerobic Exercise on Rowing Ergometer. *İnt. J. Spors Med. 21, 513-517.*

Thomas JC, Gail F, Panagiota K (2003). Effects of Physical Activity, Body Fat and Salivary Cortisol on Mucosal Immunity in Children. *J Appl Physiol, 95, 2315-2320.*

Ünal M (1998). Aerobik ve Anaerobik Akut/Kronik Egzersizlerin Immun Parametreler Üzerindeki Etkileri. *İ.Ü. Sağlık Bilimleri Enstitüsü İstanbul, 20.*

Witert GA, Livesey JH, Espiner EA, Donald RA (1996). Adaptation of the Hypothalamopituitary-Adrenal Axis to Chronic Exercise Stress in Humans. *Med. Sci. Sports Exerc. 28, 1015-1019.*