http://doi.org/10.22282/ojrs.2018.27

THE EFFECTS OF MORNING AND EVENING ENDURANCE TRAINING ON TSH AND FT4 HORMONES

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ABSTRACT

This study was carried out in order to determine the effects of endurance training during the morning hours and endurance training during the evening hours on TSH and FT4 hormones. 38 students volunteered to participate in the study. The subjects were divided into morning, evening and control groups and their hormone levels were checked with the blood samples given at 07.00 in the morning and 16.00 in the 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. IBM SPSS 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 inter-variable relations, 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, there was no significant difference between the comparison groups between morning, evening and control groups. It was determined that the relationship between TSH and FT4 was significant in the relation between variables.

Key Words: Hormone, Thyroid, Durability

INTRODUCTION

It is a known fact that TSH and FT4 express freely circulating thyroid hormones, TSH is a sign of thyroid failure and FT4 is directly related to thyroid hormone. 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 ve Hazar 2009). The increase in the rate of thyroid hormone secretion in people participating in physical training programs can be explained by the increase in TSH (thyroid stimulating hormone) levels of exercise(Galbo ve ark 1977). There are 3 iodine atoms in thyroxine (T4) and 4 iodine atoms in triiodothronin (T3). The Sufficient amount of thyroid hormone production is due to external nutrition and removal of iodine. In general, thyroid hormones have an increasing effect on metabolic rate, oxygen consumption and heat production. **R**eleasing of excess thyroid hormone is called "hyperthyroidism". In this case, attenuation, nervousness, increase in heart rate, lack of warmth, weakness, insomnia and fatigue are observed (Samuel and Torıola 1988). Thyroid hormones enable to regulation of carbohydrate and lipid metabolism by increasing the use of O2 of body tissue cells(Who 1985). Thyroid hormones influence basal metabolism (Açıkada and Ergen 1990). The increase in hormone release of thyroxine (T4) and triiodothyronine (T3) in exercise relates to regulating energy balance in exercise (Sepulveda et al 1989, Rubai ve Moddy 1991, Kuter and Öztürk 1992). The Thyroid gland hormones in exercise increases the use of carbohydrates, provides intensive hypertrophy by increasing protein synthesis, provides glucose and glycosylation to increase glucose utilization in exercise, increases durability by increasing mobilization and use of free fatty acids. Thus, the thyroid gland hormones thyroxine and triiodothronin increase in long-term, intense exercises and this increase is related to the provision of energy balance (Takashi et al., 1992).

MATERIAL AND METHOD

38 students who studied at Denizli Pamukkale University Sports Science and Technology High School have voluntarily participated in the research. The subjects were divided into morning, evening and control groups. Their blood tests were checked before the exercise started in the morning and evening and immediately after the end of the exercise. Bloodletting and blood tests were carried out at the central laboratory of Pamukkale University Medical Faculty Hospital. To determine the body fat percentages of subjects; The skinfold thickness from the biceps, triceps, supsapapula and suprailiak parts was measured with the Skinfold caliper (Holtain Ltd. UK) and the lengths were measured with the Holtain anthropometry set (Holtain Ltd. UK). 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. 15-20 minutes warming and stretching activities were carried out during the application of the test and during the exercise period (Renstrom, 2000). In this process, it is aimed to increase body heat, accelerate metabolic processes and optimize muscle-cardiovascular metabolism (Bishop, 2003). During the application of the test, this test, which was carried out circularly with the help of 5 signs located 20 m between each other, was started at a speed of 8.5 km / h. and an increase of 0,5 km/h was made every 200 m, in a one running speed . 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 was set using a laptop and a CD (Conconi, 1982, Conconi, 1996). During the Conconi test, watches that record the heart rate RS 800 (Polar Vantage NV, Polar Electro Oy, Finland)were given to sportsmen and the HR values of the athletes were recorded during the test. After the test, the results were transferred to a computer and the average CAD corresponding to each speed was determined. By going out of these speeds; They did extensive endurance training to improve the endurance performances of the athletes by 3x10 min 2 min rest and pulse 150, Intensive durability as 1x20 min pulse 165, 3x6-8 min. 3-5 min. Pulse with rest: 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 (Explore) test was performed to determine whether the data are

distributed normally (parametric) or nonparametric (nonparametric). Pearson Correlation analysis was used to examine relationships between variables, and Anova (post-hocTukey) 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	P
	X	SS	X	SS	X	SS		
Gender	1,3571[a]	,13289	1,3333[a]	,14213	1,1667[a]	,11237	,622	,543
Age	22,3571[a]	,40065	23,3333[a]	,85576	22,3333[a]	,75210	,699	,504
Height	168,4286[a]	2,27194	169,0000[a]	1,88696	169,5000[a]	2,26468	,063	,939
Weight	63,5429[a]	3,42906	58,3333[a]	2,60839	59,0167[a]	2,57452	,950	,397
Bmi	22,1714[a]	,84395	20,3417[a]	,57964	20,4417[a]	,45418	2,441	,102
Fat a	15,0500[a]	1,61350	15,4500[a]	1,76363	15,6833[a]	1,47617	,040	,961
Fat b	14,6571[a]	1,44772	13,8667[a]	1,28260	15,9333[a]	1,42432	,528	,594
Running Speed a	11,6424[a]	,41413	11,0833[a]	,41210	11,5417[a]	,33404	,570	,571
AnaHr a	183,2857[a]	1,69495	186,9167[a]	1,64436	184,2500[a]	,76994	1,632	,210
Running Speed b	11,8000[a]	,41178	11,2000[a]	,36845	11,0917[a]	,32133	1,081	,350
AnaHr b	181,5714[a]	1,70878	186,8333[a]	1,71373	184,5833[a]	,98825	3,034	,061
Topmes a	1807,1429[a]	236,84378	1666,6667[a]	211,53599	1850,0000[a]	151,50758	,204	,817
Topmes b	2098,5714[a]	242,61818	1805,8333[a]	202,61345	1791,6667[a]	128,78119	,760	,475
FT4	1,0557[a]	,03498	1,0283[a]	,02806	,9992[a]	,02271	,916	,409
TSH	2,2306[a]	,57807	2,5513[a]	,29942	1,8245[a]	,20485	,713	,497
FT4 2	1,0964[a]	,04585	1,0325[a]	,01935	1,0175[a]	,02082	1,662	,204
TSH 2	1,4717[a]	,21104	2,1660[a]	,29812	1,6479[a]	,17031	2,429	,103

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

When the table was examined, It was found that the difference between the groups was not significant in all of the variables of Gender, Age, Height, Weight, Bmi (Body Mass Index), Fat a, Fat b, Running Speed a, AnaHr (Anaobicobic Heart Rate), Running Speed b, AnaHr b, Topmes a (Total Distance), Topmes b, FT4, TSH, FT4 2, TSH 2. (P <0.05)
Table: 2 Examining the relationship between variables.

		Group	Gender	Age	Height	Weight	Bmi	Fat a	Fat b	Running Speed a	Ana Hr a	Top mes a	running Speed b	Ana Hr b	Top mes b	FT4	TSH	FT42	TSH2	
Group	C	1	-,170	,004	,060	-,185	-,299	,047	,103	-,038	,088	,020	-,225	,232	-,183	-,223	-,107	-,279	,101	
	Sig.		,307	,980	,722	,266	,069	,778	,539	,820	,600	,904	,174	,161	,273	,178	,521	,090	,547	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	
Gender	C	-,170	1	,044	,552**	,689**	,566**	-,495**	-,527**	,691**	,198	,631**	,727**	,194	,646**	,432**	,007	,213	,237	
	Sig.	,307		,795	,000	,000	,000	,002	,001	,000	,234	,000	,000	,244	,000	,007	,967	,199	,152	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	
Age	C	,004	,044	1	-,140	-,031	,053	-,030	-,061	-,209	,023	-,172	-,203	,129	-,175	,098	-,138	,006	-,137	
	Sig.	,980	,795		,401	,852	,751	,859	,716	,208	,893	,303	,221	,440	,294	,559	,407	,970	,414	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	
Height	C	,060	,552**	-,140	1	,777**	,362*	-,208	-,240	,470**	-,005	,383*	,402*	-,063	,356*	,086	-,185	-,115	,169	
	Sig.	,722	,000	,401		,000	,026	,211	,146	,003	,976	,018	,012	,706	,028	,609	,267	,492	,310	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	
Weight	C	-,185	,689**	-,031	,777**	1	,864**	,015	,004	,445**	,004	,292	,422**	-,107	,305	,336*	-,182	,113	,064	
	Sig.	,266	,000	,852	,000		,000	,930	,981	,005	,981	,075	,008	,522	,062	,039	,274	,501	,705	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	
Bmi	C	-,299	,566**	,053	,362*	,864**	1	,216	,224	,274	,013	,116	,289	-,112	,154	,441**	-,129	,249	-,016	
	Sig.	,069	,000	,751	,026	,000		,193	,177	,096	,940	,487	,079	,505	,356	,006	,439	,131	,925	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	
Fat a	P.Corre.	,047	-,495**	-,030	-,208	,015	,216	1	,974**	-,519**	-,148	-,585**	-,549**	-,292	-,589**	-,066	-,002	-,056	-,062	
	Sig.	,778	,002	,859	,211	,930	,193		,000	,001	,376	,000	,000	,076	,000	,693	,991	,740	,709	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	
Fat b	C	,103	-,527**	-,061	-,240	,004	,224	,974**	1	-,495**	-,183	-,582**	-,554**	-,322*	-,603**	-,067	-,032	-,045	-,110	
	Sig.	,539	,001	,716	,146	,981	,177	,000		,002	,270	,000	,000	,049	,000	,691	,849	,789	,511	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	

Running speed a	C	-,038	,691**	-,209	,470**	,445**	,274	-,519**	-,495**	1	,069	,904**	,946**	,022	,881**	-,037	,074	-,021	,111
	Sig.	,820	,000	,208	,003	,005	,096	,001	,002		,679	,000	,000	,896	,000	,824	,659	,898	,509
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Ana Hr a	Corre.	,088	,198	,023	-,005	,004	,013	-,148	-,183	,069	1	,179	,047	,881**	,155	,078	-,187	-,209	,288
	Sig.	,600	,234	,893	,976	,981	,940	,376	,270	,679		,281	,781	,000	,354	,641	,260	,208	,080
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Top mes a	C	,020	,631**	-,172	,383*	,292	,116	-,585**	-,582**	,904**	,179	1	,878**	,181	,970**	-,108	,104	-,101	,142
	Sig.	,904	,000	,303	,018	,075	,487	,000	,000	,000	,281		,000	,276	,000	,518	,534	,547	,397
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Running Speed b	C	-,225	,727**	-,203	,402*	,422**	,289	-,549**	-,554**	,946**	,047	,878**	1	,024	,904**	,048	,118	,079	,094
	Sig.	,174	,000	,221	,012	,008	,079	,000	,000	,000	,781	,000		,884	,000	,775	,479	,637	,574
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Ana Hr b	C	,232	,194	,129	-,063	-,107	-,112	-,292	-,322*	,022	,881**	,181	,024	1	,146	,143	-,173	-,148	,251
	Sig.	,161	,244	,440	,706	,522	,505	,076	,049	,896	,000	,276	,884		,383	,391	,299	,376	,128
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Top mes b	C	-,183	,646**	-,175	,356*	,305	,154	-,589**	-,603**	,881**	,155	,970**	,904**	,146	1	-,048	,113	-,050	,135
	Sig.	,273	,000	,294	,028	,062	,356	,000	,000	,000	,354	,000	,000	,383		,773	,501	,764	,421
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
FT4	C	-,223	,432**	,098	,086	,336*	,441**	-,066	-,067	-,037	,078	-,108	,048	,143	-,048	1	,026	,715**	,025
	Sig.	,178	,007	,559	,609	,039	,006	,693	,691	,824	,641	,518	,775	,391	,773		,879	,000	,883
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
TSH	C	-,107	,007	-,138	-,185	-,182	-,129	-,002	-,032	,074	-,187	,104	,118	-,173	,113	,026	1	,546**	,185
	Sig.	,521	,967	,407	,267	,274	,439	,991	,849	,659	,260	,534	,479	,299	,501	,879		,000	,267
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
FT42	P.Corre.	-,279	,213	,006	-,115	,113	,249	-,056	-,045	-,021	-,209	-,101	,079	-,148	-,050	,715**	,546**	1	-,224
	Sig.	,090	,199	,970	,492	,501	,131	,740	,789	,898	,208	,547	,637	,376	,764	,000	,000		,177

	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
TSH 2	C	,101	,237	-,137	,169	,064	-,016	-,062	-,110	,111	,288	,142	,094	,251	,135	,025	,185	-,224	1
	Sig.	,547	,152	,414	,310	,705	,925	,709	,511	,509	,080	,397	,574	,128	,421	,883	,267	,177	
	N	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

When the table is examined, The relationship gender variable is significant at 0.01 level with Height, Weight, Bme, Fat a, Fat b, Running Speed a, Running Speed b, Topmes a, Topmes b, FT4. The height variables has significant relationship at 0,01 level with Gender, Weight, Running Speed a; and at 0,05 with Bme, Tompes a, Tompes b, Running Speed b. The Weight variables has significant relationship at 0,01 level with Gender, Height, Bme, Running Speed, Running Speed b and at 0,05 with FT4. The relationship of Bme variables with Gender, Wieght and FT4 is significant at 0,01 level; with height at 0,05 level. The relationship of Fat a variables with Gender, Fat b, Running Speed a, Running Speed b, Topmes a, and Tompes b is significant at 0.01 level. The relationship of Fat b variables with Gender, Fat a, Running Speed a, Running Speed b, Topmes a, Topmes p is significant at 0.01 level; with AnaHr b is significant at 0.05 level. The relationship of Running Speed a with Gender, Height, Weight, Fat a, Fat b, Running Speed b, Topmes a, Topmes b is significant at 0.01 level. The relationship of Running Speed b with Gender, Weight, Fat a, Fat b, Running Speed a, Topmes a, Topmes b is significant at 0.01 level; with Height there is a significant relationship at 0.05 level. The relationship of AnaHr a variables is significant at 0.01 level with AnaHr b. The relationship of AnaKah b variables is significant at 0.01 level with AnaKah a; at 0.05 level with Fat b. The relationship of Topmes a variables is significant at 0.01 level with Gender, Fat a, Fat b, AnaHr a, AnaHr b, Topmes b; at 0.05 level with Height. The relationship of Topmes b variables is significant at 0.01 level with Gender, Fat a, Fatb, Running Speed a, Running Speed b, Topmes a; at 0.05 with Height. The relationship of TSH variables is significant at 0.01 level with FT4 2. The relationship of FT4 variables is significant at 0.01 level with Gender, Bmi, FT4 2; at 0.05 with Weight. The relationship of FT4 2 variables is significant at 0.01 level with TSH, FT4. When the Group, Age and TSH 2 variables were examined, it was determined that there was no significant relationship with other variables.

DISCUSSION AND CONCLUSION

Thyroid hormones are an important regulator of energy metabolism and there is evidence that there is an increase in the release of physical exercise (Günay 1999). Exercises and workouts cause an increase or decrease of certain hormones in the blood levels. During exercise, the level of thyroid hormone changes depending on the intensity and duration of the exercise. T3, T4 increase in long-term heavy exercise (Fox ve ark. 1988). Training increased the metabolism of tissues and increased thyroid hormones had the same effect, so it was investigated whether the training had an effect on thyroid functions and thus basal metabolism and It was found that resting metabolism did not change with training. For athletes, T4 (tyrosine) catabolism and also secretion have been shown to increase with exercise. In other words, both T4 use and hemodialysis increase in exercise (Akgün 1989). In a study done before, the anaerobic power test significantly increased the Taekwondo group values while it the did not affect TSH levels of football and cycling groups (Çakmakcı 2013). In the same study, the anaerobic power test has showed that the athletes of the cycling group did not affect the FT4 hormone levels, but the football and taekwondo group significantly increased the hormone levels (Çakmakcı 2013). Mastorakos and Pavlatou (2005) reported that the level of TSH has fallen immediately after exercise and that the decrease continued and reached its lowest level 24 hours after exercise. It was also found that TSH, T3 and T4 hormone levels were elevated after the marathon run (Sander ve Rocker 1988). As we have seen in literature surveys, there are many studies that support our work and otherwise. In our study, there was no significant difference between the comparison groups between morning, evening and control groups; it was determined that the relationship between TSH and FT4 was significant in the relation between variables. As a result, it is seen that the values of FT4 measured by the second measurement, that is, after the training, are related to the TSH hormone. Considering this aspect, the meaningful relationship with posttraumatic FT4 measurement is thought to be an indicator of the balance role of the organism after returning to normal, considering that the TSH hormone has functions such as regulation of body temperature and heart rate.

RESOURCES

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