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*Original article*

## INVESTIGATION OF THE RELATIONSHIP BETWEEN ATHLETES AGGRESSIVE BEHAVIORS AND THYROID HORMONES

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### Abstract

*Aim.* In this study, it has been examined whether or not aggressive behaviors of athletes performing various sport branches are associated with thyroid hormone.

*Methods.* The study group is consisted of 25 male athletes. T3, T4 and TSH values of the athletes have been examined and reported by the blood samples taken by the specialists in the related hospitals in order to determine the thyroid hormone values of the individuals participating in the research.

*Results.* In the analysis of the data, Friedman test and Wilcoxon test which are non-parametric tests are used by using Spss 20 program.

*Conclusions.* Findings in the study have found that aggression behaviors of athletes are related to thyroid hormone values and there are statistically significant differences.

*Keywords:* thyroid, aggression

### Introduction

Aggression is a phenomenon that is common in everyone's life, taking place from day to day. Moreover, the phenomenon of aggression is defined as an act of physically or psychologically harming a person in a group, or an act of performing a verbal or physical behavior to the opposite side (Yener, 2013). According to Baron and Richardson (1994), aggression is all the behaviors that a person engages and exhibits to harm another person, with many recognitions being included in the literature. In another definition, aggression can be defined as a targeted violence that threatens the safety of individuals and the society, resulting in damage, injury or death (Yıldız, 2004). It is not enough to describe the phenomenon aggression as a self-generated situation. It is also possible to express the elements of the formation and emergence of aggression as individual factors and factors other than the individual, as well as many factors such as family, mass media, barriers, pressure, lack of communication, gender, personality traits (Uluişik and Pepe, 2015).

Aggression is seen as a growing phenomenon in our daily lives and sport. The athlete competes with the competitor in order to be successful during the competition.

In fact, every athlete in the competition competes with himself and his surroundings at the same time. As a result of the efforts of the athletes not to fail and to continue the interest shown to them, they can behave in terms of extreme risk actions that do not match their current abilities (Güner, 2006). Whether a behavior in sport is defined as violent or non-violent is closely related to the purpose of the athlete performing that behavior and if s/he transgresses the established rules of the related sport or not. (Dogan, 2005).

As for the studies examining the causes of aggression, some theorists have suggested that the central nervous system of the brain and the endocrine system lead to aggression. The effects of neurotransmitters, which organize the neural transmission in the brain, on many behaviors, including aggression, are among the most studied subjects in recent years (Sahin, 2003). The central system of the brain, as well as the protection of the cardiovascular system, the transport of the substance through the cell membrane, the growth and secretion functions of the cells and the speed of chemical reactions are controlled by the endocrine system and the largest endocrine gland present in the human body is thyroid gland (Consolazio, Johnson and Pecora, 1963).

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The thyroid is a brown, serendipitous structure located behind the biceps strep muscles. The thyroid gland is in a thin capsule made of connective tissue. The gland consists of many follicles connected with blood and lymph capes (Bilge, 1975). The thyroid gland adjusts the rate of energy production and metabolism by affecting the metabolism of all body cells. Thyroid hormone allows the regulation of carbohydrate and lipid metabolism by increasing the oxygen consumption of body tissue cells (Cakmakci, 2013).

The thyroid gland produces two important hormones, called levothyroxine (T4) and triiodothyronine (T3), called thironamines (Uluşık ve Pepe, 2015). Hypothyroidism occurs when thyroid hormones are inadequately secreted by the thyroid gland, and hyperthyroidism occurs when it is abundant. In this case, symptoms such as weakness, nervousness, increase in heart rate, lack of warmth, weakness, insomnia and fatigue are seen, whereas as for hypothyroidism the case is the opposite (Samuel and Toriola, 1988).

Increase in thyroid hormone increases systemic vascular resistance. T3 is directly involved in the ventricular proteins of humans. It increases the effect of the sympathetic nervous system by increasing the catecholamine receptors in the heart tissue. The result is an increase in blood flow and cardiac outflow, an increase in heartbeat, an increase in systolic pressure, a decrease in diastolicity, an increase in pulse (Akıl, Kara, Biçer ve Acat, 2011). Since the thyroid hormone directly and indirectly affects the heart, it is related to both systolic and diastolic functions. Also, it has many effects on the cardiovascular system, both hypothyroidism and hyperthyroidism, which play an essential role in influencing cardiac contraction, speed, diastolic function and systemic vascular resistance (Lucille, 2000).

In particular, exercise is a physical stressor that causes hormonal metabolic cardiovascular and immunological changes (Akıl, Kara, Biçer ve Acat, 2011). During heavy exercises, the body tries to cope with the stress as a whole, such as by meeting the increased energy and oxygen need, increasing the use of energy stores (Tarım, 2005). During sportive activities, the organism uses the nervous system and the endoxin system to prepare the functional response to the load it is subjected to when the organism is subjected to higher loads than the daily life level. For this reason, the individual under pressure may show an example of aggression outside. Given the increasing aggressive behavior in the present day data, it is necessary to investigate aggression and related factors in a multidimensional manner and to take preventive measures in the light of scientific data (Köknel, 1999).

Our aim in this study is to investigate the relationship between the behavior of thyroid hormones and the behaviors exhibited by athletes who are disqualified from the competition as a result of the aggressive behavior in various sports branches.

### Material

In our research, we have worked on 25 male athletes who were disqualified from their game due to aggressive behavior while performing different sports branches. Blood samples taken from Akyazı State Hospital, Sakarya University Training and Research Hospital and Büyük Ankara Laboratory Group in terms of T3, T4, TSH values have been reported in order to determine the thyroid hormone levels of the athletes. The obtained data has been analyzed using the Friedman test, which is used to determine the difference between the averages, and the Wilcoxon test, which is used for binary comparisons, from the non-parametric tests in the Spss 20 packet program.

## Results

**Table 1.** Descriptive Statistics of Thyroid Hormone Values of Sportsmen

	N	Mean	SD	Minimum	Maximum
T3	25	3,6484	1,67455	1,29	6,09
T4	25	8,0584	4,90151	,87	14,82
TSH	25	1,9316	,98750	,77	5,04

**Ranks**

	Mean Rank
T3	2,08
T4	2,52
TSH	1,40

**Test Statistics<sup>a</sup>**

N	25
Chi-Square	15,920
Df	2
Asymp. Sig.	,000

As a result of the applied Friedman test, there occurs a significant difference between aggressive behaviors of the athletes and thyroid hormone values ( $p < 0.05$ ).

**Table 2.** Wilcoxon Test Comparisons of Sportsmen

		N	Mean Rank	Sum of Ranks
T4 - T3	Negative Ranks	7 <sup>a</sup>	4,57	32,00
	Positive Ranks	18 <sup>b</sup>	16,28	293,00
	Ties	0 <sup>c</sup>		
	Total	25		
TSH - T3	Negative Ranks	20 <sup>d</sup>	14,70	294,00
	Positive Ranks	5 <sup>e</sup>	6,20	31,00
	Ties	0 <sup>f</sup>		
	Total	25		
TSH - T4	Negative Ranks	20 <sup>g</sup>	15,40	308,00
	Positive Ranks	5 <sup>h</sup>	3,40	17,00
	Ties	0 <sup>i</sup>		
	Total	25		

**Test Statistics<sup>a</sup>**

	T4 - T3	TSH - T3	TSH - T4
Z	-3,512 <sup>b</sup>	-3,538 <sup>c</sup>	-3,915 <sup>c</sup>
Asymp. Sig. (2-tailed)	,000	,000	,000



In the comparison of the hormone levels of T3, T4 and TSH of the athletes, there exists a significant difference between T4 and T3, between TSH and T3, between TSH and T4 at  $p < 0.05$  level.

### Discussion

In this study, athletes dealing with various sports branches who are disqualified from the competition because of their aggressive behaviors have been studied and whether this behavior is related to thyroid hormones. Findings in the study indicate that there are significant differences between thyroid hormone levels in individuals exhibiting aggressive behavior.

Greenhill (2014) has conducted a nationwide study in Denmark, which shows that people with hyperthyroidism are increasingly at risk of having psychiatric morbidity (illnesses related to feelings, thoughts and behaviors). Sardogan et al. (2006) has also that there is a significant relationship between antisocial personality disorder and hormones in biological studies on anti-social personality disorders (continuous disrespect and disobedience of the individual's rights and rules). Evrensel et al. (2016) has conducted a study on the relationship between aggression and serum thyroid hormone levels in individuals diagnosed with antisocial personality disorder. The study sample is consisted of 96 individuals with antisocial personality disorder (ATD) and 97 controls. Buss-Perry Aggression Scale has been used after talking with SCID 1-2 first. The subjects are divided into two groups according to the crime patterns as criminal and noncriminal. Blood samples are taken between 07.00 and 09.00 the following day after an overnight hunger, and biochemical analyzes are conducted for thyroid function tests and possible mixers, comparing the aggressiveness levels of the experimental and control groups with thyroid hormones.

The mean free T3 level of the AKB group that is criminalized as a result of the study is found to be significantly higher than the noncriminal subgroup of AKB. It has been determined that aggression scores are higher in the experimental group with high free T3 level. It has been found that whereas there is no significant correlation between thyroid hormone levels and aggression scores in the subgroup of the criminal AKB, serum free T3 and free T4 levels increase in the non-criminal group, and aggression scores increase at the same time.

### Conclusion

Aggressiveness can be a behavior to harm a person, or to express any kind of behavior that can occur by applying pressure and force to living things or the environment.

Aggression or violence reveals the relationship between the individual and the environment. Konrad Lorenz's defines the aggression as not a reaction to external stimuli, but rather a stimulus that exists within a person and aims to be released, irrespective of how ready the outside environment is (Dilbaz, 1999).

Studies regarding the causes of aggression's emergence and control of emergence continue today. On the other hand, the role of thyroid hormones in the formation of aggression is also expressed. However, few studies have pointed to the link between thyroid hormone levels and aggression. When the investigations are examined, it has been found that the aggression or crime frequency in individuals with high T3 levels is higher than those with normal T3 levels. Again, when we look at the studies, it is determined that the T3 level of those with high aggression scores is closer to the upper class (Stalenheim, 2004; Stalenheim, Eriksson, Knorrning and Wide, 1998; Stalenheim, Knorrning and Wide, 1998; Soderstrom, Formsan, 2004).

When the sequential averages of the results of Friedman test applied to the findings and data obtained in our study are examined, it is determined that T4 and T3 values of athletes are higher than TSH values. The findings of the research have found that there is a statistically significant relationship between aggression and thyroid hormone levels in the sample of sportsmen from different branches who are disqualified due to their aggressive behaviors during the competition. According to this result, it can be said that as the values of T4 and T3 increase in the individuals, it increases the aggressive behaviors or the situation in which the individual is present can cause the increase of the existing thyroid hormone values. For example, in sports, individuals or groups are in a competition and struggle mutually. Competition can cause conflicts, debates and fights between individuals or groups.

Often, success in sports, considering the ambition to win the competition, serves the "winning ambition" by lack of control of the physical behaviors. Every move towards winning in the sportive circumstances is counterproductive by the opponent (Tutkun, Güner, Ağaoğlu ve Soslu, 2010).

The degree and purpose of inhibition will determine the power of the aggressive tendency, as well as the increase in T3 and T4 levels due to thyroid hormones and aggressive behaviors will arise in the individual who can't control himself or herself at that moment.

Studies suggest that strengthening self-control or improving anger management in individuals has a positive effect on aggression behaviors. In that case, even if the individual does not destroy it, the psychological aggression can instantaneously conceal. Therefore, psychological help services should be given to individuals who have a tendency to aggression behavior in the light of findings and as a result of this study, and the ability to control aggression in the individual should be improved. Studies on other components that are effective in the formation of behavior should be conducted and investigations about the methods related to the suppression of aggression should be conducted.

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