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## DETERMINATION OF THE EFFECTS OF PREPARATION TRAININGS ON THYROID HORMONES AND LIPID METABOLISM OF FOOTBALL PLAYERS

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### ABSTRACT

The aim of this study is to determine the effect of endurance training applied in addition to football training in the preparation period on the trioid hormones and lipid metabolism of the athletes. A training program was applied to the research group for 10 weeks, four days a week, 90 minutes a day, as well as maintaining their performance, as well as improving their conditional characteristics. Blood samples were taken from the research group twice at rest, before and after the training program. Thyroid hormones (TSH, T3, T4) and lipid metabolism (Cholesterol, HDL, LDL, Triglyceride) levels were determined in blood samples taken from the research group. As a result of the research, it was determined that there was a significant difference between the pre-post test results of the TSH and T3 levels of the football players ( $p < 0.05$ ), while there was no statistically significant difference at the T4 level ( $p > 0.05$ ). It was determined that there was a statistically significant difference between the pre-post test results of the football players' cholesterol, HDL, LDL and triglyceride levels ( $p < 0.05$ ). As a result; It was observed that endurance training applied in addition to football training in the preparation period caused changes in the thyroid and lipid metabolism of football players. In this context, if the trainings to be applied during the preparation and competition period are planned considering the physical and conditional characteristics of the athletes, it is thought that it will contribute positively to the sports performance of the athletes.

**Keywords:** Football, Thyroid hormones, Lipid metabolism, Preparation period, Training.

### INTRODUCTION

It is known that regularly applied training positively affects the general health status of individuals, cardiovascular and metabolic systems. Studies in general report that regular training positively affects the organism. However, high-intensity training may cause physiological oxidative stress in the organism (Zhang et al., 2016). Oxidative stress caused by training creates problems in terms of athletic performance as well as cardiovascular and metabolic problems in the organism (Cheserek et al., 2016). As a result of regular training, it affects both the hormonal system and lipid metabolism as well as oxidative stress.

Thyroid hormones (TH) control the expression of TR target genes and play an important role in basal metabolism and hemostasis, as well as being effective in metabolic processes required for

growth and development through thyroid hormone receptors (TRs). (Mullur et al., 2014). It is known that thyroid hormones affect energy metabolism, lipid metabolism, protein synthesis, growth and development as well as other hormones (Durgun et al., 2019). Long-term submaximal exercises and physical activity increase fatty acid oxidation. In addition, the release of thyroid hormones increases with regular training in athletes (Öniz and Göçer, 2021).

Although the effect of thyroid hormones on lipid metabolism is known, the effect of regular training on lipid metabolism remains attractive to researchers. The general belief is that physical activity and training have a positive effect on carbohydrate and lipid metabolism. In general, it is known that the trainings planned considering the current conditions of the athletes cause decreases in plasma lipid levels such as total cholesterol, LDL and triglycerides, and an increase in HDL levels (Becic et al., 2018; Durstine et al., 2019; Ooi et al., 2016; Mann et al., 2014; Blazek et al., 2013). However, in recent years, different results have been revealed according to the duration and intensity of the trainings of positive changes in lipid metabolism. In general, some researchers state that acute exercises affect lipid metabolism, and some researchers state that long-term and regular exercises cause changes in lipid metabolism (Özhan et al., 2000).

Thyroid hormones and lipid metabolism, which are of such importance for athletic performance and organism in athletes, continue to attract the attention of researchers. This study was carried out to determine the effect of endurance training applied in addition to soccer training in the preparatory period on the thyroid hormones and lipid metabolism of the athletes.

## **Method**

Ethics committee approval was received from Dicle University Social and Human Sciences Ethics Committee (2022/291).

## **Research Group**

30 male athletes, who are licensed in the football branch and regularly attend training, participated in the research group voluntarily.

## **Training Program**

A training program was applied to the research group for 10 weeks, four days a week, 90 minutes a day, as well as maintaining their performance, as well as improving their conditional characteristics. Within the scope of the applied training program, a training program was applied to the athletes in a training unit for 10-15 minutes of warm-up exercises before starting the training, and within the scope of the training, the technical-tactic for 40-70 minutes of competitions and a training program to improve their conditional characteristics. In the last phase of the training, 5-10 minute cooling exercises were applied. Considering the conditional characteristics of the research group, the applied training program was adjusted according to the Max 60-70% intensity, and the training program was increased to the Max 75-80% intensity level in the following weeks. The intensity of the training program was determined according to the Karvonen method.

## Biochemical Measurements

Blood samples were taken from the athletes in the study twice, before and after the training program, in the resting state. In order to determine the thyroid hormones (TSH, T3, T4) and lipid metabolism (Cholesterol, HDL, LDL, Triglyceride) levels in the blood samples taken from the research group, an average of 7cc blood samples were taken with sterile injectors as a result of tourniquet applied from the arm vein to the arm by experts in a rested sitting position. The samples taken were analyzed in a private hospital laboratory using pre-prepared anticoagulant tubes.

## Analysis of Data

SPSS package program was used in the analysis of the data. In order to determine whether the data showed normal distribution, normality test was applied and it was determined that it showed normal distribution. "Paired Samples t" test was applied to compare the pre-post test data of the research group. Significance was accepted as  $p < 0.05$ .

## FINDINGS

**Table 1.** Analysis Results of Thyroid Hormones Paired Samples t-Test of Football Players

	Pre-Test	Post-Test	t	p
TSH	2,10±0,32	2,14±0,31	-7,123	0,00*
T3	3,84±0,11	3,86±0,12	-5,288	0,00*
T4	1,30±0,12	1,26±0,07	2,105	0,44

\* $p < 0,05$

When Table 1 was evaluated, it was determined that there was a statistically significant difference between the pre-post test results of the TSH and T3 levels of the research group ( $p < 0.05$ ), while there was no statistically significant difference at the T4 level ( $p > 0.05$ ).

**Table 2.** Lipid Metabolism of Football Players Paired Samples t-Test Analysis Results

	Pre-Test	Post-Test	t	p
Cholesterol (µg/dL)	123,06±9,64	117,40±12	3,349	0,00*
HDL(µg/dL)	40,93±3,61	45,63±1,35	-8,652	0,00*
LDL(µg/dL)	65,97±2,45	62,92±3,23	7,412	0,00*
Triglycerid(mg/dL)	82,20±7,16	79±5,58	6,352	0,00*

\* $p < 0,05$

When Table 2 was evaluated, it was determined that there was a statistically significant difference between the pre-post test results of the study group's cholesterol, HDL, LDL and triglyceride levels ( $p < 0.05$ ).

## Discussion and Conclusion

Trainings are markers of oxidative stress in the organism, and hemostasis is restored in the body with recovery after training. Especially the hormones secreted during training, cells, organs and hemostasis cause serious problems. (Philippou et al., 2017). Certain mechanisms come into play to ensure hemostasis in the organism. Especially in acute and chronic training, the release of thyroid hormones increases. Thyroid hormone metabolism improves endurance by affecting protein, carbohydrate and fat metabolism in the organism, enabling the organism to adapt to the physiological changes that will occur with training (Louzada and Carvalho, 2018). As a result of the research, as a result of the endurance training applied in addition to the football training applied, a significant increase was observed in TSH and T3 levels, while a significant decrease was observed in T4 levels. . Johannsen et al., (2012) stated in their study that acute thyroxin and exercise application cause significant changes in thyroid hormone metabolism. Akbulut et al., (2019) stated that the vitamin E supplement they applied in addition to the eight-week exercise program caused changes in thyroid hormone metabolism. Masaki et al., (2019) stated in their study that acute exercise caused changes in the TSH and T3 levels of the participants, but did not cause any change in the T4 levels. Erdoğan (2020) stated that the twelve-week exercise program caused changes in the thyroid hormones, erythrocyte, leukocyte and thrombocyte values of the athletes. Intellect et al. (2011) reported in their study that submaximal exercises cause significant changes in individuals' thyroid hormones. In their study, Pala et al., (2020) determined that aerobic exercise applications increased the TSH, total testosterone and insulin levels of the athletes, but the tomato juice supplement applied in addition to the saddle did not affect the TSH level of the athletes. Cinar et al., (2017) stated in their study that the zinc supplementation they applied in addition to the six-week exercise program caused positive changes in the thyroid hormone metabolism of the participants.

In addition to being used as a metabolic fuel in the organism, training and regular liver metabolism also help to use lipids effectively. The accumulation or increase of lipids, also known as fatty acids, both cause diseases in the organism and have negative consequences in terms of performance. (Moraes et al., 2017). As a result of the research, it was observed that there was a significant increase in the HDL level of the athletes, while significant decreases were observed in the cholesterol, triglyceride and LDL levels. Ramezani et al., (2017) reported in their study that regular exercises caused an increase in the HDL level of the participants and a decrease in the cholesterol, LDL and triglyceride levels. . Cinar et al., (2018) determined that the application of zinc supplementation in addition to six-week exercise prompts caused positive changes in the lipid levels of athletes and sedentary individuals. Eichenberger et al., (2009) reported that as a result of 3-week training, HDL levels increased and LDL and triglyceride levels decreased. Temur et al. (2018) reported that an eight-week exercise program had no effect on the lipid metabolism of individuals. Erdoğan (2021) stated that chronic training causes changes in the lipid metabolism of athletes. Gönülateş et al., (2010) determined that the eight-week regular walking program caused positive

changes in the blood values, anthropometric characteristics, flexibility values, blood pressure values, and lipid values of the participants. Kürkçü et al., (2011) in their study comparing blood lipid parameters of athletes and sedentary individuals, determined that regular exercises have positive effects on lipid metabolism.

As a result; It was observed that endurance training applied in addition to football training in the preparation period caused changes in the thyroid and lipid metabolism of football players. In this context, if the trainings to be applied during the preparation and competition period are planned considering the physical and conditional characteristics of the athletes, it is thought that it will contribute positively to the sports performance of the athletes.

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