

An Investigation of the Leptin Levels of Footballers and Wrestlers in Terms of Aerobic Capacity

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KEYWORDS MaxVO₂. Athletes. Serum Leptin Levels. Aerobic. Oscillation

ABSTRACT The purpose of the present study is to investigate the association among the leptin levels and aerobic capacities of footballers, wrestlers and sedentary group. The study included a total of 130 volunteers (43 footballers, 41 wrestlers and 46 sedentary). The results showed a statistically significant difference between footballers and the sedentary group in terms of leptin levels both male and female. Leptin levels of the females were significantly higher than the males for all groups while MaxVO₂ levels of the males were significantly higher than the males for all groups. The correlations between serum leptin levels and MaxVO₂ levels of both males and females were no significant in all groups. Besides, as the aerobic capacity of the groups who did sports increased, their serum leptin levels decreased. Consequently, it can be ascertained that serum leptin levels of footballers and wrestlers are lower than those of the sedentary group and this difference is caused by the athletes' aerobic capacities.

INTRODUCTION

Leptin and the regulation or synthesis of oscillation of leptin is an important public health issue (Durstine et al. 2011). At the same time, leptin can be assessed as a fitness or performance variable for athletes. As a matter of fact, studies on leptin have reported an association between leptin levels and body fat mass (Kowalska et al. 1999). In addition, volumes of the exercise and energy amount spent during exercise are reported to be important factors affecting serum leptin levels (Unal et al. 2005). Thus, the strong effects of exercise on energy balance and body fat mass change the oscillation of leptin (Ucok and Gokbel 2004). Leptin is a hormone secreted from adipocytes, which suppresses the food intake by acting on the hypothalamus through negative feedback mechanisms and increases energy expenditure (Alp et al. 2011). Within this context, it is known that exercise reduces obesity effectively. Long term, moderate exercise has been observed to suppress serum leptin levels based on the decrease in body fat percentage represented by BMI (body mass in-

dex) (Sutken et al. 2006). Indeed, a large number of studies have been reported that short-term training sessions (<12 weeks) do not have an impact on leptin levels so long as they do not reduce fat mass (Kohrt et al. 1996; Gutin et al. 1999; Okazaki et al. 1999), while long-term training sessions (>12 weeks) decrease leptin levels (Torjman et al. 1999; Weltman et al. 2000; Kraemer and Castracane 2007).

Within this framework, a significant relationship is thought existing between serum leptin level and type of exercise. Further, the characteristics of a sport affect the serum leptin levels of an athlete who does that sport. Football is a team sport that requires sportive performance such as high level endurance, strength, flexibility, speed, agility, strategy and control (Bloomfield Bouassida 1994). High levels of aerobic endurance and anaerobic strength is important for footballers (Reilly et al. 2000). The studies on Professional footballers have shown that footballers have a high aerobic capacity (Reilly et al. 2000; Helgerud et al. 2001; Hoff et al. 2002; Reilly and 2003). Besides, wrestling is a sport in which anaerobic energy system is used predominantly and in which factors such as speed, strength, agility, flexibility, balance, muscular and cardiovascular endurance and coordination affect performance (Macdougall et al. 1991). In fact, the Success in wrestling depends on power, endurance, maximum strength, short term muscle endurance and flexibility as well as technical and tactical skills. Wrestling is a periodic sport characterized as a

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short term and high level explosive activity. It required anaerobic aptitude and it works in the medium level of aerobic system (Bompa and Carrea 2005).

Within this context, a difference may be expected between the leptin values of the athletes that is compared in this study, since, they are doing different sports. In addition, the sedentary group's profile is seen as a problem that should be presented.

Purpose of the Study

The purpose of the present study is to determine whether there is an obvious difference between the leptin levels of footballers and wrestlers in terms of aerobic capacity parameters and to determine how these differences are reflected in the performance.

MATERIAL AND METHODS

The study included a total of 130 young volunteer participants, 43 of them were active footballers (21 female-23 male), 40 of them were active wrestlers (20 female-20 male) and 46 of them were sedentary (20 female-26 male). The participants were between the ages of 18-25. Body mass index (BMI), aerobic capacity (MaxVO_2) and serum leptin levels of the participants were determined. BMI was measured by using GAIA 359 PLUS Body Composition Analyzer (individuals whose BMIs were close were included in the study) with a frequency analysis of 5, 50, 250 kHz; aerobic capacity (MaxVO_2) was determined by 20 meter shuttle run test in Power timer PC 1.9.5 Version New test protocol (MaxVO_2 values were measured by the device) and blood leptin levels were found by ELISA method. 4 ml blood was taken from the participants (at 09:00) and after they were put in biochemistry tubes with normal gel, they were centrifuged for 5 minutes at 3000 g, their serums were taken to eppendorf tubes and they were kept at -40°C till the end of the working day. At the end of the working day, they were melted in room temperature and worked on with ELISA method.

Ethical Considerations

Before the study, the required ethics committee approval by *Ondokuz Mayıs University* was obtained (2012/12). The aim of the study was

explained to the athletes during the data collection phase, and thus the "informed consent principle" was fulfilled.

Statistical Analysis

First, the Shapiro-Wilk test was used to assess assumption of normality of the obtained data before the use of parametric tests. Since the data presented an asymmetrical distribution, logarithmic transformation was used to normalize the data distribution. Secondly, One-way ANOVA was used to determine the differences between branches. Then Tukey multiple comparison test was applied to determine any further differences among the groups. Thirdly, Student t-test was used to present the differences between the measurement values of the participants in terms of their genders. Finally, Pearson correlation coefficient was used to determine the relationship between the parameters. Significance was evaluated at $P < 0.05$ for all tests. All the computational work was performed by means of SPSS 21.0 V.

RESULTS

It was a statistically significant difference between footballers and the sedentary group in terms of leptin levels both male and female ($P < 0.05$) while no significant difference was noted between footballers and wrestlers, and wrestlers and the sedentary group ($P > 0.05$) (Table 1).

Table 1: The leptin levels of males and females among the branches

Parameter	Branches	n	Means	SD*	P
Leptin (ng/ml) for Male	Football	20	0.74 ^b	0.49	0.018
	Wrestling	21	1.26 ^{ab}	1.03	
	Sedentary	26	2.62 ^a	3.48	
Leptin (ng/ml) for Female	Football	23	7.10 ^b	4.60	0.023
	Wrestling	20	9.68 ^{ab}	5.32	
	Sedentary	20	12.63 ^a	8.67	

Letters a,b show the differences between branches ($P < 0.05$); *: Standard deviation

Table 2 showed that a statistically significant difference was determined for MaxVO_2 levels in footballers and wrestlers compared to sedentary group both male and female ($P < 0.001$).

It was determined that leptin levels of females were significantly higher than males for all groups

Table 2: The MaxVO₂ capacity of males and females among the branches

Parameter	Branches	n	Means	SD*	P
MaxVO ₂ ml/dk/kg for Male	Football	20	52.50 ^a	9.07	<0.001
	Wrestling	21	50.22 ^a	7.58	
	Sedentary	26	35.72 ^b	9.16	
MaxVO ₂ ml/dk/kg for Female	Football	23	42.30 ^a	5.83	<0.001
	Wrestling	20	39.24 ^a	5.68	
	Sedentary	20	26.66 ^b	6.54	

Letters a,b show the differences between branches ($P<0.01$); *Standard deviation

($P<0.001$). But, MaxVO₂ levels of males were significantly higher than males for all groups ($P<0.001$) (Table 3).

Further, it was determined that the relationship between serum leptin levels and MaxVO₂ levels of males was no significant in all groups. These correlation coefficients were -0.045 for footballers, -0.137 for wrestling and 0.097 for the sedentary group ($P>0.05$). It was also determined that the relationship between serum leptin levels and MaxVO₂ levels of females was no significant in all groups. These correlation coefficients were 0.128 for footballers, -0.302 for wrestling and 0.162 for the sedentary group ($P>0.05$).

DISCUSSION

Leptin is a hormone that controls and regulates life cycle parameters in the human body; it can also affect the central nervous system, thermogenesis and obesity, immune system, hematopoiesis and angiogenesis, bone metabolism, reproduction and cardiovascular system (Ahima and Flier 2000). Plasma leptin is found to be related to being full and to increase energy consumption by activating lipid metabolism. These effects

make leptin an important regulator in restricting the storage of excess energy and protecting balance. Thus, in addition to its primary effects on the control of appetite and energy consumption, leptin was found having an important effect on fat acid (FA) metabolism and endocrine axis (Meier and Gressner 2004; Dyck 2005).

The effects of physical exercise on leptin are still being discussed (Bouassida et al. 2006). However, the volume of exercise and the amount of energy consumed are effective on changing the serum leptin level (Gomez-Merino et al. 2002). Thus, while a large number of the researchers have reported that exercise can cause a decrease in leptin concentrations based on the duration and calorie consumption (Leal-Cerro et al. 1998; Zafeiridis et al. 2003; Sutken et al. 2006) others have claimed that in general exercise which is short termed (<60 minutes) and which has an energy consumption of less than 800 kg calories does not change leptin concentrations (Torjman et al. 1999; Weltman et al. 2000; Kraemer et al. 2002; Bouassida et al. 2009).

In terms of leptin levels of the males, a significant difference was observed between footballers and sedentary group ($P<0.05$) while no significant difference was found between footballers and wrestlers and wrestlers and sedentary group ($P>0.05$). Besides, the leptin levels of the females were different at footballers and sedentary group ($P<0.023$) while no significant difference was found between footballers and wrestlers and wrestlers and sedentary group ($P>0.05$). Unal et al. (2005) found that serum leptin levels of male footballers were lower than those of male sedentary individuals. Similar results were procured in a study which compared rugby players and healthy individuals (Haluzik et al. 1998). Sim-

Table 3: The leptin and MaxVO₂ parameters of males and females in each branch

Parameter	Branches	Gender	n	Means	SD*	P
Wrestling	Leptin (ng/ml)	Male	21	1.26	1.03	<0.001
		Female	20	9.68	5.32	
	MaxVO ₂ (ml/dk/kg)	Male	21	50.22	7.58	
		Female	20	39.24	5.68	
Football	Leptin (ng/ml)	Male	20	0.74	0.49	<0.001
		Female	23	7.10	4.60	
	MaxVO ₂ (ml/dk/kg)	Male	20	52.50	9.07	
		Female	23	42.30	5.83	
Sedentary	Leptin (ng/ml)	Male	26	2.62	3.48	<0.001
		Female	20	12.63	8.67	
	MaxVO ₂ (ml/dk/kg)	Male	26	35.72	9.16	
		Female	20	26.66	6.54	

*Standard deviation

ilarly, Kecetepen and Dursun (2006) found that the leptin levels of male and female students who did not do sports were significantly higher than those of the male and female students who did sports. On the contrary, Yamaner et al. (2010) stated that there was no significant difference between male wrestlers and male sedentary individuals in terms of leptin levels. In addition, serum leptin levels of female athletes were found to be higher than those of male athletes ($P < 0.01$). Thus, it can be said that serum leptin levels of footballers and wrestlers are lower when compared with the sedentary group and the reason for this difference can be the aerobic capacity of athletes (Table 3).

In the study, a significant difference was found between male footballers and male sedentary individuals while no significant difference was found between male wrestlers and male sedentary individuals. The reasons for this can be the fact that wrestlers have a fat percentage higher than footballers but lower than sedentary individuals, training types of wrestlers (more anaerobic training), frequent weight losses and their diets.

Kecetepen and Dursun (2006) realized a negative relationship between leptin and maxVO_2 levels of male and female students just after exercise. In addition, the same study showed a negative relationship between leptin/VKI and MaxVO_2 , VO_2 , VCO_2 just after exercise. This study also found that as MaxVO_2 levels increased, serum leptin levels decreased in both male and female footballers and wrestlers, though, it was not statistically significant ($P > 0.05$). Thus, as the aerobic capacity of individuals, who do sport increase their serum leptin levels decreases accordingly. In the sedentary group, there is a statistically insignificant positive relationship between MaxVO_2 level and serum leptin level ($P > 0.05$). Additionally, a statistically significant difference was found between MaxVO_2 level and serum leptin level based on gender ($P < 0.01$).

CONCLUSION

The results of this study showed that the serum leptin levels of footballers and wrestlers are lower when compared with the sedentary group and the reason for this difference is the aerobic capacity of the athletes. In short, a decrease in serum leptin levels seems to be associated with an increase in MaxVO_2 and aerobic ca-

capacity parameters of individuals affect serum leptin levels. As a result, it can be said that determination of serum leptin levels at regular intervals provides some useful information for controlling the body weight and for improving aerobic capacity of athletes.

RECOMMENDATIONS

It can be suggested that to compare the effects of aerobic, anaerobic and resistance exercises applied by athletes and sedentary groups on leptin, longer follow-ups should be carried out and the results should be researched comparatively in terms of respiration, blood values and body composition parameters.

ACKNOWLEDGEMENTS

This study was supported by PYO-ZRT. 1904.12.002 Project of Ondokuz Mayıs University.

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