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Determination of Macronutrient, Liquid, and Nutritional Supplement Consumption in Male Athletes[1]

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Abstract

The present study was conducted to determine macronutrient, liquid, and nutritional supplements intake in male athletes. Forty male athletes living in Ankara and attending to various sport clubs participated in this study. A survey was given to subjects for including questions about sports life, nutrition habits, and liquid consumption. Within the scope of the study, i; a questionnaire containing questions about sporting life, eating habits and liquid consumption, ii; 3-day food consumption record form, iii; 3-day physical activity record form were applied to athletes. Athletes were grouped as strength/power (P) athletes (n=26) and team (T) athletes (n=14). 55,0% of the athletes use nutritional supplements and the most commonly used nutritional supplements are branched chain amino acids (35,0%), whey protein (32,5%) and glutamine (20,0%), respectively. When the food consumption records of the athletes are examined, it was found that both groups of athletes were found to have inadequate energy (P:46,1±17,6 kcal/kg/day, T:41,7±11,1 kcal/kg/day; p>0,05). It was found that athletes consumed low amount of carbohydrate (P:5,0±2,4 g/kg/day, T:5,5±1,7 g/kg/day; p>0,05) and that P athletes consumed high protein while T athletes consumed at recommended levels (2,7±1,3 g/kg/day, 1,5±0,5 g/kg/day; p<0,05). While the difference between groups was significant for the percentages of energy from carbohydrates (P:42,7±8,2%, T:52,1±5,5%; p<0,05) and proteins (P:24,3±8,6%, T:14,6±2,4%; p<0,05), the percentages of energy from the lipids are within the recommended levels and there is no significant difference between the groups (P:33,0±11,5%, T:33,3±5,1%; p>0,05). Finally, it can be said that the liquid intake of athletes is at normal levels according to recommended values for adults.

Keywords: Sports nutrition, Eating habits, Athlete health, Fluid consumption

[1] *Some findings of this research were presented as oral presentation in the First International Congress of Health Sciences (29 June – 1 July 2017) and was published as a summary paper.*

Introduction

Sport is an occupation that is people do in order to live a healthy life by having a good time and also is activities in which some people are professed and gain financial gain from it. People are encouraged to do sports thanks to the increasing interest in sport day by day and various reasons. As a result of increased interest and the number of individuals engaged in sports, the nutrition of athletes has become an increasingly explored subject (Canbolat, 2016). In recent years, important and reliable results have been put forward in the scientific studies carried out on this subject. Along with these studies, almost every athlete now knows the importance of nutrition in the sport and tries to get information about nutrition. For this reason, individuals exercising and doing sports need to learn basic knowledge about the subject (Ersoy, 2012).

The aim of the nutrition is to feed the athlete in an adequate and balanced manner considering the factors such as gender, age, physical activity level, sports type, and training or competition periods (Güneş, 2016). Proper nutrition in the athletes ensures optimal health, increased lean body mass and low-fat percentage and long-lasting durability in training. In addition to all these, proper food selection with proper timing before, during and after the competition increases performance and accelerates the recovery (Ersoy, 2004).

However, it is known today that erratic and irregular eating habits among athletes are seen. Generally, athletes who are prepared for races apply low-calorie intake, and the use inappropriate diuretics, nutritional supplements, anabolic steroids and fat burning substances. As a result of applying these methods, it has been found that decrease in bone mineral density, deterioration of metabolic events, increase in the risk of cardiovascular disease, loss of eating control, anxiety and hormonal and psychological problems are observed. In addition, it has been reported that the athlete's muscle strength, function, and durability are reduced (Robinson et al., 2015:1-2).

In the light of this information, it is necessary to examine and evaluate the athletes' nutrition. This study was conducted to determine macronutrient, liquid, and nutritional supplement intake of strength/power and team athletes.

Materials and Method

Research group

40 male athletes (26 strength/power and 14 team athletes) from various sports clubs in Ankara province participated in the survey between January-March 2017. Doing sports regularly for at least 2 years and that there is no disease and lack of use of any pharmacologic ergogenic aids (stimulants, diuretics, narcotic analgesics, anabolic agents, peptide hormones and analogs and masking agents) has been defined as the criteria for inclusion in the study. After being informed about the purpose and method of study participants signed voluntary consent forms and they were put into practice. Declaration of Helsinki principles was adhered to in the study.

Data collection tools

A questionnaire including demographic information, sports life, and eating habits were applied to 40 athletes participating in the research using face to face interview method. In addition, data were collected from the 3-day food consumption records, the 3-day physical activity records, the use of nutritional supplements and daily fluid consumption from athletes.

Data evaluation

Nutritional supplements that the athletes use are added and average energy and nutrient intake of the athletes were calculated using the Nutritional Information System (BEBIS) package program. The results were assessed based on the energy and macro nutritional values recommended by athletes per kilogram by the International Society of Sports Nutrition (ISSN), the American College of Sports Medicine (ACSM) and the International Olympic Committee (IOC). In determining the physical activity status, a practical 24-hour physical activity record form was used and the Physical Activity Level (PAL) values of the athletes were calculated (PAL=total daily energy expenditure / basal metabolic rate). According to data based on Turkey Nutrition Guide (2015) PAL values physical activity levels indicated 1,4-1,5=sedentary; 1,6-1,7=moderately active; 1,8-1,9=active and ≥2,0=overactive. Since there is no reference value for the total amount of liquid to be taken daily for the athletes the number of fluid athletes daily receive was also evaluated according to Turkey Specific Food and Nutrition Guide (2015) and Turkey Nutrition Guide (2015) the recommended amount of fluid consumed daily for adults.

Analysis of data

SPSS 18.0 package software was used to evaluate the data obtained in the study. Research data are presented in table form with absolute and percent (%) values. Mean ($\bar{X}$), standard deviation (±SD) and minimum-maximum values are given where necessary. Statistical analyzes were carried out after grouping the athletes as strength/strength and team athlete. The Independent Samples T Test was used to evaluate the means of independent groups with normal distribution according to Shapiro Wilk test results. In cases where the normality assumption is not met, the logarithms of the data to be compared is taken; normal distribution was determined to be appropriate and parametric statistical analysis was performed. Significance level in the study was taken as 0,05.

Results

The average age of the participating athletes is 24,4±4,8 years (min:19,0 years; max:40,0 years) and the athletes regularly perform sports for an average of 9,6±5,4 years (min:2,0 years; max:27,0 years). After examining sports branches performed by the athletes, it was determined that 26 of them were strength/power (65,0%) and 14 were team (35,0%) athletes. Table 1 shows findings of athletes eating habits.

Table 1. Eating Habits of Athletes (n=40)

Nutrition Habits	**n**	**%**
Number of Main Meals		
2	8	20,0
3	32	80,0
Number of Snack Meals		
1	9	22,5
2	11	27,5
3	16	40,0
Never	4	10,0
Nutritional Supplement Use		
Yes	22	55,0
No	18	45,0
Smoking		
Yes	4	10,0
No	36	90,0
Alcohol Use		
Yes	3	7,5
No	37	92,5

It was determined that the majority of the athletes performed 3 main meals (80,0%) and 3 snacks (40,0%) per day. 10,0% of the athletes never make meals, and 22,5% make only 1 snack. According to the answers given in question; would you use nutritional supplement? It is understood that 55,0% of the athletes use nutritional supplement. The most commonly used nutritional supplements were branched chain amino acids (35,0%), whey protein (32,5%) and glutamine (20,0%), respectively. Smoking and alcohol use are not common among athletes. Only 10,0% of the athletes used cigarettes and 7,5% used alcohol.

Table 2. Physical Activity Levels of Athletes (n=40)

Physical Activity Findings	**Strength/Power**		**Team**		**$\bar{X}$ ± SD (Min-Max)**	
	$\bar{X}$ ± SD (Min-Max)		**$\bar{X}$ ± SD (Min-Max)**			
Physical Activity Rate	2,21±0,38 (1,65-3,29)		2,14±0,22 (1,79-2,40)		2,18±0,33 (1,65-3,29)	
Physical Activity Level					**Total**	
	n	**%**	**n**	**%**	**n**	**%**
Intermediate Active	1	3,8	1	7,1	2	5,0
Active	6	23,1	3	21,4	9	22,5
Overactive	19	73,1	10	71,4	29	72,5
Total	**26**	**100**	**14**	**100**	**40**	**100**

The average PAL values were found to be 2,18±0,33 according to the physical activity records of the athletes for 3 days. When the physical activity levels of the athletes were examined, it was determined that 72,5% were overactive, 22,5% active and 5,0% had moderately active physical activity level. When the physical activity levels are compared

according to the sports activity it is understood that close to all of the two group athletes have physical activity at active and overactive level (Table 2).

Table 3. Energy and Macro Nutrients Received by Athletes Daily (n=40)

Energy and Macro Nutrients	Strength/Power X̄ ± SD (Min-Max)	Team X̄ ± SD (Min-Max)	t Test t	sd	p
Energy (kcal/day)*	3749,9±1466,4 (1967,8-7590,2)	3204,9±706,3 (2192,6-4831,2)	1,109	28	0,274
Energy (kcal/kg/day)*	46,1±17,6 (24,0-91,5)	41,7±11,1 (23,5-64,4)	0,638	38	0,527
Carbohydrate (%)	**42,7±8,2 (24,0-63,8)**	**52,1±5,5 (41,6-60,2)**	**-3,833**	**38**	**0,000**
Carbohydrate (g/kg/day)*	5,0±2,4 (1,9-11,7)	5,5±1,7 (2,4-8,5)	-1,015	38	0,316
Protein (%)	**24,3±8,6 (5,4±41,5)**	**14,6±2,4 (11,0-18,8)**	**5,357**	**31,484**	**0,000**
Protein (g/kg/day)*	**2,7±1,3 (1,0-6,8)**	**1,5±0,5 (1,0-2,8)**	**4,090**	**38**	**0,000**
Fat (%)*	33,0±11,5 (9,6-61,0)	33,3±5,1 (27,2-43,2)	-0,780	34,666	0,441
Fat (g/kg/day)*	1,7±1,0 (0,3-5,1)	1,5±0,4 (1,0-2,4)	0,007	38	0,994

***** *Logarithm of the data was taken because it did not show normal distribution; then normal distribution was determined to be appropriate and parametric statistical analysis was performed.*

In Table 3, the energy and macronutrients that the athletes get daily compared to the sports they play. According to this, it was determined that the strength/power athletes had higher energy than the team athletes (P:3749,9±1466,4 kcal/day, T:3204,9±706,3 kcal/day; p>0.05). The same situation is observed in the energy values per kilogram of the athletes (P:46,1±17,6 kcal/kg/day, T:41,7±11,1 kcal/kg/day; p>0,05). When the amount of carbohydrates received by the athletes was examined, it was found that the team athletes were receiving more carbohydrates (P:5,0±2,4 g/kg/day, T:5,5±1,7 g/kg/day; p>0,05). The difference between the percentages of energy coming from carbohydrates in the diet of the athletes was statistically significant (P:42,7±8,2%, T:52,1±5,5%; p<0,05). According to the findings, it was found that the strength/ power athletes were receiving higher amount of protein than the team athletes (P:2,7±1,3 g/kg/day, T:1,5±0,5 g/kg/day; p<0,05). In addition, the difference between the percentages of energy coming from the protein in the athletes' diet was statistically significant (P:24,3±8,6%, T:14,6±2,4%; p<0,05). Finally, it was determined that the amount of fat (P:1,7±1,0 g/kg/day; T:1,5±0,4 g/kg/day) consumed by athletes on a daily diet and the percentage (P:33,0±11,5%; T:33,3±5,1%) of energy from fat in their diets were similar in both groups and there was no statistical difference between the groups (p>0,05).

Table 4. Liquid Consumption Situations of Athletes (n=40)

Total Fluid Intake	Strength/Power $\bar{X}$ ± SD (Min-Max)	Team $\bar{X}$ ± SD (Min-Max)	t Test t	sd	p
mL/day*	3810,1±1461,2 (1600,0-6500,0)	3264,5±1527,9 (1170,0-6500,0)	1,359	38	0,182
mL/kg*	47,2±19,6 (19,2-93,3)	41,6±18,5 15,4-81,2	1,033	38	0,308
mL/kcal*	1,1±0,6 (0,4-3,1)	1,1±0,6 (0,3-2,1)	0,457	38	0,650

* *Logarithm of the data was taken because it did not show normal distribution; then normal distribution was determined to be appropriate and parametric statistical analysis was performed.*

In Table 4, daily amounts of liquids that athletes have taken are compared according to the type of sports they play. According to the findings obtained, it was determined that the daily amount of fluid received by the strength/ power athletes was higher than that of the team athletes but the difference was not statistically significant (P:3810,1±1461,2 mL/day, T:3264,5±1527,9 mL/day; p>0,05). The differences between the amounts of fluid that the athletes received per kilogram and the amount of fluid they received per total energy with food were not statistically significant (p>0,05).

Discussion and Conclusion

Along with the increased interest in spores in recent years, the nutrition of athletes has become a subject of further research. Regular and balanced diet is important in many respects for the athlete. Many situations that affect the athlete directly or indirectly, such as the protection of health, the improvement of performance, the prevention of weight loss and excessive weight gain, the prevention of discomfort caused by electrolyte loss in the body as a result of sweating during exercise, the regular operation of the digestive system, renewal of energy deposits during recovery period (Süel et al., 2006:272). In the light of this information, this study was carried out to evaluate the athletes' macronutrients, nutritional support, and fluid intake and to determine the current data on the feeding of athletes.

65,0% of the athletes participating in the study are in strength/ power, 35,0% are team athletes. The average age of the athletes was 24,4±4,8 years and it was determined that they had a sports life of 9,6±5,4 years. It was determined that the majority of the athletes who examined eating habits performed 3 main meals (80,0%) and 3 intermediate meals (40,0%). It is stated that the athletes should be fed at least 4-6 meals a day to meet the increased energy requirements (Potgieter, 2013). In this study, it was determined that 10,0% of the athletes did not make any snacks and 22,5% made only 1 snack. It is thought that this situation will affect the energy balance of the athletes, the sport performance and the general health condition negatively.

The various materials used by athletes to improve their performances are generally referred to as ergogenic support. Nutritional supplements contained in ergogenic supplements are prepared in liquid, powder, tablet forms of natural and daily nutrients. It was determined that nutritional supplements use was 55,0% for the participating athletes. The most commonly used nutritional supplements were branched chain amino acids (35,0%), whey protein (32,5%) and glutamine (20,0%), respectively. In a study conducted with football athletes, it was determined that 42,0% of athletes use nutritional supplements (Jazayeri and Amani,

2004). The use of nutritional supplements in professional athletes was found to be 55,8% in the study conducted by Saygın et al. (2009). Salgado et al. (2014), found that the use of nutritional supplements in running athletes was 28,3%, and it was found that athletes used carbohydrates (52,2%), vitamins (28,7%) and protein (13,5%). Wiens et al. (2014), found that 95,0% of the athletes participating in the study used at least 1 nutritional supplement and that the strength/power athletes used the most creatine, glutamine and protein powders. When this study and similar study data are examined, it is understood that nutritional supplements are widely used among athletes. It is stated that nutritional supplements threaten athletes' health in the case of unconscious use as well as benefits such as improving sport performance, balancing body fat ratio and regaining nutrients lost by exercise. For this reason, it is clear that nutritional supplements should be used in conjunction with a nutritionist (Argan and Köse, 2009). It is known that athletes need more energy and nutrients than normal adults. When the physical activity records of the participating athletes are examined, it is seen that the majority have active (22,5%) and overactive (72,5%) physical activity. For this reason, the reference values recommended for the athletes should be used when evaluating the energy and nutrient intake of the athletes. According to ISSN (2010), it is stated that athletes performing medium and high-intensity exercise should receive 50-80 kcal/kg/day energy per kilogram. According to these values, it is understood that the strength / power and team athletes participating in the study did not get enough energy (P:46,1±17,6 kcal/kg/day, T:41,7±11,1 kcal/kg/day; $p>0,05$). In a study conducted by male volleyball athletes, it was determined that the athletes received energy of 30,9±5,7 kcal/kg/day (Gamage and De Silva, 2014). Incorrect eating habits, such as skipping meals in sports, lead to inadequate energy intake. Athletes who do not have enough energy are likely to develop sport problems due to reduced sports performance, weight loss and lack of micronutrients.

Carbohydrates are one of the most important nutrients for athletes and play a role in regulating blood sugar throughout the training, in renewing the glycogen stores that emerge after training, and in achieving optimum performance of the athlete. Inadequate carbohydrate intake results in fatigue in the athletes, prolonged recovery after exercise and loss of performance (Güneş, 2016). ACSM (2009), estimates that the daily amount of carbohydrate required for athletes is 6-10 g/kg/day; ISSN (2010), estimates 5-8 g/kg/day for athletes with moderate intensity and 8-10 g/kg/day for high-intensity athletes. It is observed that the strength/power and team athletes participating in the study have received the lower recommended carbohydrate (P:5,0±2,4 g/kg/day, T:5,5±1,7 g/kg/day; $p>0,05$). Parnell et al. (2016), reported that male adolescents aged 14-18 years in their study received 5,3 g/kg/day carbohydrates; Burkhart and Pelly (2016), found that male athletes took 3,5 g/kg/day of carbohydrate in their study. The tendency of athletes to make high-protein diets can be cited as the reason for low carbohydrate intake in sports.

Daily recommended protein intake for athletes is 1,2-1,7 g/kg/day for strength/power athletes for ACSM (2009), 1,0-1,5 g/kg/day medium-intensity exercise athletes, 1,5-2,0 g/kg/day for high-intensity athletes for ISSN (2010), 1,3-1,8 g/kg/day for International Olympic Committee (IOC). However, it is known that athletes tend to consume a higher amount of protein than is generally recommended in order to improve their performance and provide muscle growth (Güneş, 2016). Spendlove et al. (2015), found that male athletes averaged 2,0-4,3 g/kg/day protein in their meta-analysis. In a study conducted by rugby athletes, it was found that athletes received an average of 2,2 g/kg/day protein (MacKenzie et al, 2015). In this study, it was determined that the strength/power athletes were high and the team athletes were receiving the recommended protein (P:2,7±1,3 g/kg/day; T:1,5±0,5 g/kg/day; $p<0,05$). The reason for the high protein intake in strength/power athletes is that more than half of the

athletes use nutritional supplements and protein supplements are involved most of them. Excessive protein intake is associated with dehydration, kidney and liver damage, urinary calcium excretion, increased risk of kidney stone formation, and joint diseases such as gout. For this reason, athletes need to pay attention to their protein intake (Ersoy, 2012).

Fats play an important role in the protection of the health of the athlete, the maintenance of energy balance, the availability of essential fatty acids and fat-soluble vitamins, and the renewal of intramuscular triacylglycerol deposits. It is stated that in the athletes' diets the energy from the fat should be around 30.0% and may reach up to 50,0% in the over-exercising athletes (40 hours/week) (ISSN, 2010). According to ACSM (2009), it was emphasized that energy in the athletic diet should be between 20,0%-35,0% and that it should not fall below 20,0%. In the athletes participating in the study, the energy from the oil in the strength/power athletes was 33,0±11,5%; and 33,3±5,1% in team athletes ($p>0,05$). In the study conducted by Wardenaar et al. (2017), the energy from the fat in the male strength/power athletes diet was 29,8% and 29,7% for team athletes. In both studies, it is seen that the energy from the oil in the athletes' diets is in the recommended range. However, it is thought that the athletes need to determine the reference amounts to be taken per kilogram, such as energy, carbohydrate, and protein, in order to evaluate the amount of fat in the diet.

Fluid intake has an important role in maintaining optimal performance and health for all athletes. Dehydration, which is likely to result in the inadequate fluid intake, not only affects the athlete's heat balance negatively but also disrupts cardiovascular functions, making it difficult to transport oxygen and nutrients to working muscles (Eskici, 2015). Athletes who play in hot and humid weather are experiencing fluid loss with 2-3 L/hour. In order to compensate for the loss of fluid, 2 cups of liquid should be consumed for every 0,5 kg loss (Ersoy, 2012). The amount of fluid lost due to variables such as sports type, weather conditions, and duration of exercise is not clearly known. For this reason, there is no recommendation for the total amount of liquid to be taken daily for athletes. However, for adult individuals, 1mL/kcal liquid intake in Turkey Specific Food and Nutrition Guide (2015) data, 35 mL/kg liquid intake in Turkey Nutrition Guide (2015) data is recommended. According to this, it can be said that the athletes take liquid at the recommended amount (P:1,1±0,6 mL/kcal, T:1,1±0,6 mL/kcal; $p>0,05$; P:47,2±19,6 mL/kg, T:41,6±18,5 mL/kg; $p>0,05$).

As a result, in this study, it was determined that the intake of energy and carbohydrates in the diet of the strength/power and team athletes was low, the intake of fluid was recommended, and the protein intake was high only in the power athletes. It has also been found that more than half of the athletes use nutritional support. These results are likely to have a negative effect on the athletes' success, performance, and general health. It is necessary for athletes to consult specialists such as sport dietitians in order to get accurate information about nutrition and prepare nutrition programs. It is thought that this study will provide both up-to-date and important information both in the country literature and in the international literature, as there are few studies on the feeding of athletes in Turkey.

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Conflict of Interest

The authors have not declared any conflicts of interest.

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