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Dietary Intake and Body Composition of Greek Adolescent Wrestlers During Preseason

Ionas Papassotiriou^{1,2} 

ABSTRACT. The nutritional adequacy of adolescent wrestlers' diet during preseason was examined. Twelve male adolescent wrestlers at the competitive level, aged from 14 to 17, participated in this study. Anthropometric measurements included weight, height, waist circumference, and four skinfold measurements (tricep, bicep, subscapular, and suprailiac). A 4-day food diary was also recorded for each athlete, including at least one weekend day. Wrestlers' mean body fat percentage was 20.5%. Nutritional intake consisted of 17.8% protein, 44.9% carbohydrates, 36.9% fats, and 0.4% alcohol. Protein and carbohydrate intake per kilogram of body mass was 1.6 and 4.1 g/kg, respectively. Correlations were found between dietary intake and anthropometric measurements where carbohydrate intake was negatively and fat intake positively correlated with triceps, biceps, and suprailiac skinfold measurements. Wrestlers of this study had higher body-fat values than elite wrestlers and higher-than-recommended fat intake. Protein intake was adequate for this sport; however, carbohydrate intake did not meet the recommended daily values. Two out of the 12 of wrestlers were using dietary supplements, which were protein and electrolyte powders. An educational program about nutrition would be necessary in order to improve body composition and nutritional intake of these athletes.

Keywords: nutrition, wrestling, adolescent athletes

INTRODUCTION

Nutritional and fluid intake is critical for the athletic performance, body composition, and health of athletes (Thomas, Erdman, & Burke, 2016). Different athletic activities have unique dietary needs according to their competition or training physiology and the energy systems that are used.

Wrestling is a vigorous combat sport that relies both on aerobic and anaerobic metabolism to produce energy (Johnson & Cisar, 1987). The performance of this sport is highly based on strength and power, which associates with quick explosive maneuvers in order to control the opponent. The energy systems that are used to provide energy during these explosive exertions are phosphagens (Adenosine triphosphate-Phosphocreatine [ATP-PC]) and glycogen (Horswill, 1992).

Wrestling at the competitive level requires the categorization of the athletes into weight divisions. Studies have

shown that wrestlers frequently adopt unusual dietary practices in order to reduce their weight (Kordi, Ziaee, Rostami, & Wallace, 2011; Viveiros, Moreira, Zourdos, Aoki, & Capitani, 2015), which may impair their health (Jang et al., 2011; Weber et al., 2013; Yanagawa et al., 2010) and performance (Mendes et al., 2013; Timpmann, Oopik, Paasuke, Medijainen, & Ereline, 2008; Webster, Rutt, & Weltman, 1990) and may cause nutritional deficiencies (Lukaski, 2001). Dietary habits and practices during the season and close to competition have been extensively studied by scientists. However, due to the fact that available data about wrestlers' nutrient, supplement, and fluid consumption during preseason are limited, the aim of this study was to assess the adequacy of nutritional intake, body composition, and nutritional-supplement use of competitive wrestlers during this phase of the training macrocycle.

METHODS

Participants

Twelve male adolescent athletes from wrestling clubs (5 free style and 7 Greco-Roman wrestlers) were recruited for this study. The athletes aged from 14 to 17 years with 4.2 (± 1.1)

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years of training experience. The weekly time spent for training was 6.2 (± 1.1) hours. Five athletes were medalists of the national championship the last two years, while 7 of them have won at least one medal during their wrestling career. The study was conducted during the preparatory phase (preseason). After receiving approval from the sports' club managers and coaches, we informed the athletes about the purposes and the process of the study and invited them to participate. Athletes who decided to take part in the study provided us with a signed constant from their guardians. The study design was submitted and approved by the research committee of T.E.I. of Thessaly. All of the procedures were in accordance with the Helsinki Declaration (Krljeza-Jeric & Lemmens, 2009).

Anthropometric Measurements

Body mass and height were measured in the morning, before any food consumption and after evacuation, to the nearest 0.1 kg and 0.1 cm, respectively, with an electronic beam scale (Tanita WB-3000). Four skinfold measurements (bicep, tricep, subscapular, and suprailiac) were completed with a Lange skinfold caliper. Body-fat percentage was estimated using Durnin's and Womersley's four-site equation (Durnin & Womersley, 1974). For body-fat categorization, McCarthy's curves were used (McCarthy, Cole, Fry, Jebb, & Prentice, 2006) and a body mass index (BMI) for age z score (BAZ) was calculated instead of BMI, according to the World Health Organization's charts (World Health Organization Multicentre Growth Reference Study Group, 2006).

Nutritional Assessment

A 4-day food diary was recorded on special forms for all participants. Athletes were instructed to report in every detail their food intake, to record at least one weekend day, and to record their fluid consumption. After each recorded day, brief interviews were undertaken for each athlete in order to confirm his food intake and to complete any insufficient information. Dietary records were analyzed with a dietary analysis program using the U.S. Department of Agriculture's food database (Nutrilog).

Statistical Analysis

Statistical analysis was performed using SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). Due to the small number of the sample ($N < 30$), the data were analyzed with a parametric analysis with the assumption that they would follow the normal distribution in the generator population. Statistical values are presented as means (\pm standard deviations). Pearson's r was used to determine correlations between the variables and t test to compare means. Significance was set at $\alpha = .05$.

TABLE 1 Anthropometric Characteristics and Body Composition of Competitive Wrestlers

	Mean	SD
Age (years)	16	± 1.1
Weight (kg)	76.6	± 10.4
Height (cm)	172	± 9.6
BAZ	1.48	± 1
Body fat (%)	20.5	± 6.4

RESULTS

Anthropometrics

According to BAZ, 5 wrestlers were categorized as overweight/obese; results that are in agreement with body-fat classification. Table 1 and Figure 1 show the anthropometric data of the wrestlers.

Nutritional Assessment

The daily intake for carbohydrates was 44.9% (± 3.7) for carbohydrates, 17.8% (± 2.9) for proteins, 36.9% (± 3.1) for fats, and 0.4% (± 0.9) for alcohol of the total caloric intake, respectively. Table 2 shows nutrient-intake values per kilogram of body mass. Daily water and fluid consumption was 2.5 L/day (± 0.74) on average, corresponding to 330 ml/kg/day (± 100). All athletes reported drinking water or water with electrolyte powder during and/or immediately after training. Two out of 12 athletes (16.7%) were using either protein and/or electrolyte powders. Protein supplementation accounted, on average, for 17.1% of the total protein intake per day in these two athletes.

Additionally, a correlation was found between dietary intake and anthropometric measurements (see Table 3). Specifically, carbohydrate intake (g/kg) correlated with tri-

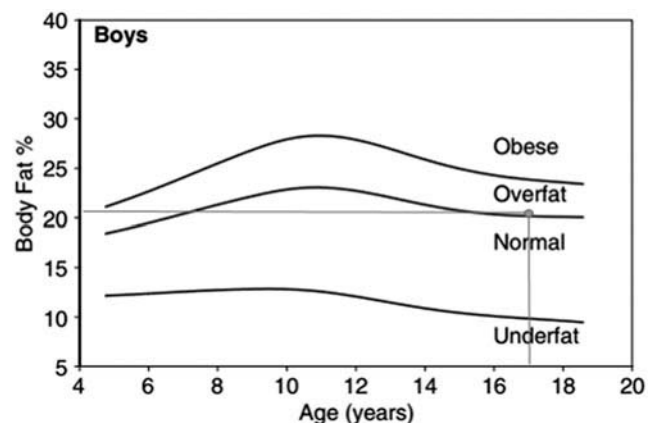


FIGURE 1 Categorization of the mean adolescent wrestler of this study (overfat) according to body-fat curves as described by McCarthy et al. (2006).

TABLE 2 Caloric and Macronutrient Intake per Kilogram of Body Mass

	Reported		Recommendations
	Mean \pm SD	Range	
Calories (g/kg)	35.8 \pm 5.9	29.5 – 47.9	–
Carbohydrate (g/kg)	4.1 \pm 0.9	2.9 – 5.8	5 – 10*
Protein (g/kg)	1.6 \pm 0.5	1.2 – 2.7	1.2 – 2*
Fat (g/kg)	1.5 \pm 0.2	1.2 – 1.7	–

*Recommended values are based on American College of Sports Medicine guidelines (Thomas et al., 2016).

TABLE 3 Correlations Between Dietary Intake and Anthropometric Measurements

	Skinfold Measurements (mm)		
	Triceps	Biceps	Suprailiac
Fat intake (%)	.639	.693	.649
Carbohydrate intake (g/kg)	-.655	-.663	-.675

The *p* values < .05.

cep, bicep, and suprailiac skinfold measurements negatively, while fat-percentage intake was positive ($p < .05$).

DISCUSSION

Anthropometrics

The adolescent wrestlers in this study had a body-fat percentage that categorized them as overweight (20.5%), and it was much higher than that described for elite wrestlers in the literature (13.6%) (Ramirez-Velez et al., 2014). We would expect a different analogy of body composition (lower body-fat percentage) considering that these athletes took part in national competitions and most of them are medalists. However, obesity is not rare among both Greek adolescents and adults. A national study has revealed that 36.8% of Greek adolescents are overweight/obese. The percentage of overweight/obese adolescent wrestlers in our study is higher with about 42% appearing to have an excessive body-fat percentage. We have to mention that most of the wrestlers in our study were from low-income cities of Attica and had a lot of spelling errors in their food records. This may indicate a low educational family level that together with gender (boy) and other factors have been found to correlate with a high body weight in Greek adolescents (Patsopoulou et al., 2015).

Macronutrients

The wrestlers in this study appeared to not follow an optimum, for their sport, diet. Percentage distribution of each

macronutrient of the wrestlers' food intake, seems to be adequate for protein, inadequate for carbohydrates, and slightly excessive for fats. These results are in agreement with the values of estimated grams for proteins but not for carbohydrates per kilogram of body mass if compared with American College of Sports Medicine's guidelines of 1.2–2 g/kg/d and 6–10 g/kg/d for protein and carbohydrates, respectively (Thomas et al., 2016). As we discussed previously, wrestling uses both aerobic and anaerobic energy systems in order to produce energy. Studies have shown that anaerobic systems, and more specific the glycolytic system, are used extensively during wrestling (Chino, Saito, Matsumoto, Ikeda, & Yanagawa, 2015; Nilsson, Csargo, Gullstrand, Tveit, & Refsnes, 2002). The fact that carbohydrates consist of the substrate for aerobic and anaerobic energy systems during high-intensity exercise indicates their significance in the daily diet of the wrestling athlete. The inadequate intake that was observed in the wrestlers of this study during the preseason may impair their performance during training and, as a consequence, the training quality.

Supplements

Protein and electrolyte supplementation were found to be the only supplements that were used in this sample of adolescent wrestlers. The contribution of protein supplementation in the total daily protein was meaningful in the two athletes that consume these supplements. However, most adolescent wrestlers had an adequate protein intake without using protein supplements.

CONCLUSIONS

On average, the wrestlers did not appear to consume an adequate amount of carbohydrates. However, at the individual level, some athletes' dietary intake was between recommendations. The same phenomenon applies to body-fat percentage values, too. Some wrestlers' body fat was very close to that of elite wrestlers and others were overweight or even obese. These facts reflect the necessity of individualized nutritional guidance of Greek adolescent wrestlers, with, in some cases, the achievement of optimum athletic performance and, in others, to deal with obesity.

Studies from different sports styles indicate special nutritional needs and the inappropriate intake of different nutrients. It is necessary to extend research on wrestlers' nutrition in order to identify possible "sports-culture" attitudes and behaviors that may lead to insufficient dietary intake. The fact that these data were collected during preseason, before the cutting-weight period of wrestlers, prognosticates that a preexisting imbalanced diet may worsen in the making-weight phase prior to competition with possible impairments on health and performance.

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CONFLICT OF INTEREST

The author declares that no conflicts of interest derived from the outcomes of this study.

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