

UNBALANCED ENERGY INTAKE OF SUBELITE FEMALE GYMNASTS – A LONGITUDINAL STUDY

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ABSTRACT

Evaluate energy intake of subelite female gymnasts among a season. Understand the evolution with other studies made. Sixty-six female gymnasts [11,8 (2,8) (years); 143,2 (12,9) (cm); 36,9 (9,8) (Kg)] of the Federação de Ginástica de Portugal (Portuguese Gymnastic Federation) were studied in three most important periods of the season: preparatory, competitive and transitory period. The nutritional evaluation included training information, anthropometric measurements and a dietary study. BMI was inadequate for gymnasts' age and height. Gymnasts consumed significantly more carbohydrate and lipid than the Dietary References Intakes. Gymnasts showed intakes of vitamins A, B1, B2 and B6 high. Deficiencies were found for calcium, iron and magnesium.

KEYWORDS

Nutrition Sciences, Nutritional evaluation, Athletes.

RESUMO

Avaliar o consumo energético de ginastas de competição ao longo de uma época e perceber a evolução com outros estudos já realizados. Sessenta e seis ginastas [11,8 (2,8) (anos), 143,2 (12,9) (cm), 36,9 (9,8) (kg)] da Federação de Ginástica de Portugal foram avaliadas nos três períodos mais importantes da época: preparatório, competitivo e transitório.

A avaliação nutricional incluiu informações sobre o treino desportivo, medidas antropométricas e de um estudo da dieta. O IMC foi inadequado para a idade e estatura das ginastas. As ginastas consumiram significativamente mais hidratos de carbon e lípidos do que as *Dietary References Intakes*. O consumo das vitaminas A, B1, B2 e B6 foi elevado. Encontraram-se deficiências no consumo de cálcio, ferro e magnésio.

PALAVRAS-CHAVE

Ciências da Nutrição, Avaliação nutricional, Atletas.

1. INTRODUCTION

Female athletes participating in sports that require gracefulness and technique, like Gymnastics are under a great pressure of keeping a lean body (Silva; Weimann et al.).

This group of athletes has been considered a potential risk group of malnutrition because of their attitude for excessive reduced weight and leanness (Cupisti et al.; Silva et al. "Competition").

On the other hand, the very short gymnasts' career embraces very young athletes, in which occur very important processes of growth and development for their future life.

Although gymnasts seem to be at a low level of energy intake, few investigations have examined this concern, especially in female athletes, so the primary aim of this investigation was to study the nutritional intake of elite female gymnasts during a season.

2. METHODS

Sixty-six competitive female gymnasts [11,8 (2,8) (years); 143,2 (12,9) (cm); 36,9 (9,8) (Kg)] of the *Federação de Ginástica de Portugal* (Portuguese Gymnastic Federation) were studied in three most important periods of the season: preparatory period, competitive period and transitory period.

Written consent was obtained from the gymnasts, their parents and trainers after the purpose and nature of this study has been explained.

The nutritional evaluation included training information, anthropometric measurements and a dietary study.

The training information was assessed using a questionnaire were the subjects reported the amount of time spent training per week and menstrual history, respectively.

Weight and height were obtained by the standard procedure (Frisancho) and body mass index (BMI) [(weight (Kg)/height² (m²)] was calculated.

Energy and nutrient intakes were estimated by a three consecutive day's food record. Participants were asked to eat normally and to remain as close as possible to their usual dietary habits during the period of diet recording and to be accurate in recording the amount and type of food and fluid consumed, using household measures.

There were given oral and written instructions on how to record exact descriptions and amounts of all foods and fluids consumed.

The energy and nutrients contents recorded were determined by means of a computer program Food Processor Plus, adapted to Portuguese reality food.

Means and SD were calculated. We used Kolmogorov-Smirnov-test to examine the normality of distribution in anthropometric data as well as in nutritional intakes.

Statistical significance was accepted for $p < 0.05$, and results are presented as the mean (SD). All statistical analyses were performed by SPSS 15.0 for Windows.

3. RESULTS

Anthropometric measurements and training information are shown in Table 1.

Gymnasts mean age increased among the season, as well as their height and weight.

However, the BMI decreased from 17.7 (1.8) Kg/m^2 to 17.4 (2.0) Kg/m^2 during the competitive period of the season and increased for the same value 17.7 (1.9) Kg/m^2 in transitory period.

Variables	Preparatory	Competitive	Transitory
Age (years)	11.8 (2.8)	12.1 (2.8)	12.5 (2.8)
Height (cm)	143.2 (12.9)	144.8 (12.5)	146.4 (12.2)
Weight (Kg)	36.9 (9.8)	37.3 (10.1)	38.6 (10.0)
BMI (Kg/m^2)	17.7 (1.8)	17.4 (2.0)	17.7 (1.9)
No. hours/day	3.0 (0.7)	2.9 (0.6)	2.7 (0.5)
No. trainings/week	5.2 (0.8)	5.1 (0.9)	4.5 (0.9)
No. hours/week	15.8 (5.0)	15.2 (4.9)	12.5 (4.2)

TABLE 1 - Anthropometrical and training parameters in competition female gymnasts (n= 66) during a season.

Gymnasts were weekly submitted to a training programme that did not significantly differ ($p < 0.05$) from preparatory period [15.8 (5.0) hours] to competitive period [15.2 (4.9) hours], but it decreased for 12.5 (4.2) hours as we go through the transitory period.

The main data of dietary intake related to energy intake and macronutrients contribution are given in table 2.

On the other hand, the contributions of protein and carbohydrate to total energy intake were similar among the three main periods of the season and did not significantly differ ($p < 0.05$) between periods.

When protein, carbohydrate and fat intakes were expressed as gram per day, we noted that gymnasts consumed significantly more carbohydrate and lipid than the Dietary References Intakes (DRI's). But carbohydrates contribution was even higher than protein and fat.

However the percentage of energy from carbohydrate at the beginning of the season was 47(3)%/day, which is lower than 60-65% of the recommended for gymnasts by Benardot.

Variables	Preparatory	Competitive	Transitory
Energy intake (Kcal/d ¹)	1600 (506)	1444 (507)	1518 (292)
Protein (g/ d ¹)	66 (17)	66 (19)	70 (12)
% of energy from protein (d ¹)	17 (3)	19 (4)	19 (3)
Carbohydrate (g/ d ¹)	204 (76)	184 (81)	187 (42)
% of energy from carbohydrate (d ¹)	47 (3)	49 (4)	49 (3)
Fat (g/ d ¹)	59 (21)	50 (17)	55 (15)
% of energy from fat (d ¹)	33 (5)	32 (5)	33 (5)

TABLE 2 - Daily energy intake in competition female gymnasts during a season.

Regarding vitamins and minerals (Table 3), significantly lower intakes of vitamin D, vitamin E, calcium, iron and magnesium were observed in gymnasts among the season (Institute of Medicine, "Dietary Reference Intakes. Calcium", "Dietary Reference Intakes. Thiamin", "Dietary Reference Intakes. Vitamin C", "Dietary Reference Intakes. Vitamin A").

In contrast, vitamins A, B1, B2 and B6 intakes were significantly higher in the three periods evaluated.

On the other hand, only vitamin A, calcium and magnesium varied significantly from preparatory period to transitory period.

Variables	Preparatory	Competitive	Transitory
Vitamin A (µg)	1001 (564)	1003 (764)	1201 (696)
Vitamin B1 (µg)	1.5 (0.5)	1.4 (0.7)	1.5 (0.4)
Vitamin B2 (µg)	1.9 (0.7)	1.8 (1.0)	1.8 (0.4)
Vitamin B6 (µg)	1.7 (0.7)	1.6 (0.9)	1.8 (0.5)
Vitamin C (µg)	55 (28)	60 (31)	68 (41)
Vitamin D (µg)	2.5 (1.9)	2.3 (1.8)	2.8 (1.5)
Vitamin E (µg)	6.1 (1.9)	4.9 (1.8)	5.7 (1.6)
Calcium (mg)	673 (236)	704 (290)	636 (174)
Iron (mg)	10 (4)	9 (4)	10 (3)
Magnesium(mg)	184 (55)	178 (59)	204 (81)
Phosphorus (mg)	964 (258)	959 (326)	972 (191)
Zinc (mg)	9 (3)	9 (3)	9 (2)

TABLE 3 - Vitamin and mineral intakes in competition female gymnasts during a season.

4. DISCUSSION

According to results, BMI was inadequate for gymnasts' age and height (D'Alessandro et al.; Dowthwaite et al.; Maimoun et al.), because the mean of participants had reached values nearly 50%.

There were no significantly differences between the number of hours per week practiced in the preparatory period and the competitive period, but it decreased in the last period.

The main objective of transitory period is to recover the athletes from all the competition effort that they had been submitted to, so the intensity of training, as well as its volume is usually reduced.

Mean reported daily intakes of most nutrients were higher than the current daily recommended intakes (Jonnalagadda; Soric, Misigoj-Durakovic and Pedisic), in particular for the protein and fat intakes, as occurred in a study with 12 juvenile elite female gymnasts (Filaire and Lac).

However, the percentage of energy from carbohydrate was low about 47(3)%/day.

It is recommended for gymnasts that training diets provides 60-65% of total energy from carbohydrate, 15% from protein, and 20-25% from fat (Benardot).

We have to enhance that in the competitive period gymnasts had the lowest mean energy intake [1444 (507) Kcal/day].

This period is where the gymnasts spend more energy, because of training intensity and stress competition (Llobet).

Gymnasts showed intakes of vitamins A, B1, B2 and B6 high, which could be attributed to a high consumption of vegetables and fruits (Nova et al.).

In relation with mineral intakes, deficiencies were found for calcium, iron and magnesium. These results may be associated with a poor bone development and an increased risk of stress fractures (Silva et al., "Composição"; Silva et al., "Massa").

On the other hand, an iron inadequate intake is associated to anaemia, which is a main factor for the development of amenorrhea (Filaire and Lac).

5. CONCLUSION

Gymnasts had an unbalanced diet, which will compromise their athletic efficiency and future health. It may be thus recommended for gymnasts to consume a greater part of carbohydrate. More research is needed to study the evolution of gymnastics related to energy intake and its distribution among the athletic season.

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