# Food intake and consumption of dietary supplements by athletes of athletics modalities

https://doi.org/10.56238/Connexpemultidisdevolpfut-146

**Daniel Malta Vanucci**
Nutritionist
E-mail: danielvanucci@outlook.com

**Mateus Cezar dos Santos**
Postgraduate in Weight Loss and Metabolism at UNIGUAÇU.

**Thaina Oliveira**
Nutritionist

**Tânia Corrêa Miller**
PhD student of the Graduate Program in Science, Technology and Society (CTS) of the Federal University of São Carlos.

**ABSTRACT**
The study aimed to identify the consumption of dietary supplements among athletes of different athletics modalities, to evaluate whether the dietary consumption of macronutrients meet the nutritional recommendations. The sample was composed of 30 athletes from different athletics modalities, focusing on competitive activity. To characterize the study group, the following data were collected: age, sex, weight and height. To know the food intake, the 24-hour Food Recall in triplicate was used, and the collection was performed on two non-consecutive days of the week and one day of the weekend. To quantify the macronutrients ingested by the athletes, the Dietbox software was used. Data analysis was descriptive with the support of the BioEstat 5.0 program. Participated in the research 30 athletes of both sexes, with a mean age of 16.5 ± 4.41 years, who had an average weight of 60.43 ± 22.81 kg. From the analysis of the 24-hour recalls, it was observed that 17% of the athletes used dietary supplements, of this total, 40% used supplements of protein origin, and these supplements were ingested on their own (40%) prescribed by a nutritionist (20%), physician (20%) or physical education professional (20%). In addition, it was also observed that 67% of respondents had a hypoglycidic diet, 73% of participants consumed a high-protein diet and 43% a high-fat diet. It is concluded that the consumption of macronutrients is not adequate for the sports modality, with the exception of the protein that is adequate for the modality practiced, being necessary strategies of nutritional education for athletes, with approaches on healthy and adequate eating, as well as on the consumption of food supplement, and this should be indicated after evaluation of the real need, both performed by the professional nutritionist.

**Keywords:** Athletics, Food consumption, Macronutrients, Nutrition, Dietary supplements.

## 1 INTRODUCTION

The regular practice of physical exercises is fundamental to maintain a good quality of life, having great importance in the prevention of cardiovascular diseases, chronic non-communicable diseases and promotes muscle strengthening and conditioning (WORLD HEALTH ORGANIZATION, 2020).

With the increase in the practice of physical activities, there was also an increase in concern with food, which tends to bring greater benefits, especially to high-performance athletes, because with

the increase in energy expenditure, there is also the need to increase energy intake and, in many cases, supplementation is indicated (PANZA et al., 2007).

A dietary orientation should be individualized according to the needs of each person, in the case of athletes, the nutritionist needs to take into account the type of test that this athlete competes, the time that practices such activity, duration of training and, many other information, always seeking the improvement and the food balance of the individual, in relation to various aspects, emphasizing the use of dietary supplements when necessary (BIESEK; ALVES; WAR, 2015).

Athletics is characterized as a base sport, because its practice is completely linked to the natural movements of the human being, since the act of running, jumping and throwing are movements that accompany man from primitive times to the present day and extend to other sports modalities (SILVA, 2019).

Nutrition has an important role in athletics throughout the training period and, even more, during the periods of competitions, and adequate nutrition is necessary from the beginning to the end of the practice of the sport, that is, from the preparation, and also maintenance and recovery of the athlete (BIESEK; ALVES; WAR, 2015).

It is important to note that carbohydrate is the main source of energy for the athlete and its intake should represent between 55 and 70% of the total energy value (VET) daily; however, endurance athletes can ingest around 75% of the daily VET to optimize their performance (BIESEK; ALVES; WAR, 2015). Thus, the daily recommendations on carbohydrate intake change from the classification of intensity in exercise: low-intensity exercises 3-5 g/kg day; moderate intensity 5-7 g/kg day; high intensity 6-10 g/kg day; very high intensity 8-12 g/kg day (THOMAS; ERDMAN; Burke, 2016). Thus, the lack of carbohydrates in the athlete's diet can generate the feeling of tiredness, leading to decreased performance and symptoms such as dizziness and fainting (BIESEK; ALVES; WAR, 2015).

As for protein intake, the minimum recommendation is 0.8 g/kg of body weight, for example, for endurance athletes, the recommendation is around twice the minimum recommendation. Daily protein recommendations are around 1.2-1.7 g/kg/day in physically active individuals, which should preferably be ingested through food, but if necessary can be supplemented with protein foods (BIESEK; ALVES; WAR, 2015).

Lipids are essential for the body, however, there is no need for extra recommendation for athletes, and their daily intake should be a maximum of 30% of the VET, according to Biesek, Alves and Guerra (2015) and 20% to 35% of the diet according to the *Academy of Nutrition and Dietetics, Dietitians* of Canada, and the *American College of Sports Medicine* (THOMAS; ERDMAN; Burke, 2016). In low-intensity, long-duration activities, lipids may account for 80% of the energy supplied for the activity (HIRSCHBRUCH; CARVALHO, 2014).

One way to evaluate the individual's dietary pattern is through the 24-hour recall, as it is a quick and easy method for assessing the athlete's food intake, and can be used to quantify the intake of macro and micronutrients, as well as the nutritional quality of the diet and verify if the needs are being met through food or if there is a need to indicate the use of food supplementation (BIESEK; ALVES; WAR, 2015).

The prescription of dietary supplements should be made only by professionals qualified for this orientation and who have full knowledge of the subject, and the nutritionist is responsible for the effects on the health of the user, according to the terms of Resolution No. 656 of the Federal Council of Nutritionists (FEDERAL COUNCIL OF NUTRITIONISTS, 2020).

Within this context, the research aimed to identify the consumption of dietary supplements among athletes of different athletics modalities, as well as to evaluate whether the dietary consumption of macronutrients of these athletes meet the nutritional recommendations.

## 2 MATERIAL AND METHODS

### 2.1 TYPE OF STUDY

It is characterized by a clinical, primary, cross-sectional and interventional study, with a qualitative/quantitative and exploratory approach, conducted during the second half of 2021.

### 2.2 RESEARCH SUBJECTS

Participated in the research 30 athletes of the athletics team of the Sports Secretariat of the City Hall of a city in the center-west of São Paulo, who competed in the different modalities of athletics.

### 2.3 ETHICAL ASPECTS

The study began only after the assessment and approval of the Research Ethics Committee of the University of Marilia – Unimar, through the Brazil platform, having obtained approval under opinion number 4,823,462.

The participants or guardians were instructed about the objectives and development of the research and its way of being carried out. After showing interest in participating in the research, each participant or guardian was instructed on the correct completion of the Free and Informed Consent Form (ICF).

### 2.4 FOOD CONSUMPTION DATA COLLECTION

Data collection was done through an interview conducted by the researchers, where a 24-hour Food Recall was applied in triplicate, comprising two non-consecutive days of the week and one day of the weekend, with the following information being obtained: name, age, gender, sports modality,

date of the interview and description of meals, followed by their respective schedules, foods/supplements ingested and the form of preparation employed. The foods were described in homemade measurements and later converted into the standard unit of measurement adopted (grams).

## 2.5 ANTHROPOMETRIC DATA COLLECTION

The body mass of the participating athletes was collected according to the method recommended by the Food and Nutrition Surveillance System (SISVAN), by means of an Avanutri digital scale (Premium Digital Scale 200 Kg ABS Avanutri®), and the athlete was barefoot, with as little clothing as possible, in the center of the equipment, erect, with arms extended along the body and feet together, without performing movements until the weight value was fixed on the display and the reading was made (MINISTRY OF HEALTH, 2004).

The height of the athletes was also measured according to the method recommended by SISVAN, by means of a portable stadiometer (SLIM FIT®), where each athlete was positioned in the center of the equipment, barefoot, with the head free of props, erect, with the arms extended along the body, the one positioned in the Frankfurt plane (lower margin of the orbital opening and upper margin of the auditory meatus were in the same horizontal line), heels, buttocks and shoulders in contact with the equipment, with the inside of the heels and knees touching and feet at a right angle to the legs. After the correct position of the participant, the moving part of the equipment was lowered, being fixed against the head with enough pressure to compress the hair, after this procedure, the participant was asked to withdraw so that the reading could be performed (MINISTRY OF HEALTH, 2004).

## 2.6 DATA ANALYSIS

O cálculo dos macronutrientes foi realizado pelo programa Dietbox® e utilizada como referência a *Academy of Nutrition and Dietetics, Dietitians of Canada* and the *American College of Sports Medicine* (THOMAS; ERDMAN; BURKE, 2016) e *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids* (NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE et al., 2005). Foi utilizada a classificação por porcentagem de macronutrientes presentes nos recordatórios, sendo em hiperglicídica (>65% de CHO), hiperproteica (>1g/kg/dia de PTN), hiperlipídica (>35% de LIP), normoglicídica (entre 45% e 65% de CHO), normoproteica (entre 0,8-1g/kg/dia de PTN) e normolipídica (entre 20% e 35% de LIP), hipoglicídica (<45% de CHO), hipoproteica (<0,8g/kg/dia de PTN) e hipolipídica (<20% de LIP).

Microsoft Office Excel® was used for data storage and the analysis of quantitative data was descriptive with the support of the *BioEstat* 5.0® program. The data were presented in tables of

absolute and/or relative frequency or mean, standard deviation, median, minimum and maximum, according to the profile of the analysis.

## 3 FINDINGS

A total of 30 athletes participated in the study, with a mean age of 16.5 years ± 4.41 years, with a minimum age of 10 years and a maximum of 28 years. Despite being a heterogeneous group in relation to age, it can be observed **in Table 1** that the majority (60%) is in the age group of 14 to 19 years, which is common in this phase to the practice of competitive sports. Among female athletes, the mean age found was 14.92 ± 2.99 years and among males from 19 ± 4.64 years, and an age difference can be observed in relation to the interest or possibility of practicing the sport between both sexes.

Table 1 – Age group of athletes of various athletics modalities. Marília-SP, 2021.

| Age group (years) | N | % |
|---|---|---|
| ≤ 14 | 7 | 23,3 |
| 14 - 19 | 18 | 60 |
| 20 - 24 | 2 | 6,7 |
| 25 – 29 | 1 | 3,3 |
| ≥ 30 | 2 | 6,7 |

Source: table prepared by the authors

Of the 30 study participants, 53.3% were male. The mean and standard deviation of BMI of the studied group was 23.9±5.05 kg/m2 and the athletes reported that they had 3 to 4 (70%) meals per day or 5 to 6 meals (30%) daily The anthropometric characteristics of the athletes of the athletics modalities are described in **Table 2**.

Table 2 – Anthropometric characteristics – Body mass and height of athletes of various athletics modalities, according to sex. Marília-SP, 2021.

| **Anthropometric data** | **Both sexes** | **Female** | **Male** |
|---|---|---|---|
| | **n=30** | **n=14** | **n=16** |
| | **Mean ± standard deviation** | | |
| | **(median)** | | |
| Height (m) | 1.69 ± 0.13 (1,71) | 1.64 ± 0.15 (1,65) | 1,73 ± 0,10 (1,73) |
| Body mass (kg) | 60.43 ± 22.81 (68.50) | 39.46 ± 18.45th (33.22) | 81.94 ± 22.51b (77.50) |

Source: table prepared by the authors

The athletics modalities practiced by the athletes are listed in **Table 3**, which there was a great variability among them, and a total of 11 athletes (37%) practice various modalities, such as high jump (n=2), long jump (n=2), discus throw (n=2), javelin throw (n=2), hammer throw (n=1), gait (n=1) and sprinter (n=1), 9 (30%) athletes compete in the shot put. Finally, 7 athletes (23%) are runners and three (10%) practice pole vaulting.

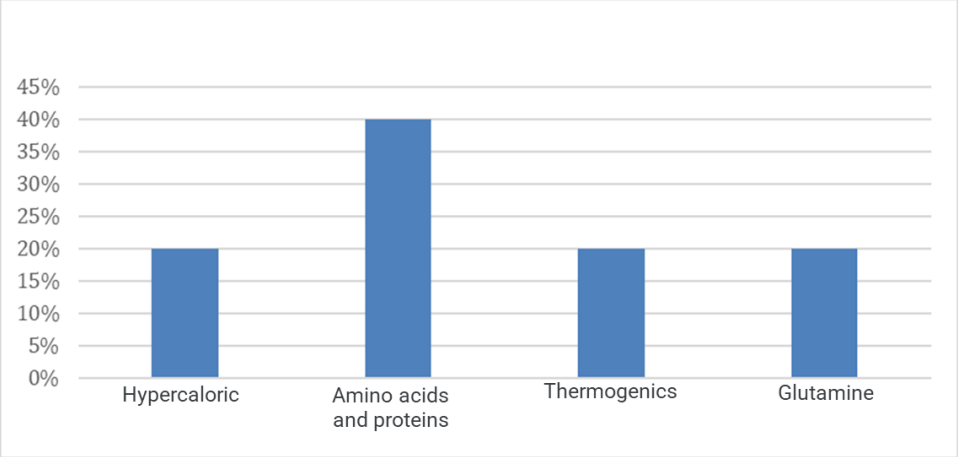
Table 3 - Modalities practiced by athletes of various athletics modalities. Marília-SP, 2021.

| Modalities | Absolute Frequency | Relative Frequency |
|---|---|---|
| Shot put | 9 | 30% |
| Race | 7 | 23% |
| Pole vault | 3 | 10% |
| Other | 11 | 37% |
| Total | 30 | 100% |

Source: Table prepared by the authors

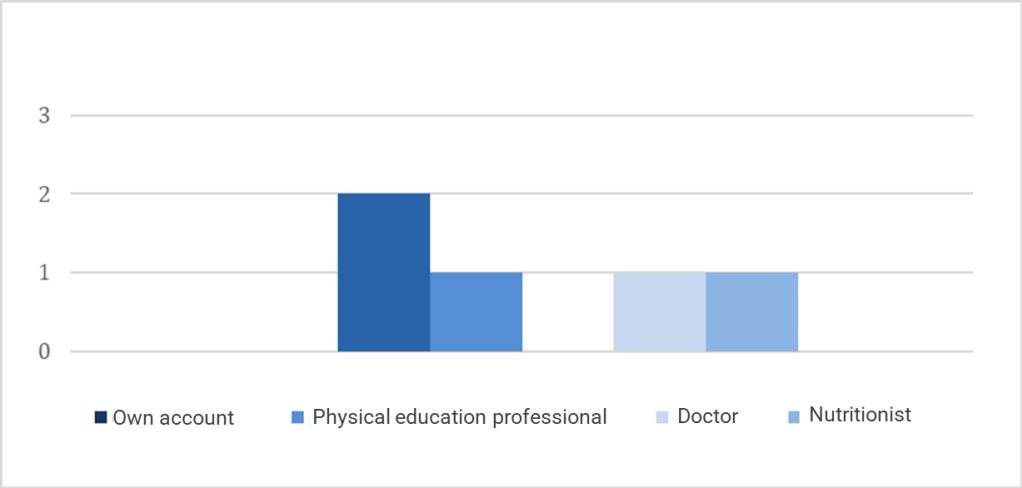
Of the 30 athletes who participated in the research, only 5 (17%) made daily use of dietary supplements with the objective of improving sports performance (10%) or muscle mass gain (7%) and all reported satisfaction with the expected results with the use of supplements. The majority (80%) reported a monthly expenditure of up to R$ 100.00 per month with the purchase of these supplements. **Figure 1** shows the types of dietary supplements consumed, and of this total, 40% (n=2) consumed protein supplements or amino acids and the remainder consumed hypercaloric, thermogenic or glutamine.

Figure 1 - Distribution of groups of dietary supplements consumed by athletes of various athletics modalities.




In **Figure 2**, it is possible to see who recommended the use of supplements for athletes, such as doctor, nutritionist, physical education professional or even consumed on their own. It is noted that only two (40%) athletes received guidance from a doctor or nutritionist for the use of nutritional supplements, professionals qualified to prescribe this type of supplement. Dietary supplementation on its own was done by two (40%) athletes. One of the athletes received guidance from a physical education professional.

Figure 2 - Distribution of athletes regarding the indication of the use of dietary supplements




After the analysis of the food recalls, we can observe (**Figure 3**) the adequacy of the carbohydrate consumption of the athletes. Among the 30 participants of the research, 20 (67%) had insufficient carbohydrate intake (CHO), and the average intake was 36.28% of the Total Energy Value (VET), this percentage being classified as hypoglycidic (<45% of CHO), 6 (20%) athletes consumed a normoglycidic diet (between 45% and 65% of CHO) and 4 (13%) consumed a hyperglycidic diet (>65% of CHO) according to the *Academy of Nutrition and Dietetics, Dietitians of Canada and the American College of Sports Medicine (*2016) and the *Dietary Reference Intakes* - DRI (NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE et al., 2005).

Figure 3 – Classification of carbohydrate intake by athletes of various athletics modalities.

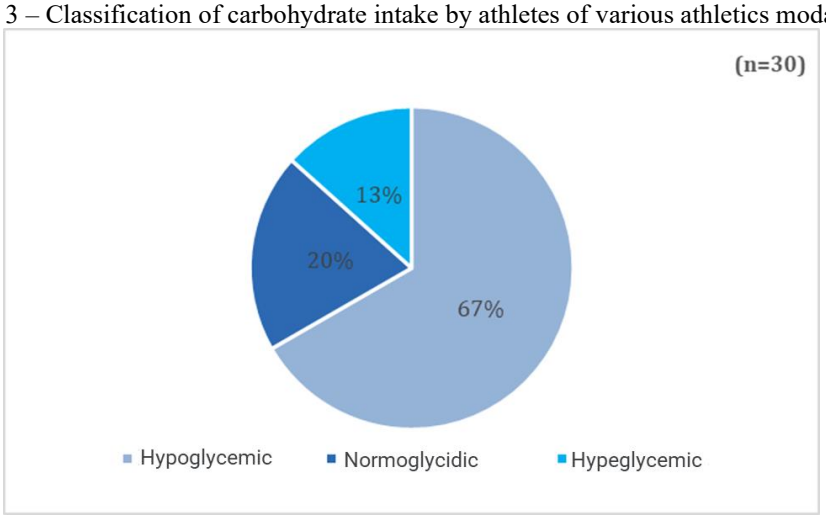
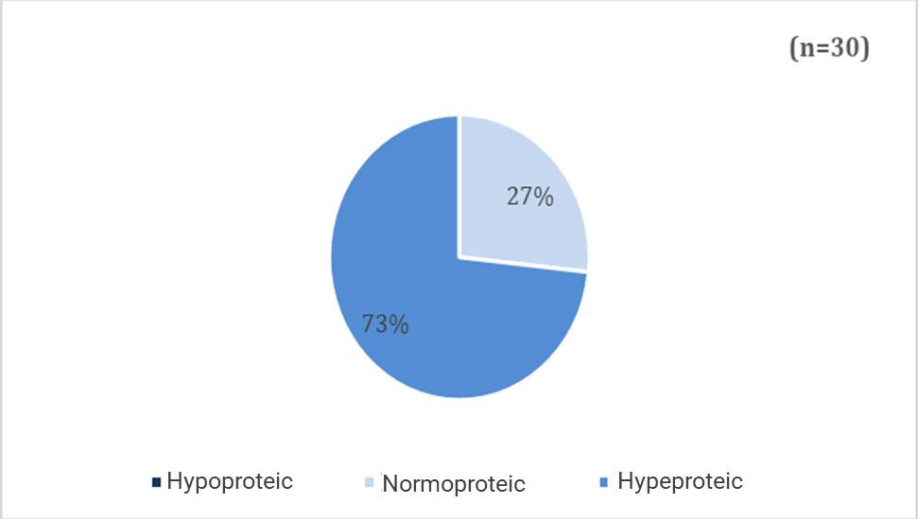



**Figure 4** illustrates the adequacy in relation to protein intake (PTN), in which 22 (73%) of respondents had a high-protein diet, and 8 (27%) athletes consumed a normoprotein diet (between 0.8-1g/kg/day of PTN) according to the *Academy of Nutrition and Dietetics, Dietitians of Canada and the American College of Sports Medicine* (2016) and the *Dietary Reference Intakes* - DRI (NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE et al., 2005). The ratio of grams

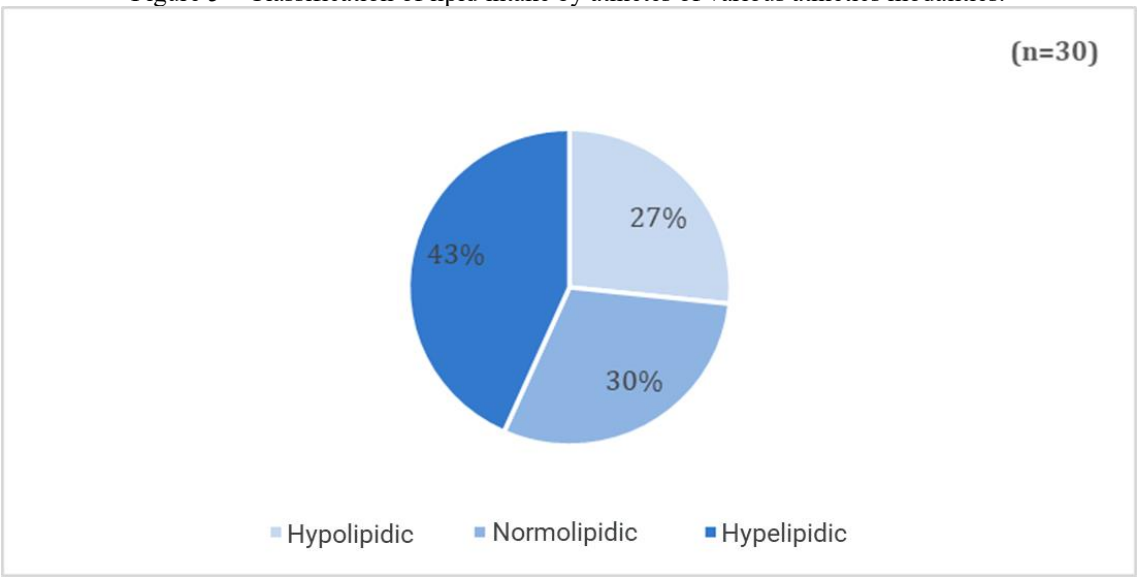
of protein per kilogram of weight (g/kg) obtained in the calculation of the recalls was 1.72±0.08 g/kg/day for athletes under 19 years of age and 1.65±0.21 g/kg/day for athletes over 19 years of age, values that are suitable for athletes.

Figure 4 – Classification of protein intake by athletes of various athletics modalities.




Finally, **Figure 5** shows the classification of lipid consumption (IPL) by athletes. Among the 30 athletes participating in the research, 13 (43%) had a high-fat diet (>35% of IPL), representing 45.72% of the VET, 9 (30%) athletes consumed a normolipidic diet (between 20% and 35% of IPL) and 8 (27%) consumed a low-fat diet (<20% of IPL) according to the *Academy of Nutrition and Dietetics, Dietitians of Canada and the American College of Sports Medicine* (2016) *and the Dietary Reference Intakes* - DRI (NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE et al., 2005).

Figure 5 – Classification of lipid intake by athletes of various athletics modalities.



## 4 DISCUSSION

This study, when evaluating the practitioners of various athletics modalities\ observed that they presented in their majority, age group between 14 and 19 years and higher prevalence of the male gender.

The consumption of macronutrients and dietary supplements have been investigated in studies with athletes of various sports modalities (MOREIRA, RODRIGUES, 2014; Sá et al., 2016; GALATI, GIANTAGLIA, TOLEDO, 2017; SILVA; ORDOÑEZ; FERNANDES, 2018; BARBOSA MACEDO, 2022). Regarding supplements, those based on amino acids and proteins are the most consumed, findings that are in line with the study by Galati, Giantaglia and Toledo (2017), who observed that the majority (86%) of the interviewed athletes used protein dietary supplements, as well as in the study by Sá et al. (2015), in which 100% of the athletes made use of protein supplement, In addition, all of them ingested protein through food in an amount higher than recommended. In addition to the adequacy of the quantity and quality of protein in the athlete's diet, the fractionation of this nutrient has been an important factor both for the gain and maintenance of muscle mass and also in muscle recovery after training and competitions (THOMAS; ERDMAN; Burke, 2016).

Athletes and sportsmen seek fast and satisfactory results in a short period of time and, thus, end up eating inappropriately and seeking other resources to achieve their goals, using dietary supplements, mostly with high protein index, indiscriminately and without adequate indication (PANZA et al., 2007). Thus, in this study it was observed that the predominant consumption of dietary supplements was performed on their own (40%) or by a physical education professional (20%), who even being a health professional, does not have qualification for this orientation. Therefore, it is important to consider the need for the consumption of dietary supplements and that it is indicated only by qualified professionals, such as physician and/or nutritionist (HIRSCHBRUCH; CARVALHO, 2014).

In this study, protein consumption is within the range considered adequate for athletes, and the average intake was 1.72±0.08 g/kg/day for children under 19 years of age, who need this nutrient for growth and development, as well as to meet the needs of the modality practiced. Athletes older than 19 years had an average intake of 1.65±0.21 g/kg/day. In active individuals, as is the case of the sample of this study, there may be a higher consumption of protein, as recommended by the *Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine* (2016) for protein *turnover* ranging from 1.2 to 2.0 g/kg/day (THOMAS; ERDMAN; Burke, 2016). The modern vision to establish recommendations for protein intake in athletes goes beyond the DRIs (NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE et al., 2005), in order to provide enough protein to supply the tissues with rapid renewal and increase the metabolic adaptations initiated by the training stimulus (THOMAS; ERDMAN; Burke, 2016).

Moreira and Rodrigues (2014) presented data on protein intake, as well as on lipid and carbohydrate consumption of physical exercise practitioners, and of the research participants, 89.47% had a hypoglycidic diet, 100% had a hyperprotein diet and 52.63% had a high-fat diet. Another study also characterizes the insufficient intake of carbohydrates in 100% of the athletes of different athletics modalities who also made use of dietary supplements, as well as the protein intake higher than the recommended amount, in 100% of the participants (SILVA; ORDOÑEZ; FERNANDES, 2018), which corroborates the findings of this study that observed that 67% of athletes ingested an insufficient amount of carbohydrates, with only 13% of athletes eating a hyperglycidic diet, and 43% consuming a high-fat diet.

Carbohydrate is an important source of energy for the brain and central nervous system, in addition to being an adaptable substrate in physical exercise, which can support exercise in a wide range of intensities, due to the possibility of use as a substrate both in anaerobic and aerobic pathways (THOMAS; ERDMAN; BURKE, 2016). In addition, these authors reported that there is significant evidence that performance is enhanced in long-term or intermittent high-intensity exercises, such as those practiced by athletics athletes, with strategies that maintain high availability of carbohydrates, both in the form of glycogen stores and adequate levels of blood glucose during the practice of the sport. Therefore, depletion of the stock of this nutrient is associated with fatigue, resulting in impaired performance.

With regard to food consumption, a diet rich in carbohydrates and proteins is more beneficial for the physiological condition for athletes who practice intermittent sport, with the presence of intense physical exertion, to avoid fatigue and early fatigue according to the *Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine* (THOMAS; ERDMAN; Burke, 2016).

## 5 CONCLUSION

Given the results obtained in this study, it is concluded that the consumption of macronutrients is not meeting the nutritional recommendations for practitioners of the various modalities of athletics, with the exception of protein that is within the limits recommended for athletes. However, lipids were consumed in greater quantities to the detriment of carbohydrates, which is the main source of energy for the athlete. Nutritional education strategies are necessary for this public, with approaches on healthy and adequate eating, as well as on the consumption of food supplements, which are indicated after evaluation of the real need, both performed by the professional nutritionist.

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