

Dietary Behavior of School-Aged Young Athletes

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Abstract

Introduction: The dietary behavior of school-aged athletes is a critical area of study because nutrition considerably influences their overall performance, growth, and well-being. These young athletes, who participate in organized sports, have specific nutritional needs that differ from those of their non-athletic peers. **Objective:** This study aims to analyze and characterize the eating habits of students engaged only in activities provided by the Physical Education curriculum compared to those who also participate in extracurricular activities (both federated and non-federated) by examining their food preferences to understand the possible influences of these activities on eating and to identify patterns that may affect their health, well-being, and performance. **Methods:** The study group consisted of a total of Portuguese 252 secondary school students, aged between 15 and 19, attending the 10th, 11th and 12th grades. A questionnaire was used that resulted from combining already validated instruments, namely the translated version of the KIDMED index (Coelho et al., 2022) and the FNLIT (Doustmohammadian et al., 2018). Descriptive and inferential analyses of the data were carried out using version 29 of the IBM

Keywords: Dietary behavior; Federated sport; School; Young athletes.

Introduction

Food is one of the fundamental pillars of physical activity, as it provides the necessary energy for performance in both physical activity and sports. At the same time, a healthy and balanced diet is fundamental for protecting the immune system against diseases and infections (Aziz et al., 2024), playing a crucial role in building and repairing muscles, maintaining hormonal homeostasis and even as a prophylactic measure against injuries. A healthy nutrition provides enough energy for exercise, through the balanced consumption of proteins, fats and carbohydrates (Gabarra et al., 2022). According to Sinigaglia et al. (2024), proteins are responsible for muscle mass gain and post-workout recovery, as they favor muscle (re)construction and inherent repair. In turn, fats are a source of energy for low-intensity, long-duration activities, while carbohydrates are the source of energy required during high-intensity activities. As part of the proper nutrition process, hydration, i.e. water intake, is also vital for the proper functioning of all the body's functions, such as regulating body temperature, lubricating joints and transporting essential nutrients (Bauce & Franken, 2021).

In this respect, nutrition plays a central role in physical activity practice, determining the practitioner's performance and general health. A balanced diet adapted to individual needs can improve performance, speed up recovery, prevent injuries and help maintain a healthy body. However, this type of behavior is still below the desired levels, with sedentary lifestyle being the main obstacle (Villalobos et al., 2022).

Among other definitions, sedentary behavior can be understood as “any activity that, when performed, does not significantly increase energy expenditure above resting values, including activities performed while standing, sitting or lying down” (Instituto Português do Desporto e Juventude, 2024, p.12). Sedentary behavior is a significant risk factor for the development of various non-communicable diseases, such as those of the brain and cardiovascular forum, diabetes mellitus, depression and respiratory, rheumatological and oncological diseases. According to data collected by Eurobarometer (2024), Portugal is the most inactive country in Europe, with 73% of the Portuguese saying they “never” or “almost never” exercise or play sport.

Looking at Portuguese young people, according to the most recent report by the World Health Organization (WHO) (2022), 78% of boys and 91% of girls are sedentary, so these results raise particular concern, as physical activity in childhood and adolescence influences later quality of life. WHO also reports that physical inactivity is the fourth leading risk factor for death worldwide, as well as the “key risk” for chronic non-communicable diseases. This becomes a serious public health factor and is associated with the onset of childhood obesity and, subsequently, poorer health levels in adulthood (WHO, 2022).

In line with the above, there is an urgent need to actively promote regular physical activity and sport practice, making it useful to be monitored by specialized health professionals, recommending and adjusting physical

activity according to young people's characteristics, as well as medical monitoring to prevent possible injuries, optimizing performance and helping young people to achieve their goals, staying healthy and motivated to practice physical activity (Matos, 2024).

In this sense, healthy eating habits should be introduced at an early age, as they are important in establishing future preferences and behaviors. According to the Portuguese Institute of Sport and Youth (2024), adequate eating and physical activity are the main determinants of health, capable of preventing or delaying the main diseases that cause death or disability. The National Program for the Promotion of Healthy Eating (2016) emphasizes that nutrition can improve performance and recovery from exercise through well-chosen and individually planned nutritional strategies.

Bearing in mind that an athlete's "working tool" is their own body and that their sporting performance is influenced by their nutritional status, a correct diet adapted to the sporting objectives becomes crucial (most associations and clubs highlight this issue by allocating resources in their organizational structure to nutritional health). These professionals can advise athletes on their specific energy, nutrient and fluid needs and help create nutritional strategies adapted to the training and competition's types. Minderico (2016) states that during the training process and in preparation for competition, an appropriate diet is recommended, considering: the energy input; the nutrients' selection (macro and micro); the training and competition diet (before, during and after); hydration; and dietary supplementation and ergogenic enhancers.

With this in mind, this study aims to characterize and analyze the eating behavior of students who only engage in activities offered by the Physical Education school curriculum and those who, in addition to curricular activities, practice extracurricular activities (federated and non-federated), through their food preferences, in order to understand the possible influences of these activities on eating and to identify patterns that may affect their health, well-being and performance.

Material & methods

Participants

The study group consisted of a total of Portuguese 252 secondary school students, aged between 15 and 19, attending the 10th, 11th and 12th grades. Vegetarian students were considered an exclusion criterion, as the instrument (described below) contained questions that did not apply to this group.

Data collection instrument

A questionnaire was used that resulted from combining already validated instruments, namely the translated version of the Mediterranean Diet Quality Index in Children and Adolescents - KIDMED index (Coelho et al., 2022) and the Food and Nutrition Literacy (FNLIT).

The KIDMED index, originally developed by Majem et al. (2004), consists of sixteen questions aimed at analyzing the daily consumption and frequency of food intake, and was originally developed to assess the adherence level to the Mediterranean Dietary Pattern (MDP) of children and adolescents aged between 2 and 24 years. Items are given a score of "+1" or "-1", depending on their agreement with the MDP. The sum of the values varies on a scale between 0 and 12 points and allows adherence to the MDP to be classified into three levels: level 1 - high adherence (> 8 points); level 2 - intermediate adherence (4 - 7 points) and level 3 - low adherence (≤ 3 points).

The second questionnaire, by Doustmohammadian et al. (2018), consists of a set of 49 items aimed at identifying the dimensions and components of food and nutrition literacy. The content and face validity of the questionnaire was assessed by a panel of experts and students. Responses were given based on frequency and/or agreement degrees, presented on a Likert scale, ranging from "always, often, sometimes, rarely or never", as well as "totally agree, agree, undecided, disagree and totally disagree", according to a positive or negative agreement's perception.

Procedures

With regard to the methodological aspects of organizing and obtaining the data to be processed later, i.e. the instrument applying protocol, the following stages are listed: a) survey of possible schools to apply the study; b) contact with schools' responsible requesting authorization to carry out the study and explaining its; c) sending detailed information to the participants' parents/guardians, containing the research objectives, potential benefits and the guarantee of the data's anonymity and confidentiality; d) requesting authorization through informed consent, thus authorizing the students' participation in the study; e) questionnaire's personal delivery, in collaboration with the Physical Education teachers involved classes, with the researcher being absent during the completion period so as not to condition the answers (the questionnaires were administered, with data coded and stored securely, accessible only to the research team during Physical Education classes, so as to be naturally integrated into the school curriculum); f) questionnaires' collection within a period following their personal delivery, with the emphasis on creating and maintaining a welcoming environment, concluding with a thank you for participating and sincerity for the answers given in this study. Again, the data was coded and stored securely, accessible only to the research team.

Statistical analysis

In accordance with the previously defined objectives, descriptive and inferential analyses of the data were carried out using version 29 of the IBM Statistical Package for the Social Sciences (SPSS), setting the

confidence interval at 95%, thus defining the study's significance level (p-value) at 0.05. The use of non-parametric tests (Mann-Whitney Test and Chi Square Test) was due to the scale of the variables, the objectives of the study and, in fact, the failure to meet the requirements for the use of parametric tests, specifically the distributions' lack of normality (Marôco, 2018). The results reveal, according to the scale and dimensions created and mentioned above, the respondents' perception of a set of indicators that allow to infer the importance they have regarding the practice and non-practice of strength training and functional conditioning. The starting point was based on the critical, language dynamic conception and meaning interpretation that a respondent attributes to concepts, also considering the contextual conditions of their producers.

Results

The descriptive analysis revealed that, out of the 252 students in the study group, 60% engage in extracurricular physical activity, with 4% enrolled in school sports as a non-mandatory school activity. Among these, 24% participate in a federated activity, and 33% in a non-federated activity. Regarding their eating habits, it was observed that the rare and occasional consumption of soup is low for both types of practitioners. Among the non-federated group, 2.4% rarely consume soup, 1.2% "sometimes," 42.7% consume it "often," and 53.7% "always." On the other hand, 3.3% of the federated group "rarely" consume soup, 1.6% "sometimes," 46.3% consume it "often," and 55.7% "always." Therefore, it can be deduced that regardless of being federated or not, the specific variations between categories are minimal, revealing a general trend of high frequency in soup consumption.

As for the composition of lunch, the highlighted proportions consist of 50% "salads/vegetables" (raw or cooked), 25% "meat/fish/egg", and 25% "rice/pasta/potato", among both federated and non-federated groups. The non-federated group shows a higher consumption of these proportions ("always," 18%) compared to the federated group (7%). Federated individuals display a more balanced distribution, with a slight tendency to consume the meal "often" (11%) compared to the non-federated group (10%). Both federated (74%) and non-federated (78%) individuals tend to finish their meals with fruit, with a more pronounced trend among the federated, which may reflect a healthier lifestyle associated with regular sports practice.

In the inferential paradigm, the data reveal a significant association between being federated and the frequency of including dairy, "cereals, and fruits" in breakfast, as federated students tend to consume these foods more frequently ($p = 0.00$). Similarly, there is a significant association between being federated and the frequency of consuming the recommended lunch ($p = 0.02$).

Regarding water consumption, the results indicate significant differences between the groups, with federated individuals consuming significantly more water than non-federated ones ($p = 0.02$). In terms of fast-food consumption, there are no significant differences between the groups ($p = 0.80$). Finally, when comparing the groups in relation to the consumption of "sweets, candies, and other processed foods", the data indicate that federated individuals consume significantly more of these foods than non-federated ones ($p = 0.03$).

Discussion

Breakfast is intended to "break the fast" after the sleep period, during which the body's energy levels decrease significantly. As such, this meal should be complete, balanced, and varied to provide the essential energy, and nutrients needed to face the early hours of the day (Portuguese Nutrition Association, 2024). The same organization points out that having breakfast immediately after waking up brings more benefits, being especially important for children and adolescents who are in a growth and development phase. The most reported benefits include: replenishing energy levels after the nighttime fast; improving intellectual performance, memory, and concentration; maintaining a healthy weight; contributing to a more balanced food and energy distribution throughout the day; and positively influencing mood due to the replenishment of blood glucose levels. Various studies show that, compared to those who skip breakfast, individuals who regularly eat this meal tend to have a higher quality diet, as regular breakfast consumption is associated with more appropriate eating habits, better choices throughout the day, and a healthy body weight (Franko et al., 2011; O'Neil et al., 2014; Papoutsou et al., 2014).

A study from Public Health England and the Food Standards Agency (2014) found an association between having breakfast at home and engaging in moderate to high-intensity physical activity among school-aged children. The authors observed that the sample group who had daily breakfast engaged in more intense physical activity for a longer period and were exposed to longer periods of physical activity compared to other participants who never had breakfast. Thus, the results suggest that breakfast consumption is linked to a healthier lifestyle. According to the World Health Organization (2022), breakfast should contribute about 20-25% of the total daily energy intake (TDEI). In effect, breakfast should consist of 55-75% carbohydrates, 15-30% lipids, and 10-15% proteins. The data collected in this study indicate that most students who engage in physical activity outside of school "never" or "rarely" meet the recommended breakfast guidelines. This suggests that belonging to a club or association outside the school context does not influence the eating habits specific to this meal. Therefore, it can be inferred that extracurricular activities do not impact eating habits in this regard, compared to students who only participate in school-based activities, even though non-federated students show the highest rates of dietary inadequacy.

Regarding main meals, the Portuguese Nutrition Association (2016) indicates that these should be composed of three components: the starter, the main course, and the dessert. Concerning the main course, attention should be given to the proportions considered adequate and necessary. Half of the plate should contain vegetables, either raw or cooked (in the form of salads or sautéed vegetables), a quarter should include potatoes, rice, or pasta, and the remaining quarter should be filled with meat, fish, or eggs.

This study revealed that most students who "never" or "rarely" compose their plate according to the recommended ratios are only participating in Physical Education classes at school. The responses "often" and "always" are predominantly reported by students who participate in Physical Education and complement it with another sports activity outside of school, suggesting a more consistent eating pattern. In the analysis between federated and non-federated students, it is noteworthy that the latter group is more likely to report composing their plates with the suggested proportions "almost always" and "always."

When contrasting the estimated dietary consumption data from the National Food and Physical Activity Survey (Lopes et al., 2016) for the Portuguese population with the recommendations provided by the Portuguese Food Wheel, it is possible to conclude that the consumption of "fruit" and "vegetables" is below the recommended values (13% vs. 20% and 14% vs. 23%, respectively), while the consumption of "meat, fish, and eggs" is above the recommended values (17% vs. 5%) (Lopes, et al., 2016).

Regarding fruit and vegetable consumption, 53% of the Portuguese population does not meet the WHO recommendations for a daily intake of at least 400g/day. These figures are even more concerning among younger age groups, as this recommendation is not met by 69% of Portuguese children and 66% of adolescents. It is also important to consider that "100%" fruit juices do not have the same properties as whole fruit, so their consumption should be limited (Directorate-General of Health, 2021). In this investigation, it was found that students who engage in extracurricular activities "often" to "always" consume the aforementioned plate composition, in contrast to students who only participate in Physical Education and "never" or "rarely" have this habit. Similarly, regardless of whether they are federated or not, most participants regularly consume soup in their meals, indicating that the specific variations between categories are minimal, with a high frequency of soup consumption being the predominant trend. Regarding fruit consumption, when comparing the results with the recommendations of the Mediterranean Food Wheel, it is noted that the Portuguese population consumes 6% less fruit than recommended. Organic fruit is consumed daily by 14.7% of the population, and 15.3% report consuming it two to six times per week (Portuguese Nutrition Association, 2020). Data from the Directorate-General of Health (2021) reveal that 50.5% of adolescents consume fruit at least once a week, and 40.5% consume it at least once a day. Fruit can be included in the daily diet at lunch and/or dinner (ranging from the starter to dessert) or in between meals. Variety is also important, so it is advisable to opt for fruits of different colors throughout the day to maximize their benefits. All fruits fit into an athlete's diet, and the more fruits consumed during the day, the greater the amount of vitamins ingested.

Morais (2024) notes that fruits and vegetables' consumption is crucial for enhancing sports performance, directly influencing endurance, performance, and overall results. The micronutrients present in these foods are essential for energy production and tissue recovery. Maintaining a fruits and vegetables' rich diet is vital for supporting both training and post-training recovery. A lack of these foods can lead to fatigue and compromised immune function. Among the study's students that engage in extracurricular physical activity, the vast majority finish their meals with fruit, in contrast to those who only participate in Physical Education, with most of the latter group responding "sometimes." Both federated and non-federated youth tend to finish meals with fruit, although this trend is more pronounced among federated students (126 students consume the minimum recommended portions of fruit per day, out of a total of 143 participants).

Regarding water consumption, according to Lopes et al. (2016), the Portuguese population drinks, on average, less than one liter of water per day, considering drinking water (excluding water intrinsic to food or used in cooking). Water plays a crucial role in the body (more than 50% of the human body is composed of water) and performs various functions: it helps transport nutrients into cells and eliminate toxic substances, as well as other metabolic byproducts. Water contributes to regulating body temperature and is an essential component of bodily fluids and digestive juices, such as gastric, pancreatic, and bile juices, among others (Portuguese Nutrition Association, 2020). Dehydration, caused by insufficient liquid intake throughout the day, particularly when physical activity increases, can lead to symptoms such as headaches and fatigue, also affecting concentration, attention, and memory.

Regarding this issue, most of our participants consume between 1L to 1.5L of daily water, which is insufficient given the previously mentioned recommendations. When comparing federated and non-federated students, the former tend to consume more water daily, suggesting that being affiliated with a sports club has a positive influence on water intake. It would be expected that more students would consume 2L daily, considering the energy expenditure caused by physical exertion and the increased need for water intake.

Although the National Food and Physical Activity Survey, conducted by Lopes et al. (2016), identified water as the most consumed beverage by the Portuguese population, it was also predominantly selected in this study, as the consumption of soft drinks and/or fruit nectars is substantial, particularly among adolescents. The average daily consumption in this age group reaches 161g/day, with 42% consuming more than 220g/day, and within this group, 25% drink approximately two soft drinks per day.

We are currently witnessing unprecedented growth in fast-food restaurant chains and an increase in advertising promoting this type of food, even though Portugal is among the developed countries with the lowest fast-food consumption (WHO, 2022). However, Portugal recently held the title of European vice-champion in childhood obesity. The influence of fast-food consumption on individual health and among adolescents is a significant concern that requires reflection from educators and health professionals, particularly regarding nutritional education.

High fast-food consumption among adolescents has been observed in both developed and developing countries (Al-Hazzaa, 2011; Black & Billette, 2015; Braithwaite et al., 2014; Svastisalee et al., 2014). Regular fast-food consumption among adolescents increases the likelihood (by up to 80%) of becoming obese compared to those who consume fast food less than once a week (Qudah, 2014). In this context, the WHO has issued a set of guidelines to reduce current sugar consumption by half, recommending that less than 10% of daily energy intake should come from sugar. This includes both sugar added to foods and sugar naturally present in honey or fruit juices. The project suggested limiting sugar to 5% of daily energy intake or 25g per day for an adult of normal weight.

Currently, this recommendation still requires debate, as reducing products' sugar content remains a challenge for the food industry. Lower or poorer sweetness quality can lead to decreased product acceptance (Mooradian et al., 2017). Therefore, there is a need for alternatives that combine flavor, sweetness, mouthfeel, and texture (Saraiva et al., 2020; Tan et al., 2020). In the present study, the majority of individuals who "never" visited fast-food restaurants were those involved in extracurricular physical activities. Participants who "rarely" visited such restaurants were also significantly concentrated in this category, while those who "always" frequented fast-food restaurants were students who only participated in school-based Physical Education. When analyzing federated and non-federated students, it was found that this status did not significantly influence the frequency of visits to fast-food restaurants.

In a study conducted by Louzada et al. (2021) with adolescents from the final four grades of municipal public schools, a high consumption of ultra-processed foods was detected (61.2%), with the most consumed items being sweets (48%), soft drinks (23.5%), processed meats (19%), and packaged snacks (13%). A similar result was obtained in the research conducted by Brito et al. (2020), where a high percentage of adolescents reported consuming sweets. Regarding the consumption of sweets and processed foods, our students who only participated in school-based Physical Education regularly included these items in their diet, which is also influenced by whether they are federated or not.

Conclusions

The significance of this study's results lies in a matter of great social and educational importance, specifically in the eating habits of young athletes. Identifying these factors helps education and health professionals create more stimulating learning environments that promote more active and healthy human development.

The research's participants number ensured more reliable results, and the sample's subdivision into various groups allowed for a richer and more comprehensive dietary differences' analysis. The findings concluded that students affiliated with a sports club tend to make healthier choices, aligning with the WHO recommendations. In the comparison between federated and non-federated students, significant differences in eating habits were not evident; however, federated students tend to follow a more appropriate dietary pattern, indicating that participation in extracurricular physical activities positively influences their diet.

To strengthen these findings, it is suggested to conduct an initial survey, followed by a practical activity (such as a workshop or nutritional activity), and a final survey to raise awareness among students, potentially leading to changes in their eating behavior. Additionally, expanding the study's geographic scope of application is recommended, as each school environment has its own dynamics and characteristics. Therefore, replicating the study in different demographic contexts is essential to validate the applicability of the conclusions.

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