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Impact of an Interdisciplinary Food, Nutrition and Health Education Program for adolescent Brazilian volleyball players

Impacto de um Programa Interdisciplinar de Educação Alimentar, Nutricional e em Saúde para jogadoras de voleibol adolescentes

Natália Vilela Silva DANIEL¹
Luana Pilon JÜRGENSEN¹
Ricardo da Costa PADOVANI²
Claudia Ridel JUZWIAK³

ABSTRACT

Objective

To evaluate the impact of an Interdisciplinary Food, Nutrition and Health Education Program on nutrition knowledge, intention to change eating behavior, and body dissatisfaction of adolescent volleyball players.

Methods

The sample consisted of 10 female volleyball players from the juvenile category of the city of *Santos, São Paulo*, Brazil, who participated in a program with eight monthly meetings (one discussion group followed by six educational activities and one final discussion group for evaluation).

Results

Nutrition knowledge, body perception, intention to change eating behavior, eating attitudes and practices were investigated using questionnaires and discussion groups before and after the athletes' participation in ludic activities designed to address nutrition strategies for athletic performance and healthy eating, and how to deal with pressure for results and self-image. Nutrition knowledge improved from 57.0%±9.9 to 63.0%±11.8 ($p=0.03$) of correct answers. The mean body distortion score did not change (70.0±14.9 versus 76.5±22.4,

¹ Universidade Federal de São Paulo, Instituto de Saúde e Sociedade, Programa de Pós-Graduação Interdisciplinar em Ciências da Saúde. *Campus* Baixada Santista, R. Silva Jardim, 136, Vila Matias, 11015-020, Santos, SP, Brasil. *Correspondência para/*Correspondence to: NVS DANIEL. E-mail: <natalia.vilelasd@gmail.com>.

² Universidade Federal de São Paulo, Instituto de Saúde e Sociedade, Departamento da Saúde, Educação e Sociedade. Santos, SP, Brasil.

³ Universidade Federal de São Paulo, Instituto de Saúde e Sociedade, Departamento de Ciências do Movimento Humano. Santos, SP, Brasil.

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$p=0.235$). Six athletes advanced in their intention to change eating behavior. Positive food practices were reported during the program and the identified discourses indicated the intention of changing the daily eating habits in the future.

Conclusion

The program had a positive impact on nutrition knowledge and intention of changing eating behavior; however, for other issues, especially involving emotional aspects, further interventions should be planned.

Keywords: Athletes. Feeding behavior. Food and nutrition education.

R E S U M O

Objetivo

Avaliar o impacto de um Programa Interdisciplinar de Educação Alimentar, Nutricional e em Saúde sobre o conhecimento nutricional, a intenção de mudança de comportamento alimentar e a insatisfação corporal de jogadoras de voleibol adolescentes.

Métodos

A amostra foi composta por 10 atletas de voleibol, jogadoras da categoria juvenil da cidade de Santos, SP, que participaram do programa composto por oito encontros mensais (um grupo de discussão seguido por seis atividades educacionais e um grupo de discussão final para avaliação).

Resultados

Conhecimento nutricional, percepção corporal, intenção de mudança de comportamento alimentar, atitudes e práticas alimentares foram investigadas por questionários e grupo de discussão antes e depois da participação das atletas nas atividades lúdicas, as quais abordaram estratégias nutricionais para desempenho esportivo, alimentação saudável, lidar com pressão por resultados e percepção corporal. O conhecimento nutricional aumentou de 57,0% \pm 9,9 para 63,0% \pm 11,8 ($p=0,03$) de acerto. Não houve diferença no escore de distorção corporal (70,0 \pm 14,9 versus 76,5 \pm 22,4, $p=0,235$). Seis atletas avançaram na intenção de mudança de comportamento alimentar. Modificações positivas nas práticas alimentares foram relatadas durante as atividades e os discursos identificados apontam intenções de futuras mudanças nos hábitos alimentares diários.

Conclusão

O programa teve impacto positivo em aumentar o conhecimento nutricional e mudança de comportamento alimentar; porém, para outros aspectos, principalmente envolvendo questões emocionais, outras intervenções devem ser planejadas.

Palavras-chave: *Atletas. Comportamento alimentar. Educação alimentar e nutricional.*

I N T R O D U C T I O N

Despite the recognition of the importance of nutrition for athletic performance, inappropriate dietary intake is frequently observed in athletes¹⁻³. This may be related to the complex process of selecting foods, which depends on biological, socioeconomic, food supply/availability, and cultural aspects⁴. In athletes, little access to accurate information, influence of the media, coach and peers, and the adoption of restrictive diets aimed at achieving desired weight/body composition, play particularly important roles⁵.

To investigate aspects that affect food choices is to look beyond the relationship between nutrition knowledge and dietary practices⁵; it involves investigating the factors that influence food choices, such as: food availability, social and cultural environment, beliefs, habits, body image perception, among others⁶. Understanding what governs these food choices allows the professional team to provide support and alternatives to motivate the adoption and maintenance of an adequate diet for athletic performance and health⁵. Furthermore, to know if and when athletes intend

to change their eating habits, and only then plan the diet intervention, is also pointed out as important for the professional sports team⁷.

Studies with athletes indicate the need to develop food and nutrition education programs, which enables individuals to take appropriate nutritional decisions and make autonomous food choices^{2,3,8}. These programs should be specially designed and consider the demands of athletes¹.

Considering this, the aim of this study was to qualitative and quantitatively evaluate the impact of an interdisciplinary program of Food, Nutrition and Health Education (FNHE), planned and developed according to specific demands of an adolescent female volleyball team, on some of the factors involved in their food choices (nutrition knowledge, intention to change eating behavior and body dissatisfaction).

METHODS

The Food, Nutrition and Health Education program was created based on a study that investigated nutritional issues of athletes in the city of Santos/Brazil, and which identified inappropriate food intake, nutrition knowledge gaps, food beliefs, and body dissatisfaction⁹. The activities were designed by an interdisciplinary group (nutrition and psychology) for a female volleyball team.

The theoretical framework comprised Freire's precepts¹⁰ and the Maguerez's Arch methodology¹¹. From Freire¹⁰ we adopted and applied the precepts of the horizontal dialogue (without health professionals' authoritarianism), and aiming to apply theory to practice, activities were directed at promoting group discussions. As recommended by Freire¹⁰, previous knowledge and beliefs were respected and subjects were encouraged to exchange their knowledge and experiences. Activities stimulated participative actions and athletes' empowerment. The five learning steps proposed in the Maguerez's Arch methodology¹¹ were adopted as follows: early in the process, mainly in the first group discussion,

subjects were encouraged to observe their reality and identify problems and their key points (first and second steps, respectively); information was provided in the following meetings, through ludic educational activities. Adding this new knowledge to their own previous knowledge and experiences, athletes were encouraged to find solutions (third and fourth steps). Finally, they were encouraged to use the possible solutions according to their reality (fifth step). Throughout the meetings, the professional team supplied the athletes with tools to deal with and improve their daily habits. Both problematization methodological frameworks are considered important critical pedagogical approaches for health education, since they value knowledge and experience of the subjects and assist them in recognizing subsidies to transform their reality¹².

The study was approved by the Research Ethics Committee of the *Universidade Federal de São Paulo* (n° 220448/13). The sample comprised of a female volleyball team (juvenile category), which represented the city of Santos in regional and state level competitions. The athletes had three to ten years of volleyball practice, and in the study year they were among the eight best teams of São Paulo state. Out of the 14 athletes who comprised the team, 10 completed all stages of the program and were included in this study.

The program consisted of eight monthly meetings. Profile information was collected in the first meeting, whereas educational intervention activities were held in the following six meetings. In the final meeting the program impact was evaluated, both qualitatively (discourses and reported impressions) and quantitatively (statistical analysis of the questionnaires' results before and after the intervention).

The steps to plan the FNHE program were: 1) education profile assessment; 2) goal setting; 3) selection of programmatic content; 4) development of materials; 5) logistical design; 6) program evaluation process¹³.

Athletes answered questions on demographic characteristics, eating habits, exercise routine, and

socioeconomic status¹⁴. Nutrition knowledge was assessed through a validated questionnaire containing multiple-choice questions about healthy eating, food groups, and nutrient composition (macro and micronutrients), and a five-point Likert scale with 18 statements based on beliefs about sports nutrition⁷. Each correct answer was assigned one point, with a maximum possible score of 53 points. The transtheoretical model¹⁵ assessed the stage of intention to change eating behavior. The self-assessment instrument contains questions regarding 'when' and 'how motivated' the athlete was in planning to change and adopt a healthy diet. By a generated algorithm, participants could be categorized into one of six stages: pre-contemplation (no intention of changing behavior); contemplation (recognizing the need to change behavior and intention to do it in the next six months); preparation (she/he wants to change behavior in the next 30 days and has already taken some actions accordingly); action (changed behavior less than six months ago); maintenance (changed behavior more than six months ago); or relapse (interruption of the changed behavior and return to old practices)¹⁵.

Body dissatisfaction was identified with the body shape scale proposed by Kakeshita *et al.*¹⁶ for adults, which is appropriated for adolescents¹⁷. This body shape scale ranges from thinness (silhouette 1) to obesity (silhouette 15), and athletes selected the body shape that represented their "current body shape" and their "desired body shape". Dissatisfaction was given by the difference between current and desired body shapes (zero= satisfaction with body image, less than zero= dissatisfaction with thinness; greater than zero= dissatisfaction with excessive weight). Furthermore, the Body Shape Questionnaire¹⁸ was used to classify athletes' body distortion in: "without distortion" (<80 points), "slight distortion" (<111), "moderate distortion" (<141), and "severe distortion" (>141).

A group discussion was organized to complement the profile and identify athletes'

demands. Through a problematization methodology, participants were stimulated to express opinions about specific topics (food attitudes, barriers, interests)¹⁹. The speeches of the group were recorded by observers and later analyzed using the Collective Subject Discourse²⁰. This method is based on the construction of a 'collective self', that means, it reconstitutes several individual speeches of a group, gathered under central ideas, in a speech that represents the collective. From recorded speeches, key expressions were identified, deriving central ideas, which represent the content of the key expressions in a concise manner. Central ideas were grouped into categories with similar meanings and collective subject discourses were created in the first-person singular, portraying opinions on the discussed topics that represent the collective²⁰.

Each of the six ludic activities focusing on food, nutrition, and health is summarized in Chart 1. After the six meetings, questionnaires were readministered to assess the impact of the FNHE program. Results are expressed as mean and standard deviation. The Student's *t*-test compared the baseline and final results of the Body Shape Questionnaire and knowledge score.

The observers took notes in all meetings²², which were used to complete the data. All notes were analyzed based on the Collective Subject Discourse method. At the final meeting, through a discussion group, athletes evaluated the program, expressing positive and negative aspects, the most meaningful messages, dietary modification throughout the process, and the intention to change eating practices after the program. This second discussion group was designed to qualitatively evaluate impressions on FNHE program.

RESULTS

The athletes were 17.2 (SD=0.94) years old, attended high school (n=7), were classified socioeconomically as class B (n=6), and had a training schedule of 16 hours/week. Six athletes

Chart 1. Outline of the six meetings of the interdisciplinary program of Food, Nutrition, and Health Education developed with an adolescent female volleyball team, by themes, objectives, and strategies. Santos (SP), Brazil, 2015.

Meeting	Theme	Educational objectives	Used strategies
1°	Healthy diet	To know and understand the idea of a healthy diet.	Explanation followed by a board game.
2°	Nutrition and sports performance	To be capable of making good food choices for performance.	Discussion of eating situations relate to competition (pre-game, during/ immediately after, post-game meal).
3°	Pressure for results, anxiety and eating	To learn coping strategies to deal with sports pressure.	Discussion based on different stress situations in sport.
4°	Antioxidants in fruits and vegetables	To know the importance and stimulate the consumption of these food groups.	Explanation followed by a game ("capture the flag of antioxidants") and tasting of a healthy recipe with vegetables.
5°	Energy equivalence	To know how food groups can be alternated.	Culinary workshop.
6°	Body image and healthy food choices	To be sensitized to making good food choices and its relation with body image.	Group discussion.

Note: Adapted from Daniel *et al.*²¹.

moved from their hometown to be part of the city's team and shared the same residence. Lunch was available at a sports club restaurant. Training and school schedule created some food intake difficulties, mainly lack of time and tiredness for cooking evening meals.

Table 1 shows the results of nutrition knowledge. The program improved the team's knowledge score ($p=0.03$). Nutrition beliefs in sports decreased after the program, and those with fewer "believers" at the end were: "pineapple has special value in diets for weight loss because they burn fat" (from 4 to 1 athlete) and "to enhance muscle definition it is necessary to maintain a diet with little bread and potatoes" (from 7 to 2 athletes). The most present belief was protein overvaluation, with 82% (n=9) of concordant athletes before the FNHE program; notwithstanding, after the intervention only one athlete changed her opinion.

Two athletes completed the questionnaire on intention to change eating behavior incorrectly and were excluded from this analysis. The remaining athletes (n=8) showed heterogeneity in the stages. Five athletes advanced at least one stage of intention to change behavior (Figure 1).

Table 1. Mean and standard deviation of correct answers in the nutrition knowledge questionnaire and percentage of nutrition beliefs in sports before and after the Food, Nutrition and Health Education program (n=10).

Nutritional aspects	Before		After	
	M	SD	M	SD
Nutrition knowledge	57.0	9.9*	63.0	11.8*
Macronutrients' questions	72.0	16.6	77.3	16.7
Micronutrients' questions	27.0	22.6	38.0	24.9
Food groups' questions	98.9	3.5	97.8	4.7
Nutrition beliefs in sports (%)	70.9	15.9	58.2	16.2

Note: * $p=0.03$.

M: Mean; SD: Standard Deviation.

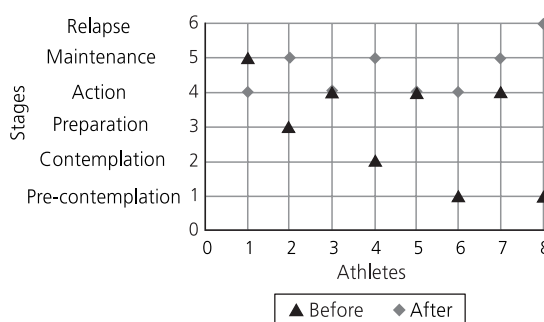


Figure 1. Distribution of athletes according to the stage of behavior change and their classifications before and after the Food, Nutrition and Health Education program (n=8). Santos (SP), Brazil, 2015.

This result was confirmed in the final meeting, when six athletes reported the intention to make future changes, emphasizing vegetable consumption, substitution of snacks for balanced meals at dinner, and reduction of sweets intake.

The program did not change the mean Body Shape Questionnaire scores ($p=0.235$). Before the FNHE program, mild body image distortion was observed in three athletes, while the others were classified as 'without distortion'. After the program four athletes presented mild, one presented moderate, and five had no body image distortion.

Body image dissatisfaction (Figure 2) was initially observed in six athletes, and only four of them were less dissatisfied after the program. The greater the difference between current and desired body shape, the greater the degree of dissatisfaction. The magnitude of initial dissatisfaction ranged from -1 to 5, and the final assessment ranged from -2 to 3.

Chart 2 shows the athletes' perceptions about discussed issues and intention to change daily practices. At the fourth meeting, the coach reported having observed positive changes regarding the food brought to competitions, saying that habitual commercially-prepared snacks were replaced by homemade sandwiches and fruits. At the final meeting, nine athletes said they

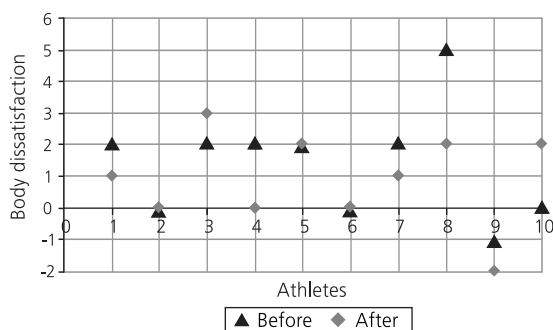


Figure 2. Body dissatisfaction before and after the Food, Nutrition and Health Education program (n=10). Santos (SP), Brazil, 2015.

had made dietary changes during the year: daily intake of fruits, vegetables, and breakfast; food intake before and after training (athletes who ate nothing or preferred sandwich cookies after training started eating cereal bars or fruits); decrease in high-energy, low-nutrient food intake (referred by the athletes as "junk food") throughout the day and awareness of the quantity consumed. All participants evaluated the program positively, indicating preference for ludic and participatory dynamics.

DISCUSSION

The athletes are adolescents, who study and train daily, and some live away from their families, all aspects that may influence their food choices, as well as their economic condition. Gouvea *et al.*²³ emphasizes that in addition to socioeconomic factors, team interaction and family support should be considered.

Previous studies that analyzed the nutrition knowledge of female volleyball athletes reported similar findings (55.0%²⁴ and 45.0%² of correct answers) compared with our pre-FNHE results (57.9%). The main contribution of the program was to improve nutrition knowledge. An individualized dietary education provided by Valliant *et al.*² also had positive impact on nutrition knowledge (increasing from 45.0 to 57.0%). All these studies confirm that FNHE programs can contribute to nutrition knowledge.

The beliefs presented by the athletes were also found in other studies. Rosenbloom *et al.*⁸ also noted that athletes avoid carbohydrates when trying to lose weight. In another study²⁵ the belief that pineapple helps to "burn body fat" was common among coaches, and the authors highlighted the risk of propagating this information among athletes. Protein overvaluation was also observed by Almeida & Soares²⁶, who analyzed the dietary profile of adolescent volleyball players.

Despite the importance of going beyond knowledge transmission when designing a FNHE

program, in most studies, which proposed such programs for athletes, activities are planned based on generalized nutrition information²⁷, frequent nutrition doubts presented by athletes²⁷, or general nutrition recommendation for performance²⁸. The present study, using the diagnosis results to design a process based on athletes' needs, was constructed to be meaningful for the group and to link the contents discussed in each activity to their reality.

Chalip²⁹ suggests that the heuristic theory of Tversky and Kahneman can be associated with the difficulties of athletes' education process. The first factor highlighted is 'availability', when the individual, at the time of decision, considers and reacts according to what is mostly available in his/her mind. The 'representativeness' factor gives causal relation to the situations and enhances availability; therefore, by recalling an example of other successful athletes and their nutrition strategies, even receiving information that those strategies are not the most appropriate, individuals disregard the guidelines given by experts and rely on "false" claims. The third factor is called "anchor and adjust". From a formed and previous opinion any contrary information could be believed, but not considered. Although these factors hinder the FNHE process, the author outlines three strategies that will change them and affect food choices positively: a) athlete's imagination should be stimulated; b) health professionals, contrary to formed opinions, should provide other points of view, and c) athletes should identify reasons for their eating behaviors, attributing meaning to justify behavior change²⁹. The adoption of the Maguerez's Arch methodological framework in this study allowed developing the strategies proposed by Chalip²⁹. Furthermore, we can relate them with the problematization methodology adopted from Freire's work, which took into consideration athletes' knowledge, their active participation during the education process, and the concern to supply them with tools to deal with their reality in critical and creative ways.

Although athletes did not advance significantly through the stages of change, the observed advance is noteworthy, once it may be

related to relatively stable cognitive patterns. Furthermore, the results highlight the potential of new learnings in the change process.

The final results indicated that 38% of the athletes were in "maintenance", meaning they already had made changes for at least six months, and 50% were in "action", meaning that they were in the process of changing their eating behavior (in less than six months). Knowing the stage in which the individual is classified is important to choose the intervention strategies that will assist in behavior changing¹⁵.

Public display of the body and pressure in the sports environment can lead to body dissatisfaction in athletes³⁰. Concerns about self-image³ and body dissatisfaction³¹ were also observed in other studies with female volleyball players. Regarding body distortion (Body Shape Questionnaire) our results did not show improvement between the first and second assessments. Individually, some athletes (n=3) had improved their body image perception after the program, while others (n=2, apart from the 3 that initially presented body distortion) started having image distortion. Contact with such constructs throughout the intervention program may have triggered the discrimination of new self-image determinants and consequently, a reinterpreted self-assessment. Considering that there is a sociocultural construction often involved in personality structuring, the effective modification of such patterns of interpretation may not present itself. This fact does not necessarily indicate impossibility of learning new ways to deal with the situation and reduce psychological distress.

The findings on body distortion evidenced a decrease in body dissatisfaction between assessments. It is important to highlight that the body image theme was little verbalized by the athletes during the discussion groups. This fact, together with the results obtained from the instruments, may indicate some resistance from the athletes on this issue. These findings clearly show the need to consider specific models of intervention to address body image issues in female athletes.

Chart 2. Central Ideas and Collective Subject Discourse of the meetings of the Food, Nutrition and Health Education program developed for an adolescent female volleyball team. Santos (SP), Brazil, 2015.

Meeting	Central idea	Discourse synthesis
	Pressure for results	<p><i>"I'm happy when I train well and I am praised for that".</i></p> <p><i>"I feel sad when something goes wrong and I fail at the training. I don't know what to do next, but I like to be alone".</i></p> <p><i>"I have little time for lunch. So I eat in a rush and make up for my hunger at dinner".</i></p>
Discussion Group	Difficulty with dinner	<i>"Is dinner (rice, black beans, steak, etc.) very important or can we have a sandwich?"</i>
	Relevant issues identified	<p><i>"I want to know what to eat to improve performance".</i></p> <p><i>"I don't like to eat vegetables".</i></p>
1°	Balanced diet	<i>"The thing I most liked was to know more about food, its groups and roles".</i>
	Breakfast habit	<i>"I'm not used to having breakfast because I have no time. And even when I have, cycling when I'm full is hard, so I only eat after a while".</i>
2°	What I eat before and after the game	<p><i>"When the game delays we eat what we take in our backpacks: fruits, cereal bar, and juice box".</i></p> <p><i>"After the game we should eat bread and juice, but we eat pizza, right? It is what the coach offers and if there is nothing else I will eat it, I'm not going to starve".</i></p>
	What do you intend to change in dietary habit	<i>"After this activity I intend to eat something right after the training and during breakfast".</i>
3°	Consumption and benefits of fruits and vegetables	<i>"I eat fruits every day, but vegetables not always".</i>
	Antioxidants	<p><i>"Those foods are rich in vitamins, iron, calcium, fibers, and zinc".</i></p> <p><i>"I enjoyed knowing about antioxidants. I didn't know they existed."</i></p>
	Pressure from the coach	<i>"The expectations of the coach are stressful, but he also is pressured by many people. I think all this pressure is on the account of victories besides the support, marketing and the great name and structure of the team. If I were the coach I would put more pressure on the athlete despite the risk of creating more anxiety and losing performance".</i>
4°	Responsibilities and sacrifices of an athlete	<i>"There are several elements involved in the life of an athlete, such as fans, distance from the family, injuries, and staying on the bench. To be an athlete a lot of sacrifice is needed! Take good care of the diet, work well to avoid lesions, concentrate and always try to improve defects".</i>
5°	Adequate quantity for dinner	<i>"I liked to gain notion about adequate amount and how a sandwich can substitute a traditional meal at dinner. It is good to know how much we should eat after training".</i>
	Prohibited food	<i>"There are no prohibited foods, but you have to eat well".</i>
6°	Emotional status and diet	<i>"It was interesting to learn about the influence of emotional status on food choices".</i>

The discourses reported in Chart 2 reinforce the positive impact on the athletes' food practices. The discourse, *"After this activity I intend to eat*

something right after the training and during breakfast", indicates that the lack of breakfast before a competition, identified at the beginning

of the activity, was understood as an inappropriate habit for subsequent sports performance and may be changed, as well as the intake of a recovery snack, right after the training session, as recommended³². Athletes also became more interested in their food choices, showing interest to know about food/meal equivalence, antioxidants, and the influence of emotional status on their food choices. As the importance of good nutrition for athletic performance is well recognized^{1,5,32}, it is essential that athletes become more aware and capable of handling their eating issues. Furthermore, data shows the importance of an interdisciplinary program in learning cognitive and emotional new skills.

An important aspect for the success of the FNHE program was athletes' adherence. The partnership with the technical staff and the fact that activities were developed at the end of the training sessions were crucial to ensure the presence of athletes in all activities. Ludic and participatory strategies (games, discussion groups, sensory analysis) were well received by the athletes.

Educational strategies appropriately created favorable conditions for reframing the participants' perceived reality, which represents an important element in the process of nutrition knowledge acquisition and behavior change.

The study highlights the need of further evaluation of the impact of an interdisciplinary FNHE program, planned specifically for athletes' requirements.

CONCLUSION

The interdisciplinary approach of the study FNHE program was designed according to the specific demands of the volleyball team, so the activities were proposed taking into account their knowledge gaps, nutrition beliefs, issues related to perceived body image, and stage of intention to change behavior. The program had a positive impact on nutrition knowledge and stage of intention to change behavior. Positive eating

behavior changes were identified along the meetings: higher intake of fruits, lower intake of "junk foods", daily intake of breakfast, and awareness of the quantity consumed. The lack of results on body image issues shows that there are still challenges to be overcome.

The results should not be generalized as the study aimed to assess the potential impact of this specific intervention, designed according to athletes' needs. The small sample is a study limitation. More specific strategies, more frequent meetings, and longer activities are factors that may improve success.

COLLABORATORS

NVS DANIEL planned and applied the FNHE program, collected, analyzed, and interpreted data and wrote the article. LP JÜRGENSEN planned and applied the FNHE program, collected data, and revised the article. RC PADOVANI supervised the FNHE program, analyzed and interpreted data, and revised the article. CR JUZWIAK conceived the program, supervised the planning and application of the FNHE program, analyzed and interpreted data, wrote and revised the article.

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