RBCDH Revista Brasileira de CINEANTROPOMETRIA e Desempenho Humano

DOI: http://dx.doi.org/10.5007/1980-0037.2015v17n3p280

original article

Assessment of the diet quality of team sports athletes

Avaliação da qualidade da dieta de atletas de esportes coletivos

Luana Pilon Jürgensen[1]
Natália Vilela Silva Daniel[1]
Ricardo da Costa Padovani[2]
Lara Cristina D'Avila Lourenço[2]
Claudia Ridel Juzwiak[3]

Abstract – Few studies about food consumption of athletes have assessed the quality of their food choices, and the factors that influence these choices. The aim of this study was to assess the diet of team sports athletes through a revised version of the Healthy Eating Index (HEI-R) in order to identify their nutritional knowledge and the stage of intention to change eating behavior (SICEB) and to identify possible association with demographic and anthropometric variables. Seventy-two athletes (35 men) were evaluated for the following variables: body mass, height, Body Mass Index (BMI), body fat percentage (BF%), nutritional knowledge (questionnaire), food intake (24-hour recall), diet quality (HEI-R) and SICEB (transtheoretical model). For statistical analysis, the Student t test and the Pearson correlation coefficient were used. None of the athletes presented diet classified as "healthy" and 45.7% (men) and 51.4% (women) had "inadequate" diets. Low consumption of fruits, vegetables, whole grains, milk and dairy products was observed. The HEI-R "meats, legumes and eggs" component received the best scores. Pre-contemplation (25.0%) and action (23.6%) stages were the most frequent in the group. The mean percentage of correct answers in the nutritional knowledge questionnaire was 55.7% (men) and 57.3% (women). No association was found between HEI-R and variables age, BMI, BF%, SICEB, nutritional knowledge score and energy intake. This group presents inadequate dietary intake. The lack of association between study variables indicates the need to investigate other factors that influence athlete's feeding behavior.

Key words: Athletes; Cross-sectional studies; Feeding; Feeding behavior.

Resumo – *Poucos estudos sobre o consumo alimentar de atletas avaliam a qualidade dos alimentos selecionados e os fatores que interferem nessas escolhas. Objetivou-se avaliar a dieta de atletas de esportes coletivos por meio do Índice de Qualidade da Dieta – Revisado (IQD-R), identificar seu conhecimento nutricional, estágio de intenção de mudança de comportamento alimentar (EIMCA) e identificar possíveis associações com variáveis demográficas e de antropometria. Foram avaliadas as seguintes variáveis em 72 atletas (35 homens): massa corporal (MC), estatura, IMC, percentual de gordura (%G), conhecimento nutricional (questionário), consumo alimentar (recordatório de 24-horas), qualidade da dieta (IQD-R) e EIMCA (modelo transteórico). Para a análise estatística empregou-se o teste t de Student e coeficiente de correlação de Pearson. Nenhum atleta apresentou dieta classificada como "saudável" e 45,7% (homens) e 51,4% (mulheres) apresentaram dieta "inadequada". Há baixo consumo de frutas, hortaliças, cereais integrais e leite e derivados. O componente do IQD-R "carnes, leguminosas e ovos" recebeu a melhor pontuação. Os estágios pré-contemplação (25,0%) e ação (23,6%) foram os mais frequentes. O percentual médio de acertos dos atletas no questionário de conhecimentos nutricionais foi 56,5%. Não foi observada associação entre IQD-R e as variáveis: idade, IMC, %G, EIMCA, escore de conhecimento nutricional e consumo energético. O grupo apresenta inadequação do consumo alimentar. A falta de associação entre as variáveis estudadas indica a necessidade de investigação de outros fatores que influenciam o comportamento alimentar de atletas.*

Palavras-chave: *Alimentação; Atletas; Comportamento alimentar; Estudos transversais.*

1 Federal University of São Paulo. Baixada Santista Campus. Interdisciplinary Postgraduate Program in Health Sciences. Santos, SP. Brazil.

2 Federal University of São Paulo. Baixada Santista Campus. Department of Health, Education and Society. Santos, SP. Brazil.

3 Federal University of São Paulo. Baixada Santista Campus. Department of Human Movement Sciences. Santos, SP. Brazil.

Received: 14 January 2015
Accepted: 22 March 2015

INTRODUCTION

Sports performance and post-exercise recovery can be optimized with adequate feeding practices[1]. However, studies have detected that athletes do not fully meet recommendations[2-6]. Nevertheless, there is little knowledge about possible barriers and facilitators to select diets that contribute to athletic performance[7-9]. In general, studies are based on the comparison of energy and nutrients intake with specific recommendations[4-6], and few have assessed selected foods and their quality[3,9]. Several tools have been proposed to assess the quality of diets such as the Healthy Eating Index (HEI), the Nutrient Index, and the Diet Variety Score[10]. HEI, published in 1995 in the US, was later adapted for Brazil[11]. In 2011 a revised version, the Revised Brazilian Health Eating Index (HEI-R)[12] was proposed, which evaluates the consumption of food groups and some nutrients, comparing it to recommendations. Although not specifically designed for athletes, the HEI-R allows adjusting food servings to energy consumption, making it interesting to assess athletes, who generally have higher energy intake.

Several factors influence food choices: biological, comprising age, health status, hunger/satiety mechanisms and flavors preferences ; experiences with food, which represent learning to like certain foods and associations, physiological, social and personal: beliefs, attitudes, knowledge, culinary skills, family/social influences, as well as environmental factors, such as availability, accessibility and culture. These dynamic factors interact in determining food choices[13].

Among these factors, nutritional knowledge and intention to adopt more appropriate feeding behavior are aspects that deserve attention among athletes. Although knowledge may influence food selection and therefore sports performance[14], the relationship between knowing and doing is not always clear[13]. In addition, adherence or maintenance of healthy feeding behavior changes depending on intrinsic or extrinsic motivation that encourages individuals to act[15].

Considering the importance of food choices for health and excellence in performance, and given the gap in research with this approach, the aim of this study was to evaluate diet through the HEI-R in order to identify nutritional knowledge, intention to change eating habits, age, Body Mass Index (BMI), body fat percentage (BF%), training hours/week and energy intake, and assess the relationship between these variables.

METHODOLOGICAL PROCEDURES

This is a cross-sectional study with a quantitative approach. Seventy-two athletes (35 male) from team sports of Santos/SP were evaluated. To characterize the sample, a trained health team performed the following measures: body mass (BM) measured in digital scale (G-tec®); height, measured in a fixed stadiometer (Sanny®) and skinfolds (triceps, subscapular, supra iliac, abdominal, thigh, chest and mid-axillary) with adipometer (Cescorf®).

Athletes were barefoot and wore light clothing. BMI was calculated and classified according to age by the WHO cut-off points[16,17], and BF% using equations of Slaughter et al.[18] for those under 18 years of age, and Jackson and Pollock[19,20] for those over 18 years of age.

The study was approved by the Research Ethics Committee of the Federal University of São Paulo (appraisal 2087/11 on January 06, 2012). Data were collected between August/2012 and July/2013.

Nutritional knowledge assessment

Athletes answered a nutritional knowledge questionnaire, and a score was calculated (maximum = 53). The questionnaire was developed for the study "Nutritional Mapping of High-Performance Athletes" and validated by the same authors. It consisted of multiple choice questions elaborated based on the literature[21,22], addressing two categories: nutritional knowledge (food composition, food groups and health and sports nutrition) and food beliefs. Validation took place in three stages: 1) questionnaire evaluation by six professionals; 2) application to a pilot group of athletes who did not participated in this study. These steps showed need for adjustments; 3) After modifications, the questionnaire was applied to two new groups: undergraduate nutrition students at two times (before and after intervention, which was to attend the Sports Nutrition discipline in the 3rd year) and other athletes who did not participated in this study.

The questionnaire allowed to identify changes in the scores of nutrition students with a difference of 6.2 [Min = 3.2 and max = 9.2] points between assessments, before and after intervention (p = 0.005). In addition, the scores discriminated individuals with some nutrition knowledge from laymen. For this, the Student t test for unrelated samples was used, verifying average difference of 12.9 [min = 9.4; max = 16.3] points among groups (p = 0.001).

Dietary assessment

A 24-hour recall of one usual day of training was applied by a trained team. Photographic record of foods[23] was used to estimate amounts ingested. To estimate the HEI-R's nutrient components, the Virtual NutriPlus[Ò] software was used. Food groups were evaluated according to the Food Guide for the Brazilian Population[24]. For the final analysis, the HEI-R[12] was applied, which was composed of nine food groups, two nutrients and one component representing the energy value provided by solid fat, alcohol and sugar. The maximum score of components was obtained with intake greater than or equal to recommendation. In the absence of consumption, a score zero was assigned, and intermediate values were proportionally calculated[11] (Box 1).

The score (maximum = 100) was calculated by comparing consumption to the recommended number of daily servings[24] per 1000 kcal. Diet was classified as: "inadequate" (less than 51 points) "needs modifications" (between 51 and 80 points) and "healthy" (greater than 80 points)[25].

Box 1. Score of DQI-R components

Components	Maximum score	Serving corresponding to maximum score
Total Fruits[b]	5	1.0 serving/1.000Kcal
Whole fruits[c]	5	0.5 serving /1.000Kcal
Total vegetables	5	1.0 serving /1.000Kcal
Dark green and orange vegetables and legumes[d]	5	0.5 serving /1.000Kcal
Total cereals[a]	5	2.0 serving /1.000Kcal
Whole cereals	5	1.0 serving /1.000Kcal
Milk and dairy products[e]	10	1.5 serving /1.000Kcal
Meats, eggs and legumes	10	1.0 serving /1.000Kcal
Oils[f]	10	0.5 serving /1.000Kcal
Saturated fat	10	7%TEV
Sodium	10	≤0.7 g/1.000Kcal
Fat_AS	20	≤10% of TEV

[a]Total Cereals = cereals, roots and tubers; [b]Includes fruit and natural fruit juices; [c]Excludes fruit juices; [d]Includes legumes only after maximum score of meat, eggs and legumes is reached; [e]Includes milk and dairy products and soy beverages; [f]Includes mono- and polyunsaturated fats, oilseed oils and fish fat; Fat_AS: calories from solid fat, alcohol and sugar; TEV: Total Energy Value
Source: Previdelli et al, 2011.

Identification of the stage of intention to change eating behavior (SICEB)

To identify SICEB, the transtheoretical model[26] was adopted, which categorizes the individual into one of the following stages:

- Pre-contemplation: no intention of changing in the next six months;
- Contemplation: individual begins to consider the need to change eating behavior in the future with intention to change within six months;
- Preparation: individual decides to change and starts strategy planning period. There is intention to change over the next thirty days and some steps have already been taken;
- Action: individual implements the change plan and begins performing it consistently in less than six months;
- Maintenance: behavioral practice is solidified and incorporated in routine for more than six months, being characterized as the effort to prevent relapse.
- Relapse: it can happen at any stage, which is represented when the individual returns to old habits.

Individuals completed a self-administered questionnaire[28] on intention to change behavior related to healthy eating, which, by means of an algorithm, identifies at which stage the individuals is in at the time.

Statistical analysis

The results were presented as mean, standard deviation and minimum and maximum values. To compare genders with respect to the variables of interest, the Student t test for unrelated samples was used. To investigate the association between pairs of variables of interest (between HEI-R and:

nutritional knowledge, SICEB, age, BMI, %BF, training hours/week and energy intake) the Pearson correlation coefficient and the 95% confidence interval (CI) were used. The critical level of p£0.05 was considered significant.

RESULTS

Initially 157 basketball, indoor soccer, handball and volleyball athletes were invited to participate, and those who did not complete the evaluation stages (n = 46; 29.3%) or have trained for less than one year and/or less than three days/week (n = 39; 24.8%) were excluded.

Table 1 shows the characteristics of the athletes. The sample consisted of 86.1% of adolescents. Men had higher mean values of age, body mass, height and energy intake, while women had higher %BF.

Table 1. Characteristics of athletes. Santos, 2014

	Men (n=35)			Women (n=37)		
	Mean	SD	min-max	Mean	SD	min-max
Age (years)	19.1[a]	4.4	15.0-38.0	17.3[a]	1.5	15.0-20.0
Body mass (kg)	82.6[b]	14.8	59.4-112.7	66.2[b]	14.8	50.5-92.5
Height (cm)	183.8[c]	8.2	170.0-197.5	165.7[c]	7.0	149.3-178.0
Body Mass Index (kg/m^2)	24.4	2.8	20.6-32.6	23.9	2.9	19.2-32.0
Body fat percentage	16.6[d]	9.6	3.7-49.9	25.5[d]	6.5	15.5-45.9
Total training (hours/week)	13.0	2.6	6.0-18.5	12.5	3.5	7.5-14.0
Energy intake /day (kcal)	3179[e]	1131	1598-6112	2097[e]	1238	813-8027

SD = standard deviation; min-max = minimum-maximum values. [a]p = 0.027; [b, c, d, e] p = 0.001;

It is noteworthy that 33.3% were overweight according to BMI. There was a moderate correlation between BMI and% BF (r = 0.62; confidence interval 95% - CI = 0.46; 0.75).

Table 2 shows the HEI-R score. None of the athletes had a healthy diet and 45.7% of men and 51.4% of women had inadequate diets.

Of the total, 45.7% and 48.6% of men and 56.8% and 59.5% of women did not consume vegetables and whole fruits on that day, respectively. Only 10.8% of women and 14.3% of men met the recommended intake of milk or dairy products and 5 athletes (three men) consumed whole grains and one met recommendations. The component "meats, legumes and eggs" showed the best score, 56.8% of women and 68.6% of men had scores above recommendation.

Variation in the items comprised in the Fat_AS component was observed. The average consumption of added sugar was 71.9g (SD = 57,5g, ranging from 0.0 to 264.6g/day) and 67.0g (SD = 55.3g, ranging from 4.0 to 244.0g/day) and solid fat 100.3g (SD = 60.2g, ranging from 35.0 to 312.0g/day) and 59.1g (SD = 41.9, ranging from 13.0 to 248.5g/day) for men and women, respectively. Only one athlete reported drinking alcohol (148g alcoholic beverage/day). As for the added sugar, simple carbohydrates in the form of supplements were also considered, and seven athletes used this strategy during or after training.

Table 2. HEI-R and athletes' score per component. Santos, 2014

	Men (n=35)		Women (n=37)	
Component	Serving/ 1.000Kcal	Score	Serving / 1.000Kcal	Score
DCI-R Score	-	52.4 (10.0) [33-69.7]	-	51.4 (10.1) [28.7-70.0]
Total fruits	0.6 (0.7) [0.0-3.0]	2.2 (2.1) [0.0-5.0]	0.9 (1.2) [0.0-5.3]	2.5 (2.2) [0.0-5.0]
Whole fruits	0.3 (0.4) [0.0-1.4]	2.1 (2.3) [0.0-5.0]	0.4 (0.6) [0.0-2.5]	1.9 (2.4) [0.0-5.0]
Total vegetables	0.4 (0.5) [0.0-2.4]	1.6 (1.8) [0.0-5.0]	0.3 (0.4) [0.0-1.4]	1.3 (1.9) [0.0-5.0]
Dark green vegetables and legumes	0.5 (0.3) [0.0-1.3]	3.2 (2.0) [0.0-5.0]	0.5 (0.6) [0.0-1.8]	2.5 (2.4) [0.0-5.0]
Total cereals	2.0 (0.6) [1.1-3.8]	4.6 (0.6) [2.8-5.0]	2.3 (0.8) [1.0-3.9]	4.5 (0.8) [2.3-5.0]
Whole cereals	0.1 (0.2) [0.0-1.2]	0.3 (1.0) [0.0-5.0]	0.0 (0.1) [0.0-0.6]	0.1 (0.4) [0.0-2.2]
Milk and by-products	0.8 (0.7) [0.0-2.6]	5.1 (3.6) [0.0-10.0]	0.7 (0.7) [0.0-2.5]	4.5 (3.6) [0.0-10.0]
Meats, legumes and eggs	1.4 (0.5) [0.6-2.9]	9.8 (0.9) [5.5-10.0]	1.3 (0.8) [0.0-3.8]	9.1 (2.1) [0.0-10.0]
Oils	0.6 (0.3) [0.2-1.6]	8.6 (1.8) [4.2-10.0]	0.8 (0.4) [0.3-1.9]	9.8 (0.6) [6.9-10.0]
Saturated fat	10.4 (4.2) [3.5-19.2]	6.0 (3.8) [0.0-10.0]	10.0 (2.7) [4.8-15.1]	6.8 (3.1) [0.0-10.0]
Sodium	1.1 (0.3) [0.5-1.8]	6.9 (2.3) [1.9-10.0]	1.2 (0.6) [0.4-3.2]	6.5 (2.7) [0.0-10.0]
Fat, sugar and alcohol	36.5 (9.4) [21.3-58.0]	2.3 (3.0) [0.0-10.3]	36.6 (9.5) [19.5-62.4]	2.3 (3.5) [0.0-11.6]

Values expressed as mean (standard deviation), [minimum-maximum values]

Only two athletes reported other supplements; one of them consumed whey protein and other BCAA and whey protein, not considered in any of the components.

The SICEB classification was heterogeneous. Men were mostly in the pre-contemplation and maintenance stages, while women were in the decision and action stages (Figure 1).

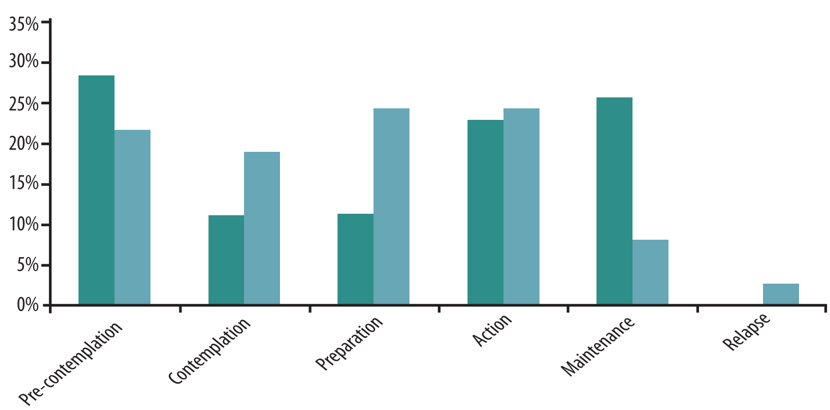

Figure 1. Distribution of athletes according to the stage of intention to change eating behavior

Considering the possible 53 points of the nutrition knowledge questionnaire, men had, on average,55.7% (mean score = 29.5, SD = 7.1) and women 57.4% (mean score = 30.4, SD = 5.7) of correct answers. Questions with higher proportions of correct answers were about: pre-training snack (98.6%), healthy eating (91.6%), balanced meal (90.3%), post-training snack (84.7%), foods high in fats and food groups (both with 88.0%). The lowest proportion of correct answers was about foods rich in vitamin C (27.2%). The most common beliefs were related to the overvaluation of proteins, consumption of pure water as the best strategy for long training sessions and banana as the best strategy against cramp.

No association was found between the HEI-R score and the variables analyzed ($p > 0.05$) (Table 3).

Table 3. Association between HEI-R and the variables analyzed. Santos, 2014

Variables	r	Confidence interval
Age	0.07	[-0.16;0.30]
Body Mass Index	-0.01	[-0.24;0.23]
Fat percentage	0.00	[-0.23;0.24]
Hours of weekly training	-0.02	[-0.25;0.22]
Stage of intention to change eating behavior	0.20	[-0.04;0.41]
Nutritional knowledge	0.08	[-0.15;0.31]
Energy intake	-0.19	[-0.40;0.04]

DISCUSSION

The average BM value found for women was higher than that found for adolescent athletes of different sports discipline (54.7kg)[2], volleyball (57.0kg)[3] and indoor soccer players (60.0kg)[5]. The means found are within ranges reported in literature for height (157.7 to 165.0cm)[2,3,5] and BMI (21.5 to 22.4 kg / m2)[2,3,5]. The proportion of those classified as overweight, according to BMI, was higher than that found for adolescents of different sports disciplines (28%)[2]. Men showed higher mean BM value compared to adolescents of different sports disciplines (62.7kg)[2], indoor soccer (74.2kg)[5] and volleyball players (65.7kg)[6], as well as for height (166.4 to 175.0cm)[2,5,6] and BMI (21.3 to 24.1kg/m^2)[2,5,6]. The proportion of overweight, according to BMI, was lower in athletes from Santos compared to those studied by Zimberg et al.[2] (38%). The age range found in the studies could probably explain the magnitude of values found.

In athletes, the association between body composition and BMI is essential to identify whether BMI is high at the expense of muscle mass or fat. The results of this study suggest that overweight, in some cases, is related to high %BF. Excess BM, mainly due to high fat can impair performance. Conte et al.[28] found that overweight resulted in lower abdominal muscle strength, lower limb strength and agility in adolescents.

Studies on food intake have shown varied energy intake[3-6]. The average energy intake by athletes from Santos was higher than that found for volleyball players (1447 Kcal)[3] and close to the intake of handball (2102 kcal)[4] and indoor soccer players (2294 kcal)[5]. Men showed energy intake between values found for indoor soccer (2796 Kcal)[5] and volleyball players (3688 Kcal)[6].

There are no other studies using the HEI-R to assess athletes. Bissochi and Juzwiak[3] used the HEI[25] to evaluate adolescent volleyball players and Malinauskas et al.[9] used the HEI in college baseball athletes. These authors observed that most athletes needed changes in their diets; although the instruments adopted did not have their components adjusted to energy value and used different components from those of the HEI-R.

Those studies' findings[3,9] on the consumption of fruits and vegetables are in line with this study. Although the "fruits" component of the HEI is based on servings/day, without adjustment to energy values, it was the second worst score among baseball players[9] and most volleyball players[3] did not ingest recommended values. Another common feature of the studies was that the "meats and eggs" component presented the best score. Most of the athletes from Santos and those cited in previous studies[3,9] consumed amounts of meats and eggs equal to or greater than recommended values. This result may be related to the overvaluation of protein intake identified in the beliefs presented by athletes, corroborating this perception among athletes[29]. In addition, the age group must be considered, as this may be one of the factors which influence food choices[13].

As a limitation, not exclusive to the HEI-R, is that the excessive intake of some groups i.e. meat, was not considered. Nevertheless, the excess of this food group reflected in the low score of the saturated fat component.

Although the intake of added sugar should be restricted, in athletes, using this type of carbohydrate during prolonged exercise (30-60g/h),is an interesting strategy to help maintaining blood sugar levels and delaying the depletion of muscle glycogen stores[1]. The seven athletes who consumed sports drinks had reduced scores of this component, even being a recommended strategy. This characteristic must be considered when selecting this instrument to assess athletes' diet.

The heterogeneous SICEB classification confirms the importance of planning food and nutrition education activities (NEA) considering that not everyone is ready for changes and of the same magnitude[15]. Individuals at different stages benefit from different types of educational messages. For example, for individuals at the maintenance stage, activities can be focused on practice; while for those at the pre-contemplative stage, to stimulate awareness may be more interesting since they do not recognize the problem[15].

Although studies have indicated that food choices are influenced by age, body composition, body image, educational level and motivation[15], the lack of association between variables supports the principle of dynamic interaction of biological, social, cultural and psychological components[13].

The concern with excessive weight and body fat was identified as having influence on the feeding behavior of soccer players[7] and adolescents of aesthetic sports[8]. In addition, lack of time, financial constraints, culinary skills and the sporting environment stand out as components affecting food choices.

No other study has used the same nutritional knowledge questionnaire, making the comparison of results difficult. However, the average percentage of correct answers obtained by the athletes from Santos was better than the results found for volleyball players before intervention (44.9%) and close to the results after intervention (57.3%)[30], as well as for rugby players (55.6%)[21]. Nevertheless, the lack of association between knowledge and the HEI-R reinforces that knowledge is only one of the influencing factors and NEA strategies based only on knowledge transmission may not be effective. Furthermore, it should be considered that eating reflects socio-cultural aspects and individual experiences determinants of behavior. In addition to physiological needs, eating habits acquired at different stages of life can have meanings and be related to psychological, environmental, economic and cultural processes[13].

Although many factors influence food choices, as described above, this study has only assessed the effect of nutrition knowledge and SICEB on diet quality, finding no association between them. Biological and environmental factors also have fundamental importance; however, for identification and analysis, they require longer follow-up of the target group, which was not possible in this study. Further studies should seek to evaluate and discuss these factors to better understand the complex process of food choices.

It is noteworthy that this study has limitations that may have influenced the lack of associations between variables, such as the small sample size and application of the 24-hour recall, which does not assess the variability in daily intake and is dependent on the memory and report of subjects. Longitudinal studies and/or the use of qualitative methods such as in-depth interviews, which explore the history of life and food experiences, may clarify other issues that quantitative methods cannot measure, enabling a better understanding of food choices among athletes.

CONCLUSION

The results of the assessment allowed concluding that athletes have inadequate dietary intake. The lack of association between variables indicates the need to investigate other factors that influence food behavior of athletes, in order to know the determinants of their food choices. To understand these factors allows the development of NEA actions designed according to specific need of the groups, enabling improvements in the quality of diet, nutritional knowledge, body composition, and consequently sports performance.

Acknowledgments

To the students of the Federal University of Sao Paulo who participated in the Nutritional Mapping of High-performance Athletes (2013-2014), to the Department of Physical Evaluation (SEAFIS) of the Municipal Sports Bureau (SEMES), to the Pro-Sport Foundation of Santos (FUPES) and to Fabio Tadeu Montesano and Felipe de Souza Granado for the statistical analyses. To CNPQ for the Institutional Program of Scientific Initiation Scholarships - PIBIC.

REFERENCES

1. American College of Sports Medicine, American Dietetic, Association, Dietitians of Canada. Nutrition and Athletic Performance. Med Sci Sports Exerc 2009;41(3):709-31.
2. Zimberg IZ, Cavalieri RB, Camargo LR, Cintra IP. Perfil nutricional de adolescentes esportistas frequentadores de um ambulatório de nutrição esportiva. Braz J Sports Nutr 2012;1(1):21-9.
3. Bissochi CO, Juzwiak CR. Avaliação nutricional e da percepção da autoimagem corporal de atletas adolescentes de voleibol. Nutrire 2012;37(1):34-53.
4. Weber MH, Kehl C, Moreira JCF. Comparação do perfil dietético e antropométrico de atletas de handebol durante um período de treinamento. FIEP Bulletin 2012;82 Special Edition - Article II; Available from: http://www.fiepbulletin.net [2015 fev 10].
5. Quintão DF, Oliveira GC, Silva AS, Marins JCB. Estado nutricional e perfil alimentar de atletas de futsal de diferentes cidades do interior de Minas Gerais. Rev Bras Futebol 2009;2(1):13-20.
6. Dias SX, Bonatto S. Composição corporal e perfil dietético de adolescentes atletas de voleibol da universidade de Caxias do Sul – RS. RBNE 2011;5(29):417-24.
7. Long D, Perry C, Unruh SA, Lewis N, Stanek-Krogstrand K. Personal food systems of male collegiate football players: a grounded theory investigation. J Athl Train 2011;46(6):688-95.
8. Fortes LS, Neves CM, Filgueiras JF, Almeida SS, Ferreira MEC. Body dissatisfaction, psychological commitment to exercise and eating behavior in young athletes from aesthetic sports. Rev Bras Cineantropom Desempenho Hum 2013;15(6):695-704
9. Malinauskas BM, Overton RF, Cucchiara AJ, Carpenter AB, Corbett AB. Summer league college baseball players: do dietary intake and barriers to healthy eating differ between game and non-game days? Smart J 2007;3(2):23-34.
10. Cervato AM, Vieira VL. Índices dietéticos na avaliação da qualidade global da dieta. Rev Nutr 2003;16(3):347-55.
11. Fisberg RM, Slater B, Barros RR, Lima FD, Cesar CLG, Carandina L, et al. Índice de Qualidade da Dieta: avaliação da adaptação e aplicabilidade. Rev Nutr 2004;17(3):301-8.
12. Previdelli AN, Andrade SC, Pires MM, Ferreira, SRG, Fisberg, RM, Marchioni DM. Índice de Qualidade da Dieta revisado para população brasileira. Rev Saúde Pública 2011;45(4):794-8.
13. Contento IR. Nutrition education: linking research, theory, and practice. Asia Pac J Clin Nutr 2008;17(1):176-9.
14. Pessi S, Fayh APT. Avaliação do conhecimento nutricional de atletas profissionais de atletismo e triathlon. Rev Bras Med Esporte 2011;17(4):242-5.
15. Toral N, Slater B. Abordagem do modelo transteórico no comportamento alimentar. Ciênc Saúde Colet 2007;12(6):1641-50.
16. World Health Organization. WHO Reference 2007: Growth reference data for 5-19 years. 2007; Available from: <http://www.who.int/growthref/en/> [2014 oct 01].
17. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO Consultation on Obesity. Geneva: World Health Organization; 1997.
18. Slaughter MH, Lohman TG, Boileau RA, Horswill CA, Stillman RJ, Van Loan MD, et al. Skinfold equations for estimations of body fatness in children and youth. Hum Biol 1988;60(5):709-23.
19. Jackson AS, Pollock ML, Ward A. Generalized equations for predicting body density of women. Med Sci Sports Exerc 1980;12(3):175-82.
20. Jackson JA, Pollock ML. Generalized equations for predicting body density of men. Br J Nutr 1978;40(3):497-504.
21. Zinn C, Schofield G, Wall C. Evaluation os sports nutrition knowledge of New Zealand Premier Club rugby coaches. Int J Sport Nutr Exerc Metab 2006;16(2):214-25.
22. Juzwiak CR, Ancona-Lopez F. Evaluation of nutrition knowledge and dietary recommendations by coaches of adolescent Brazilian athletes. Int J Sport Nutr Exerc Metab 2004;14(2):222-235.

23. Zabotto CB, Vianna RP, Gil MF. Registro fotográfico para inquéritos dietéticos: utensílios e porções – NEPA-UNICAMP. Goiânia: Ed UFG; 1996.
24. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Guia Alimentar para a População Brasileira: promovendo a alimentação saudável. Ministério da Saúde, Secretaria de Atenção à Saúde. Brasília: Ministério da Saúde; 2008.
25. Godoy, FC, Andrade SC, Morimoto JM, Carandina L, Goldbaum M, Barros MBA, et al. Índice de qualidade da dieta de adolescentes residentes no distrito de Butantã, município de São Paulo, Brasil. Rev Nutr 2006;19(6):663-71.
26. Prochaska JO, Redding CA, Evers KE. The transtheoretical model and stages of changes. In: Glanz K, Rimer BK, Visvanath K, editores. Health, behaviour and health education. Theory, Research, and Practice. San Francisco: Jossey-Bass; 2008:97-117. Available from: http://www.academia.edu/6487965/HEALTH_BEHAVIOR_AND_HEALTH_EDUCATION_Theory_Research_and_Practice_4TH_EDITION [2013 set 01].
27. Zaccarelli EM. Modelo Transteórico e curso de vida. In: Fisberg RM, Slater B, Marchioni DML, Martini LA. Inquéritos Alimentares: Métodos e bases científicos. Barueri: Manole; 2005. p. 53-70.
28. Conte M, Gonçalves A, Aragon FF, Padovani CR. Influência da massa corporal sobre a aptidão física em adolescentes: estudo a partir de escolares do ensino fundamental e médio de Sorocaba/SP. Rev Bras Med Esporte 2000;6(2):44-9.
29. Kanno P, Rabelo M, de Melo GF, Giavoni A. Dieta ideal versus desempenho esportivo: um estudo sobre os estereótipos nutricionais aplicados por triatletas. Rev Bras Cineantropom Desempenho Hum 2009;11(4):444-8.
30. Valliant MW, Emplaincourt HP, Wenzel RK, Garner BH. Nutrition education by a registered dietitian improves dietary intake and nutrition knowledge of a NCAA female volleyball team. Nutrients 2012;4(6):506-16.

Corresponding author

Claudia Ridel Juzwiak.
Departamento de Ciências do Movimento Humano, Universidade Federal de São Paulo - Campus Baixada Santista, São Paulo, Brasil.
Rua Silva Jardim, no136 – Vila Matias – Santos/SP, Brasil – CEP 11015-020
Email: claudia.juzwiak@unifesp.br