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QUALITY OF DIET OF WHEELCHAIR BASKETBALL PLAYERS BEFORE AND AFTER A NUTRITIONAL INTERVENTION

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ABSTRACT

This is a quantitative quasi-experimental study with 11 male wheelchair basketball players aged between 18 and 55 years (average of 36.8 ± 9.9 years) aiming to evaluate their quality of the diet before and after a nutritional intervention. We assessed theirbody composition by measuring body mass, height, waist circumference, skinfold thickness and body fat percentage of each player. To evaluate their eating habits, three dietary records were made, considering a sports training day, a normal day and a weekend day. We used the Brazilian Healthy Eating Index Revised, consisting of 12 components, for the dietary evaluation. During the six-month period, we delivered lectures on healthy eating, as well as individualized nutritional guidance following good eating concepts and guidelines. After the nutritional intervention there was a significant improvement (p = 0,0488) in the overall quality of the diet, mainly due to the higher consumption of vegetables and fruits, as well as a decrease in the intake of saturated fat, oils and added sugar.

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INTRODUCTION

The increasing changes in lifestyles and production of processed foods that began during the twentieth century changed the population's eating patterns (Oliveira *et al*., 2015; PAHO, 2019). Consumption of processed foods, usually of high caloric value, sources of salt/sodium and free sugars, increased, as well as the preference for foods of animal origin. These eating habits negatively influence the nutritional profile of individuals and contribute to the emergence of Noncommunicable Chronic Diseases (NCDs), especially Cardiovascular Diseases (CVD) and obesity (Oliveira and Pereira, 2014; PAHO, 2019). According to the World Health Organization (WHO, 2015), NCDs cause 16 million deaths per year, most of which are premature and could be prevented by tobacco and alcohol elimination, balanced diet, physical activity and access to public health. The report calls for measures to be taken to combat this NCD epidemic, particularly in low- and middle-income countries, where the number of deaths from these diseases has exceeded the number of deaths from infectious diseases, as is the case of Brazil. In this context, the Pan American Health Organization – PAHO (2019), similarly to the WHO, recommends the adoption of healthy eating as a protective factor against malnutrition and NCDs, such as diabetes, CVD, stroke and cancer. PAHO guides healthy eating practices through caloric intake in balance with energy expenditure, reduction in total, saturated and trans fat consumption, and moderation in daily consumption of free sugars and salt/sodium. In this perspective, the Brazilian Ministry of Health published in 2014 the Food Guide for the Brazilian Population (Brasil, 2014), a set of official dietary guidelines aimed to support nutrition education actions. This document prescribes the intake of fresh foods such as fruits, vegetables and grains or minimally processed foods as the ideal basis for a nutritionally balanced diet. On the other hand, it warns the population that processed

and ultra-processed foods have a high concentration of additives and preservatives, as well as high levels of salt/sodium, fat and free sugars, nutrients whose excessive consumption is associated with obesity and the development of CVD (Brasil, 2014). Thus, healthy eating along with lifestyle changes are factors that have a direct impact on CVD prevention and control (Faludi *et al*., 2017). In this sense, the ingestion of fresh or minimally processed foods presents a much higher nutritional composition when compared to ultra-processed foods, especially in relation to fiber, minerals and vitamins, nutrients whose content is considered insufficient in the diet of Brazilians (Brasil, 2014).

When it comes tothe diet of people with disabilities, care should be increased, as this population is more likely to have kidney stones, osteoporosis, changes in body composition and risk of developing CVD. Such complications can aggravate the general health status, as well as impact the quality of life and longevity of these individuals (Ribeiro *et al*., 2005; Silva *et al*., 2004; Barreto *et al*., 2009; Santos *et al*., 2014). According to these authors, the assessment of food consumption is relevant to the understanding of nutritional needs and to the development of interventions aimed at adapting the nutritional assistance provided to this population. From this point of view, a study that evaluated the food consumption of people with physical disabilities in the city of Itajaí, a city in the state of Santa Catarina, Brazil, showed a high consumption of refined carbohydrates and fat, as well as low consumption of fruits (Dalcastagne *et al*., 2015). Inadequate diet was also found in the studies by Ribeiro *et al*. (2005); Barreto *et al*. (2009) and Eskici, Ersoy (2016) conducted with people with disabilities who play sports.

Moreover, in assessing diet and supplement use by Paralympic athletes, Barboza *et al*. (2015) and Madden, *et al*. (2017) identified inadequate diet and micronutrient intake deficiencies, respectively. These results show the exposure of these individuals to health problems resulting from inadequate eating behavior associated with lack of mobility caused by disability. Even among practitioners of physical activity, there is a need to adopt healthy eating as a form of protection and health promotion. On the other hand, in the studies by Goosey-Tolfrey and Crosland (2010) with athletes with spinal injuries and Krempien and Barr (2011); Gerrish *et al*. (2017) with wheelchair basketball players, energy intake and macronutrients were according to participants' needs. These findings indicate that the eating behavior of these individuals is a protective factor against the emergence of diseases due to changes in body composition. From this perspective, research with the purpose of investigating the impact of adopting a healthy diet in improving the nutritional status of individuals aiming at a consequent reduction of risk factors for CVD has been carried out (Deus, 2015; Horta and Santos, 2015; Campos Borges, 2017). Ebrahimof and Mirmiran (2013) found clinical studies that proved the effectiveness of guideline-based nutritional interventions in reducing risk factors for CVD. In these studies, populations followed for periods of four, six or 24 months showed reduction and maintenance of body weight, improvement of biochemical parameters, and reduction in blood pressure levels.

However, few studies have been conducted to evaluate parameters indicative of body composition and food intake of wheelchair basketball players after nutritional intervention. In view of this question, the aim of this study was to evaluate the quality of the diet of wheelchair basketball players before and after nutritional intervention.

MATERIALS AND METHODS

This is a quasi-experimental study with a quantitative approach carried out at the nutrition outpatient clinic, the nutritional assessment laboratory and the classrooms of block D of the University Center of Patos de Minas (UNIPAM), from March to September 2018.Participants were wheelchair basketball players from a team that meets periodically for annual championships. They were recruited at UNIPAM's multi-sport gym on a training day. This research was approved by the Research Ethics Committee of the University Center of Patos de Minas (number 2.494.455).We applied a socio-demographic questionnaire to collect data such as personal background, medical history and body composition measurements to describe the sample and elucidate cardiovascular risk factors such as smoking and family history. Body composition was assessed by measuring body mass, height, waist circumference (WC), skin folds (WC) and the body fat percentage of each player (BF%). Body mass and height data were used to calculate Body Mass Index (BMI). Furthermore, the Central Obesity Index (IOC) was calculated by using height and WC data. To evaluate the eating habits, three dietary records were made, considering a sports training day, a normal day and a weekend day. Players were instructed to observe all foods and beverages ingested for 24 hours and register their type, quantity, trademark and preparation. The portion size consumed was recorded in traditionally used home measurements (Fisberg *et al*., 2005). To this end, participants were instructed to estimate the amounts of food ingested by using photographs of utensils, portions and food (Sueiro and Botelho, 2008). Each food record was reviewed with the participant to ensure better accuracy of the data.

The dietary assessment was based on the Brazilian Healthy Eating Index Revised (BHEI-R), which consists of 12 components. Nine are food groups (total fruits, whole fruits, total vegetables, dark green or orange vegetables, total grains, whole grains, milk and dairy products, meat, eggs and legumes and oils), two are nutrients (saturated fat and sodium) and another represents the sum of the energy value from the intake of solid fat, alcohol and added sugar (Gord _AA component). To assess the quality of the diet, the recommended daily portion numbers of these food groups were defined for each 1,000 kcal ingested, as recommended in the first version of the Food Guide for the Brazilian Population (Previdelli *et al*., 2011).We calculated the average intake of the three dietary records completed by each player. Also we converted reported foods into portions by energy value according to the food group to which they belong. We used AVANUTRI 4.1 software to analyze total caloric intake of nutrients (saturated fat and sodium) and dietary components (AA fat). The 12 food components of the BHEI-R received a score ranging from 0 to 10 points for later classification of the diet, being the highest values for the ideal consumptions. For intake greater than or equal to the recommended portions of the food groups per 1,000 kcal, the maximum score (five to 10 points, depending on the group) was attributed, whereas zero was attributed for no consumption. Intermediate values were calculated proportionally to the amount consumed (Previdelli *et al*., 2011). After the first collection of anthropometric data and eating habits, we proposed three lectures and three individual consultations with returns for all players. The first lecture, held

on 05/20/2018 with the theme "Healthy Eating", addressed the importance of adopting adequate, complete and balanced nutrition for the prevention and control of diseases such as obesity, DM and CVD. We presented food groups and principles for healthy eating through the food pyramid (Philippi, 2014). The second lecture, held on 06/28/2018 with the theme "Eating in sports", portrayed the recommended foods and nutrients for pre-, during and post-training meals or games. The guidelines for exercise nutrition and sports practice were based on the American College of Sport Nutrition, the International Olympic Committee and the International Society for Sports Nutrition (Potgieter, 2013). The third lecture, held on 23/08/2018 with the theme "Health and Dietary Guidelines – Urinary Tract Infections and Pressure Ulcers" sought to meet the players' demand for nutritional guidance on the subject. Hence, we addressed preventive measures, importance of hydration and adequate nutrition for the pathologies.

The individual consultations took place between April and September 2018 at the UNIPAM Nutrition Outpatient Clinic following pre-established protocols. There were three monthly consultations and three biweekly returns with each player. In the first consultation, we made an anamnesis, 24-hour food recall and food frequency questionnaire with each player. From the data collected, the daily energy requirement of each player was calculated based on the guidelines for exercise nutrition and sports practice of the American College of Sport Nutrition, the International Olympic Committee and the International Society for Sports Nutrition (Potgieter, 2013). This calculation was used to propose an individualized eating plan, as well as dietary guidelines, which were delivered to each player. In the return of the consultation, the players were instructed to bring the food plan to discuss the reasons for complying or not with the guidelines. Subsequent consultations set targets for each player, such as increasing the consumption of fresh and minimally processed foods and reducing the consumption of processed and ultra-processed foods. The eating plan was tailored according to individual demand and on subsequent returns the players received guidance on reading food labels and preparing food through the delivery of healthy food recipes. Statistical analysis consisted of using the Graph Pad Prism 7 software for Windows to calculate frequency, means, standard deviation, correlations and associations. For comparisons of pre- and post-intervention means, the normality test was initially performed to evaluate the behavior of the analyzed variables (Shapiro-Wilk normality test). Paired Student's t-test (for pre- and post-intervention comparisons) was performed for data that presented parametric distribution and the Wilcoxon matched-pairs signed rank test for data without normal or Gaussian distribution. Significant tests with a significance level of $p < 0.05$ were considered.

RESULTS

Eleven male players aged between 18 and 55 years (mean 36.8 ± 9.9 years) participated in the study. Among them, four with spinal cord injury, four were amputated, one had a polio virus sequel, one had prosthesis, and one had a disability resulting from a left leg injury. Four were single, four were married and three were divorced. Three players had incomplete elementary school; three, complete elementary school; two, incomplete high school; one, complete high school; and two, complete higher education. Only one participant reported smoking, as shown in Table 1.Through the evaluation of the anthropometric variables collected, it was possible to evaluate the nutritional status before and after the nutritional intervention of the players. Regarding BMI, there was a decrease in the normal classification (n = 6; 54.5% for n = 5; 45.5%) and an increase in the grade I obesity classification (n = 1; 9.1% for n = 2, 18.2%).

Table 1. Characterization of wheelchair basketball players

		n	%
Age	10 - 19 years	1	9.1
	20 - 29 years	2	18.2
	30 - 39 years	3	27.3
	40 - 49 years	3	27.3
	50 - 59 years	2	18.2
Deficiency	Spinalcordinjury	4	36.3
	Amputation	4	36.3
	Sequelofpoliovirus	1	9.0
	Use ofprosthesis	1	9.0
	Leftleginjury	1	9.0
Marital Status	Single	4	36.4
	Married	4	36.4
	Divorced	3	27.3
Education	IncompleteElementarySchool	3	27.3
	ElementarySchool Complete	3	27.3
	Incomplete High School	2	18.2
	Complete High School	1	9.1
	Complete UniversityEducation	2	18.2
Smoking	Yes	1	9.1
	No	10	90.9
	Total	11	100.0

Source: Research Data, 2018

The high cardiovascular risk rating assessed by the IOC decreased (n = 4; 36.4% to n = 2; 18.2%). However, in this same assessment, the low risk increased (n = 3; 27.3% to n = 5; 45.5%). In the evaluation of WC, there was an increase in the normal classification (n = 3; 27.3% to n = 4; 36.4%) and a decrease of greatly increased risk classification of metabolic complications (n = 3; 27.3% to n = 2; 18.2%). In the BF (%) evaluation, we observed an increase of the above average classification (n = 3; 27.3% to n = 4; 36.4%), but the risk of diseases associated with obesity decreased (n = 7; 63.3% to n = 4; 36.4%). In addition, after nutritional intervention, one player (9.1%) was classified as at risk for diseases associated with malnutrition. The results in Table 2 show the mean values of BMI, IOC, WC and BF (%) found in the study participants before and after nutritional intervention.

Table 2. Nutritional status of wheelchair basketball players before and after nutritional intervention

	Pre (Mean/SD)	Post (Mean/SD)	p
BMI	24.8 ± 3.72	25.38 ± 3.79	0.2901
IOC	0.56 ± 0.08	0.54 ± 0.09	0.1821
WC	98.92 ± 11.88	94.55 ± 14.72	0.0673
BF (%)	25.36 ± 7.47	22.12 ± 12.68	0.1446

Data are represented as mean and standard deviation of anthropometric data.
Caption: SD: Standard Deviation; BMI: body mass index; IOC: Central Obesity Index; CC: Waist Circumference; BF (%): Body Fat Percentage
Differences between pre- and post-nutritional intervention averages were assessed by paired t-test ($p < 0.05$).
Source: Research Data, 2018

As observed, in relation to the average BMI, there was a change from the normal classification (18.5 to 24.9 kg / m^2) to the overweight classification (25.0 to 29.9 kg / m^2) (WHO, 2000). The mean values of IOC remained adequate for male references, (0.51 to 0.58 cm) (Rossi *et al*., 2017). In the classification of WC, a decrease in the mean values was

observed; yet, they remained at increased risk of metabolic complications (In men, when WC is ≥ 94cm, there is an increased risk, whereas when WC is ≥102cm, there is a substantially increased risk). It was observed that the average BF (%) score of the players changed from "risk of obesity-associated diseases" (≥ 25%) to "above average" (16 to 24%), according to Lohman (1992).In assessing diet quality, a significant increase in the total average BHEI-R score of wheelchair basketball players after nutritional intervention (p = 0,0488) was found, as shown in Table 3.

Table 3. Distribution and average score of BHEI-R components of wheelchair basketball players before and after nutritional intervention

BHEI-RComponents	Reference Score[ii]	PreMean/SD Score	Post Mean/SD Score	p
Total fruits	5	1.81 ± 2.27	3.26 ± 1.85	0.1602[b]
WholeFruits	5	1.71 ± 2.29	3.64 ± 2.33	0.1250[b]
Total vegetables	5	3.02 ± 1.95	4.52 ± 0.87	0.0547[b]
Dark green and orange vegetables and legumes	5	5.00 ± 0.00	4.46 ± 1.09	0.2500[b]
Total cereals	5	5.00 ± 0.00	5.00 ± 0.00	ns
WholeGrains	5	0.45 ± 0.83	0.45 ± 1.51	0.8750[b]
Milkanddairyproducts	10	3.41 ± 2.47	4.09 ± 3.31	0.5992[a]
Meat, eggsandlegumes[i]	10	10.00 ± 0.00	10.00 ± 0.00	ns
Oils	10	1.56 ± 0.53	1.86 ± 1.07	0.4131[b]
Saturatedfat	10	7.95 ± 3.08	9.45 ± 1.21	0.1406[b]
Sodium	10	8.86 ± 1.24	8.73 ± 1.33	0.8594[b]
Gord_AA	20	16.45 ± 5.34	19.27 ± 1.68	0.1875[b]
Total	100	65,22 ± 10.82	74.73 ± 9.14	0.0488*

Data are represented as mean and standard deviation of anthropometric data.
Caption: SD: Standard Deviation; GORD_AA: Calories from solid fat, alcohol and added sugar; HEI-R: Revised Healthy Eating Index.
a Differences between pre- and post-nutritional intervention averages were assessed by paired t-test (* p <0.05).
b Differences between pre- and post-nutritional intervention averages were assessed by the combined paired Wilcoxon test and were considered statistically significant when p <0.05.
ns:non-significant
i Only meat, eggs and legumeswere considered when exceeded.
iiPrevidelli et al., 2011
Source: Research Data, 2018

Among the 12 components evaluated in the BHEI-R, there was an increase in the average score of the components "total fruits", "whole fruits", "total vegetables", "milk and dairy products", "saturated fat", "oils", and " Gord_AA "after the nutritional intervention. The sodium component showed a slight decrease in the score after the intervention. The average score remained maximum in the "total cereals" and "meat, eggs and legumes" groups in both evaluations. On the other hand, the "dark green and orange and legume vegetables" component showed a decrease in the average score and the "whole grains" component remained much lower than the reference in the post-intervention evaluation, according to the classification proposed by Previdelli *et al*. (2011).

DISCUSSION

As to socio demographic variables, all participants were male. In fact, wheelchair basketball is a sport practiced by athletes of both sexes who have a physical-motor disability, according to the adapted rules of the International Wheelchair Basketball Federation (IWBF, 2017).The average age range found was 36.81 ± 9.94 years, which revealed the predominance of a young adult population. However, 45.4% were 40 years of age or older, as it cannot be disregarded, since CVD were listed among the main NCDs, accounting for 51.6% of all deaths in the population aged 30 to 69 in Brazil in 2015 (Brasil, 2015). This reinforces the importance of stimulating the adoption or maintenance of healthy habits to decrease cardiovascular risk factors in the study population. Also, most players (eight of eleven participants) had completed elementary school or even had a university degree, which can be, as Candido *et al*. (2016) assert, a factor of health protection. According to these authors, there is a lower prevalence of behavioral risk factors for CVD among individuals with higher education. When it comes to smoking, 10 participants were non-smokers. This data is especially significant due to the strong association of this habit with the occurrence of CVD. According to Simon *et al*. (2014), 50% of CVD deaths could be prevented by quitting smoking.

To assess the body composition of the participants, we measured body mass and height to calculate BMI. These parameters were also adopted for the evaluation of wheelchair basketball players in other cross-sectional studies(Santos and Guimarães, 2002; Donato *et al*., 2008; Sutton *et al*.,2009; Araújo *et al*., 2015; Santos *et al*., 2016). No experimental studies were found with this population concerning pre- and post- nutritional assessments interventions. It is worth mentioning that there are no specific protocols and parameters for the population of this study. Thus, the same protocols and parameters used for the general population were adopted. The results showed a change in the participants' mean BMI classification, ranging from normal in the pre-intervention to overweight in the post-intervention. This may have been due to a rest period of approximately 20 days after participating in a championship. The fact that this period was not foreseen at the beginning of the nutritional intervention and it was not possible to end it before this date was a limiting factor of this research, since the lack of training may have directly influenced the increase in the BMI of the players. It is important to emphasize that the interpretation of BMI values should be done with caution, since the increase in body weight may not reflect a condition of higher body fat accumulation, but a consequence of the participation of lean mass (Ribeiro *et al*., 2018). Due to this limitation of BMI, the participants' WC and BF (%) were also measured in order to assess abdominal fat, as well as total body fat distribution. As there are no specific protocols for the assessment of WC and BF (%) of disabled people, protocols and parameters of the general population were used, which was also done in other studies with wheelchair basketball players (Donato *et al*., 2008; Quintana and Neiva, 2008; Gorla *et al*., 2007; Araújo *et al*., 2015; Santos *et al*., 2016). In addition, we evaluated the IOC of the players, considered by Rossi *et al*. (2017) as a predictor of cardiovascular risk for men and women.

The results of these evaluations revealed a decrease without significant difference in the values before and after nutritional intervention. Among players, mean WC remained at increased risk of metabolic complications such as CVD and DM (WHO, 2000). The disabling of the lower limbs, as in the case of the participants, leads to the accumulation of abdominal fat, which hinders venous return to the heart, overloading the organ, which may increase the incidence of death from coronary disease (Rodenbaugh *et al*., 2003). Increased WC is also a potential indicator of a metabolic syndrome, as people with spinal cord injuries, such as the participants in this study, have insulin resistance, decreased muscle glucose uptake, and reduced mitochondrial content (Phillips *et al*., 2004). In a study by Donatto *et al*. (2008) comparing anthropometric measurements between wheelchair basketball athletes and physically active individuals, there was a significant difference in WC measurement. Wheelchair athletes presented WC of 106.3 ± 13.5 cm, while physically active individuals presented

WC values of 88.4 ± 11.2 cm, representing an indication of abdominal fat accumulation in wheelchair athletes. On the other hand, the study by Quintana and Neiva (2008) revealed that wheelchair basketball players, when compared with disabled individuals who do not practice this sport, had a lower level of central fat deposition (76.40 ± 8, 44 cm and 89.25 ± 9.73 respectively). These authors concluded that regular exercise has a relevant role in reducing risk factors for metabolic syndrome in wheelchair basketball players.

With regards to BF (%), there was a decrease without significant difference in the mean values after nutritional intervention. Yet, changing the classification to a lower (above average) can also be considered a cardiovascular risk protection factor for these individuals. Mainly due to the results of studies that associate the amount of adipose tissue and its body distribution with dyslipidemia, high blood pressure, glucose intolerance and insulin resistance, which contribute to the increase of this risk (Walton *et al*., 1995; VonEyben *et al*., 2003; Rezende *et al*., 2006). In a study that used the same calculation to evaluate the BF(%) proposed in this research, Gorla *et al*. (2007) evaluated two groups of individuals, one with a lower lesion and another with a superior lesion. The authors observed that all research participants had BF (%) above normal levels for the age group studied (23.44% ± 7.44 in the lower lesion group and 19.27% ± 8.43 in the upper lesion group). Still adopting the same calculation, Santos *et al*. (2016) found a high BF (%) (26.54% +7.9) in wheelchair basketball players, with the highest percentages in patients with post-polio syndrome. By means of another calculation, Araújo *et al*. (2015) also found BF (%) very high in most (38.8%) wheelchair basketball adolescents participating in the study. Regarding the IOC, the adequacy of the mean values to the references after the nutritional intervention was maintained. Such result is relevant, since this parameter also predicts cardiovascular risk, since it uses WC data in its calculation.

The assessment of food intake of wheelchair basketball players revealed a significant difference in the mean BHEI-R total score in the pre- (66.09 ± 10.44) and post- (74.73 ± 9.14) nutritional intervention periods. Although differences observed in the scores of some specific food components of the BHEI-R were not statistically significant, these results may be beneficial to players, as the adoption of healthy eating is considered by PAHO (2019) as a preventive factor against NCDs. Especially with regard to people with disabilities, who are more susceptible to changes in body composition and development of such diseases (Ribeiro *et al*., 2005; Silva *et al*., 2004; Barreto *et al*., 2009; Santos *et al*., 2014). Similar results to this research were observed by Santos *et al*. (2014); Grams *et al*. (2016); Nascimento *et al*. (2016) in their studies that evaluated the influence of nutritional interventions on the adequacy of food for disabled people. These authors are consensual in reporting the benefits of nutritional counseling on the adequacy of macro and micronutrient intake by the individuals surveyed. It is important to mention that during the intervention period the players were advised in relation to the choice of healthy foods, as well as the adequacy of the quantity and frequency of meals. Thus, through nutritional education, we sought to modify their eating behavior, in addition to developing their food autonomy. Also, the research participants increased their intake of the "total fruits", "whole fruits" and "total vegetables" components of BHEI-R after the nutritional intervention. According to the Food Guide for the Brazilian Population (Brasil, 2014), the intake of these foods is beneficial to health as they are sources of vitamins, minerals, and fibers essential for the prevention of CVD. In addition, the players increased the consumption of the component "milk and dairy products", protein source foods, vitamin A and, mainly, calcium, a nutrient involved in bone mineral density and consequent fracture prevention. Increased scores for "saturated fat", "oils" and solid fat, trans fat, alcohol, and added sugar ("Gord_AA") reflect improvement in player's diets, as higher scores indicate lower intake of these BHEI-R components. Considering that saturated fat and sugar are nutrients whose high consumption may be harmful to health, reducing their intake can be considered a factor in reducing the risk of CVD, dental cavity, obesity and several other NCDs (Brasil, 2014). In this direction, Santos *et al*. (2014) and Nascimento, *et al* (2016) also observed a reduction in saturated fat intake, as well as an increase in fruit and vegetable consumption, after performing different nutritional intervention protocols with disabled people.

As to the intake of the "sodium" component, a small decrease in the score was identified, which, although not significant, indicates an increase in the intake of this micronutrient by the players. This intake should be monitored, mainly due to the greater predisposition of CVD development by players. In this regard, PAHO (2019) recommends maintaining daily salt intake below 5g (equivalent to less than 2g sodium) as a means of preventing hypertension and reducing the risk of CVD and stroke among the adult population. The intake of the "total cereals" and "meat, eggs and legumes" groups observed in this study reached a maximum score before and after the nutritional intervention. Such eating habits of players are in line with the Brazilian dietary pattern revealed by the Family Budget Survey conducted by the Brazilian Institute of Geography and Statistics between May 2008 and May 2009 (IBGE, 2010). Through this research, it was found that rice and beans correspond to almost 25% of the Brazilian diet, followed by red meat, chicken meat, cassava and potato, fruits, fish, vegetables and eggs. However, it should be remembered that the intake of the "total cereals" group should not exceed individual recommendations, since excessive consumption of refined cereals may increase the risk of insulin resistance, with consequent development of NCDs (Santos *et al*., 2014). As far as the consumption of the group "meat, eggs and legumes" is concerned, it is important to highlight that these foods are good sources of protein and most vitamins and minerals, essential nutrients for health. Indeed, the players were instructed to consume lean meats to avoid excess saturated fat in the diet, which may favor the risk of obesity, CVD and NCD.

On the other hand, there was a reduction in the score of the "dark green and orange vegetables and legumes" component, although the excess of energy value from the legumes was considered. Such conduct is suggested by Previdelli *et al*. (2011), for the important participation of this food group in the habit of Brazilians. The reduction in the intake of these foods indicates a worsening in the intake of fiber, minerals and vitamins by players, nutrients that are also considered insufficient in the diet of Brazilians. It was also observed the worst score in the two evaluations of all BHEI-R components in the item "whole grains", which remained much lower than the reference. Although the players were instructed to increase the consumption of these foods, the adoption of this habit was not observed. It is considered that the preference for refined

cereals, such as white rice and wheat grains used to make most wheat flours, may have influenced players' food choices. This data is relevant since the ingestion of whole grains, sources of dietary fiber, contributes to intestinal function and consequent prevention of diseases of the gastrointestinal tract (Santos *et al*., 2014).In addition, worsening diet quality through the ingestion of low-fiber, caloric foods induces abdominal fat accumulation and consequent cardiovascular risk, where as eating adequate amounts of fruits, vegetables, oilseeds, cereals products and lean meats reduces the risk of the individual acquiring CVD (Campos, Borges, 2017).

It was observed that after the nutritional intervention there was a significant improvement in the overall quality of the diet, mainly due to the higher consumption of vegetables and fruits, and decreased intake of saturated fat, oils and added sugar. Such changes in eating habits are believed to be factors that have a direct impact on CVD prevention and control, which are frequent comorbidities in the study population. The nutritional intervention proposed in this study as well as its results is in line with the Sustainable Development Goals (SDGs) that propose, among other things, a reduction in one-third of premature CVD mortality by 2030(WHO, 2015).It is believed that food education and the nutritional assessment performed with the participants of this study is one of the ways to achieve this goal, since the adoption of healthy eating habits is considered a factor for the prevention of CVD. Also, the intervention had an important role regarding the development of players' autonomy in food choices. Studies with a larger longitudinal scope involving a larger number of variables related to the daily life of this population may provide more robust information to plan sustained actions aimed at improving the quality of life and preventing cardiovascular disease risk factors.

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