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Evolution of nutritional status and body composition during the sports season in young football players

Ciências da Nutrição

Faculdade Ciências da Saúde

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Declaro para os devidos efeitos ter atuado com integridade na elaboração deste Trabalho de Projeto, atesto a originalidade do trabalho, confirmo que não incorri em plágio e que todas as frases que retirei de textos de outros autores foram devidamente citadas ou redigidas com outras palavras e devidamente referenciadas na bibliografia.

(Pedro Miguel Carvalho Faria)

Trabalho apresentado à Universidade Fernando Pessoa como parte dos requisitos para obtenção do grau de licenciado em Ciências da Nutrição.

Orientadora e *Coorientador:*

Prof. Doutora Rita Guerra

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I. Index of tables

II. List of Abbreviations and Acronyms

IAN-AF - Portuguese Food and Physical Activity Survey (do Português Inquérito Alimentar Nacional e de Atividade Física)

SD - Standard Deviation

SF -Skinfolds

ISAK - International Society for the Advancement of Kinanthropometry

%BFM – Percentage of Body Fat Mass

BMI – Body Mass Index

MUAC – Mid-Upper Arm Circumference

MD – Mediterranean Diet

KIDMED – Mediterranean Diet Index

IQR - Interquartile Range

U - Under

III. Title/Authors/Academic Affiliation

Evolution of nutritional status and body composition during the sports season in young football players

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IV. Resumo e Palavras-Chave

Introdução: A informação sobre o estado nutricional, composição corporal e hábitos alimentares de jogadores de futebol em idade pediátrica são escassos.

Objetivo: Avaliar o estado nutricional, composição corporal e hábitos alimentares de jogadores de futebol em idade pediátrica durante a época 2021/2022.

Métodos: Incluíram-se 40 crianças (9-13 anos). Dados antropométricos recolhidos: peso corporal (kg), altura (cm), perímetro da cintura (cm), perímetro do braço (PB, cm) e oito pregas cutâneas (PC, mm). Calculou-se a soma das 8 PC (mm), a percentagem de massa gorda (%MG) e índice de massa corporal (IMC, kg/m2). Avaliou-se o estado nutricional através do IMC (baixo peso: ≤P3, normal: P3-P85, pré-obesidade: P85-95, obesidade: P>95), %MG (baixa: ≤P10, normal: P10-P85, elevada: >P85) e PB (baixo: ≤P15, normal: P15-P85, elevado: >P85). Aplicou-se o questionário de adesão à dieta mediterrânea (DM) (KIDMED) em abril. Avaliou-se o consumo diário de água e hortofrutícolas. Apresentam-se as variáveis contínuas como mediana e intervalo interquartil e as variáveis categóricas como frequências. Recorreu-se ao teste de Mann-Whitney para comparar variáveis contínuas e ao teste Qui-quadrado para comparar variáveis categóricas entre dois momentos de avaliação: janeiro/fevereiro e junho. Considerou-se $P<0,05$.

Resultados: Perímetro da cintura, soma das PC e %MG diminuíram em junho relativamente a janeiro/fevereiro, respetivamente: 63,1 (3,3) cm vs. 64,1 (3,7) cm, 31,1 (8,8) mm vs. 40,2 (12,6) mm e 6,6 (2,4) % vs. 9,4 (3,5) %. Os participantes não apresentaram obesidade, %MG elevada ou PB elevado, em qualquer momento. Em janeiro/fevereiro 83,3%, 61,1% e 72,2% dos atletas apresentaram IMC normal, baixa %MG e baixo PB, respetivamente. Em junho estas frequências foram respetivamente 92,6%, 92,6% e 63,0%. A pontuação média do KIDMED foi de 8,5 (DP:1,9) pontos. 26,3% dos participantes apresentaram nível médio de adesão à DM e 73,7% nível de adesão elevado. A ingestão de água foi <1,5L para 63,2% dos participantes e 57,9% ingeriram ≥5 porções de hortofrutícolas/dia.

Conclusão: Embora a maioria dos participantes apresente IMC normal, apresentavam também %MG baixa, evidenciando a necessidade de delinear intervenções nutricionais para garantir níveis de composição corporal compatíveis com desempenho físico e saúde. Apesar do nível de adesão à DM ser elevado, as recomendações de consumo diário de água e hortofrutícolas devem ser alcançadas.

Palavras-chave: Parâmetros Antropométricos; KIDMED; Hábitos Alimentares; Atletas; IMC; % massa gorda

V. Abstract and Keywords

Introduction: Information regarding nutritional status, body composition and eating habits of football players in lower categories is scarce.

Objective: To evaluate nutritional status, body composition and eating habits of young football players during 2021/2022 season.

Methods: Forty children (9-13 years old) were included. Anthropometric data integrated: body weight (kg), height (cm), waist circumference (cm), mid-upper arm circumference (MUAC, cm) and eight skinfolds (SF, mm). The sum of 8 skinfolds (mm), percentage of body fat mass (%BFM) and body mass index (BMI, kg/m^2) were calculated. Nutritional status was assessed using BMI (underweight: ≤P3, normal: P3-P85, pre-obesity: P85-95, obesity: P>95), %BFM (low: ≤P10, normal: P10-P85, high: >P85) and MUAC (low: ≤P15, normal: P15-P85, high: >P85). Mediterranean diet (MD) adherence questionnaire (KIDMED) was applied in April. Daily water, fruit and vegetable intake were questioned. Continuous variables are presented as median and interquartile range and categorical variables as frequencies. Mann-Whitney test was used to compare continuous variables and Chi-square test to compare categorical variables between two moments of evaluation: January/February and June. $P<0.05$ was considered.

Results: Waist circumference, sum of SF and %BFM decreased in June compared to January/February, respectively: 63.1 (3.3) cm vs. 64.1 (3.7) cm, 31.1 (8.8) mm vs. 40.2 (12.6) mm and 6.6 (2.4) % vs. 9.4 (3.5) %. None of the participants presented obesity, high %BFM or high MUAC, at any of the evaluation moments. In the first moment of evaluation 83.3%, 61.1% and 72.2% of athletes presented normal BMI, low %BFM and low MUAC, respectively. In the second moment these figures were respectively 92.6%, 92.6% and 63.0%. In April, average KIDMED score was 8.5 (SD:1.9) points. 26.3% presented an average level of adhesion to MD and 73.7% a high level of adherence. Water intake was <1.5L for 63.2% of participants and 57.9% ate ≥5 portions of fruits and vegetables/day.

Conclusion: Although most participants presented normal BMI, most athletes were in the low %BFM category which highlights the need to design nutritional interventions to guarantee body composition levels compatible with physical performance and health. Moreover, despite the high level of adherence to MD, daily recommendations for water, fruits and vegetables should be attained.

Keywords: Anthropometric Parameters; KIDMED; Food Habits; Athletes; BMI; % body fat mass

1. Introduction

Childhood pre-obesity and obesity are a public health problem that has reached epidemic proportions in almost all regions of the world. Pre-obesity and obesity are classified by the World Health Organization as an abnormal or excessive fat body content that imposes health risks (1). Pre-obesity and obesity in paediatric age can impair growth in height, increase the development of dyslipidaemia, arterial hypertension and type 2 diabetes mellitus, in addition to being associated with psychological trauma (2). Furthermore, childhood obesity is associated with a higher prevalence of obesity in adulthood and, therefore, the majority of children and adolescents with obesity remain obese during adulthood, which has deleterious effects on their health and quality of life (3).

Childhood pre-obesity and obesity are a consequence of interactions between a complex set of factors that are related to genetics and to the environment, standing out the influence of the family, of the community and of the school where the children belong (3,4).

Sedentary behaviours and low physical activity are recognized as important causes for the development of childhood obesity (4). According to the most recent Portuguese Food and Physical Activity Survey (IAN-AF), from 2015-2016, children and adolescents between 6 and 14 years old present on average 9h06min of daily sedentary behaviours (excluding sleep time) (5). Thus, sports initiatives that reduce sedentary behaviours, increase the practice of physical activity with favourable metabolic and nutritional consequences, are needed (6).

Football is the most popular sport, with approximately 265 million registered players in the world and is among the sports with the highest rates of participation of children and adolescents throughout the world (7). It is an intermittent team sport characterized by large amounts of low-intensity actions combined with frequent bouts of high-intensity actions such as accelerations and decelerations, rapid changes in directions, jumping, and landing tasks (8). Football players with average age 11.8 (standard deviation, SD: 0.6) years old can run distances between 5 and 7 km during a match (9).

Educating children for physical activity is a very important strategy to ally to nutritional and food promotion strategies for the promotion of a healthy lifestyle. It has been previously and widely shown that dietary intervention strategies that lead to better eating habits are crucial in maintaining a healthy weight and nutritional status of children, especially when implemented from an early age (3).

Scientific associations, such as the Academy of Nutrition and Dietetics, the Dietitians of Canada, the American College of Sports Medicine of physical activity, the International Society of Sports Nutrition and the Union of European Football Associations expert group position, reinforce how athletic performance and exercise recovery can be optimized through nutrition (10–12). Accordingly, nutritional strategies focused on the Mediterranean diet could be adopted since it has been shown that adhesion to this dietary pattern can improve performance in some physical skills but also because it ensures good health, promotes weight reduction or maintenance of a healthy weight and it is associated with a decrease in total and local adiposity and with a better quality of life (13–16).

In fact, in the past few years, professional football clubs have been implementing educational programs for healthy eating habits among young players, that will be the foundation of their health, growth and physical performance (17).

For this reason, many clubs have included dieticians in their medical team, who work together with medical doctors and physiotherapists in providing personalized interventions, including nutritional assessment and nutrition education programs to parents and children of lower categories (17).

Despite the increasing interest of football clubs in this kind of interventions, information regarding the nutritional status of players in lower categories, including nutritional status and body composition evaluation and eating habits assessment are still scarce (18,19).

This study pretends to evaluate nutritional status, body composition and eating habits of young football players during the season 2021/2022.

2. Methods

2.1. Study design and participants

An observational study was conducted in *Núcleo Solar do Norte* from *Sporting Clube de Portugal*, between February and June of 2022. Moreover, data collected previously by the team staff in January was used. Children aged between 9 and 13 years old were included. Parents or legal guardians of the participants were informed about the study objectives and gave their written informed consent to participate. Additionally, only children who consented to the study participated. Anonymity was preserved for all participants.

2.2. Data collection

Parents were asked if their children had food allergies or intolerances.

2.2.1. Anthropometric Measurements

Anthropometric measurements were taken in two moments: the first, during the months of January and February and the second in June.

The following anthropometric data were collected: body weight (kg), height (cm), sitting height (cm), waist circumference (cm), mud-upper arm circumference (MUAC, cm) and eight skinfolds (SK, mm), triceps, subscapular, biceps, iliac, supraspinal, abdominal, front thigh and medial calf. A digital scale with 1 g resolution, Seca 803, was used to measure body weight. A stadiometer, SECA 206, with a scale of 1cm resolution was used for height and sitting height measurements. All SF were measured twice with a Lipowise Skinfold Calliper, digital scale with 0,1mm resolution, and all the circumferences with a metal tape from Lipowise, with a scale of 1mm(20). Each measurement was taken two times, in accordance with the recommendations of the ISAK.

For each athlete, the sum of the 8 skinfolds (mm) and the percentage of body fat mass (%BFM) (21) using the equations of Slaughter (%BFM = 0.735 * (triceps skinfold + calf skinfold) + 1.0), which is specific to children and adolescents, were calculated (22). Nutritional status classification using body mass index (BMI, kg/m^2) and according to World Health Organisation percentiles was used and athletes were grouped in the following categories: underweight (BMI ≤ P3), normal weight (P3 < BMI ≤ P85), pre-obesity (P85 < BMI ≤ 95) and obesity (BMI > 95) (23).

Athletes were also grouped in what regards their %BFM according to these categories: low BFM (%BFM ≤ P10), normal BFM (P10 < %BFM ≤ P85) and high BFM (%BFM > P85). They were also groped according to the mid-upper arm circumference: as low MUAC (MUAC ≤ P15), as normal MUAC (P15 < MUAC ≤ P85) and high MUAC (MUAC > P85).

2.2.2. Evaluation of the Mediterranean Diet Quality Index

The Mediterranean diet (MD) adherence questionnaire for children and adolescents (KIDMED) was used to characterize the level of adhesion to the MD (24–26). Two questions related to food intake were also asked in order to evaluate water intake and the amount of fruit and vegetables ingested per day. The participants were grouped according

to water intake in two groups, those who drank 1,5 L or more and those who drank less than that amount. According to fruit and vegetables ingested per day, participants were also grouped in two groups, those who ate 5 portions a day or more and those who ate 4 portions or less.

This questionnaire was available online to the children's parents during the first two weeks of April and then, in last two weeks of June.

KIDMED items are shown in Table 1. If the participant answers affirmatively to the questions with a positive connotation (questions 1, 2, 3, 4, 5, 7, 8, 9, 10, 11,13, 15), a +1 is added to their score. However, if the participant answers affirmatively to questions with negative connotation (questions 6, 12, 14, 16), a point is subtracted to the score (−1). The result of the KIDMED test is given by these calculations. The level of adhesion to MD is carried out through the following classifications: low adherence if total score ≤3, that means very low diet quality; average adherence if total score is between 4 and 7 and that means that an improvement is needed to adjust intake to Mediterranean patterns; and high adherence if total score ≥8 and diet quality is considered optimal (24,26).

2.3 Statistical Analyses

The Kolmogorov-Smirov test was applied to assess the distribution of continuous variables. As most of these variables show a distribution different than normal, continuous variables are presented as median and respective interquartile range (IQR). Categorical variables are presented as frequencies. The Mann-Whitney test was used to compare continuous variables and the Chi-square test was used to compare categorical variables between the two moments of evaluation (January/February and June).

The results were considered significant for values of $p<0.05$. All statistical analyzes were performed using the program Statistical Package for the Social Sciences (SPSS) for Windows, version 26.

2.4 Ethics

The study protocol was approved by the Ethics Committee of Faculdade de Ciências da Saúde, Universidade Fernando Pessoa (Annex A).

3. Results

The study sample is composed of 40 male athletes, 36 that participated in the first moment of evaluation (January/February) and 27 that participated in the second moment (June).

Participants were from two ethnicities (38 Caucasians and 2 Backs). The average age of these young athletes was, median (IQR), equal to 11 (1.3) years old. Participants trained at least 5h30 per week, however during the season and due to tournaments physical has increased.

Anthropometric characteristics, body composition and nutritional status of participants are presented in Table 2. Between the two evaluation moments, an increase in height and sitting height median values was observed. On the contrary, there was a decrease in median values for waist circumference and for all evaluated SF - triceps, subscapular, biceps, iliac crest, supraspinal, abdominal, front thigh, medial calf, as well in the sum of the 8 skinfolds. Moreover, a decrease was also observed for %BFM in the second moment of evaluation.

Within this sample, none of the young football player was diagnosed with obesity, with high body fat mass or high mid-upper arm circumference at any of the two evaluation moments (Table 2).

In two moments of evaluation the most of young football players presented a normal body mass index, a normal mid-upper arm circumference and a low body fat mass. Furthermore, the proportion of young football players with underweight or pre-obesity decreased from the first evaluation moment to the second. The proportion of young football players with a normal mid-upper arm circumference also decreased from the first moment to the second and an increase in the proportion of subjects in the low mid-upper arm circumference category was observed (Table 2).

In what regards adherence to the MD, only 19 of the young football player's parents answered to the online questionnaire in first moment (April) and 8 answered in the second moment (June). The young players average KIDMED score was 8.5 (SD:1.9) points. Five (26.3%) of these young players showed an average level of adhesion to MD and 14 (73.7%) a high level of adherence to MD.

From the first moment of evaluation to the second one, there were no category changes in what regards adherence to MD, one young player showed average level of adhesion to MD (score=6) and seven high level of adherence to MD (score ≥8). For these eight players, KIDMED final score at the second moment improved or remained the same found at the first moment.

In this sample, 89.5% of the players consumed at least one piece of fruit or natural juice per day, however, only 57.9% consumed a second piece of fruit. For vegetables, 78.9% consumed them daily whereas only 42.1% consumed a second portion of vegetables a day. On the other hand, 94.7% of the players consumed complex carbohydrates daily, and 89.5% of the players had cereal or derivatives for breakfast, and all of them ate a dairy product at breakfast. However, 5.3% of young football players reported to sometimes skip breakfast. Extra-virgin olive oil was used for cooking for 100% of players and 73.7% ate legumes at least once a week. Nevertheless, 73.7% did not consume nuts more than 2 or 3 times a week. Finally, only 10.5% of participants included commercially produced pastries in their breakfast or consumed sweets several times a day and 68.4% did not frequently visit fast-food restaurants. Finally, 73.7% consumed two yogurts and/or some cheese daily.

The water intake and daily consumption of fruits and vegetables of participants in April are presented in Table 3. The majority of the participants drank <1.5L of water daily (63.2%) and ate at least 5 portions of fruits and vegetables a day (57.9%).

One young football player had chocolate allergy and others two had lactose intolerance.

4. Discussion and Conclusion

In this study it was intended to assess the body composition, nutritional status and level of adherence to MD of young football players. A good nutritional status, improved body composition and high adherence to MD are associated with good quality of life, protection against diseases and premature deaths and optimization of sports performance of those who become future professional players (1).

From January to June, the young football players decreased their weight and have grown up significantly, which may explain the reduction found in the median BMI. It is important to highlight that all skin folds measurements decreased during this period, as did MUAC and waist circumference.

Within this sample, a higher percentage of young football player presented a normal BMI value at the second evaluation moment compared to the first one. This was due to the lower proportion of athletes in the categories underweight and pre-obesity. Regarding body composition, the %BFM decreased between January and June.

According to IAN-AF 2015-2016 results, the prevalence of pre-obesity among 10-17 years old' group in Portugal was 23,6 % (5), which is higher than the prevalence found in this sample in both moments of evaluation. Moreover, within this sample, %BFM was 9,4 (SD: 3.5) % in the first moment and 6.6 (SD: 2.4) % in the second moment, values which are considered a low fat level in childhood (27). This might be explained by the fact this is a sample of young football players and whose levels of physical activity leads to decreased body fat mass (28).

Nikolaidis demonstrated that an elevated BMI and %BFM are associated with decreased physical fitness in young football players (29). The sample of Nikolaidis is composed of 136 players, from Greece, aged between 12 and 14 years old and the prevalence of obesity was 19,9%, whereas for present study sample no football player was identified with obesity at any moment. The %BFM in Nikolaidis study is 16.2 (SD: 4.6) %, which is higher than median values found in our sample.

On the other hand, Campa et al., showed that %BFM values of U(Under)10, U11 and U12 Italian male professional football players were 12.8% (SD: 2.2%), 14.0% (SD: 3.2%), and 15.9% (SD: 3.9%), respectively, which is higher than median values found in the present study (30). It is also important to highlight that in the study from Campa et al., %BFM was estimated with DXA method in August and therefore at the beginning of the season. Differences towards present study results may be due to different timings in data collections and it has been shown that the Slaughter equation may underestimate %BFM compared to DXA (19,31). Also, according to Sánchez et al., mean %BFM of U10-U12 Spanish male professional football players was 15.1% (SD: 4.6%), a lower value than those found for our sample (19). The study from Sánchez et al. was carried out during the regular competition season (September–June) however authors did not specify when the anthropometric assessments were collected which impairs comparisons with present data.

The present study evaluates diet quality using the KIDMED (24). The first moment of evaluation showed that the young players present high adherence to the MD since mean average score was higher than 8 (optimal Mediterranean diet with total score ≥8) and most players were in the high level of adherence category. Despite the low number of responses at the second moment, KIDMED final score improved or remained the same compared to the first moment. These results suggest that the dietary pattern of these

athletes is aligned with nutritional recommendations and possibly contributes to the low levels of obesity and fat mass found.

It is important to highlight that almost all participants eat fruits and vegetables every day, but the percentage of young football players that meets the recommendations of 400g of fruit and vegetables a day is not optimal (57.9%). According to other studies, consumption of fruits and vegetables continues to be a point needing to be addressed (5,19,32). The IAN-AF showed that only 22% of 10-19 years old adolescents eat at least 5 portions of these two food groups a day. Comparing our group with this data, they show better consumption levels of fruits and vegetables, 57.9% consume a second piece of fruit, 42.1% consume a second portion of vegetables and 57.9% eat at least 5 portions of these two groups a day (5). However, water intake of these young athletes is low, only 36,8% drank at least 1,5 l of water per day, a value below the average of mean for the 10-19 years old group in Portugal (2,1 l/day) (5). The Dietary Reference Intakes for children between 9 and 13 years old is between 1,6 l and 1,8 l, however, it is easily understood that athletes need higher amounts of water, depending on the expenditure during physical activity and climatic factors during sports practice (33,34). In a sports context, adequate hydration has a substantial impact on the performance of the athlete. Dehydration can bring serious damage to the athlete's health in addition to the increased risk of severe degradation in performance (35,36). For this reason, and due to the low water intake for most of the athletes involved in this study, the family and staff team should encourage the consumption of water during main meals and sport practices (37,38).

On the other hand, this study has shown that only 5,3% of the young football players skip breakfast and that only 10,5% of them eat commercially produced pastries for breakfast. In this sense, the evidence has shown that skipping breakfast or consuming an unhealthy breakfast affects negatively athletic performance (39,40).

According with Martinez et. al (41), the KIDMED test is a good identifier of bad eating habits, but it might not be a good predictor of variations in body composition in young male football players because it does not evaluate the quantity of food ingested. Nevertheless, it was not possible to relate differences in adherence to MD with differences in body composition between the two moments of evaluation due to the low number of answers to the KIDMED questionnaire in the second moment.

This study was important to this team because it was the first to evaluate body composition, nutritional status and eating habits and included most of the club's young athletes (n=40). Some other study's strengths can be enumerated, such as the extensive anthropometric assessment of the athletes carried out and the use of a validated tool, KIDMED, to evaluate eating habits, more specifically, adhesion to MD.

However, this study has some limitations. At first, the researcher was inexperienced in anthropometric measurements and this group was composed of two ethnicities (Caucasians and Blacks) with different characteristics at body composition levels (42). The low number of Blacks athletes impaired the sample stratification by ethnicity. The KIDMED test allows to evaluate the quality of the diet, but not the quantity. In addition, the data collection using the KIDMED questionnaire could be biased due to errors in the reports and memory bias.

In a future perspective it would be important to carry out a study with more participants, throughout all the season, from September to June, and would be valuable in the sports practice field, to evaluate and to compare differences in body composition between players at different field positions, as well as to evaluate characteristics, such as speed and jumping ability, that are indicative of sports performance and are likely to be related to body composition and food habits. Moreover, it should also be evaluated the association between adherence to the MD, energy and nutritional intake, body composition and the physical performance of young football players.

In conclusion, this study has shown that most of these young athletes have a normal and decreasing BMI during the season. Regarding BMI, most participants were in the normal range and no obese athletes were identified. In what concerns to %BFM, it decreased during the season and most athletes were in the low %BFM category which highlights the need to design nutritional interventions to guarantee body composition levels compatible with physical performance and health. Moreover, despite the better eating habits of football players compared to their national peers and the high level of adherence to the MD, it would be important to meet the daily recommendations for water, fruits and vegetables, which would be beneficial for physical performance and health.

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6. Tables and figures

Table 1: Mediterranean Diet Quality Index (KIDMED)

KIDMED Test	Scoring [a]
1. Consume natural fruit juice or fruit juice every day	+1
2. Have a second fruit every day	+1
3. Eat fresh or cooked vegetables once a day	+1
4. Eat fresh or cooked vegetables more than once a day	+1
5. Consume fish at least 2–3 times a week	+1
6. Go once or more times a week to a fast-food restaurant	-1
7. Eat legumes more than once a week	+1
8. Consume pasta, rice, bread, and potato almost every day	+1
9. Have cereals or grains for breakfast	+1
10. Consume nuts at least 2 or 3 times a week	+1
11. Use olive oil at home	+1
12. Skip breakfast	-1
13. Have a dairy product for breakfast	+1
14. Have commercially baked goods or pastries for breakfast	-1
15. Consume two yogurts and/or some cheese daily	+1
16. Consume sweets and candy several times every day	-1

a – Score ranges between -4 and 12; low adherence if total score ≤3, average adherence if total score is between 4 and 7; and high adherence if total score ≥8.

Source: Serra-Majem L, Ribas L, Ngo J, Ortega RM, García A, Pérez-Rodrigo C, et al. Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean Diet Quality Index in children and adolescents. Public Health Nutr. 2004;7(7):93.

Table 2: Anthropometric Characteristics, Body Composition and Nutritional Status of young football players (9 – 13 years) in the first moment of evaluation (n= 36, January and February 2022) and in the second one (n= 27, June 2022).

	First moment (n=36)	Second moment (n=27)	p
	Median (IQR)		
Weight (kg)	41.2 (8.0)	40.8 (6.9)	0.592
Height (cm)	153.9 (10.6)	154.4 (9.0)	**<0.001**
Sitting Height (cm)	79.1 (10.6)	79.5 (4.7)	**<0.001**
Mid-upper Arm Circumference (cm)	21.2 (2.3)	20.8 (2.1)	0.161
Waist Circumference (cm)	64.1 (3.7)	63.1 (3.3)	**0.006**
Triceps SF (mm)	5.2 (2.2)	3.1 (1.5)	**<0.001**
Subscapular SF (mm)	4.7 (1.4)	4 .0 (1.0)	**<0.001**
Biceps SF (mm)	2.9 (1.4)	2.2 (0.8)	**<0.001**
Iliac Crest SF (mm)	5.6 (1.8)	5.3 (1.4)	**0.006**
Supraspinale SF (mm)	4.5 (1.7)	4.1 (1.3)	**0.004**
Abdominal SF (mm)	4.7 (2.1)	3.8 (1.2)	**0.002**
Front Thigh SF (mm)	7.7 (3.3)	5.3 (2.2)	**<0.001**
Medial Calf SF (mm)	4.9 (2.3)	3.1 (1.0)	**<0.001**
Sum 8SF (mm)	40.2 (12.6)	31.1 (8.8)	**<0.001**
% BFM	9.4 (3.5)	6.6 (2.4)	**<0.001**
	n (%)		
BMI (kg/m^2)			
Underweight	3 (8.3)	1 (3.7)	**<0.001**
Normal	30 (83.3)	25 (92.6)	
Pre-obesity	3 (8.3)	1 (3.7)	
BFM (%)			
Low BFM	22 (61.1)	25 (92.6)	0,076
Normal BFM	14 (38.9)	2 (7.4)	
MUAC (cm)			
Low MUAC	10 (27.8)	10 (37.0)	**<0.001**
Normal MUAC	26 (72.2)	17 (63.0)	

SF – Skinfold; BMI – Body Mass Index; BFM – Body Fat Mass; MUAC – Mid-Upper Arm Circumference

For BMI following categories were created: underweight (BMI ≤ P3), normal weight (P3 < BMI ≤ P85) and pre-obesity (P85 < BMI ≤ 95); for BFM, low BFM (%BFM ≤ P10) and normal BFM (P10 < %BFM ≤ P85); and for MAUC: low MUAC (MUAC ≤ P15) and normal MUAC (P15 < MUAC ≤ P85).

Table 3: Eating habits of young athletes (n= 19, 9 – 13 years old) in April 2022.

	n (%)
Water Intake	
≥1.5Lt	7 (36.8)
<1.5Lt	12 (63.2)
Intake of fruits and vegetables a day	
≥5 Portions	11 (57.9)
<5 Portions	8 (42.1)

7. Attachments

Annex A

Universidade Fernando Pessoa

Exma. Senhora
Prof. Doutora Sandra Gavinha
Diretora da FCS

Nº	Data
FCS/CNU – 236/21-2	22 de Fevereiro de 2022

Exma. Senhora Professor Doutora,

A Comissão de Ética apreciou a ressubmissão do projeto apresentado por Pedro Miguel Carvalho Faria, intitulado "Evolução do estado nutricional e da composição corporal durante a época desportiva em crianças da modalidade de futebol" a realizar no âmbito da licenciatura em Ciências da Nutrição.

As alterações solicitadas no ofício anterior foram realizadas:
1. Proposta de projeto de investigação foi entregue (e não só a fundamentação do estudo e os objetivos)
2. O consentimento informado (para menor) foi alterado
3. O questionário/escala foi alterado de acordo com o solicitado
4. O investigador entregou o questionário e verificou-se que não há recolha de informação sensível

Deste modo, a Comissão de Ética considera não haver nada a opor quanto à realização do estudo.

Com os melhores cumprimentos.

A Presidente da
Comissão de Ética da UFP

Inês Lopes Cardoso

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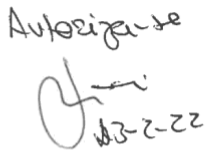
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