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Evaluation of nutritional status, body composition and nutrition literacy in adolescent dancers

Abstract

Introduction: Teenage dancers have a low level of nutrition knowledge. Restrictive eating behaviors and / or incorrect eating habits characterize a significant percentage of dancers, starting these practices very early in their training process. The evaluation of food and nutritional knowledge of teenage dancers is a very relevant subject, because may help dancers to identify gaps in food and nutrition knowledge and, also may contribute to improve their eating habits and sports performance.

Aim: To evaluate nutritional status and knowledge in a sample of 12 adolescent dancers.

Methodology: Cross-sectional analytical observational study carried out at the Dance School. Anthropometric measurements were performed according to international standards for anthropometric assessment. A general questionnaire was developed and applied to obtain socioeconomic and lifestyle. The study was organized in three phases. The diagnostic phase included the application of a nutritional knowledge questionnaire for adolescents, anthropometric and body composition assessment and the application of a general information and lifestyle questionnaire. The intervention phase included a food education session and new application of the same nutritional knowledge questionnaire. The evaluation was performed by analyzing anthropometric and body composition data and comparing the results of the nutritional knowledge questionnaires applied before and after the food education session.

Results: Seven dancers had values of body fat mass above 30%. The highest values were obtained to the tricipital and geminal skin folders (25 mm) and the lowest value was obtained for bicipital skin fold (4 mm). The results of the nutritional knowledge questionnaire showed that 8 of the adolescents did not reach 50% of correct answers dancers failed more questions and failed more answers in groups III and IV. Group I, on the other hand, had the highest rate of correct answers (55%). Nine of the participants showed improvement in nutritional knowledge after a session of food education.

Conclusion: Although there has been an increase in nutritional knowledge, the results of this study revealed that there are still many doubts regarding nutrition and diet. A better knowledge may not necessarily reflect an immediate change in the participants eating habits. A balanced, varied, and complete diet and not just an adequate caloric intake is necessary to keep body composition within healthy values, especially for dancers who presented a high BMI and excess of body fat, in order to improve their health condition and sport performance.

Keywords: young dancers, nutritional knowledge, nutrition education.

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Introduction

Dance is a form of artistic expression that allows the transmission of emotions through movement, at the same time that it requires a significant physical effort from the dancer[1] imposed by the repetitive nature of the movement patterns of the choreographies,[2,3] in order to achieve the desired artistic results.[1] The dancer must have a good balance during body movement, motor coordination, body awareness, endurance, rhythm and musicality.[4,5] Some dance styles, such as ballet, require the dancer to have a body silhouette compatible with aesthetic requirements, which is a reason for pressure to maintain low weight and low levels of body fat.[6] From the outset, it is essential that the dancer has an adequate diet, since a deficient diet may lead him to run health risks such as injuries and eating disorders[7] such as anorexia and bulimia.[8] Symptoms and behaviors related to these disorders, such as low weight, food intake below the recommendations and use of inappropriate strategies for weight control seem to be more frequent in dancers.[8] In ballet, the syndrome of the female athlete triad is widely recognized, which includes not only the eating disorders that give rise to deficits in macronutrients and micronutrients, but also other clinical conditions such as osteoporosis and amenorrhea.[9] These behaviors are often associated with poor nutritional literacy,[10] not only by dancers but also by dance teachers who seem to overestimate the weight of their students and contribute to the tendency to demand a underweight body by Akivis & Sive-ner. Good nutritional literacy allows not only to make choices and have healthier eating practices by Associação Portuguesa de Nutrição but also contributes to the good development and growth of young dancers. A balanced nutrition is essential to achieve an excellent performance in dance, being extremely important that professional and non-professional dancers, teenagers or adults, have food and nutritional advice according to the guidelines created for this purpose.[6] The present study aims to evaluate the nutritional and dietary knowledge of adolescent dancers from the amateur dance school.[11,12]

Methodology

Study design

Cross-sectional analytical observational study carried out at the Dance School. The study was organized in three phases. In the

first phase it was assessed anthropometric and body composition data. In this phase was also applied two questionnaires: a) general questionnaire with closed questions focused on socioeconomic and lifestyle aspects and b) Knowledge Questionnaire of Nutrition for Adolescents (QCNA)[13] for Portuguese adolescents (aged 11 to 18 years old) that focus on food and nutritional literacy. The second phase consisted of a food education session about healthy eating and demystifying food myths. In the last phase was performed in new evaluation of the dancers nutritional literacy applying the same questionnaire of the first phase.

Study population

The sample consists of 12 dancers from a dance school aged between 11 and 18 years old. All students practice ballet, contemporary, bar on the floor and modern jazz, with 10 students also practicing ballet with points in addition to the styles mentioned above. They dance 6 days a week, with a minimum workload of 13 hours.

Ethical considerations

All research work was carried out according to the considerations present in the Declaration of Helsinki.[14] All participants were informed of the objectives and methodology of the study and freely accepted to participate, and an informed consent was sent, which was signed by the education responsible so that they were aware of the study and thus authorized the participation of their student in it.

Data collection and study procedure

Anthropometric and body composition assessment

Anthropometric measurements were performed according to international standards for anthropometric assessment.[15] Weight was assessed using an SECA da electronic scale, model 813 (SECA GmbH & Co.KG, Hamburg, Germany). Height was measured using a portable stethoscope, SECA®, model 213 (SECA GmbH & Co.KG, Hamburg, Germany). For measuring biepicondylar diameters (femur and humerus), a Cescorf® caliper (Cescorf Innovare, Porto Alegre, Brazil) was used; To measure skin folds (bicipital, tricipital, crural, geminal, subscapular, suprailiac, supraspinal and abdominal), a Cescorf® adipometer (Cescorf Innovare, Porto Alegre, Brazil) was used, with precision of 1 mm. For the perimeter measurements (arm, contracted arm, chest, hip, waist, thigh and twin) were performed with a 2 m flexible steel tape with 1 mm of precision from the Cescorf® brand (Cescorf Innovare, Porto Alegre, Brazil). The Body Mass Index (BMI) was calculated according to the equation weight/(height^2) (kg/m^2). World Health Organization growth curves for children aged 5 to 19 years were used to assess nutritional status.[16] The percentage of fat mass (FM) was obtained by applying the Slaughter equation.[17] To assess body composition, it was used the RJL Systems® device, model Quantum X, serial number Q1102X and the BC4 software - tetrapolar electrical bio-impedance test (RJL Systems, Inc., Michigan, USA) (RJL Systems, nd).

General and lifestyle questionnaire

A general questionnaire consisting of 6 closed questions was developed and applied to obtain socioeconomic and lifestyle data from the participants.

Assessment of nutritional and food knowledge

Nutritional literacy of participants was assessed through the self-completed QCNA comprising 43 questions, organized in four groups. The questionnaire is evaluated by points, being variable between groups. For each correct answer, 1 point is obtained, in a total of 137 points distributed as follows: group 1 - 13 points; group 2 - 73 points; group 3 - 9 points; group 4 - 42 points. All questionnaires were distributed on paper before and after the food education session and their self-completion was supervised to ensure that there was no exchange of information between the participants.

Food education session

The food education session took place in the second phase with a duration of 2h30m. It was carried out with the objective of clarifying the students and their guardians about what it means to have a healthy diet and, also to demystify some food myths mentioned in the QCNA. During the session, several nutritionally balanced dietary recommendations for snacks were also suggested, in order to be able to apply the concept of a practical and healthy diet adapted to the daily life of a young dancer.

Data analysis

A descriptive evaluation of anthropometric data and body composition was performed. The Body Composition Analysis software was also used to interpret bdy composition data. The socioeconomic and lifestyle characteristics of the participants are presented in the form of proportion (%) or average ± standard deviation. The results obtained in the application of the QCNA before and after the food education session were presented as a proportion (%).

Results

Table 1 shows the socioeconomic and lifestyle characteristics of the sample. The average age of the sample was 13.3 years. There is no chronic disease associated with each of the participants and only 1 participant reported taking medication (pill). Regarding supplementation, also only 1 participant responded affirmatively to the consumption of vitamin C supplement. With regard to physical activity in addition to dance classes, only 1 participant reported practicing another physical activity (volleyball). Regarding eating habits, most of the participants reported being on or having been on a diet at least once (58.3%). The sample's average hours of sleep was 8.25 hours.

Table 1 Socioeconomic and lifestyle characteristics of the sample

Dancers(n=12)	Age(years)	CD	Medication	Suplementation	PA	Diet	HS
1	11	No	No	No	No	No	9
2	11	No	No	No	No	Yes	9
3	11	No	No	No	No	Yes	9
4	11	No	No	No	No	No	9
5	15	No	No	No	No	No	8
6	12	No	No	No	No	Yes	8
7	15	No	Yes	No	No	Yes	9

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Table Continued..

Dancers(n=12)	Age(years)	CD	Medication	Suplementation	PA	Diet	HS
8	12	No	No	No	No	No	8
9	15	No	No	No	Yes	No	8
10	18	No	No	Yes	No	Yes	6
11	15	No	No	No	No	Yes	6
12	14	No	No	No	No	Yes	10
Prevalence (%)	--	0.0	8.3	8.3	8.3	58.3	--
M ± SD	13.3 ± 2.3	--	--	--	--	--	8.25 ± 1.2

PA, physical activity; CD, chronic diseases; HS, sleep hours; M ± SD, Mean ±Standard Deviation

In the Table 2, we can see the anthropometric data of study participants. The average weight of the dancers is 52.7 kg and the average BMI is 21.1 kg/m^2. The skin folds that registered the greatest discrepancy in values among the dancers were the tricipital, supraspinatus, crural and geminal. The highest skin fold values were obtained from the tricipital and geminal folds (25 mm) and the lowest value was obtained with the bicipital fold (4 mm). The average percentage of fat mass was 21.7%.

Table 2 Anthropometric data of the sample

Dancers (n=12)	Weight (kg)	Height (cm)	BMI (kg/m^2)	Perimeter (cm)					Skin folds (mm)								BF (%)
				Waist	Hip	Arm	Thigh	Twin	T	B	S	Supra	Sup	A	C	G	
1	31.5	143	15.4	56.0	69.0	20.0	36.9	27.0	12	7.8	6.0	10	7.0	12	16	11	17
2	51.9	153	22.2	67.0	89.7	27.0	53.5	35.3	17	7.0	9.0	13	8.0	18	16	13	23
3	47.0	149	21.2	67.9	81.8	24.7	47.5	32.5	16	10	11	15	9.0	12	16	13	24
4	28.2	135	15.5	53.5	68.0	18.9	39.0	28.3	12	5.0	6.0	9.0	3.0	7.5	10	7.0	17
5	41.8	152	18.0	60.9	81.0	21.5	44.3	32.5	8.0	4.0	7.0	11	9.0	9.0	8.0	5.0	15
6	53.3	163	20.1	64.7	93.0	24.7	49.7	34.8	12	7.0	9.0	11	8.0	8.0	12	9.0	20
7	66.4	156	27.5	77.1	98.8	33.1	56.5	39.8	25	10	20	18	20	18	23	25	31
8	54.1	159	21.5	67.8	89.5	25.7	51.0	35.5	15	10	10	14	10	13	16	15	23
9	80.8	171	27.6	81.8	104	31.8	60.3	39.0	21	12	12	15	12	19	25	18	27
10	63.2	163	23.7	70.4	94.0	28.0	57.0	38.0	12	5.0	7.5	15	9.0	15	23	22	19
11	57.0	163	21.3	72.0	90.1	24.5	50.0	32.8	15	6.5	10	19.5	13	18	20	13	23
12	56.6	162	19.3	68.0	92.0	24.5	47.3	32.6	16	9.0	6,5	11.5	10	18	25	16	21
M±SD	52.7± 14.5	156 ± 10	21.1 ± 3.9	67.9 ± 8.0	89.9 ± 10.9	24.7 ± 4.3	49.9 ± 7.0	33.8 ± 3.9	15 ± 4.5	7.4 ± 2.5	9.0 ± 3.9	13.5 ± 3.2	9 ± 4.1	14 ± 4.2	16 ± 5.7	13 ± 5.8	21.7 ± 4.4

A, abdominal; B, bicipital; C, crural; G, geminal; S, subscapularis; Sup, supraspinatus; supra, supraillic; T, triceps; M±SD, Mean ± Standard Deviation

In Table 3, we can verify the sample's body composition in relation to body fat, body water, lean mass and phase angle. The average percentage of body fat is 24.5% and the average percentage of lean mass is 22.4%. Of the 12 dancers, 7 have values of fat mass above 30%. The dancers who had the highest percentage of body water (63.2% and 65.6%) were also the participants with the lowest percentage of body fat (13.9%), still presenting the same value for the phase angle (5th) which was the lowest in the sample.

Table 3 Body composition of the participants

Dancers (n=12)	Reactance(Ω)	Resistance(Ω)	Body fat(%)	Body water (%)	Lean mass (%)	Phase angle(°)
1	65.0	745.3	13.9	63.2	22.9	5.0
2	66.0	610.2	31.3	51.8	16.9	6.2
3	58.8	581.5	27.1	55.8	17.0	5.8
4	60.5	698.3	13.9	65.6	20.5	5.0
5	75.4	642.4	21.5	59.0	19.5	6.7
6	69.3	664.9	28.6	52.3	19.1	6.0
7	60.3	565.6	39.4	45.7	14.9	6.1
8	68.4	630.2	30.5	51.7	17.9	6.2
9	60.4	546.5	38.1	45.7	16.2	6.3
10	67.3	583.0	33.2	49.8	17.0	6.6
11	65.0	672.0	32.8	49.1	18.1	5.5
12	73.7	784.0	31.2	48.5	20.3	5.4
M ± SD	65.8 ± 5.3	643.6 ± 73	24.5 ± 11.6	52.8 ± 6.3	22.4 ± 5.2	5.9 ± 0.6

M ± SD, Mean ± Standard Deviation

Table 4 shows the results of the nutritional knowledge questionnaire for adolescents before and after the food education session. Dancers failed more questions in groups III and IV, since 8 of the adolescents did not reach 50% of correct answers. Group I, on the other hand, had the highest rate of correct answers (55%).

Table 4 Comparison of results obtained between the 4 groups of the nutritional and food knowledge questionnaire before and after the food education session (% of correct answers)

Dancers (*n* = 12)	Group I Recommendations from the experts (%)		Group II Classification of foods by groups (%)		Group III best food choices (%)		Group IV Health problems or illnesses (%)	
	Before	After	Before	After	Before	After	Before	After
1	46	39	43	48	56	44	19	24
2	62	62	53	69	56	56	52	41
3	23	46	53	40	33	56	14	29
4	54	62	33	26	56	33	26	21
5	62	69	56	63	67	56	52	57
6	31	46	41	30	44	44	38	12
7	62	46	62	67	11	33	62	62
8	39	54	44	51	33	11	45	33
9	46	62	63	59	33	33	57	69
10	54	62	47	73	44	44	45	48
11	69	62	29	33	11	56	21	29
12	54	54	45	44,1	22	22	48	60
M ± SD	50.1 ± 13.7	55.3 ± 9.2	47.4 ± 10.5	50.3 ± 16	38.8 ± 18.3	40.6 ± 14.7	39.9 ± 16.1	40.4 ± 18.5

M ± SD, Mean ± Standard Deviation

In Table 5 are presented the differences in the total score between the initial and final nutritional knowledge questionnaire for adolescents. Of the 12 dancers, 9 showed improvement in nutritional knowledge after the food education session: 2 dancers showed a difference of over 7 points, 3 dancers showed a difference of over 4 points, 1 dancer showed a difference of over 1 point, 1 dancer presented a difference of 2 more points, 1 dancer presented a difference of 9 more points and 1 dancer presented a difference of another 22 points. Two dancers regressed the knowledge they already had with a difference of minus 17 and 8 points. Only 1 dancer maintained the same nutritional knowledge, with no difference in the score between the initial and final questionnaire (0 points).

Table 5 Assessment and comparison of the QCNA score before and after the food education session held for study participants

Participants	QNFK* (punctuation)	QNFK** (punctuation)	Difference
1	50	54	+4
2	74	81	+7
3	51	52	+1
4	47	39	-8
5	77	84	+7
6	54	37	-17
7	80	84	+4
8	59	59	0.0
9	79	83	+4
10	64	86	+22
11	40	49	+9
12	73	75	+2

QNFK, Questionnaire of Nutritional and Food Knowledge.

* Applied before the food education session.

** Applied after the food education session.

Discussion

The present study evaluates the nutritional and food knowledge of adolescent dancers. According to current knowledge, there are few studies dedicated to this topic.[18–20] According to the results, an improvement in nutritional and food knowledge was observed by the participants after a food education session. Although it consisted of only one session, it represents a positive step in the nutritional literacy of the participants and the need to invest in food education in these non-professional athletes is important for improving performance as well as for the healthy growth of adolescents.[10] The dancer who presented a greater difference in results and a higher score after the food education session, was the dancer at 18 years of age, which is to be expected given that at this age individuals have a more complex cognitive structure and structured.[21]

The 2 dancers who regressed nutritional knowledge after the food education session, marked the majority of the answers in the option "I am not sure", contributing to a result lower than expected, compared to the other participants. A possible explanation for this result may be the fact that they were left with more doubts than certainties in relation to certain concepts, which made it impossible for them to indicate the correct answer.

All dancers, including those in charge of education, showed great interest in the food education session, with pertinent questions about certain concepts acquired by various sources of disinformation, such as social networks. The way links are shared on social networks makes it difficult to identify the nature of the content in circulation and uncertainty about its veracity.[5]

One of the limitations of this study was the age range of the participants, because although the QCNA is validated for adolescents aged 11 to 18, it is nonetheless challenging to address certain concepts for an audience with heterogeneous cognitive development and with a speed of processing. distinct information.[21] In addition, some questions present in group 3 - best food choices - of QCNA, are subject to a certain ambiguity, since the definition of healthy can

be very relative depending on the objective and nutritional strategy adopted by a given individual.

Comparing the values of fat mass obtained through skinfolds and bioimpedance, it appears that there is an average difference of approximately 3% between the two methods. This difference was more accentuated in dancers with a higher percentage of fat mass and less accentuated in dancers with a lower percentage of fat mass. A possible explanation for these results may be related to the fact that the Slaughter equation was used, which only takes into account two skin folds (tricipital and subscapular) and which ends up underestimating the values of fat mass compared to bioimpedance, a result that also it has been verified in other studies,[22,23] although there is another study where there are no differences between both methods.[24] Regarding the phase angle, and although there is little knowledge about reference values,[25] the observed values are in accordance with what is documented in the literature.[26]

Analyzing the fat mass profile, and taking into account the percentile in relation to BMI (WHO, 2007), it was found that 3 dancers are in pre-obesity and 1 is overweight, a very divergent reality in the dance universe, especially ballet, where the weight and fat mass of the dancers are typically low.[27] The 3 dancers were classified as pre-obese, obtained scores above 81 points in the nutritional knowledge questionnaire after the food education session. Two of the ballet dancers with pre-obesity and one ballet dancer with excess weight, claimed to have energy restriction without professional accompaniment, despite having already sought a Nutritionist. Food restriction is generally the method used by dancers to maintain a low weight and low percentage of body fat, a method that is counterproductive to their performance.[6]

In the future, it will be relevant to carry out more studies with a longer intervention period, that is, with more food education sessions to improve the dancers' nutritional and food knowledge and thus enable them to adapt food choices to their needs.

Conclusion

The results of the present study showed that there is a lack of knowledge in the field of nutrition and food and that some myths are the basis for inappropriate eating behavior in this type of athletes. A balanced, varied and complete diet and not just an adequate caloric intake, is necessary to keep body composition within healthy values, especially for dancers who presented above-normal BMI and BF% values, in order to improve their health condition and physical performance. The Nutritionist has a very important role in promoting health, healthy eating habits and contributing to the increase in nutritional literacy among dancers. More studies should be carried out with this type of population, in order to better understand their doubts related to food and nutrition and, consequently, to be able to contribute to the improvement of their income, health promotion and increase in nutritional literacy.

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Conflicts of interest

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