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ORIGINAL

Consumption of nutritional supplements by teenagers attending gyms supplements and exercise in teenagers

Consumo de suplementos nutricionais por adolescentes frequentadores de academias

Fabio Luis CESCHINI[1] 0000-0001-7829-1184
Carine Danielle Ferreira Costa LEITE[2] 0000-0002-9047-5557
Roberta Luksevicius RICA[3] 0000-0002-6145-1337
Adriano Fortes MAIA[2] 0000-0003-1880-3998
Aylton José FIGUEIRA JÚNIOR[1] 0000-0002-6635-8019
Danilo Sales BOCALINI[2] 0000-0003-3993-8277

ABSTRACT

Objective

To describe the supplements used by adolescents in gyms in the city of *São Paulo* and the factors related to their use.

Methods

Participants were 1,012 adolescents of both sexes, aged between 13 and 18 years old, all of them regular regulars at gyms in the city of *São Paulo*. For data collection, a questionnaire was used to identify the main supplements consumed by adolescents. The chi-square test was used to verify possible associations with a significance of $p<0.05$.

[1] Universidade São Judas Tadeu, Centro de Educação Física, Programa de Pós-Graduação em Educação Física. R. Taquari, 546, Mooca, 03166-000, São Paulo, SP, Brasil. Correspondence to: FL CESCHINI. E-mail: <flceschini@yahoo.com.br>.
[2] Universidade Federal do Espírito Santo, Centro de Educação Física e Desportos, Programa de Pós-Graduação em Educação Física. Vitória, ES, Brasil.
[3] Faculdade Estácio de Sá, Curso de Educação Física. Vitória, ES, Brasil.

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Results

The use of supplements was more frequent in the age group between 16 and 18 years, in the socioeconomic level B, and the use of these supplements was higher as the time of exercise in the gym was longer (>12 months). The amount of exercise modalities practiced in the gym was inversely associated with the use of supplements. Male adolescents consumed significantly more supplements than females, and Physical Education professionals, friends and parents were the ones who most influenced adolescents to use supplements. The main supplements used by the boys were carbohydrate gel (90.9%) and hypercaloric (94.5%). In girls it was fat burner (55.0%) and vitamins and minerals (50.0%).

Conclusion

The use of supplements was common among adolescents who exercise in gyms in *São Paulo* and the indication was made by physical education professional.

Keywords: Adolescents. Nutritional supplementation. Physical activity.

RESUMO

Objetivo

Descrever os suplementos utilizados por adolescentes em academias da cidade de São Paulo e os fatores relacionados à sua utilização.

Métodos

Participaram 1.012 adolescentes de ambos os sexos, com idade variando entre 13 e 18 anos, sendo todos frequentadores regulares de academias de ginástica na cidade de São Paulo. Para coletada de dados, foi utilizado um questionário com objetivo de identificar os principais suplementos consumidos pelos adolescentes. Utilizou-se o teste Qui Quadrado para verificar possíveis associações com significância de p<0,05.

Resultados

O uso de suplementos foi mais frequente na faixa etária entre 16 e 18 anos, no nível socioeconômico B, e, o uso desses suplementos foi mais alto a medida que o tempo de prática de exercício na academia foi maior (>12 meses). A quantidade de modalidades de exercício praticada na academia esteve inversamente associada ao uso de suplementos. Adolescentes do sexo masculino consumiram significativamente mais suplementos do que o sexo feminino, e, os profissionais de Educação Física, amigos e pais foram os que mais influenciaram os adolescentes para o uso de suplementos. Os principais suplementos utilizados pelos meninos foram o gel de carboidrato (90,9%) e hipercalóricos (94,5%). Nas meninas foram o fat burner (55,0%) e vitaminas e minerais (50,0%).

Conclusão

*O uso de suplementos foi comum entre adolescentes praticantes de exer*cícios em academias de *São Paulo* e a indicação foi feita basicamente por profissionais de educação física.

Palavras-chave: *Adolescentes. Suplementação nutricional. Atividade física.*

INTRODUCTION

Adolescents from 10 to 19 years are one fifth of the world's total population, representing the healthiest age group in terms of physical fitness, physical capacity, and productivity in the personal, cognitive, social, and family spheres [1]. Adolescence rapidly and considerably changes physical, endocrine, psychosocial, and cognitive aspects, being a critical period due to the changes in body structures. Thus, attention to nutritional needs must respect individual requirements and adapt considering the physical activity practiced, maintaining body adiposity within the reference values at this stage of life [1,2].

The use of nutritional supplements is widespread in sports, with evidence that it starts as early as 11 years [2]. According to Garthe and Maughan [3], the use of nutritional supplements has been growing among adolescents, with an average age of 18 years. They aim to obtain more energy, improve the feeling of well-being, and complement their diet.

Studies show that adolescent athletes lack knowledge about the effect of nutritional supplements, even when knowing that its use does not relate to athletic development, physical fitness improvement, movement technique and motivation, or even sports talento [2,3]. Using supplements should respect the individuals' nutritional strategies and aim to improve performance, adapt training, and prevent injuries [4].

Sports substances have become popular among adolescents by proposing improvements in sports performance, weight, body composition, and physical appearance [5]. In 1994, the U.S. Senate established the Dietary Supplement Health & Education Act, defining supplements as products intended to supplement the diet, and may contain vitamins, minerals, amino acids, proteins, herbal, antioxidants, carbohydrates, lipids, a concentrate, metabolites, extracts, or combinations of these ingredientes [6]. Hirschbruch and Carvalho [7] define nutritional supplementation as the punctual consumption of a nutrient aiming at a certain effect. Nutritional supplements may have an ergogenic effect when they improve the exercise performance after days, weeks, or months of ingestion, especially in increasing strength and speed [8]. Still, nutrition plays a fundamental role in the phase of sexual development and maturation, having great significance in sports performance [3,4]. However, the potential of nutrition is often unknown among athletes and coaches [4]. Thus, to avoid the excessive use of nutritional supplements and unfounded practices, only nutritionists should administer nutritional strategies for adolescentes [5].

Using nutritional supplementation during childhood and adolescence without proper guidance can increase the risk of problems associated with pharmacological interactions. Also, since physical or web stores promotes products that are not always reliable, an absence of active ingredients and presence of harmful or dopant substances may occur [9]. Adolescents are more vulnerable because they suffer significant influences from friends, media, and social networks, which leads to the introduction of new habits and interests. Thus, one must be careful using nutritional supplements since in many cases an exchange of food intake by supplements occurs, tending to reduce the consumption of vitamins and minerals [9].

Despite the stimulus to the consumption of nutritional supplements in gyms, the scientific information available so far does not support the effectiveness of most supplements commonly consumed by practitioners of physical activity in gyms, especially those that promise to reduce adiposity and increase muscle mass gain, as popularly reported [3,4-10]. Thus, to implement educational mechanisms, we must understand the prevalence of nutritional supplements use by adolescents, their main objectives, the most consumed types, and indication and/or prescription sources, along with the scientific community and health authorities' important role due to the need to improve current guidelines and surveillance, especially regarding the sale and orientation of the consumption of supplements by adolescents in gyms and training programs. Therefore, this study aimed to describe the nutritional supplements used by adolescents in gyms in the municipality of *São Paulo* and the factors related to its use.

METHODS

A total of 1,012 adolescents of all genders, aged between 13 and 18 years, and who regularly attended physical activity programs in gyms in the municipality of *São Paulo* were included. Our sample was designed by randomly selecting 74 gyms, which were divided into small (less than 500 enrolled students); medium (between 500 and 999 students); and large (≥1000 students), from all geographic regions of the municipality of *São Paulo* (Center, South, North, East, and West). To estimate the required sample size, the following parameters were used: 1) an expected prevalence of supplement use of 50.0%; 2) sampling error of 3 points; and 3) 95% confidence interval. Thus, the minimum estimated required sample was of at least 384 adolescents.

The adolescents were randomly approached by the research team at the gym, on different days of the week and times, during May and June 2016.

The inclusion criteria were (a) age from 13 to 18 years; (b) be regularly enrolled in any gym modality; (c) have submitted the informed consent form filled and signed by the legal guardian. This study was approved by the Research Ethics Committee of *Universidade São Judas Tadeu* (nº 2.093.078, CAAE nº 67107817.1.0000.0089).

Data collection was performed via a questionnaire developed for this study containing questions related to sociodemographic information (gender and age), exercise habit (practice time, frequency, exercise types and objectives), and current consumption of nutritional supplements (type, objective, indication/prescription). *Associação Brasileira de Empresas de Pesquisa* (The socioeconomic classification questionnaire of the Brazilian Association of Research Companies), was also used [11]. This questionnaire uses as criterion the schooling of the head of family and some consumer goods, allowing to scale the Socioeconomic Status in 5 categories, decreasing from A to E. Thus, the questionnaire contained 3 groups of closed and open questions: personal data, physical activity and/or training outside the gym, gym practices, and use of nutritional supplements (categorized as indicated by the product manufacturer). To ease the interviews dynamics, the answers were collected verbally and then transcribed by the interviewer. The instrument reliability was verified via a separate pilot study with 50 adolescents for 5 days, resulting a correlation coefficient r=0.76 in a test and retest model.

Via an anthropometric evaluation, Body Mass Index (BMI) was evaluated by measuring body mass (kg) with a 100-gram-accurate Toledo Prix digital scale without a stadiometer. A Professional Sanny model stadiometer was used to evaluate height (cm). Anthropometric evaluation was performed at the gym before the adolescents' training sessions. The critical BMI points used for classification followed the model proposed for Brazilian adolescentes, according to their gender and age: low weight, normal weight, overweight, and obesity [12].

In this study, were considered users of nutritional supplements adolescents who were using it at the month of data collection. Adolescents who had consumed nutritional supplements in the prior month, but were not currently using them, were considered non-users. The interviewees answered the questions, and the interviewer filled the appropriate answers.

For data analysis, chi-squared test was used to detect associations and differences when proportions were compared between the sexes. Fisher's exact test was used when necessary. The statistical significance adopted was 5%, and the program used to analyze all data collected was the SPSS®IBM® (version 21).

RESULTS

Table 1 shows the sample distribution according to sociodemographic characteristics and exercise practice according to the total sample. Most adolescents practiced only one modality at the gym (64.7%) and strength training was the most practiced modality (52.3%). A total of 39.0% practiced physical activities for more than one year at the gym and 66.6% used nutritional supplements. Approximately 30.0% presented BMI values above normal.

Considering the total sample, supplements use was positively associated (p<0.001) between adolescents aged from 16 to 18 years, with socioeconomic status B (p=0.013), and longer time of physical activity (p=0.032) at the gym (>12 months). The amount of exercise modalities practiced at the gym was inversely associated with the use of supplements (p<0.001). We did not find any significant association between BMI and supplements use.

Table 1 – Sample distribution according to sociodemographic characteristics and gym-related factors. *São Paulo* (SP), Brazil, 2022.

Supplements	n	%
Sex		
Boys	498	49.2
Girls	514	50.8
Age (years)		
13	122	12.0
14	161	15.9
15	188	18.6
16	176	17.4
17	171	16.9
18	194	19.2
Socioeconomic status		
A	-	-
B	367	36.3
C	426	42.1
D	219	21.6
E	-	-
Body mass index		
Underweight	104	10.3
Normal	621	61.4
Overweight	231	22.8
Obesity	56	5.5
Number of modalities practiced		
1	655	64.7
2	241	23.8
≥3	116	11.5
Exercise time		
<6 months	231	22.8
From 6 to 12 months:	387	38.2
>12 months	394	39.0
Gym size		
<500 students	198	19.6
From 500 to 1000 students	365	36.1
>1000 students	449	44.4
Supplements use		
Yes	674	66.6
No	338	33.4
Total	1,012	100.0

As Table 2 shows, boys consumed more supplements than girls (p=0.021). The girls consumed more fat burning substances, such as fat burner (55.0%), while the male group consumed more hypercaloric (94.5%), carbohydrate gel (90.9%), proteins (88.6%), branched chain amino acid (81.9%), amino acids (79.6%), and maltodextrin (68.7%).

Table 3 shows the indication source for supplements use by adolescents. Physical educator (p<0.001), friends (p=0.022), and parents (p=0.034) significantly influenced its use. On the other hand, the orientation by nutritionist (p=0.876) and physician (p=0.822) was not significant. In both groups, the gym physical educator (33.5%) was who most indicated the use of nutritional supplements, followed by friends (30.0%), and self-prescription (19.0%).

Table 4 shows the main reasons for supplements use, with a significant difference regarding gender. Women used more supplements associated with fat burn, while men used supplements to gain more muscle mass, and 6.5% of the adolescents used supplements to complement the diet. Approximately

30.0% used supplement due to the influence of friends, 5.3% did not know why they used, and 5.0% used because physicians or nutritionists indicated.

Table 2 – Distribution of absolute (n) and relative (%) frequency of supplement consumption according to gender. *São Paulo* (SP), Brazil, 2022.

Supplements	Boys		Girls		Total	
	n	%	n	%	n	%
Isotonic	81	52.2	74	47.8	155	23.0
Fat burner	58	45.0	71	55.0	129	19.1
Vitamins and minerals	41	50.0	41	50.0	82	12.2
Hypercaloric	70	94.5*Ŧ	4	4.4	74	11.0
BCAA	59	81.9*	13	18.1	72	10.7
Amino acids	39	79.6*	10	21.0	49	7.3
Proteins	137	88.6*Ŧ	5	11.4	44	6.5
Maltodextrin	22	68.7*	10	31.3	32	4.7
Carbohydrate gel	20	90.9*Ŧ	2	9.1	22	3.3
Creatine	15	10.00	-	-	15	2.2
Total	444	65.9*	230	34.1	674	100.0

Note: *Significant difference in the proportions between boys and girls ($p<0.05$). ŦFisher's exact test. BCAA: Branched Chain Amino Acid.

Table 3 – Absolute frequency distribution (n) of sources of indication for supplement use. *São Paulo* (SP), Brazil, 2022.

Supplements	PE	Friends	Nutritionist	Physician	Parents	Self-Prescription	Sum
				n			
Isotonic	90	29	4	3	25	4	155
Fat Burner	34	36	9	-	22	28	129
Vitamins and minerals	19	12	4	5	18	24	82
Hypercaloric	12	29	6	-	10	17	74
BCAA	22	31	3	-	5	11	72
Amino acids	17	15	-	-	2	15	49
Proteins	13	21	-	-	2	8	44
Maltodextrin	4	16	-	-	-	12	32
Carbohydrate gel	6	9	-	-	-	7	22
Creatine	9	4	-	-	-	2	15
Total	226	202	26	8	84	128	674

Note: BCAA: Branched Chain Amino Acid. PE: Physical Educator.

Table 4 – Absolute frequency distribution (n) of the main reasons for supplement use. *São Paulo* (SP), Brazil, 2022.

Supplements	Fat reduction	Hypertrophy	Hydration	Potential energetic	Complement diet	Friends use	Do not know	Sum
				n				
Isotonic	-	-	87	12	15	34	7	155
Fat Burner	80	-	-	-	-	39	10	129
Vitamins and minerals	4	6	5	12	22	29	4	82
Hypercaloric	-	36	-	4	5	27	2	74
BCAA	-	41	-	4	2	21	4	72
Amino acids	-	15	-	2	-	27	5	49
Proteins	-	24	-	2	-	16	2	44
Maltodextrin	-	20	-	12	-	-	-	32
Carbohydrate gel	-	12	-	4	-	4	2	22
Creatine	-	12	-	3	-	-	-	15
Total	84	166	92	55	44	197	36	674

Note: BCAA: Branched Chain Amino Acid.

DISCUSSION

The type of supplement differed between genders. While boys consumed more supplements to increase muscle mass, girls consumed it to lose weight. This may relate to a desire of a specific body type in each gender and maturational adaptation [12].

The literature constantly discusses and researches the physiological factors which affect hypertrophic capacity during physical activity since adolescents commonly choose strength training, and most often use protein supplementation [3-13].

Athletes and physically active people often associate strength training with protein supplementation. They consider that this type of supplement helps to improve strength and to lean mass gain, which disagrees with the effectiveness found in the literature [13].

To minimize oxidative losses of amino acids induced by exercise and establish muscle mass gain, the recommendation of daily protein intake for adolescents who practice physical activity – especially strength training – is 1.5g/kg of body mass [14]. But before using supplementation – especially protein supplements – the basic nutrition, that is, the correct diet, must be considered. And only trained professionals must evaluate if one needs supplementation [14,15].

Nissen and Sharp [16] conducted a meta-analysis to quantify what type of supplement could increase muscle mass and strength in a strength training program (at least 2 times per week). They examined a total of 250 supplements, but the results showed no significant difference in the increase of strength and muscle mass after strength training with supplementation. On the other hand, creatine was one of the only nutritional supplements that showed a significant effect in increasing lean mass (0.28-0.36%) and strength (1.09-1.40%). But even though creatine efficacy is proved, our findings suggest that few adolescents used creatine as a supplementation strategy.

A systematic review and meta-analysis, found out that protein supplementation in young people failed to improve efficacy since their daily protein need was supplied only by a training strength and adequate food intake [14]. The supplementation in young people was effective only on those who failed to reach 1.6g/kg/day by feeding. We should highlight that we found a high consumption of protein supplementation in boys. Thus, we can offer scientific evidence of a relation between daily intake and supplementation. Adolescents mostly consumed protein nutritional supplements or those which included proteins. Moreover, supplements were mostly indicated by physical educators, followed by friends and self-prescription.

Only 26 adolescents (3.8%) followed the recommendation of a nutritionist and 8 (1.2%) consumed it under medical guidance. Therefore, the majority consumed it without pre-criterion or previous evaluation regarding their actual consumption needs.

A careful nutritional assessment is the only way to offer parameters to recommend supplements use in the face of nutritional deficiencies. We hypothesize that if adolescents consume nutritional supplements associated with daily diet without professional guidance, they may – for one or more types of nutrientes – ingest doses above the recommended, resulting in medium and long term side effects [17].

Via questionnaire, Bell *et al.* [18] analyzed the influence of nutritional supplement on performance and muscle mass of 333 adolescents from 13 to 19 years. Their results showed that male adolescents consumed more protein, creatine, and multivitamins than female adolescents. These findings corroborate with data from Scofield [19] in which 38.1% of adolescents followed recommendations from their coaches, friends, and self-prescription in supplement use.

Also via questionnaire, Duellman *et al.* [20] evaluated the use of protein supplement in 61 adolescents and average age of 15±1 years. In 39 adolescents, the average frequency of indication/prescription of

protein supplement was 6 times per week. A total of 22 adolescents did not use supplement. Physical educators and friends were the main indicators for its use. The reasons that led to the use of nutritional supplements differed between genders. Girls used more supplements related to weight loss and boys to gain muscle mass.

Compared with the control group, Belza *et al.* [21] showed that after six weeks, supplements with *citrus aurantium* (975mg) and caffeine (500mg) significantly reduced body mass by 1-1.5%. Assessing physical fitness and clinical health status in overweight boys and girls.

Poole *et al.* [22] evaluated a meal replacement associated with reduced body adiposity. They were distributed into two groups: experimental (6 boys, 7 girls; 21±5 years, 168±8cm, 75.4±12.7kg, 31.6±7.7% body fat) and control (6 boys, 6 girls; 22±4 years, 174±9cm, 84.1±8.8kg, 30.2±5.6% body fat). Both groups consumed 4 capsules and a meal replacement daily. For 8 weeks and 3 sessions per week, these groups had done strength (2 sets with 12 repetitions at 75-80% 1RM) and cycloergometer training (30 minutes at 70-85% of heart rate reserve). Both groups showed significant reduction in body mass and body fat. However, the control group showed an increase in adipose mass.

Although these studies showed that supplements consumption by adolescents practicing physical activity is frequent, they also showed that non-qualified people indicated it, evidencing an indiscriminate use, which is worrisome and should be analyzed by regulatory agencies.

Contrary to scientific evidence and local and Brazilian legislation, adolescents' gym-goers in the municipality of *São Paulo* use nutritional supplements indicated by non-qualified people (friends). These prescriptions occur without proper care, disregarding nutritional needs. We must remember that the *Conselho Regional de Educação Física de São Paulo* (Regional Council of Physical Education of *São Paulo*), resolution nº 151/2022, recognizes the physical educator as trained to advise, inform, and clarify qualitative aspects and general characteristics about nutritional supplements exclusively related to physical exercise practices [23]. However, the *Conselho Federal de Nutrição* (Federal Council of Nutritition), technical standard 04/2022 and resolution nº 731/2022, reinforces the nutritionists' qualification, competence, and full domain of the subject to prescript nutritional supplements in an effective, safe, relevant, and scientific manner [24].

Our findings may present new questions and limitations, allowing further studies to be conducted. The main problem is the physical educator indicating products for nutritional supplementation, or the easy access to these information. A full-time nutrition department in fitness spaces could assist practitioners about their real needs and appropriate dose. Also, even instructed about the supplements, some participants may have filled the questionnaire erroneously. Finally, the knowledge of physical educators about the action mechanisms of nutritional supplements, recommendations, and real need is a primary factor for multidisciplinary and interprofessional actions.

CONCLUSION

Our findings suggest that the use of nutritional supplements was common among adolescent gym goers in the municipality of *São Paulo*. Physical educators were the main source of indication. However, even though the *Conselho Regional de Educação Física* recognizes the physical educator capabilities to advise, inform, and clarify about general aspects of nutritional supplementation regarding physical exercises, further studies on the knowledge of these professionals are necessary.

CONTRIBUTORS

FL CESCHINI and AJ FIGUEIRA JÚNIOR contributed to the collection, interpretation and tabulation of data and statistical analysis. FL CESCHINI, CDFC LEITE and RL RICA contributed to the writing of the manuscript. AF MAIA, AJ FIGUEIRA JÚNIOR and DS BOCALINI contributed to the adjustment of the manuscript discussion.

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