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Evaluation of supplement consumption by bodybuilders in Ouro Preto–MG fitness centers

Avaliação do consumo de suplementos por praticantes de musculação em academias de Ouro Preto – MG

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Abstract

In the search for aesthetic body patterns and improvement in performance, individuals have been subjected to the consumption of nutritional supplements, often indiscriminately. This study aimed to evaluate the consumption of nutritional supplements by bodybuilders in two academies of Ouro Preto-MG, Brazil. A cross-sectional study was performed, a non-probabilistic sample, composed of individuals between 19-56 years old, bodybuilders. A self-administered structured questionnaire was used, available in the academies for a period of three months. A total of 124 individuals participated, of which 58% were men. Mean age was 29.3 years, with 58.1% of the sample belonging to the age group of 19-29 years; 52.4% trained five times a week or more, 50% performed training sessions longer than one hour and 48.4% used some type of supplement, whey protein predominating (76.7%). The main sources of prescription were of professional nutritionist and physical trainer. The main objective for the use of supplements was gain of muscle mass (81.7%); 93.3% considered effective supplementation and only 45% of the supplementation was classified as adequate, with 80.0% of adequacy when the prescription was made only by the nutritionist. There was no significant difference between the variables analyzed in the study. It was concluded that there was significant use of supplements in an indiscriminate way and the need of the nutritionist to avoid health problems.

Keywords: Dietary Supplements. Sports Nutritional Sciences. Resistance Trainign. Fitness Centers.

Resumo

Na busca de padrões estéticos corporais e melhoria na *performance*, indivíduos têm se submetido ao consumo de suplementos nutricionais, muitas vezes de forma indiscriminada. O objetivo deste estudo foi avaliar o consumo de suplementos nutricionais por praticantes de musculação em duas academias de Ouro Preto-MG. Realizou-se estudo transversal, amostra não probabilística, composta por indivíduos entre 19-56 anos, praticantes de musculação. Utilizou-se questionário estruturado autoaplicável, disponível nas academias por período de três meses. Participaram 124 indivíduos, sendo 58% homens. Média de idade foi 29,3 anos, com 58,1% da amostra pertencente à faixa etária de 19-29 anos; 52,4% treinavam cinco vezes por semana ou mais, 50% realizavam sessões de treino superiores a uma hora e 48,4% utilizavam algum tipo de suplemento, predominando *whey protein* (76,7%). As principais fontes de prescrição foram de profissional nutricionista e preparador físico. O principal objetivo para utilização de suplementos foi ganho de massa muscular (81,7%); 93,3% consideraram suplementação eficaz e apenas 45% da suplementação foi classificada como adequada, sendo 80,0% de adequação quando a prescrição foi realizada somente pelo nutricionista. Não houve diferença significativa para uso de suplemento entre as variáveis analisadas no estudo. Concluiu-se que houve expressiva utilização de suplementos de forma indiscriminada e necessidade do nutricionista para evitar agravos à saúde.

Palavras-chave: Suplementos Nutricionais. Ciências da Nutrição Esportiva. Treinamento de Resistência. Academias de Ginástica.

Introduction

One of the main features of the contemporary consumer society is the growing emphasis on body appearances. In the last few decades, physical appearancehas become the target of attentionwith the dissemination of information on body care and management techniques,[1] leading to a greater demand for fitness centers, as well as the use of nutritional supplements.[2]

According to the CFN (Conselho Federal de Nutrição – Federal Nutrition Council) Resolution No. 390/2006,[3] nutritional supplements are foods that complement the daily diet of a healthy person with energy and/or nutrients when the intake of nutrition from their diet is insufficient or when the diet requires supplementation. These supplements should contain at least one of the following nutrients: vitamins, minerals, proteins, amino acids, lipids, fatty acids, carbohydrates or fibers, in the isolated or combined form.

Through its Ordinance No. 32, of January 13, 1998,[4] Resolution RDC (Resolução da DiretoriaColegiada – Resolution of the Board of Directors), and No. 18, of April 27, 2010,[5] ANVISA (Agência Nacional de VigilânciaSanitária- Brazilian National Health Regulatory Agency) classifies nutritional supplements as vitamins ormineral supplements, hydroelectrolytes, energy boosters,proteins for partial meal replacement, creatine, and caffeine.

When properly implemented, nutrient supplementation can improve physical performance and recovery between workouts, reduce fatigue and perceived exertion, prolong endurance, provide greater disposition, increase strength and energy reserves, mobilize substrates for muscles and protein anabolism, decrease body fat and minimize disease risks.[6-8] However, abusive and indiscriminate use without the guidance of a trained professionalcan cause many health damages including body fat increase, dehydration, changes in the micronutrient bioavailability, insomnia, seizures, organ overload, and diseases such as hypertension, acute myocardial infarction, stroke, cancer, renal, hepatic and endocrine disorders, psychosis, and even death.[6-7,9-11] Moreover, it can also cause a placebo effect, a phenomenon in which the individual's expectations regarding the effects of a supplement determinesthe body's response to that substance.[12]

According to Resolution CFN No.390/2006,[3] a nutritionist is a qualified professional who prescribesnutritional supplements in compliance with the maximum safety levels stipulated by ANVISA. Therefore, a nutritionistwill prescribe and guide the use of appropriate nutritional supplements in cases where nutritional needs are not being met by the usual dietary sources alone.[6] The prescription should provide the definite supplement dosage and should be based on scientific data and evaluation of the nutritional, dietary, and health status of the individual, after accounting forthe individual's food consumption.[13] Considering the increased use of nutritional supplements in the modern world, our studywas aimed at evaluatingtheir consumption by bodybuilders in two fitness centers in Ouro Preto, Minas Gerais in Brazil.

Methods

This was a cross-sectional study with a non-probabilistic sample taken fromtwo of the largest fitness centers in Ouro Preto, one in the university region and the other in the city outskirts.

The sample consisted of male and female individuals aged between 19 and 56 years. Inclusion criteria were adult age group; literate individuals; members of one of the two fitness centers selected for the study and interest in participating in the study.

The data collection method was a self-administered structured questionnaire developed for the present study, which was available in the fitness centers for three months to all those who were willing to respond and sign the informed consent terms approved by the Comitê de Ética em

Pesquisa (Research Ethics Committee) of the Universidade Federal de Ouro Preto (Ouro Preto Federal University) - CEP/UFOP (CAAE: 69917317.6.0000.5150).The answered questionnaires were then collected and digitalized in a Microsoft Excel file.

Statistical analyses were performed with the STATA/SE 13 software after setting a 5% significance level for all tests. Descriptive and univariate analyses were performed using the Pearson's chi-square test. The use of supplements was consideredas a dependent variable, while sex, age, frequency of use hours dedicated to physical activity, and fitness center location were considered as independent variables.

The classification of the adequacy of the supplementation in relation to the goals of each individual was based on scientific evidence regarding the effects and functions of each supplement.[14-20] Based on this evidence, the individuals interviewed for the study were classified as using adequate, partially adequate,or inadequate supplementation according to the established criteria (table 1).

Table 1. Criteria used to classify the adequacy of supplementation in relation to the goals of each individual: Ouro Preto-MG, 2017.

Adequate	The supplements used meet all the objectives
Partially adequate	Some supplements meet goals, others are unnecessary; The supplements used do not meet all the objectives.
Inadequate	The supplements used do not meet any of the objectives; The use of one of the supplements inhibits the effect of the other.

Results

A total of 124 bodybuilders, with 52.4% (n = 65) attending a fitness center located in the university region were interviewed for the study. Of the participants, 58.0% (n = 72) were males with a mean age of 29.3 years and 58.1% (n = 72) were in the age group between 19 to 29 years. Regarding exercise frequency, 52.4% (n = 65) practiced weight training five times a week or more, and 50% performed sessions of one hour or more. Regarding the consumption of supplements, 48.4% (n = 60) reported using some type of supplement.

Most study participants reported using three supplements (26.7%, n=16). Among the most used supplements were proteins and amino acid based supplements, particularly whey protein, which was used by 76.7% (n=46) of body builders, followed by branched-chain amino acid (BCAA)and creatine, which were consumed by 53.3% (n=32) and 36.7% (n=22) of the individuals, respectively (table 2).

Table 2. Characterization of the use of supplements by the sample (n = 60): Ouro Preto-MG, 2017.

Variables	N	%
Number of used supplements		
1	14	23.3
2	15	25.0
3	16	26.7
4	4	6.7
5 or more	11	18.3
Supplements used		
Whey Protein	46	76.7
BCAA	32	53.3
Creatine	22	36.7
Caffeine	12	20.0
Vitamin Complexes	12	20.0
Glutamine	11	18.3
Maltodextrin	9	15.0
Omega 3	8	13.3
Waxy Maize	7	11.7
Albumin	7	11.7
Hypercaloric	5	8.3
EnergyDrinks	4	6.7
Minerals	1	1.7
Carbohydrate gel	1	1.7
Others	6	10.0

to be continued

Variables	N	%
Prescription Source		
Nutritionist	28	46.7
Physical Trainers	24	40.0
Self-prescription	13	21.7
Doctor	7	11.7
Supplement Store Seller	7	11.7
Family / Friend	4	6.7
Media	1	1.7
Social Networks	1	1.7
Others	1	1.7
Objective for use		
Muscle Mass Gain	49	81.7
Performance Improvement	31	51.7
Muscle Looses Restoration	18	30.0
Food Deficiencies Compensated	9	15.0
Burn fat	9	15.0
Replace Meals	4	6.7
Prevent Diseases	3	5.0
Do not Know	-	-
Others	3	5.0
Effectiveness of prescription		
Yes	56	93,3
No	4	6.7
Adequacy of the use of nutritional supplements in relation to the goals of body builders		
Adequate	27	45.0
Partially adequate	26	43.3
Inadequate	7	11.7

Regarding prescriptions, supplements were mainly prescribed by the nutritionists (46.7%, n=28) and physical trainers (40% n = 24), followed by self-prescription (21.7%, n=13) (table 2).

Among the purposes cited for the use of nutritional supplements weregain of muscle mass (81.7%, n=49), improvement in performance (51.7%, n=31), and muscle loss replacement (30%, n=18). Of the total users, 93.3% (n=56) stated that supplementation was effective in achieving their goals (table 2).

Regarding the classification of the adequacy of the consumed supplements in relation to the goals for which they were used, 45% (n=27) were classified as adequate, 43.3% (n=26) as partially adequate, and 11.7% (n=7) as inadequate.

Adequacy analysis on the use of supplements according to the source of the prescription showed 80% adequacy in those with a prescription provided by a nutritionist, and 31.2% adequacy in those who obtained prescriptions from professionals other than a nutritionist. The latter was therefore classified as inadequate in this group (table 3)

Statistical analyses showed no significant differences between those who used supplements and those who did not, with respect to any of the independent variables evaluated. (table 4)

Table 3. Adequacy of the objective for supplementation according to the source of prescription: Ouro Preto-MG, 2017.

Prescription	Adequate		Adequate Partially		Inadequate	
	N	%	N	%	N	%
Nutritionist	12	80	3	20	-	-
Nutritionists + Additional	5	38.5	8	61.5	-	-
Additional	10	31.2	15	46.9	7	21.9

Table 4. Statistical analysis of the distribution of supplement users according to variables: fitness center location, gender, age, exercise frequency per week, training hours per session: Ouro Preto-MG, 2017

Variable	Uses		Do not use		p
	N	**%**	**N**	**%**	
Fitness center location					
City periphery	31	52.5	28	47.5	0.450
University region	29	44.6	36	55.4	
Gender					
Male	38	52.8	34	47.2	0.286
Female	22	42.5	30	57.7	
Age					
19 – 29 years old	34	47.2	38	52.8	0.912
30 – 39 years old	18	50.0	18	50.0	
40 – 49 years old	7	46.7	8	53.7	
50 – 59 years old	1	100	-	-	
Exercise frequency/ week					
4timesor less	26	44.1	33	55.9	0.407
5 times or more	34	52.3	31	44.1	
Training hours/session (n=120)					
≤ 1h	29	49.3	31	51.7	0.719
> 1h	30	50.0	30	50.0	

Discussion

Among the individuals in the present study, 48.4% reported using some type of supplement. Similar results were reported by Oliveira and Faicari,[21] Wagne,[22] and Maximiano and Santos.[10] However, Frade et al.,[23] and Araújo and Navarro[24] reported lower values of 32.2% and 28%, respectively.Halak et al.[25] reported a much higher percentage of 81% supplement usage than that found in our study. This result may be attributed to individual self-perception based on cultural and aesthetic influences, which in turn is directly linked to self-esteem, self-confidence, self-acceptance and emotional stability.[26] The fitness center environment also favors the dissemination

of stereotypic aesthetic standards, as well as the supplements market, which has media support to launch products with the promise of reaching these standards without the need for medical or nutritional prescription.[27]

The number of supplements used by the bodybuilders was higher in our study than that in other studies in this field. Hallaket al.,[25] Costa et al.,[6] and Cheffer and Benetti[27] reported that approximately 45% to 50% of the individuals in their studies were using only one supplement. The use of several nutritional supplements may lead to overeating, and consequently pose potential health risks,[27]as well as inhibition or damage due to the nutritional action of one supplement over another.[20]

The supplements used by the individuals interviewed in this study were mostly based on proteins and amino acids, mainly whey protein, followed by BCAA and creatine. These results were corroborated with those reported by Maximiano and Santos,[10] Pellegrini et al.,[28] and Oliveira and Faicari.[21] Albuquerque[8] found a difference in only in relation to the second most used supplement by his study cohort, which was maltodextrin as opposed to BCAA in our study. The higher utilization of whey protein can be explained by the belief that excess protein helps to increase muscle mass.[29] Proteins are important in the hypertrophic process, playing a role in the formation, growth and development of body tissues, as well as in the regulation of energy production and muscle contraction through enzyme production.[30] However, excessive consumption of this macronutrient has several disadvantages. Excess protein can be converted to fat leading to an increase in adipose tissue. Additionally, it can trigger a series of risks to an individual's health, such as increased calcium excretion and osteoporosis development, liver and kidney overloads due to the need to metabolize and excrete the extra nitrogen produced and the risk of high blood cholesterol levels because most protein food sources contains large amounts of cholesterol.[31] According to the Sociedade Brasileira do Exercício e do Esporte – SBME (Brazilian Society of Exercise and Sport),[32] the intake of 1.2 to 1.4 g of protein per pound of body weight per day meets the needs of active individuals. For individuals who perform weight training exercises, the recommended intake is 1.6 to 1.7 g of protein/kg/day. To determine the adequate individual protein requirement, it is essential to consider the individual characteristics (gender, age, anthropometric profile, health status, etc.) and the features of the physical exercises such as modality, intensity, frequency and duration.[24] In addition to the adequate intake of proteins, it is important to provide adequate amount of carbohydrates forthe for efficient protein function, since carbohydrates play an important role in protein preservation. When carbohydrate intake is insufficient, proteins are converted and used as a source of energy.[31] The International Society of Sports Nutrition's (ISSN)[18] guideline on protein consumption and exercise states that carbohydrate consumption along with protein and amino acid in take is essential to gain strength, promote hypertrophy post-work out, and to reduce protein degradation. For this purpose, SBME[32] recommends a dose of 10g of protein of high biological value and 20g of carbohydrates, which are in agreement with the total protein and caloric intake.

An analysis of the source of the prescription of the nutritional supplements showed that these are mainly prescribed by nutritionists and physical trainers, followed by self-prescription. Similar results were found by Araújo and Navarro,[24] and Brito and Liberali.[33] On the other hand, Cheffer and Benetti[27] reported physical trainers as the main source of supplement prescriptions, followed by prescriptions from friends, and lastly by nutritionists (21.43%). Sperandio et al.[11] and Pellegrini et al.[28] also reported the physical trainer as the main source of prescription. Studies carried out by Cardoso et al.,[7] Hallak et al.[25] and Costa et al.[6] showed that self-prescription was the main source of prescription. Bertoletti et al.[34] and Oliveira and Faicari[21] reported that less than 10% of supplement prescriptions are distributed by nutritionists. In a study carried out in 1999, 54% of the individuals stated that they used supplements without any professional indication, and 46.0% reported supplement prescription by professionals as indicated by physical education teachers.[35] These studies suggest that little value is given to nutritionists as the professionals qualified to prescribe nutritional supplements, which is contrary to what is stipulated by Resolution CFN No.390/2006.[3] In fact, it is very common for athletes to acquire nutritional supplements without the guidance of a nutritionist, and without considering their physiological particularities and needs, resulting in the use of inadequate supplements.[30] Sperandio et al.[11] concluded that the main issues are the lack of information among the bodybuilders regarding which professional is qualified to provide supplement prescriptions, along with the negligence of unqualified professionals who provide supplement prescriptions.

Among the study participants, the most cited objectives for the use of supplements were gain of muscle mass, improvement of performance, and restoration of muscle losses. These goals may explain the fact that the most used supplements are those based on proteins and amino acids. Similar results were found by Albuquerque[8], who found that the main goal for supplement use was muscle mass gain, followed by increased energy and performance. Studies by Wagner,[22] Araújo and Navarro et al.[24] and Frade et al.[23] also indicated muscle mass gain as the main objective for supplement use. Cheffer and Bennetti[27] and Bertoletti et al.[34] pointed out improvement in training as the possible main objective for supplement use. Despite the knowledge that physical exercise is beneficial to health, most individuals have sought to perform physical exercise for aesthetic reasons, mainly for gaining muscle mass and/or fat reduction,[36] and the practice of bodybuilding is related to a desire for muscular hypertrophy.[8,23] In the present aesthetic context, and as observed in this study where bodybuilders seek hypertrophy, attention must be given to muscular dystrophy or vigorexia. In vigorexia or body dysmorphic disorder, the individual imagines or potentiates aesthetic defects. In this disorder there is an obsession with muscular hypertrophy, and the practice of strength exercise, together with distortion of body image characterized by the perception of an underdeveloped body, although visibly hypertrophied, at levels above the population average leads to consumption of diet with excess protein and increased consumption of supplements.[37]

The evaluation of the adequacy of use of nutritional supplements in relation to the goals of bodybuilders showed that 93.3% of athletes who used supplements found it effective in achieving their goals. However, only 45% of the supplements were classified as adequate in relation to the stated objectives. Therefore, this fact may be related to the placebo effect. Higher percentages of satisfaction with the use of supplements were also found in studies conducted by Frade et al.,[23] and Cardoso et al.[7] A study conducted by Jacob et al.[38] with the objective of analyzing placebo effect in bodybuilders, recruited 13 individuals who had practiced the modality for more than two years and subjected them to maximal load tests in the bench press exercise (10 repetitions). After a recovery period, they were made to perform a single exhaustion series with 80% of the maximum load. After 48 hours, the same individuals received a placebo substance but were informed that they were ingesting amino acid complex capable of increasing strength and resistance, and repeated the previous experimental procedures using placebo as hypothetical supplementation. The results obtained in the study showed that there was an increase in strength, causing the individuals to exceed the maximum load of the first execution, thereby proving the placebo effect. The use of nutritional supplements is often associated to the objectives of the individuals, and many believe that it is not possible to achieve their intention without the use of supplements.[21,24]

Comparing the percentage of adequacy with the supplements source of prescription, a greater percentage of supplementation adequacy was verified in relation to the objectives when the prescription was directed only by the nutritionist (80%). These results highlight the importance of the nutritionist in the nutritional supplements prescription, a fact affirmed by the study of Silva et al.[20] that evaluated the knowledge on sports nutrition by Physical Education professionals in a sports club in São Paulo and found that large number of the individuals in the sample did not have an adequate knowledge of protein and hydration requirements for athletes and sedentary individuals. According to Araújo and Navarro,[24] knowledge about nutrition and supplement prescription is indispensable to avoid unnecessary use and health problems attributed to abusive use, since in most cases, particularly in sportsmen, an adequate diet is sufficient to supply exercise needs.

Of all variables analyzed as possible determinants for supplements use, none presented a statistically significant difference to determine the use of supplements, despite the percentage differences presented between them, allowing us to infer that the use of supplements was homogeneous in this particular sample. Hirschbruch et al.[39] evaluated the consumption of supplements by young people attending fitness centers in São Paulo and found statistically significant associations for the use of supplements in the variables such as gender, age, and hours of exercise, where they found a greater use of supplements among males, adolescents and individuals who spent more time in the fitness center.

Conclusion

The present study showed a considerable use of nutritional supplements by bodybuilders in the evaluated fitness centers, in which most of the prescriptions were not provided by the qualified professionals namely, the nutritionists. The importance of nutritionists in these environments is emphasized so that appropriate actions can be taken to promote awareness about adequate nutrition. Consequently, there may be a significant reduction in health problems related to the indiscriminate use of nutritional supplements. This study has as a limitation where we did not evaluate the participants' food intake, which may have masked an even greater inadequacy in the use of supplements by bodybuilders.

Collaborators

Gomes AC, Figueiredo SM and Souza AA participated of study design, writing, analysis, interpretation of the data and revision of the article. Souza AA and Figueiredo SM guided the study.

Conflicts of interests: The authors declare that there is no conflict of interests.

References

1. Iriart JAB. Chaves JC, Orleans, RG. Culto ao corpo e uso de anabolizantes entre praticantes de musculação. Cad Saúde Pública. 2009; 25(4):773-782.
2. Lima LD, Moraes CMB, Kirsten VR. Dismorfia muscular e o uso de suplementos ergogênicos em desportistas. Rev Bras Med Esporte. 2010; 16(6):427-430.
3. Brasil. Conselho Federal de Nutricionistas. Resolução CFN nº 390, de 27 de outubro de 2006. Regulamenta a prescrição dietética de suplementos nutricionais pelo nutricionista e dá outras providências. Diário Oficial da União. 22 nov. 2006.
4. Brasil. Agência Nacional de Vigilância Sanitária. Portaria nº 32, de 13 de janeira de 1998. Aprova o Regulamento Técnico para Suplementos Vitamínicos e ou de Minerais. Diário Oficial da União. 15 jan. 1998.
5. Brasil. Agência Nacional de Vigilância Sanitária. Resolução nº 18, de 27 de abril de 2010. Dispõe Sobre alimentos para Atletas. Diário Oficial da União. 28 abr. 2010.
6. Costa DC, Rocha NCA, Quintão DF. Prevalência do uso de suplementos alimentares entre praticantes de atividade física em academias de duas cidades do Vale do Aço/MG: fatores associados. Revista Brasileira de Nutrição Esportiva. 2013; 7(41):287-299.
7. Cardoso RPQ, Vargas SVS, Lopes WC. Consumo de suplementos alimentares dos praticantes de atividade física em academias. Revista Brasileira de Nutrição Esportiva. 2017;11(65):584-592.

8. Albuquerque MM. Avaliação do consumo de suplementos alimentares nas academias de Guará-DF. Revista Brasileira de Nutrição Esportiva 2012; 6(32):112-117.

9. Hirschbruch MD, Carvalho JR. Nutrição esportiva: uma visão prática. 2. ed. Barueri: Manole; 2008.

10. Maximiano CMBF, Santos LC. Consumo de suplementos por praticantes de atividade física em academias de ginástica da cidade de Sete Lagoas-MG. Revista Brasileira de Nutrição Esportiva. 2017; 11(61):93-101.

11. Sperandio BB, Silva LDS, Domingues FS, Ferreira EF, Oliveira RAR. Consumo de suplementos alimentares e recursos ergogênicos por mulheres praticantes de musculação em Ubá-MG. Revista Brasileira de Nutrição Esportiva. 2017; 11(62):209-218.

12. Wilmore JH, Coltill DL, Kenney WL. Fisiologia do esporte e do exercício. 4 ed. Barueri: Manole; 2010.

13. Maughan RJ, Burke LM. Nutrição esportiva. Porto Alegre: Artmed; 2007.

14. Becker LK, Pereira AN, Pena GE, Oliveira EC, Silva ME. Efeitos da suplementação nutricional sobre a composição corporal e o desempenho de atletas: uma revisão. Revista Brasileira de Nutrição Esportiva. 2016; 10(55):93-111.

15. Campbell B, Wilborn C, La Bounty P, Taylor L, Nelson MT, Greenwood M, et al. International Society of Sports Nutrition Position Stand: energy drinks. Journal of the International Society of Sports Nutrition [Internet]. 2013; 10(1). Disponível em: https://jissn.biomedcentral.com/track/pdf/10.1186/1550-2783-10-1

16. Cardoso M, Seabra TTP, Souza EB. Dextrose, Maltodextrina e Waxy Maize: principais diferenças na composição, mecanismo de ação e recomendações para o desempenho esportivo. Cadernos UniFOA. 2017; 33:101-109.

17. Goldstein ER, Ziegenfuss T, Kalman D, Kreider R, Campbell B, Wilborn C, et al. International Society of Sports Nutrition Position Stand: caffeine and performance. Journal of the International Society of Sports Nutrition [Internet]. 2010; 7(5). Disponível em: https://jissn.biomedcentral.com/track/pdf/10.1186/1550-2783-7-5

18. Jäger R, Kerksick CM, Campbell BI, Cribb PJ, Wells SD, Skwiat TM, et al. International Society of Sports Nutrition Position Stand: protein and exercise. Journal of the International Society of Sports Nutrition [Internet]. 2017; 14(20). Disponível em: https://jissn.biomedcentral.com/track/pdf/10.1186/s12970-017-0177-8

19. Kreider RB, Wilborn CD, Taylor L, Campbell B, Almada AL, Collins R, et al. ISSN Exercise & Sport Nutrition Review: research & recommendations. Journal of the International Society of Sports Nutrition [Internet]. 2010; 7(7). Disponível em: http://images.biomedsearch.com/20181066/1550-2783-7-7.pdf?AWSAccessKeyId=AKIAIBOKHYOLP4MBMRGQ&Expires=1539734400&Signature=akeJCvspAW0Z8CgeX8gfNeNZHRw%3D

20. Silva RSN, Toigo AM. Os efeitos do uso concomitante de cafeína e creatina nos exercícios físicos. Rev Aten Saúde. 2016; 14(47):89-98.

21. Oliveira TC, Faicari LM. Avaliação da ingestão alimentar e suplementação em praticantes de musculação de academias de Hortolândia-SP. Revista Brasileira de Nutrição Esportiva. 2017; 11(63):265-277.

22. Wagner M. Avaliação do uso de suplementos nutricionais e outros recursos ergogênicos por praticantes de musculação em academias de um bairro de Florianópolis-SC. Revista Brasileira de Nutrição Esportiva. 2011; 5(26):130-134.

23. Frade RET, Viebig RF, Moreira ICLS, Fonseca DC. Avaliação do consumo de suplementos nutricionais por frequentadores de uma academia da cidade de São Paulo-SP. Revista Brasileira de Nutrição Esportiva. 2016; 10(55):50-58.

24. Araújo MF, Navaro F. Consumo de suplementos nutricionais por alunos de uma academia de ginástica, Linhares, Espírito Santo. Revista Brasileira de Nutrição Esportiva. 2008; 2(8):46-54.

25. Hallak A, Fabrini S, Peluzio MCG. Avaliação do consumo de suplementos nutricionais em academias da Zona Sul de Belo Horizonte, MG, Brasil. Revista Brasileira de Nutrição Esportiva. 2007; 1(2):55-60.

26. 26 Del Ciampo LA, Rodrigues DMS, Del Ciampo IRL, Cardoso VC, Bettiol H, Barbieri MA. Percepção corporal e atividade física um uma coorte de adultos jovens brasileiros. Rev Bras Crescimento Desenvolvimento Hum. 2010; 20(3):671-679.

27. 27 Cheffer NM, Benetti F. Análise do consumo de suplementos alimentares e percepção corporal de praticantes de exercícios físicos em academia do município de Palmitinho-RS. Revista Brasileira de Nutrição Esportiva. 2016; 10(58):390-401.

28. 28 Pellegrini AR, Corrêa FSN, Barbosa MR. Consumo de suplementos nutricionais por praticantes de musculação da cidade de São Carlos- SP. Revista Brasileira de Nutrição Esportiva. 2017; 11(61):59-73.

29. 29 Barros AJS, Pinheiro MTC, Rodrigues VD. Conhecimentos acerca da alimentação saudável e consumo de suplementos alimentares por praticantes de atividade física em academias. Revista Brasileira de Nutrição Esportiva. 2017; 11(63):301-311.

30. Reis EL, Camargos GL, Oliveira RAR, Domingues SF. Utilização de recursos ergogênicos e suplementos alimentares por praticantes de musculação em academias. Revista Brasileira de Nutrição Esportiva. 2017; 11(62):219-231.

31. Morais ACL, Silva LLM, Macêdo EMC. Avaliação do consumo de carboidratos e proteínas no pós-treino em praticantes de musculação. Revista Brasileira de Nutrição Esportiva. 2014; 8(46):247-253.

32. Sociedade Brasileira de Medicina do Esporte. Modificações dietéticas, reposição hídrica, suplementos alimentares e drogas: comprovação de ação ergogênica e potenciais riscos para a saúde. Rev Bras Med Esporte. 2009;15(3):3-12.

33. Brito DS, Liberali R. Perfil do consumo de suplemento nutricional por praticantes de exercício físico nas academias de Vitória da Conquista-BA. Revista Brasileira de Nutrição Esportiva. 2012; 6(31):66-75.

34. Bertoletti AC, Santos A, Benetti F. Consumo de suplementos alimentares por praticantes de musculação e sua relação com o acompanhamento nutricional individualizado. Revista Brasileira de Nutrição Esportiva. 2016; 10(58):371-380.

35. Araújo ACM, Soares YNG. Perfil de utilização de repositores proteicos nas academias de Belém, Pará. Rev Nutr. 1999; 12(1):5-19.

36. Sussmann K. Avaliação do Consumo de Suplementos Nutricionais por Praticantes de Exercício Físico em Academia na Zona Sul do Rio de Janeiro. Revista Brasileira de Nutrição Esportiva. 2013; 7(37):35-42.

37. Paula SSF, Viebig RF. Risco de dismorfia muscular em frequentadores de academias do centro de São Paulo. Revista Brasileira de Prescrição e Fisiologia do Exercício. 2016; 10(57):142-148.

38. Jacob N, Willian B, Madereira F, Guedes D, Oliveira F, Madsen L, et al. O efeito placebo no desempenho de praticantes de musculação. Revista Brasileira de Prescrição e Fisiologia do Exercício. 2016; 10(57):10-15.

39. Hirschbruch MD, Fisberg M, Mochizuki L. Consumo de suplementos por jovens frequentadores de academias de ginástica em São Paulo. Rev Bras Med Esporte 2008 Nov/Dez; 14(6): 539-543.

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