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Supplement consumption profile by strength training practitioners in Brazil: a literature review

Gizelle de Sá VELASCO[1], Carolina Barbosa RIBEIRO[2], Gustavo Luis de Paiva Anciens RAMOS[3], Gabriel Vasconcellos de Lima Costa e SILVA[4], Marcia Cristina SILVA[3], Marco Antônio Pereira da SILVA[1], Leandro Pereira CAPPATO[1]*

Abstract

The search for muscle hypertrophy and health improvements has increased both the number of exercisers and the consumption of supplements. The correct use is able to delay muscle fatigue and improve sports performance. However, inadequate supplementation can cause several health problems, so it is necessary to seek a qualified professional for indication of use. The present literature review objective to evaluate the profile of supplement consumption in gyms in different cities and states in Brazil. The research was carried out through a literature review, within the criteria established by the PRISMA Statement. The following databases were used: PubMed, Google Scholar and SciELO, integrating only studies about the use of dietary supplements by strength training practitioners in Brazil, using 25 scientific articles, published between 2011 and 2021. The results shows that the most cited objective for use of supplementation was for muscle hypertrophy, where the most used supplements was whey protein. Another relevant result was the lack of indication of a suitable professional, such as a nutritionist, for consumption recommendation. On the other hand, the main sources of indication were Physical Education professionals, followed by friends and self-referral, which can result in inadequate consumption and, consequently, bring health risks.

Keywords: gyms; protein supplements; strength exercises; bodybuilders.

Practical Application: The knowledge of the profile of consumers, the sources of indication, which supplements are most used and the goals are of great relevance for the development of education and nutritional intervention strategies, aiming at conscious and correct consumption of supplements in Brazil.

1 Introduction

The regular practice of physical exercise brings several health benefits, both for mental (reduced risk of depression and anxiety) and physical health (improved components of physical fitness levels, increased immunity and reduced risk of non-communicable chronic diseases). Thus, the practice of exercise results in an improvement in the quality of life as a whole, including physical, mental and social well-being. (Ferraz et al., 2015; Melo & Bordonal, 2009).

Currently, the excessive search for the perfect body stereotype in a short time, driven mainly by the advent of social networks, has resulted in a significant increase in the consumption of supplements, often indiscriminately, since they are easily marketed products and there are no need for a prescription to buy them (Ferraz et al., 2015; Oliveira et al., 2021). According to Brazilian legislation, a food supplement is a product for oral ingestion, presented in pharmaceutical forms, intended to supplement the diet of healthy individuals with nutrients, bioactive substances, enzymes, or probiotics, isolated or combined (Brasil, 2018).

For those who practice physical exercise, whether athlete or not, nutrition is extremely important, as a correct diet is able to delay muscle fatigue and improve sports performance. In food planning, each nutrient has a specific function, where carbohydrates have an energy function, proteins function in the construction and repair of tissues and vitamins function in the maintenance of homeostasis (Fontan & Amadio, 2015; Andrade et al., 2009).

There are different types of supplements on the market. Carbohydrate supplements have various forms of presentation, such as powder for dissolution, liquids, gels, bars and candies, where the choice of the best form will depend on the time between ingestion and performance of the activity, type and intensity of exercise. Supplements in liquid form, for example, have faster gastric emptying and are ideal for when you want a quick obtainment of energy, while in solid form, the release and absorption are slower, being indicated for long-term exercise, due to the release phase of energy (Fontan & Amadio, 2015).

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[1] *Instituto Federal de Educação, Ciência e Tecnologia Goiano – IFGoiano, Rio Verde, GO, Brasil*
[2] *Department of Food & Nutrition, School of Pharmaceutical Sciences, Universidade Estadual Paulista – Unesp, Araraquara, SP, Brasil*
[3] *Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro – IFRJ, Rio de Janeiro, RJ, Brasil*
[4] *Laboratory of Human Movement Science, Colégio Pedro II, Rio de Janeiro, RJ, Brasil*
*Corresponding author: leandrocappato@gmail.com

Regarding protein supplements, there is a wide variety on the market such as albumin, casein, branched-chain amino acids (BCAA), creatine and whey protein, the latter being the most consumed. The use of amino acids and powdered protein supplements has anti-catabolic and anabolic effects and is intended to replace dietary proteins and increase the biological value of the meal (Alves & Lima, 2009; Menon & Santos, 2012).

Despite the benefits presented, inadequate supplementation can cause several health problems, such as overweight, diabetes and insulin resistance associated with carbohydrate supplements; increased fat stores, thyroid disorders, renal and liver overload associated with protein supplements and toxicity and kidney stones, in the case of inadequate intake of vitamin and mineral supplements (Macedo & Ferreira, 2021; Medeiros et al., 2014; Oliveira et al., 2021). Thus, the search for a professional, such as a Nutritionist, is essential for prescribing the appropriate supplement and the necessary amount of consumption. However, the use of a supplement from a technical prescription is still very low (Viana, 2017).

Researches that addresses the consumer profile on the types of supplements used, their purposes, their pros and cons, is essential for the dissemination of the benefits of the correct consumption of supplements, thus minimizing damage to health (Alves & Lima, 2009; Ferraz et al., 2015; Ziaka et al., 2021). In this scenario, this review aims to evaluate the profile of strength training practitioners supplement consumption in gyms in different cities and states in Brazil (2011-2021), in order to understand their prevalence of consumption, type of supplements used, indication sources, prescription profile,, nutritional characteristics and objectives in the use of these supplements.

2 Methods

This literature review, despite not systematic, was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al., 2009).

2.1 Search criteria

The present research was carried out October 2021, with the objective of finding studies that evaluate the profile of supplement consumption in 3 databases: PubMed, Google Scholar and SciELO.

2.2 Inclusion criteria

To be part of research, articles should meet the following inclusion criteria: (a) original articles and literature review that evaluate the profile or the effects of supplement consuming; (b) studies investigating the strength training practitioners supplement consuming; (c) human male and/or female strength training practitioners; (d) published in Portuguese and English.

2.3 Exclusion criteria

The exclusion criteria were: basic science models, letters to the editor, conference summaries, not indexed articles, studies that not published in the last ten years (2011-2021) and studies that not analyses the supplement consumption in gyms in different cities and states of the Brazil country. Articles that did not meet the criteria were excluded.

2.4 Search procedures

For the preparation of this literature review, complete scientific articles, written in Portuguese and English, indexed in the PubMed, Google Scholar and SciELO databases were used. The following descriptors were used for research: "supplementation", "supplement consumption", "strength training practitioners", and "sports nutrition". In conjunction with the descriptors, the Boolean operators "AND/OR" were used for search.

2.5 Selection of researches

The procedures for searching and selecting articles were performed by the present study authors, and in case of disagreement the last author (L.C) was asked for a final opinion. An initial analysis was performed read the article titles. From these selected articles, the abstracts were read, and the articles included in this review was read full. A review of references of these articles was made to identify other potentially relevant studies about the topic.

2.6 Data extraction, search results and methodological analysis

A methodological and outcome analyze was performed. In methodological analysis, the sample profile, sex, age, type of supplement, dietary supplement use (including professionals involved in the prescription), indication/dose, objective of the supplementation and an application of the method were investigated. In the analysis of the results, we included the possible benefits of use and aspects related to security of the supplement consumption.

An initial search returned 28759 articles. After the exclusion of duplicate records, exclusion by title and abstract, there were 174 articles. After met the eligibility criteria, the present study consider some studies relevant and includes only articles that analyzed the supplement consumption profile in Brazil (n = 25), according to Figure 1. Those articles were select and analyzed both from literature review and from the field and/or experimental research, published between 2011 and 2021. All those manuscripts that addressed supplementation in strength training human practioners in different states of Brazil country, as well as bibliographical reviews on this theme.

3 Main supplements marketed in Brazil

Whey Protein is the most used protein supplement among athletes and practitioners of physical activity, resulting in an important role in protein synthesis, increased lean muscle mass and carbohydrate metabolism, thus improving sports performance (Miller et al., 2014; Davies et al., 2018). The ideal dose that an individual should consume varies depending on their goals, level of physical activity and current body composition. However, doses between 20 to 30 g/day of Whey Protein are sufficient to achieve the proposed benefits, while doses above

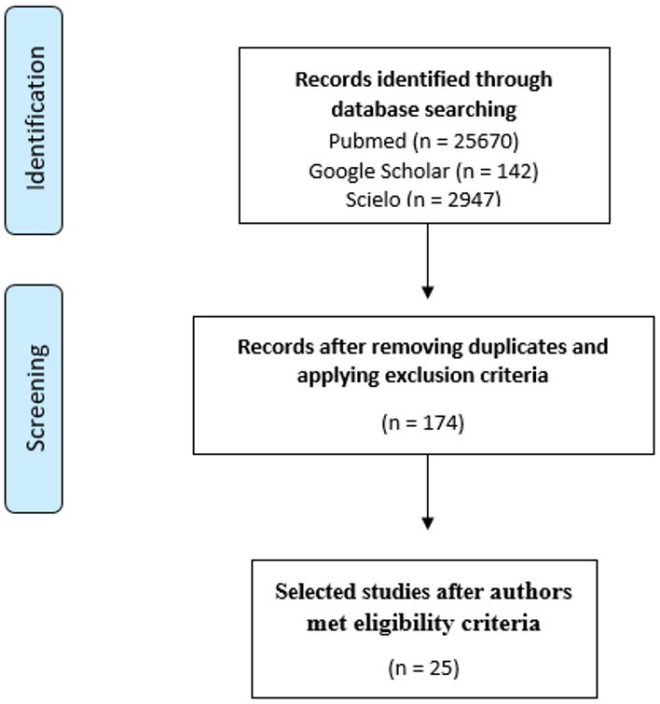

Figure 1. Flowchart of the search for articles selection.

the recommended may be related to possible adverse effects on the body, such as microbiota dysfunction, increased presence of acne and total cholesterol and triglyceride levels, and changes in kidney and liver metabolism, especially in sedentary individuals (Vasconcelos et al., 2021; Cardoso & Leonhardt, 2017).

Regarding the use of creatine, another important protein supplement, a recent meta-analysis showed that creatine supplementation (3 to 5 g/day) promoted favorable results, such as improved training performance, recovery, increased muscle strength and decreased fatigue (Butts et al., 2018). According to Kreider et al. (2017) there is no scientific evidence that short- or long-term use of creatine has any harmful effects in healthy individuals. Therefore, creatine use can be considered safe and without significant adverse effects. However, creatine supplements should not be used in people with chronic kidney disease or using potentially nephrotoxic medications (Vega & Huidobro, 2019).

Another supplement used by practitioners of physical activity is BCAA, branched-chain amino acids that comprise three essential amino acids (leucine, isoleucine and valine). BCCA can help with muscle hypertrophy, help reduce damage to muscles and preserve muscle mass, in addition to decreasing muscle fatigue (Moosavian et al., 2020). However, contradictory results are found in the literature. Wolfe (2017) reports that there is no justification for BCAA supplementation as a strategy to improve performance. In addition, the wrong supplementation can damage the immune system, as well as increase body fat levels (Vieira et al., 2020).

Regarding carbohydrate-based supplements, maltodextrin is widely consumed, being a supplement based on dextrin and maltose (complex carbohydrate), derived from corn starch or cassava starch. Maltodextrin supplementation has a rapid absorption and can prevent muscle degradation, prevent early fatigue and improve the neuromotor reflex, thus constituting a good form of dietary supplementation for practitioners of physical exercises that aim to improve performance and increase muscle mass (Wilburn et al., 2020). L-carnitine has been used as an ergogenic resource for professional athletes and as a dietary supplement in the physically active population. Studies show that supplementation of up to 2 g/day of L-carnitine is safe, and can facilitate the recovery process after exercise, improve muscle performance and muscle strength, in addition to attenuating the effects of high-intensity training, reducing the magnitude of exercise-induced hypoxia and muscle injury (Hathcock & Shao, 2006; Fielding et al., 2018; Sawicka et al., 2020). On the other hand, a study carried out for 4 weeks in 21 obese individuals of both sexes (aged between 41 and 51 years), showed that the daily administration of 1.8 g of L-Carnitine did not promote a reduction in the mass index body, body fat percentage and abdomen circumference, showing that supplementation is not able to increase fat oxidation. In addition, orally administered carnitine preparations can occasionally cause heartburn or dyspepsia (Sawicka et al., 2020).

4 Profile of consumption of supplements in exercise practitioners

The increase in the consumption of supplements has been influenced by different factors, such as the wide variety of products on the market, easy access and the influence of the media and social networks. Its use more and more frequently in physical exercise practitioners aims to seek better results in performance and esthetics (Molin et al., 2019; Ribeira et al., 2020). However, the wrong supplementation, without proper guidance, can bring risks to the individual's health, such as kidney, liver, cardiovascular and neurological problems (Galvão et al., 2017; Macedo & Ferreira, 2021).

Table 1 shows the main studies involving the assessment of supplement use in strength training practitioners in different regions of Brazil. In the table, it can be seen that the consumption of sports supplements has been used in different states of the country. Another important aspect observed, regardless of the region analyzed, was that the vast majority of consumers consume supplements on their own or the recommendation of a physical education professional.

Regarding the public profile of the surveys analyzed in the different regions, there was no pattern regarding age and sex, and the studies were carried out in individuals of both sexes, with a predominance of supplement use by men aged between 18 to 59 years. As for the type of supplements and the objectives of the supplementation practice, it was observed that the most consumed supplements were those with protein, such as whey protein and BCAA.

These findings are in accordance with the review carried out by Carvalho et al. (2018), where the results showed that the use of dietary supplementation by practitioners aims to gain muscle mass (hypertrophy) combined with the loss of body fat. This

Table 1. Main researches involving the evaluation of supplement use in strength training practitioners in Brazil.

Region of Brazil	Objective	Main results	Conclusion	References
Midwest	Assessment of dietary supplement consumption in gyms in Guará (DF)	**Supplements:** Whey protein **Public profile**: 110 people of both sexes, with 86 supplement consumers **Indication**: 34% indicated by the nutritionist and own initiative **Goals for supplement use**: increase muscle mass (75%)	Growing use of supplements by strength training practitioners, with a greater number of existing products that suggest numerous benefits, but there are few that have their effects scientifically proven	Albuquerque (2012)
	Pre- and post-training food and supplement consumption in male bodybuilders in Goiânia (GO)	**Supplements**: Whey Protein, BCAA, Creatine, Vitamins and Minerals, Thermogenics, Glutamine, Hypercaloric **Public profile**: 78 male bodybuilders aged between 18 and 50 years old **Training frequency**: 31% greater than 3 years, 47% 5 times a week, 35% average duration of 60 to 90 minutes per day **Goals for supplement use**: Gain in muscle mass (35.9%), healthy style (32.05%), weight loss (11.54%), improvement in fitness (10.26%) **Supplement use time**: 35% started 3 to 5 months ago, 12% use it for at least six months **Time of consumption**: before, during and after training (23.08%), before and after training (20.5%)	The consumption of nutritional supplements and foods was frequent in the studied population, and these resources were ingested before and after training. Protein supplements were the most consumed	Aragão & Fernandes (2014)
	Consumption of food supplements enriched with vitamins and minerals, and/or vitamin-mineral supplement in a private university in Brasília (DF)	**Supplements**: vitamin and mineral supplements **Public profile**: 160 students of both sexes **Supplement use**: 58.2% have already consumed vitamin and/or mineral supplements **Indication**: doctors (39%), own initiative (38.3%)	More and more individuals are using dietary supplements. The importance of making the population aware that the consumption of nutritional supplements should occur after diagnosis of the nutritional status through clinical, dietary, anthropometric and biochemical results is evident.	Frinhani & Leonhardt (2016)
	Evaluation of the consumption of protein supplements by bodybuilders in a gym in Planaltina (DF)	**Supplements**: whey protein and albumin **Public profile**: 50 bodybuilders of both sexes **Training frequency:** 92% more than 3x week and 8% three times a week. **Most used supplement**: 95% whey protein and 10% albumin. **Time of consumption**: pre- and post-training (47%) and post-training (21%). **Amount consumed**: one scoop a day (47%), more than one scoop (37%) and half a scoop (16%). **Indication**: self indication (58%), nutritionist (21%) and physical educator (5%). **Goals for supplement use**: gain in muscle mass (63%), supplement the diet (21%) and both reasons (16%)	Males are the ones who most practice bodybuilding and use protein supplements. The most cited protein supplement was whey protein, so that most consume it on their own in order to gain muscle mass	Cardoso & Leonhardt (2017)

Table 1. Continued...

Region of Brazil	Objective	Main results	Conclusion	References
Southeast	Supplementation and food consumption in bodybuilders in a neighborhood in Rio de Janeiro (RJ)	**Supplements**: Whey protein, BCAA, and creatine **Public profile**: 40 bodybuilders, 20 beginners and 20 trained **Results**: high intake of food and protein supplements	There is a consensus that the presence of a professional nutritionist is essential for proper guidance within the gyms. The high use of supplements and a high-protein diet aimed at muscle hypertrophy in a way not guided by a professional in the area was verified. This practice becomes harmful to the health of practitioners and deviates from its objective	Macedo et al. (2018)
	The use of dietary supplements by practitioners of physical activity in the city of Juiz de Fora (MG)	**Supplements**: Whey protein and creatine **Public profile**: 283 people, between 18 and 40 years of age, both genders **Goals for supplement use**: gain in muscle mass (80.5%) **Results**: 12.2% of those using supplements had a history of kidney stones.	It is essential that there is a correct indication of the use of supplements by a health professional for those who really need them.	Macedo & Ferreira (2021)
	Consumption of food supplements and ergogenic resources by women who practice bodybuilding in Ubá (MG)	**Supplements:** Whey Protein (80.0%) and BCAA (48.6%) **Public profile**: 70 women, aged between 19 and 56 years old, bodybuilders **Main sources of information**: internet (53.8%) and gym teachers (40.0%) **Results**: Use them continuously (41.9%), indicated by the gym teacher (48.8%) and with aesthetic goals (51.2%)	Ergogenic resources and food supplements are being consumed in excess by female bodybuilders in gyms in the city of Ubá (MG), and improperly, without proper guidance from a specialist	Sperandio et al. (2017)
	Reasons for consuming nutritional supplements by frequenters of gyms in São Paulo (SP)	**Supplements**: Whey protein and BCAA **Public profile**: 71 people of both sexes, with an average age of 36.7 years **Predominant physical activity**: weight training **Goals for supplement use**: maintenance of health and quality of life	The profile of consumers differed from non-users of supplements regarding frequency, duration and purpose of physical activity. It is necessary to pay attention to the real need for supplementation, as free access to products increases indiscriminate consumption, often unnecessarily.	Benvenuto & Marques (2017)
	Evaluation of the profile of gym goers regarding the consumption of nutritional supplements and associated factors, in the city of Alfenas (MG)	**Supplements:** Whey protein (34.50%) of consumption **Public profile**: 152 gym attendees with an average age of 24 years old **Predominant physical activity**: weight training (85.18%) **Indication**: without expert advice (56.76%) **Goals for supplement use**: Increased muscle mass (31.25%)	A significant amount of men who consume nutritional supplements with the main goal of muscle hypertrophy. Most consume supplements without professional guidance and mainly on their own initiative, which can cause serious health problems in the medium and long term.	Silva et al. (2017)
	Evaluation of the consumption of nutritional supplements by exercise practitioners in a gym in the south of Rio de Janeiro (RJ)	**Supplements**: amino acids or protein and thermogenic concentrates **Public profile**: 50 people of both sexes, aged between 18 and 58 years old **Goals for supplement use**: muscle hypertrophy and body fat loss **Indication**: nutritionist	The use of nutritional supplements is a practice that is part of the reality of the observed group, making clear the need for specific studies with this population, focusing on aspects of nutritional education so that such individuals can have better guidance on their use	Sussmann (2013)

Table 1. Continued...

Region of Brazil	Objective	Main results	Conclusion	References
North East	Consumption of protein-based supplements and knowledge about protein foods by bodybuilders in the city of Toritama (PE)	**Supplements**: whey protein and BCAA **Public profile**: 53 bodybuilders of both sexes aged between 18 and 40 years **Training frequency**: 70% with time greater than one year with weight training 4 to 5 x/week. **Length of stay in the gym**: 79.24% more than one hour of activity per day and 20.76% thirty minutes per day. **Goals for supplement use**: Health and aesthetics, weight gain, hypertrophy and definition. **Consumption period**: 50% less than six months and more than 30% more than one year. **Indication**: physical education teachers (50%), nutritionists (5%)	It is necessary to insert the professional nutritionist in the routine of gyms and improve the knowledge of practitioners about protein foods	Bezerra & Macedo (2013)
	Consumption of dietary supplements by adult bodybuilders in gyms in the cities of Lagoinha and Pesqueira, located in the Agreste region of Pernambuco	**Supplements:** protein supplements (32.7%), thermogenic (12.6%) and BCAA (9.5%) **Public profile**: 180 bodybuilders, aged between 18 and 59 years old **Training frequency**: 86.1% in a period of less than 5 years and 77.2% performed weight training five times a week Objectives: 69.4% esthetic (gain in muscle mass and muscle definition) **Time of consumption**: after training (37.6%), during training (4%) **Indication**: Friends/lay (38.2%), physical educator (25.5%), physician and/or nutritionist (9.8%)	The high consumption of dietary supplements by bodybuilders demonstrates the need to sensitize the population to proper and conscious use	Silva & Silva (2018)
	Reasons for the use of nutritional supplements by bodybuilders in gyms in the city of Fortaleza (CE)	**Public profile**: 200 people who practice bodybuilding of both sexes with an average age of 24 years **Indication**: Physical education teacher **Goals for supplement use**: athletic performance	The huge lack of information on dietary supplements, as well as on proper nutrition, is quite clear in this study and proves the emerging need for qualified professionals within gyms, as the influence that social life and gym teachers exert on their students	Daniele (2012)
	Characterization of the profile and habits of dietary supplementation of bodybuilders in a gym in Fortaleza (CE)	**Supplements:** Whey Protein 80%, BCAA 50%, Creatine 35%, Maltodextrin 30%, Glutamine and vitamin complexes 25%, Carbohydrate-based drink and thermogenic 20% **Public profile**: 40 people of both sexes aged 26-30 years **Goals for supplement use**: 50% improvement in esthetics **Reason for use**: gain muscle mass, increase energy and mood 20%, improve performance 17.5%, compensate for food deficiencies 12.5%, improve health 10% and prevent diseases 5%	The sample profile was formed mostly by subjects with a high level of education, whose main objective is related to aesthetics. There is a predominance in the use of supplements related to muscle mass gain, with whey protein being the most consumed among respondents. The group proved to be quite active, as the majority remained active in the modality for at least a year	Rodrigues (2017)
	Consumption of nutritional supplements by practitioners of physical activities in two gyms in Salvador (BA)	**Supplements:** BCAA and Whey Protein **Public profile**: 187 people of both sexes between 18 and 59 years old **Usage time**: less than six months (37%) **Frequency of use:** four to six times a week (67%). **Objective**: muscle hypertrophy (34%). **Indication**: nutritionist or physical educator (33%). **Objective for the practice of physical activity**: health and well-being **Time of physical activity**: 61% have been practicing for more than a year, from three to six hours a week (47%)	The use of supplements is growing and individuals have become aware of seeking guidance, however, the demand for a nutrition professional is still low. Therefore, it is necessary to constantly carry out studies on the use of such products and their consequences	Santos & Farias (2017)
	Profile of nutritional supplement consumption by exercise practitioners in gyms in Vitória da Conquista (BA)	**Supplements:** Whey Protein, Thermogenic, BCAA. **Public profile**: 137 people - 47.5% men and 52.5% women **Objective**: muscle hypertrophy **Indication:** 33% by the nutritionist. **Expenses:** R$ 51.00 to 75.00 (31%). **Practice of physical exercise**: 3 to 6 hours/week (48%), 49% for more than 1 year **Exercise objective**: increase muscle mass (50%) **Most practiced modality**: weight training (39%)	Although the prescription by qualified professionals was higher, the use of supplements in the analyzed group is low, but there is always a need for nutritional education to ensure safety in their use	Brito & Liberali (2012)

Table 1. Continued...

Region of Brazil	Objective	Main results	Conclusion	References
North	Evaluation of consumption of ergogenic food supplements by practitioners of physical activity in gyms in Manaus (AM)	**Supplements**: Whey Protein (73%) and branched chain amino acids "BCAA" (79%) **Public profile:** 250 people, 155 men (62%), with an average age of 28 years **Indication**: Physical Education instructors and teachers, salespeople, friends and self-indication	The routine use of these supplements, mostly without the supervision of a qualified professional, with the possibility of serious health problems, alerting to a current and serious problem	Vieira et al. (2019)
	Assessment of knowledge among physically active and sedentary practitioners about the physiological and adverse effects of thermogenic supplements in Santarém (PA)	**Supplements**: Thermogenic **Public profile**: 102 participants, 52 practitioners of physical activity and 50 sedentary individuals aged 18 to 24 years (59.8%) from Santarém (PA) **Goals for supplement use**: 42.1% of practitioners of physical activity was weight loss and 90.9% achieved expectations; 58% of sedentary people cited the stimulant function and 90% met expectations **Side effect**: 23.5% and 23.8% of physical activity and sedentary people, respectively, reported insomnia **Indication**: For practitioners of physical activity - own initiative (54.5%) and nutritionist (9.1%). For sedentary - own initiative (70.8%) and nutritionist (4.2%)	Knowledge about thermogenics is greater in the group of practitioners of physical activity. Insomnia represents the main adverse effect of the participants and, since most use thermogenics indiscriminately, educational actions with these groups are necessary	Santos & Ramos (2018)
	Profile of users of anabolic steroids and dietary supplements in resistance training practitioners in the city of Gurupi (TO)	**Supplements**: 30.7% carbohydrates, 46.1% protein or carnitine and 30.76% thermogenic **Public profile**: 56 people of both genders over 18 years old **Frequency of use**: daily (69.2%) and (53.8%) uses it for at least four months **Indication**: friends (38.46%), gym professionals (30.76%)	The profile of the group is mostly young, male, with complete elementary education, consume supplementation, in the search for hypertrophy	Sousa et al. (2012)
	Knowledge about Food Supplements by Health Professionals from Palmas (TO)	**Supplements**: carbohydrates, amino acids and sports drinks **Public profile**: 30 people of both sexes, 15 physical educators and 15 nutritionists **Applied questions**: knowledge about the action and purpose of supplements **Results:** average hit of approximately 70%	The professionals' knowledge was average, few observed the emergence of side effects in their patients and most had no postgraduate training in the field of sports science.	Miranda et al. (2020)

Table 1. Continued...

Region of Brazil	Objective	Main results	Conclusion	References
South	Evaluation of the profile of whey protein supplement use by bodybuilders in gyms in the city of Chapecó (SC)	**Supplements**: Whey Protein **Public profile**: 40 people, 34 males with an average age of 31 years **Training frequency**: Up to three times (22.5%), four times (7.5%), five times (50%), six or seven times (20%) **Goals for supplement use**: Mass gain (82.5%), increased strength (2.5%), increased calorie intake (10%), muscle recovery (30%), and others (2.50%) **Indication:** Physical education teachers (29.5%), self-nomination (20.45%), friends (20.45%), nutritionist (18.8%) and salesperson (2.27%)	The consumption profile of bodybuilders in this study is unsatisfactory. Participants are aware of the importance of nutritional monitoring, however, they do not do it correctly because they use supplements as recommended by the Physical Education professional, followed by use on their own.	Vieira et al. (2017)
	Investigation of the consumption of nutritional supplements in bodybuilders in gyms in the city of Tenente Portela (RS)	**Supplements**: Whey Protein (41.17%), Creatine (23.52%), Albumin (23.52%), Amino Acids (23.52%) and others (11.79%) **Public profile**: 30 bodybuilders with an average age of 27 years, 56.7% of whom were male. **Training frequency**: Up to 3X (52.9% men and 46.2% women). According to the daily workload, 58.8% of men and 61.5% of women practice weight training for 45-60 minutes a day. **Goals for supplement use**: Hypertrophy **Indication:** Physical education teachers (42.2%), self-nomination (23.2%), friends (22.5%) and nutritionist (12.1%)	The consumption of food supplements is considerably low in bodybuilders. In addition, the prescription is usually performed by untrained professionals	Marchioro & Benetti (2015)
	Evaluation of the consumption of nutritional supplements by practitioners of physical activity in gyms in the city of Toledo (PR)	**Supplements**: Whey Protein (32.2%), BCAA (21.2%), Creatine (20.5%), Vitamin Complexes (15.6%) and others (10.5%) **Public profile**: 410 individuals with an average age of 27 years, 58% of which were male. **Training frequency**: Up to three times (24.1%), four times (21%), five times (32.9), six or seven times (22%) **Goals for supplement use**: Hypertrophy (49.3%), Quality of life (25.6%), Weight Loss (17.3%) and others (7.8%) **Indication**: Self-nomination (21.2%), physical education teachers (14.1%), nutritionist (11%)	The consumption of supplements by practitioners from Toledo was lower than the literature	Vidaletti et al. (2019)
	Analysis of the consumption of nutritional supplements and the effectiveness of an individualized nutritional monitoring plan in bodybuilders who attend a gym in Frederico Westphalen (RS)	**Supplements:** Whey Protein (27%), Creatine (13%), BCAA (10%), Albumin (10%) and others (40%) **Public profile**: 24 individuals with an average age of 21 years. **Training frequency**: Up to five times (50%) **Goals for supplement use**: Improved Training (53%), Esthetics (23%), Nutritional Recommendation (3%) and others (21%) **Indication:** Friends (53%), self-nomination (18%), physical education teachers (18%), salesperson (7%) and nutritionist (4%)	The groups that received nutritional guidance and an individualized eating plan showed reductions in weight, waist circumference and percentage of body fat, a fact that reinforces the importance of the professional nutritionist's role in gyms	Bertoletti et al. (2016)
	Verification of the use of nutritional supplements or other ergogenic resources by individuals who practice bodybuilding in gyms in a neighborhood of Florianópolis (SC)	**Supplements**: Whey Protein (32%), Maltodextrin (13%) BCAA (13%), Hypercaloric (9%) and others (33%) **Public profile**: 98 individuals, 62% of whom were male, with an average age of 32 years. **Goals for supplement use**: Hypertrophy (79.6%) **Indication**: Self-referral (34.7%), friends (28.6%), physical education teachers (14.3%), nutritionist (12.2%) and salesperson (10.2%)	50% of practitioners consume some type of nutritional supplement or other ergogenic resources and the vast majority of them use it on their own initiative or indication of third parties, that is, without any professional indication	Wagner (2011)

concern with body image leads activity practitioners to use food supplements, often consuming inappropriately or unnecessary. For this reason, monitoring by the nutrition professional is important, both to avoid risks and to enhance results.

Another relevant result observed in the surveys analyzed was in relation to the source of indication. It was noted that the most cited source by consumers was the Physical Education professionals, followed by friends, self-referral, salespeople, nutritionist and doctor. This fact occurs due to the daily contact with Physical Pducation professionals in gyms, which are often asked to advise on the diet or use of supplements, even if they are not the appropriate professionals for this type of guidance (Miranda et al., 2020).

When comparing the results between different regions of the country, there is a similarity in relation to the profile of consumers, consumed supplements, the main reasons for use and consumption on their own, without indication of a professional. In the Midwest region, Aragão & Fernandes (2014), observed that most bodybuilders were male aged between 18 and 50 years, where whey protein was the most consumed supplement, with the main objective of gaining mass muscle. Similar results were obtained by Cardoso & Leonhardt (2017), where it was observed that the majority of whey protein consumers (most consumed supplement) consumed the product on their own, which may entail risks to the consumer's health. Unlike previous research, Frinhani & Leonhardt (2016), evaluated the use of vitamin and mineral supplements at a private university in Brasília and observed a large use of these products. About 58.2% of respondents consumed these products, 39% on medical advice, while 38.3% on their own.

In the Southeast region, similar results were obtained for the different states. Macedo et al. (2018), observed a high intake of protein supplements (Whey protein, BCCA and creatine) and a high-protein diet, without professional guidance. Similar results were obtained by Macedo & Ferreira (2021), regarding the high consumption of protein supplements without the guidance of a professional, which can result in damage to health. Another interesting information was that 12.2% of supplement consumers had a history of kidney stones, which further underscores the importance of professional guidance since excessive intake of protein supplements can result in kidney problems (Macedo & Ferreira, 2021).

In bodybuilding practitioners in the state of Minas Gerais, Sperandio et al. (2017) reported that most consumers used supplements without a professional prescription, where 53.8% of practitioners sought information about consumption on the internet, while 40% were guided by gym teachers, in a total of 70 women interviewed. In another study carried out by Silva et al. (2017), similar results were obtained, where the majority (56.76% of the 152 respondents) consumed protein supplements on their own. In contrast, Sussmann (2013), observed that most supplement consumers ingested this type of product under the guidance of nutritionists (43% of the 30 consumers), while the others consumed it under the guidance of family, friends, internet, or sellers. This result may be related to the purchasing power of practitioners since the research was conducted in an upscale region of the city of Rio de Janeiro.

In the North and Northeast regions, surveys carried out showed results similar to the states mentioned above, where protein supplements were the most consumed by gym practitioners, with the objective of weight gain, hypertrophy and definition (Bezerra & Macedo, 2013; Vieira et al., 2019). On the other hand, Santos & Ramos (2018) analyzed 52 practitioners of physical activity and 50 sedentary individuals aged 18 to 24 years, living in Santarém/PA, who used a greater amount of thermogenics, with the aim of losing weight.

Regarding the source of indication, Bezerra & Macedo (2013) and Daniele (2012) observed that most health club supplement consumers in the cities of Toritama and Fortaleza, in Ceará, sought Physical Education professionals as a source of indication. In the interior of the Northeast, in the cities of Alagoinha and Pesqueira, da Silva & Silva (2018) observed that the majority used it by indication of friends/laymen. In the North, the same trend can be observed regarding the source of indication in relation to the Northeast and other regions in Brazil. In Manaus, Vieira et al. (2019) report that Physical Education professionals, salespeople, friends and self-referral are the main sources of indication of the use of supplements.

In the southern region, in the municipality of Chapecó, Santa Catarina, Vieira et al. (2017) indicate that 50% of the individuals exercised weight training 5 times a week, used a greater amount of protein supplement, with 82.5% of respondents focus was on muscle mass gain. Marchioro & Benetti (2015) evaluated that most bodybuilders in the city of Tenente Portela had an average age of 27 years, with 56.7% male, where whey protein (41.17%) was the most used supplement, aiming at hypertrophy. In the city of Frederico, in the South region, similar results were found by Vidaletti et al. (2019) where they observed that the main source of referral was friends (53%), followed by self-nomination (18%), physical education teachers (18%) and sellers (7%).

According to the analyzed results, it can be observed that the consumption of supplements by exercisers in gyms in different states of Brazil was high, showing a great concern in the search for better results and sports performance. In addition, the vast majority of respondents did not seek a nutritionist to prescribe the use of supplements, which can directly affect the consumer's health. According to the results observed in different regions, it was observed that the most consumed supplements were whey protein, followed by BCAA and creatine. However, despite the related benefits when consumed correctly, the vast majority of research, regardless of the region analyzed, observed an inappropriate use of these products, which could harm health. According to Macedo & Ferreira (2021), an evaluation was done correctly, especially by the nutritionist before its prescription, so that the benefits reported regarding the use of supplements are achieved, without compromising the consumer's health.

5 Conclusion

According to the analyzed results, it can be observed that the consumption of supplements by strength training practitioners in gyms in different cities and states of Brazil was high, showing a great concern related to the improvement of physical performance. In this context, protein supplements such

as whey protein, BCAA and creatine were the most consumed, aiming at muscle hypertrophy, aesthetic issues, health, weight loss and performance improvement. Hypertrophy was the most cited objective.

In addition, the vast majority of respondents did not look for a nutritionist, who is a trained and qualified professional to prescribe a food supplement, which can directly affect the consumer's health. Thus, the correct use of dietary supplements is extremely important.

Thus, it is essential to have an educational intervention policy in gyms, regarding the correct use of food supplements, especially in relation to protein supplements, which, as observed in the results mentioned above, are the most consumed.

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