

**IMPACTS OF A VEGETARIAN DIET ON ATHLETE PERFORMANCE:
A SYSTEMATIC REVIEW OF THE EFFECTS ON STRENGTH AND ENDURANCE**

Catarina Escamilhas Ribó¹, Emilson Colantonio²

ABSTRACT

Vegetarianism, characterized by the exclusion of animal-derived products, is increasingly present in individuals' dietary habits. Consequently, there is growing scientific interest in understanding the impacts of vegetarian diets on athletic performance, particularly in strength and endurance. However, the results of these studies are still inconclusive. Some indicate benefits, while others observe no significant differences or suggest risks to athletic performance with this diet. Objective: To conduct a systematic review of the literature regarding the effects of vegetarian diets on strength and endurance performance in athletes. Materials and Methods: Methodological procedures for systematic reviews were applied. The eligibility of studies considered the investigated population, intervention, comparisons, and outcomes. The search strategies were conducted in two phases to identify studies published in the last 15 years, considering three databases: PubMed, SciELO, and Web of Science. The search was performed using descriptors from DeCS. The titles and abstracts of the articles were analyzed by two researchers, with a third consulted in case of disagreement. Additionally, references cited in these articles were examined to identify other relevant studies. Conclusion: This study showed that a vegetarian diet, when properly planned, is capable of satisfying the nutritional needs of athletes, ensuring good performance in both strength and endurance.

Key words: Vegetarianism. Physical performance. Sport.

1 - Federal University of São Paulo - UNIFESP, Santos, São Paulo, Brazil

2 - Department of Human Movement Sciences, Federal University of São Paulo - UNIFESP, Santos, São Paulo, Brazil.

RESUMO

Impactos da dieta vegetariana na performance de atletas: uma revisão sistemática dos efeitos sobre força e endurance

O vegetarianismo, caracterizado pela exclusão de produtos de origem animal, está cada vez mais presente nos hábitos alimentares dos indivíduos. Consequentemente, há um crescente interesse científico em compreender os impactos das dietas vegetarianas no desempenho atlético, particularmente em força e resistência. No entanto, os resultados desses estudos ainda são inconclusivos. Alguns indicam benefícios, enquanto outros não observam diferenças significativas ou sugerem riscos para o desempenho atlético com essa dieta. Objetivo: Realizar uma revisão sistemática da literatura sobre os efeitos das dietas vegetarianas no desempenho de força e resistência em atletas. Materiais e Métodos: Foram aplicados procedimentos metodológicos para revisões sistemáticas. A elegibilidade dos estudos considerou a população investigada, a intervenção, as comparações e os desfechos. As estratégias de busca foram conduzidas em duas fases para identificar estudos publicados nos últimos 15 anos, considerando três bases de dados: PubMed, SciELO e Web of Science. A busca foi realizada utilizando descritores do DeCS. Os títulos e resumos dos artigos foram analisados por dois pesquisadores, com um terceiro consultado em caso de discordância. Adicionalmente, as referências citadas nesses artigos foram examinadas para identificar outros estudos relevantes. Conclusão: Este estudo demonstrou que uma dieta vegetariana, quando adequadamente planejada, é capaz de satisfazer as necessidades nutricionais dos atletas, garantindo um bom desempenho tanto em força quanto em resistência.

Palavras-chave: Vegetarianismo. Desempenho físico. Esporte.

Author e-mail:
catarina.ribo@unifesp.br
colantonio@unifesp.br

INTRODUCTION

Vegetarian diets are increasingly being incorporated into individuals' eating habits. Data from IBOPE (2018) showed a 75% increase in adherence to vegetarian diets in metropolitan areas of Brazil between 2012 and 2018. This trend has sparked growing interest, not only in society in general, but also in the academic community.

This interest is particularly evidenced by the increase in the number of review articles published on veganism in the context of sports since 2017, signaling a considerable scientific demand to explore the intersection between vegan diets and the practice of sports and physical exercise (Wirnitzer et al., 2020).

According to the Brazilian Vegetarian Society (SBV, 2025), vegetarianism is a dietary regime based on the exclusion of the consumption of products of animal origin. However, it is important to highlight that there are at least seven variations regarding the restriction, the best known being: the ovo-lacto-vegetarian diet (where there is no consumption of meat, but there is milk, dairy products and eggs), the lacto-vegetarian diet (which does not include the consumption of meat and eggs, but there is milk and dairy products), the ovo-vegetarian diet (which does not include the consumption of meat, milk and dairy products, but there is eggs), and finally, the strict vegetarian, or vegan, diet, in which there is no consumption of meat, milk, dairy products and eggs, as well as the exclusion of the use of any product tested on animals.

Conforming to Wirnitzer et al., (2016), there is believed to be a significant increase in the number of people who exercise and follow a vegetarian diet.

Therefore, a number of studies have explored the impact of vegetarian and vegan diets on athletic performance. While some studies suggest that well-planned and balanced vegetarian diets can effectively support athletic performance (Santos Neto et al., 2022), others have found no significant differences in physical performance between vegetarian and omnivorous diets (Craddock et al., 2016).

However, it is important to note that vegetarian and vegan diets require careful planning to ensure adequate intake of essential nutrients such as protein, vitamin B12, iron, zinc, calcium, iodine, and vitamin D (Rogerson 2017).

Despite these potential challenges, plant-based diets have been shown to reduce the risk of chronic diseases and have a smaller environmental impact compared to diets that include meat (Lynch et al., 2018). More research is needed to fully understand the implications of vegetarian and vegan diets on athletic performance.

In terms of strength and endurance performance, Hernandez-Lougedo et al., (2023) demonstrated that well-balanced vegetarian diets can provide all the necessary nutrients for good physical performance.

On the other hand, authors such as Nebl et al., (2019), while acknowledging that a plant-based diet is associated with several benefits for human health, such as a negative association with obesity, type 2 diabetes, hypertension, and cancer, argue that this form of restrictive diet can be considered critical due to the risk of offering a low supply of nutrients.

Despite the increasing publication of research on the impacts of vegetarian diets on the strength and endurance performance of athletes, much controversy remains in the literature; making a systematic review necessary to discuss the nutritional needs of vegetarian athletes, as well as the possible impacts on performance, and thus allow for a better understanding of the vegetarian diet and its potential benefits, drawbacks, or whether this diet presents significant differences compared to an omnivorous diet, with regard to the physical performance of athletes.

Therefore, the objective of this study is to conduct a systematic review of the literature on the effects of vegetarian diets on the strength and endurance performance of athletes.

MATERIALS AND METHODS

Based on the central ideas guided by the research objective, the methodological procedures outlined by Galvão and Ricarte (2020) were applied, encompassing a set of methods for developing systematic literature reviews. This research model was chosen due to "the importance of systematic reviews for scientific advancement and for various decision-making processes, especially in the context of health" (Galvão, Ricarte, 2020).

The authors, in arguing that the first step in conducting a literature review is defining research objectives and questions, present the PICO approach for formulating the research question. In this sense, it is understood that this

question should include the specification of the population (P), or the problem or condition to be studied, the type of intervention (I) to be analyzed, whether there will be a comparison (C) between interventions, and the outcome (O) to be studied.

According to this approach, the population to be studied in this research project is athletes, the intervention is a vegetarian diet, and the comparison concerns the possible impacts of this diet on the effects of strength and endurance, as a result, of the defined population.

With the research question defined, the next steps of the research, based on Galvão and Ricarte (2020), were carried out in four stages:

- selection of databases;
- development of the search strategy;
- selection of texts to be studied;
- discussion of the results through a systematic review.

The eligibility of studies was determined based on:

- a) specification of the population, or the problem or condition to be studied;
- b) the type of intervention to be analyzed;
- c) whether there was a comparison between interventions;
- d) the outcome to be studied; and e) whether the study had been published in the last 15 years.

The research strategies were carried out in two phases to identify potential studies. First, three electronic databases were considered: PubMed, SciELO, and Web of Science, using English and Portuguese. The search for descriptors and terms was conducted

based on the DeCS - Health Sciences Descriptors from the Virtual Health Library (VHL) database. This included combinations of variations between two groups of keywords/terms, including, but not limited to, the following examples: a) "vegetarianism," "physical performance," "sport"; and b) "vegetarianism," "physical performance," "sport"; e b) "vegetarianismo," "desempenho físico," "esporte".

The terms were combined using available terminological mappings as search tools. In the second phase, the titles and abstracts of potentially relevant articles were selected by two researchers. Subsequently, a complete copy of the documents was obtained from those that met the initial screening criteria and then fully examined by two researchers. When the two reviewers did not reach a consensus, a third researcher was consulted. In addition, the references cited by each of these articles were examined in an attempt to identify other potential studies for inclusion.

Finally, the following data were extracted from all eligible articles: a) title; b) author(s); c) year of publication; d) study objective; e) study population; f) methodology employed; g) outcomes found; h) conclusion. The research analyzed 184 articles in the databases, of which 165 were excluded after applying the filters. In total, 17 were included in the final analysis.

RESULTS

The analysis of the results was conducted by comparing the findings of quantitative and qualitative studies, separately, on the effects of a vegetarian diet on the strength and endurance performance of athletes.

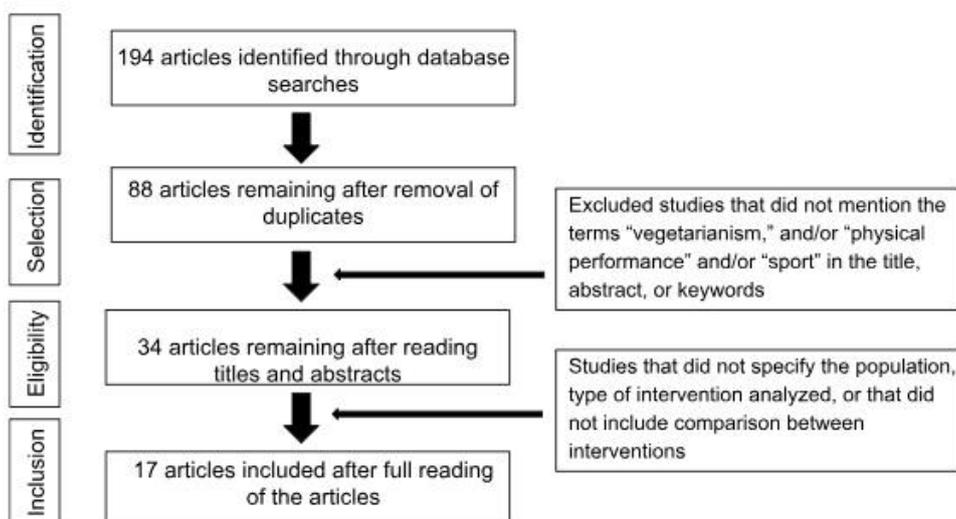


Figura 1 - Flowchart.

This included an analysis of the nutritional requirements for optimal performance, as well as an examination of the potential benefits and challenges of a vegetarian diet in improving physical performance.

Figure 1 shows the flowchart demonstrating the procedures adopted for the selection of articles.

Table 1 summarizes the 17 selected articles after the filtering process, with the main information from said articles, namely, title, author(s), year of publication, study objective, study population, methodology employed, outcomes found, and conclusion.

Table 1 - Brief overview of the included studies.

Title	Author / Year publication	Aim of the study	Study population	Methods	Outcomes found	Conclusion
Vegetarian and Omnivorous Nutrition - Comparing Physical Performance.	Crad-dock et al., 2016	To examine the evidence of the relationship between consuming a predominantly vegetarian diet in calories and improved physical performance.	Athletes who follow a vegetarian diet and athletes who follow an omnivorous /mixed diet.	Systematic literature review using the SCOPUS database. The keywords used were "vegetarian", "vegan", "sport", "athlete", "performance", "endurance", "training".	There were no significant differences between vegetarian and omnivorous diets when physical performance was compared.	Consuming a predominantly vegetarian diet neither improved nor harmed the athletes' performance.

Cardiorespiratory fitness and peak torque differences between vegetarian and omnivore endurance athletes: a cross-sectional study.	Lynch, et al., 2016	Compare elite adult endurance athletes of vegetarians and omnivores for maximum oxygen uptake and strength.	27 vegetarian endurance athletes and 43 omnivorous endurance athletes.	Assessment of VO_{2max} on a treadmill and strength assessment using a dynamometer to determine maximum torque for leg extensions, in addition to detailed seven-day food records.	The cardiorespiratory fitness of vegetarian endurance athletes was higher than that of omnivorous athletes, but peak torque did not differ between the diet groups.	The data suggests that vegetarian diets do not compromise performance outcomes and may even enhance aerobic capacity in athletes.
Quality of life of female and male vegetarian and vegan endurance runners compared to omnivores - results from the NURMI study (step 2).	Boldt, et al., 2018	To compare Quality of Life (QoL) scores between endurance runners following a vegetarian or vegan diet versus those adhering to an omnivorous diet.	159 women and 122 men endurance runners.	The participants completed a questionnaire covering the domains of physical health, psychological well-being, social relationships, and environment, which generated scores on a scale of 4 to 20. Data analysis was performed using ANOVA.	23 subjects followed an omnivorous diet and 158 adhered to a vegetarian/vegan diet. Of these, 173 met the inclusion criteria ('NURMI-Runners'). Men had higher scores than women, due to the dimensions of physical health and psychological well-being.	Endurance runners had high quality of life (QoL), regardless of race distance or dietary choice. These findings support the notion that adhering to a vegetarian or vegan diet can be an appropriate and equal alternative to an omnivorous diet.
Plant-Based Diets: Considerations for Environmental Impact, Protein Quality, and Exercise Performance.	Lynch, et al., 2018	To examine the impact of plant-based diets on human physical health, environmental sustainability, and exercise performance capacity.	Athletes with plant-based diets, vegetarians, vegans, and omnivores.	Literature review on plant-based diet, physical health, environmental sustainability, and athletic performance.	Plant-based diets do not offer a disadvantage in terms of athletic performance compared to omnivorous diets, but they reduce the risk of chronic diseases and require fewer natural resources.	Plant-based diets are viable options for supporting athletic performance and contribute to physical health and sustainability. More research is needed.
Plant-based diets for cardiovascular safety and	Barnard, et al., 2019	To explore the role of nutrition in providing cardioprotectio	Endurance athletes.	Literature review on the effects of plant-based diets on	Plant-based diets can reduce cardiovascular risk, improve body	Plant-based diets offer significant benefits for cardiovascular

performance in endurance sports.		n, with a focus on plant-based diets.		cardiovascular risk factors, performance, and protection against atherosclerotic lesions.	composition, increase glycogen storage, improve blood flow and tissue oxygenation, and reduce oxidative stress and inflammation.	health and can improve the performance of endurance athletes.
Dietary Intake, Body Composition and Iron Status in Experienced and Elite Climbers.	Gibson-Smith, et al., 2020	To assess dietary intake, body composition, and iron status in experienced climbers across a range of performance levels.	40 climbers [20 men (6 vegan/vegetarian and 14 omnivore) and 20 women (5 vegan/vegetarian and 15 omnivore)]; 8.8 +/- 6.6 years of experience; BMI 21.6 +/- 1.7) aged between 18 and 46 years (30.3 +/- 6.7 years).	Analysis of a 3-day food diary, body composition (using a skinfold profile), and iron status (through blood markers).	The average energy intake of the climbers did not meet the energy requirements for moderate training. There was no significant difference in macronutrient intake between genders. Approximately 17% of men and 45% of women had iron levels below the ideal, with 30% of women having iron deficiency. Serum ferritin was significantly higher in omnivorous men and women compared to vegan/vegetarian women.. Protein intake was significantly lower in vegan/vegetarians when compared to omnivores (1.25 ± 0.43 vs. 1.71 ± 0.47 g·kg ⁻¹ ·day ⁻¹ ; p = 0.007). There was no significant difference in protein intake between vegan and vegetarian climbers, when	These findings suggest that experienced climbers are at risk of energy restriction and iron deficiency. Future research should consider iron status in relation to energy availability and investigate additional factors that may predispose this population to iron deficiency, as well as the risk of relative energy deficiency in the sport.

RBNE
Revista Brasileira de Nutrição Esportiva

					analysed separately (1.35 ± 0.49 vs. $1.17 \pm 0.41 \text{g} \cdot \text{kg}^{-1} \cdot \text{day}^{-1}$; $p = 0.50$).	
Efficacy of popular diets applied by endurance athletes on sports performance: beneficial or detrimental? A narrative review.	Devrim-Lanpir et al., 2021	Provide a perspective on popular diets: a) vegetarian; b) rich in fat; c) intermittent fasting; d) gluten-free; e) low in FODMAPS.	Endurance athletes.	Literature review of studies published from 1983 to January 2021, investigating the impact of popular diets on the performance and health of endurance athletes.	Analysis of benefits and harms of popular diets on endurance performance, in addition to gastrointestinal symptoms.	While several approaches offer benefits, it is important to also consider the negative aspects and seek appropriate strategies to support performance and health.
Macronutrient intake, carbohydrate metabolism and cholesterol in Polish male amateur athletes on a vegan diet.	Sliz, et al., 2021	Compare energy and macronutrient intake, carbohydrate metabolism, and cholesterol concentrations between vegetarian and omnivorous athletes.	Male amateur athletes from Poland (44 vegans, 54 omnivores; aged between 20 and 39 years).	Record of their diets for 4 days. Serum concentrations of cholesterol, glucose, C-peptide, and insulin were measured.	The VEG group consumed more carbohydrates and less protein, had better insulin sensitivity and low cholesterol levels, but the intake of protein, EPA and DHA was inadequate.	The vegan diet provided a healthy balance of macronutrients and vegan athletes had better insulin sensitivity and lower cholesterol, but protein, EPA and DHA may be inadequate and increased intake or supplementation of these nutrients may be considered.
Training and racing behaviors of omnivorous, vegetarian, and vegan endurance runners - results from the NURMI study (Step 1).	Wirnitzer et al., 2021	To investigate whether long-distance runners with vegan, vegetarian, and omnivorous diets have different training and running patterns overall and based on subgroups of	Runners (men and women) divided into groups according to diet (omnivores $n=1272$; vegetarians $n=598$ and vegans $n=994$) and race distance	Epidemiological approach based on a questionnaire of sociodemographic information, complete profile of running and competition behaviors/patterns.	Omnivorous runners prepared for running events for a longer period, completed a greater number of marathons and half-marathons with better finishing times, and were more dependent on supervised training.	Diet types, training patterns, and race schedules among endurance runners may be related to different reasons for participating in events.

		running distance.	(<21 km, half marathon and marathon/ultramarathon).			
Effect of a four-week vegan diet on performance, training efficiency and blood biochemical indices in CrossFit-trained participants	Durkalec - Michalski et al., 2022	To examine the effect of a four-week vegan diet program during high-intensity functional training on performance, training results and blood biochemical indices in CrossFit participants with moderate training.	20 participants (12 women and 8 men) with moderate CrossFit training.	Four-week intervention study with a vegan or mixed diet, analyzing performance, training results and blood biochemical indices before and after a dietary intervention in a high-intensity functional training.	The mixed diet group showed significant improvement in the number of repetitions in the classic squat, while the vegan diet group showed improvement in the classic deadlift; Both groups showed improvement in some test exercises, but the differences were not clinically relevant.	The vegan diet had a positive effect on strength endurance in the classic deadlift during training, but was not shown to be more beneficial than the mixed diet for overall performance.
Active vegetarians show better lower limb strength and power than active omnivores.	Souza, et al., 2022	Evaluate the diet and physical performance of vegetarians through dynamic, isometric and relative strength tests; muscle power; and aerobic capacity.	32 vegetarians and 26 omnivores, physically active.	They were evaluated according to the Healthy Eating Index and performance was tested in barbell squats, handgrip strength, isometric deadlift strength, countermovement jumping and maximum aerobic speed (MAS).	Better diet quality, greater relative strength and greater jumping height were found among vegetarians. No difference was observed in MAS or isometric strength of the upper and lower limbs	Vegetarians and omnivores show similar performance in strength and aerobic capacity, but the vegetarians evaluated showed higher levels of relative strength and power.
A relação entre dieta vegetariana e desempenho esportivo: uma revisão sistemática	Hernández-Lougedo et al., 2023	Verificar as diferenças nas variáveis relacionadas ao desempenho, ingestão	Atletas vegetarianos e onívoros	Busca bibliográfica em diferentes bases de dados: PubMed, Web of Science,	Não foram obtidas diferenças significativas em variáveis relacionadas ao desempenho físico ou saúde,	Não se pode afirmar que indivíduos vegetarianos apresentam maior desempenho esportivo, para o

		nutricional e saúde em atletas, de acordo com sua condição física (onívoros ou vegetarianos)		Dialnet e Cochrane. As palavras-chave utilizadas foram "vegetarian diet", "vegan diet", "exercise", "sport" e "performance"	mas a ingestão alimentar foi significativamente maior em carboidratos e menor em proteínas atletas vegetarianos	qual mais pesquisas devem ser realizadas.
Racing experiences of recreational distance runners following omnivorous, vegetarian, and vegan diets (Part B) - Results from the NURMI study (Step 2).	Wirmitzer et al., 2023	Investigating a multitude of training behaviors among long-distance recreational running athletes and the relationship of general diet types to improved sprint performance.	109 omnivorous long-distance recreational runners, 45 vegetarians and 91 vegans.	Based on the cross-sectional design (survey), the NURMI Study Step 2 aimed to investigate a plethora of training behaviors among recreational long-distance running athletes and the relationship of general diet types with best time race performance. Statistical analysis was based on the chi-square and Wilcoxon tests.	Differences were found between dietary subgroups in body mass index, sex, marital status and motivations related to running for well-being, no significant differences were found for best performance time in half marathon, marathon and/or ultramarathon based on diet type.	Whether the vegan diet is associated with improved endurance performance remains unclear. Current results are suggestive that 100% plant-based (vegan) nutrition is compatible, at a minimum, with long-distance running performance.
Completely plant-based diets that meet energy requirements for resistance training can supply enough protein and leucine to maximize hypertrophy and strength in male bodybuilders:	Goldman et al., 2024a	Evaluate whether all-plant diets can meet the nutritional needs of American football players, particularly in relation to protein, leucine and micronutrients, to optimize physical	Professional American Football athletes.	Using dietary data from a large cohort following plant-based diets and scaling these to the energy needs of professional American football players, using the Cunningham equation to estimate caloric needs.	Scaled diets meet and exceed the protein, leucine and micronutrient needs necessary for muscle development, strength and athletic performance.	Plant-based diets can meet the nutritional needs of American football players, reconciling recommendations for chronic disease prevention with the demands of athletic performance.

a modeling study		performance and health.				
Protein requirements for maximal muscle mass and athletic performance are achieved with completely plant-based diets scaled to meet energy needs: a modeling study in professional American football players	Goldman et al., 2024b	Evaluate the nutrient composition of all-plant-based diets scaled to the caloric demands of maximal muscle mass and strength development	Male bodybuilders.	Study based on anthropometric data from bodybuilders, applying the resting metabolic rate prediction equation and considering factors of physical activity and caloric surplus to model diets entirely based on vegetables	The modeled diets met protein and leucine needs, in addition to exceeding micronutrient needs (except vitamin D), with saturated fat levels in line with guidelines, but sodium levels above recommended levels.	All-plant-based diets can meet nutritional needs for maximum muscle hypertrophy without the need for additional planning, as long as they are sized correctly to meet energy and nutritional demands.
Nutritional considerations for vegetarian athletes: a narrative review.	Luna, et al., 2024	To examine the effects of a vegetarian diet on athletes and the nutritional considerations of energy, macronutrients, micronutrients, and creatine.	Vegetarian athletes.	A narrative literature review on vegetarian diets, focusing on nutritional adequacy, health risks, and risks of nutritional deficiencies.	Well-planned vegetarian diets meet the specific needs of athletes and allow for performance levels similar to those observed in athletes with other well-planned dietary patterns. Furthermore, they reduce the risk of cardiovascular disease, type 2 diabetes, and some types of cancer.	Well-planned vegetarian diets can be effective for athletes, but they need to pay attention to their meal planning to avoid deficiencies in essential nutrients. More research is needed to clarify some nutritional aspects for vegetarian athletes.
Plant-based diet and sports performance.	Sarmiento, et al. 2024	Evaluate the impact of plant-based diets on sports performance, with an emphasis on carbohydrates, antioxidants, dietary fiber and phytochemical	Human participants in experimental studies carried out between 1986 and 2024.	Literature review from 1986 to 2024 that involved an experimental design with human participants.	Plant-based diets do not harm athletic performance and can positively impact sports performance by improving blood flow and reducing oxidative stress.	Plant-based diets have a potential positive impact on sports performance, being an effective dietary intervention to optimize physical capabilities, with favorable effects also on general

		s present in these foods.				health and the intestinal microbial community.
--	--	---------------------------	--	--	--	--

DISCUSSION

Effects on strength and endurance.

Observational data show that there are no significant differences in strength and endurance athletic performance between vegetarian and omnivorous athletes. According to Souza et al., (2022), vegetarians and omnivores show similar performance in strength and aerobic capacity. Craddock et al., (2016) corroborate this conclusion, stating that consuming a predominantly vegetarian diet neither improved nor impaired the athletes' performance.

The study by Goldman et al., (2024a), using bodybuilding athletes as a sample, concluded that plant-based diets met the needs for protein, leucine, and micronutrients, with saturated fat levels aligned with guidelines, but sodium levels above recommendations, stating that it is possible to meet the nutritional needs for maximum muscle hypertrophy without additional planning, provided they are correctly sized to meet energy and nutritional demands.

Lynch et al., (2016) conducted a study with 27 vegetarian and 43 omnivorous athletes, in which they assessed maximum oxygen consumption (VO_{2max}) using a treadmill protocol; they also measured lower limb strength (peak torque) using an isokinetic dynamometer. The results of this study showed that VO_{2max} for relative values ($ml.kg^{-1}.min^{-1}$) was higher for the vegetarian group, especially for women; however, for absolute values ($L.min^{-1}$) there was no statistical difference between the two groups. The authors suggest that vegetarian diets, in addition to not compromising performance results, facilitate aerobic fitness in athletes. Peak torque was not different between the vegetarian and omnivorous athlete groups.

Thus, scientific evidence indicates that a well-planned vegetarian diet is capable of providing all the necessary nutrients for an athlete without compromising good physical performance, whether in strength or endurance sports (Hernandez-Lougedo et al., 2023).

Therefore, the fear of adopting a plant-based diet, believing that it may harm physical

performance, proves to be unfounded, since scientific evidence demonstrates that, when well-planned, this dietary strategy is capable of supporting hypertrophy and even optimizing aerobic endurance.

Nutritional Needs

Despite the marked differences in food consumption between vegetarians and omnivores, both diets satisfy the nutritional needs of athletes. However, according to Luna et al., (2024), although there was a concern that vegetarian diets would not meet the nutritional needs of athletes, the opposite has been proven.

However, it is important to emphasize the importance of paying attention to meal planning in order to avoid macronutrient deficiencies, especially protein, as these are present in lower concentrations. A clear caveat, however, is that vegan diets consumed spontaneously may induce suboptimal intakes of key nutrients, most notably quantity and/or quality of dietary protein and specific micronutrients (eg, iron, calcium, vitamin B12, and vitamin D).

As such, optimal vegan sports nutrition requires (more) careful consideration, evaluation, and planning. Individual/seasonal goals, training modalities, athlete type, and sensory/cultural/ethical preferences, among other factors, should all be considered when planning and adopting a vegan diet (West et al., 2023).

The study by Gibson-Smith et al., (2020) evaluated food intake, body composition, and iron status in experienced climbers on omnivorous and vegetarian diets and concluded that average energy intake did not meet the energy requirements for moderate training, in addition to presenting a serum iron value below the ideal, highlighting the importance of greater nutritional care for vegetarian athletes. Hernandez-Lougedo et al., (2023) pointed out higher carbohydrate intake and lower intake of protein and saturated fat in vegetarian athletes when compared to omnivores.

Despite these concerns, Goldman et al., (2024b) found positive results when evaluating the plant-based diets of professional American football players and concluded that, in addition to meeting the athletes' nutritional needs, the recommendations for protein, leucine, and micronutrients were exceeded. Thus, although a vegetarian diet can meet the nutritional needs of athletes, meal planning and supplementation when necessary are essential to avoid deficiencies (Luna, et al., 2024).

Therefore, appropriate planning involves a caloric intake above 30 kcal per kilogram of fat-free mass (kg/FFM) in order to prevent Relative Energy Deficiency in Sport (RED-S), which is directly related to athletic performance and health (Luna et al., 2024).

Moreover, according to the American College of Sports Medicine position stand (American Dietetic Association et al., 2009), it is recommended to consume 3 to 12 g of carbohydrates per kilogram of body weight, depending on the intensity level of physical activity; 1.2 to 2 g of protein/kg/day or 0.3 g/kg after exercise, distributed across meals every 3 to 5 hours; and at least 20% of total energy intake from lipids, limiting saturated fat intake to a maximum of 10%.

Thus, based on the studies presented, it is possible to affirm that the apprehension many athletes have about adopting a plant-based diet, due to fears of low lean mass gain or decreased physical performance, can be overcome. With individualized nutritional monitoring, it is possible to guarantee all the nutritional needs of athletes, making a vegetarian diet a viable option for performance.

Vegetarian Diet and Health

Observational data indicate that vegetarian athletes tend to have a lower risk of chronic non-communicable diseases when compared to omnivorous athletes. According to Luna et al., (2024), vegetarian diets show a reduced risk of cardiovascular disease, type 2 diabetes, and some types of cancer.

Sliz et al., (2021) corroborate these statements, as these authors measured serum concentrations of cholesterol, glucose, C-peptide, and insulin in Polish male athletes and showed that vegan athletes had better insulin sensitivity and lower cholesterol levels.

The study by Barnard et al., (2019) examined the physiological effects of plant-based diets that present potential safety and

performance advantages in endurance sports; it also explored the role of nutrition in providing cardioprotection for these athletes. This study showed that plant-based diets offer significant health benefits, as they can improve body composition, increase glycogen storage, improve blood flow and tissue oxygenation, reduce oxidative stress, inflammation, and cardiovascular risk.

Sarmiento et al., (2024) corroborate the previous study by stating that plant-based diets have a positive impact on athletic performance, being an effective dietary intervention to optimize physical capabilities, with favorable effects also on general health and the gut microbial community.

In this way, it is evident that plant-based diets not only reduce the risk of developing chronic diseases throughout life, but also require fewer natural resources for their production when compared to omnivorous diets (Lynch et al., 2018).

CONCLUSION

This review demonstrated that a vegetarian diet, when properly planned, is capable of meeting the nutritional needs of athletes, ensuring good performance in both strength and endurance.

Furthermore, it shows that this dietary pattern has a positive impact on health, reducing the risk of developing chronic diseases. It should also be noted that a large part of the research selected for this study was conducted with recreational athletes; therefore, further studies involving elite athletes are necessary to verify if differences may appear at higher levels of training and competition.

FUNDING

This research received a scientific initiation grant from the Institutional Program of Scientific Initiation Grants - PIBIC, UNIFESP.

DECLARATION OF INTEREST

The authors report no conflict of interest.

REFERENCES

1-American Dietetic Association; Dietitians of Canada; American College of Sports Medicine; Rodriguez, N.R.; Di Marco, N.M.; Langley, S.

American College of Sports Medicine position stand. Nutrition and athletic performance. *Med Sci Sports Exerc.* Vol. 41. Num. 3. 2009. p. 709-731. doi: 10.1249/MSS.0000000000000852.

2-Barnard, N.D.; Goldman, D.M.; Loomis, J.F.; Kahleova, H.; Levin, S.M.; Neabore, S.; Batts, T.C. Plant-based diets for cardiovascular safety and performance in endurance sports. *Nutrients.* Vol. 11. Num. 1. 2019. p. 130. doi: 10.3390/nu11010130.

3-Boldt, P.; Knechtle, B.; Nikolaidis, P.; Lechleitner, C.; Wirnitzer, G.; Leitzmann, C.; Rosemann, T.; Rust, C. A.; Wirnitzer, K. Quality of life of female and male vegetarian and vegan endurance runners compared to omnivores - results from the NURMI study (step 2). *J Int Soc Sports Nutr.* Vol. 15. Num. 1. 2018. p. 33. doi: 10.1186/s12970-018-0237-8.

4-Craddock, J.C.; Probst, Y.C.; Peoples, G.E. Vegetarian and Omnivorous Nutrition-Comparing Physical Performance. *Int J Sport Nutr Exerc Metab.* Vol. 26. Num. 3. 2016. p. 212-220. doi: 10.1123/ijsnem.2015-0231.

5-Devrim-Lanpir, A.; Hill, L.; Knechtle, B. Efficacy of popular diets applied by endurance athletes on sports performance: beneficial or detrimental? A narrative review. *Nutrients.* Vol. 13. Num. 2. 2021. p. 491. doi: 10.3390/nu13020491.

6-Durkalec-Michalski, K.; Domagalski, A.; Główska, N.; Kamińska, J.; Szymczak, D.; Podgórski, T. Effect of a four-week vegan diet on performance, training efficiency and blood biochemical indices in CrossFit-trained participants. *Nutrients.* Vol. 14. Num. 4. 2022. p. 894. doi: 10.3390/nu14040894.

7-Galvão, M.C.B.; Ricarte, I.L.M. Revisão sistemática da literatura: conceituação, produção e publicação. *Logeion: Filosofia da informação.* Vol. 6. Num. 1. 2020. p. 57-73. doi: 10.21728/logeion.2019v6n1.p57-73.

8-Gibson-Smith, E.; Storey, R.; Ranchordas, M. Dietary intake, body composition and iron status in experienced and elite climbers. *Front Nutr.* Vol. 5. Num. 7. 2020. p. 122. doi: 10.3389/fnut.2020.00122.

9-Goldman, D.M.; Warbeck, C.B.; Karlsen, M.C. Completely plant-based diets that meet energy

requirements for resistance training can supply enough protein and leucine to maximize hypertrophy and strength in male bodybuilders: a modeling study. *Nutrients.* Vol. 16. Num. 8. 2024a. p. 1122. doi: 10.3390/nu16081122.

10-Goldman, D.M.; Warbeck, C.B.; Karlsen, M.C. Protein requirements for maximal muscle mass and athletic performance are achieved with completely plant-based diets scaled to meet energy needs: a modeling study in professional American football players. *Nutrients.* Vol. 16. Num. 12. 2024b. p. 1903. doi: 10.3390/nu16121903.

11-Hernandez-Lougedo, J.; Maté-Muñoz, J.L.; García-Fernández, P.; Úbeda-D'ocasar, E.; Hervás-Pérez, J.P.; Garnacho-Castaño, M.V. The Relationship between Vegetarian Diet and Sports Performance: A Systematic Review. *Nutrients.* Vol. 15. Num. 21. 2023. p. 4703. doi: 10.3390/nu15214703.

12-IBOPE. Instituto Brasileiro de Opinião Pública e Estatística. Pesquisa de Opinião Pública sobre o Vegetarianismo. 2018. Disponível em: <https://www.svb.org.br>.

13-Luna, F.; Rossi, E.V.; Arrieta, E.M. Nutritional considerations for vegetarian athletes: a narrative review. *Hum Nutr Metab.* Vol. 37. 2024. p. 200267. doi: 10.1016/j.hnm.2024.200267.

14-Lynch, H.M.; Wharton, C.M.; Johnston, C.S. Cardiorespiratory fitness and peak torque differences between vegetarian and omnivore endurance athletes: a cross-sectional study. *Nutrients.* Vol. 8. Num. 11. 2016. p. 726. doi: 10.338110726.

15-Lynch, H.; Johnston, C.; Wharton, C. Plant-Based Diets: Considerations for Environmental Impact, Protein Quality, and Exercise Performance. *Nutrients.* Vol. 10. Num. 12. 2018. p. 1841. doi: 10.3390/nu10121841.

16-Nebi, J.; Schuchardt, J. P.; Wasserfurth, P.; Haufe, S.; Eigendorf, J.; Tegbur, U.; Hahn, A. Characterization, dietary habits and nutritional intake of omnivorous, lacto-ovo vegetarian and vegan runners - a pilot study. *BMC Nutr.* Vol. 5. 2019. p. 51. doi: 10.1186/s40795-019-0313-8.

17-Rogerson, D. Vegan diets: practical advice for athletes and exercisers. *J Int Soc Sports*

Nutr. Vol. 13. Num. 14. 2017. p. 36. doi: 10.1186/s12970-017-0192-9.

18-Santos Neto, A.M.; Rocha, M.N.; Bezerra, J.A.; Libâneo, J.A.; Sousa, P.V.L.; Brito, M.M. The effect of the vegetarian diet on the performance of endurance practitioners. *Res Soc Dev*. Vol. 11. Num. 11. 2022. p. e202111129695. doi: 10.33448/rsd-v11i11.29695.

19-Sarmento, T.C.; Ferreira, R.D.; Franco, O.L. Plant-based diet and sports performance. *ACS Omega*. Vol. 9. Num. 49. 2024. p. 47939-47950. doi: 10.1021/acsomega.4c07560.

20-Sliz, D.; Parol, D.; Wełnicki, M.; Chomiuk, T.; Grabowska, I.; Dąbrowska, D.; Kłodzik, L.; Mamcarz, A. Macronutrient intake, carbohydrate metabolism and cholesterol in Polish male amateur athletes on a vegan diet. *Nutr Bul*. Vol. 46. Num. 2. 2021. p. 120-127. doi: 10.1111/nbu.12491.

21-SVB. Sociedade Vegetariana Brasileira. Vegetarianismo. 2025. Disponível em: <https://www.svb.org.br>.

22-Souza, A.C.; Brandão, M.S.; Oliveira, D.L.; Carvalho, F.G.; Costa, M.L.; Aragão-Santos, J.C.; Mendonça, C.R.; Silva-Grigoletto, M.E. Active vegetarians show better lower limb strength and power than active omnivores. *Int J Sports Med*. Vol. 43. Num. 8. 2022. p. 715-720. doi: 10.1055/a-1753-1322.

23-West, S.; Monteyne, A.J.; Van Der Heijden, I.; Stephens, F.B.; Wall, B.T. Nutritional Considerations for the Vegan Athlete. *Adv Nutr*. Vol. 14. Num. 8. 2023. p. 774-779. doi: 10.1016/j.advnut.2023.04.012.

24-Wirnitzer, K.; Seyfert, T.; Leitzmann, C.; Keller, M.; Wirnitzer, G.; Lechleitner, C.; Rosemann, T.; Knechtle, B. Prevalence in running events and running performance of endurance runners following a vegetarian or vegan diet compared to non-vegetarian endurance runners: the NURMI Study. *SpringerPlus*. Vol. 5. Num. 458. 2016. p. 1-7. doi: 10.1186/s40064-016-2126-4.

25-Wirnitzer, K. Vegan diet in sports and exercise - Health benefits and advantages to athletes and physically active people: A narrative review. *Int J Sports Exerc Med*. Vol. 6.

2020. p. 165. doi: 10.23937/2469-5718/1510165.

26-Wirnitzer, K.; Motevalli, M.; Tanous, D.; Wirnitzer, G.; Leitzmann, C.; Wagner, K.H.; Knechtle, B. Training and racing behaviors of omnivorous, vegetarian, and vegan endurance runners - results from the NURMI study (Step 1). *Nutrients*. Vol. 13. Num. 10. 2021. p. 3521. doi: 10.3390/nu13103521.

27-Wirnitzer, K.; Tanous, D.; Motevalli, M.; Wagner, K.H.; Raschner, C.; Wirnitzer, G.; Rosemann, T.; Knechtle, B. Racing experiences of recreational distance runners following omnivorous, vegetarian, and vegan diets (Part B) - Results from the NURMI study (Step 2). *Nutrients*. Vol. 15. Num. 10. 2023. p. 2243. doi: 10.3390/nu15102243.

Author Correspondence:

Emilson Colantonio
 colantonio@unifesp.br
 Department of Human Movement Sciences,
 Federal University of São Paulo - UNIFESP,
 Rua XV de Novembro, 195,
 Centro, Santos, São Paulo, Brasil.

Recebido para publicação em 27/11/2025
 Aceito em 31/01/2026