

TRAINING AND SPORTS NUTRITION, FROM BASICS TO DAILY SUPPLEMENTATION, A NARRATIVE REVIEW.

NUTRIÇÃO ESPORTIVA E DE TREINAMENTO, DO BÁSICO A SUPLEMENTAÇÃO DIÁRIA, UMA REVISÃO NARRATIVA.

NUTRICIÓN DEPORTIVA Y DE ENTRENAMIENTO, DE LO BÁSICO A LA SUPLEMENTACIÓN DIARIA, UNA REVISIÓN NARRATIVA.

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ABSTRACT

Aim: This review aims to analyze the current evidence regarding supplements and nutritional intake for four popular physical activities bringing the latest research on basic sports nutrition and performance. **Methods:** This narrative review used Pubmed, Google Scholar and EBSCO SportDiscus databases to find classic and recent studies about nutrition and supplementation, related to Resistance Training (RT), Team Sports (TS), Crossfit and Endurance Training (ET). **Results:** On RT the use of creatine, beta-alanine and multi-ingredients pre-workouts are the most popular supplements among practitioners. Due to the complexity of TS and its features, a balanced nutritional pattern is paramount for the athletes, also the use of isotonic drinks and caffeine are related to improved performance. Among CrossFit practitioners and athletes, higher calories consumption, mainly from carbohydrates, and the use of solutions with sodium bicarbonate, improving the buffering system are the most cited resources. Lastly, for ET the consumption of carbohydrates is essential, and caffeine and nitric oxide supplementation are recommended. **Conclusion:** A balanced and well-structured nutritional plan is important for all four activities, deficits in nutrients, mainly carbohydrates are reported, and some supplements are reported as positive such as caffeine, creatine, isotonic drinks and sodium bicarbonate solutions.

KEYWORDS: Resistance Training; Team Sports; CrossFit; Endurance Training; Nutrition.

RESUMO

Objetivo: Esta revisão tem como objetivo analisar as evidências atuais sobre suplementação e ingestão nutricional em quatro modalidades físicas populares, apresentando pesquisas recentes sobre nutrição esportiva básica e desempenho. **Métodos:** Esta revisão narrativa utilizou as bases de dados PubMed, Google Scholar e EBSCO SportDiscus para identificar estudos clássicos e recentes sobre nutrição e suplementação relacionados ao Treinamento Resistido (TR), Esportes Coletivos (EC), CrossFit e Treinamento de Endurance (TE).

Resultados: No TR, o uso de creatina, beta-alanina e suplementos pré-treino com múltiplos

ingredientes são os suplementos mais populares entre os praticantes. Devido à complexidade dos EC e suas características, um padrão alimentar equilibrado é fundamental para os atletas; além disso, o uso de bebidas isotônicas e cafeína está associado à melhora do desempenho. Entre praticantes e atletas de CrossFit, maior consumo calórico, principalmente proveniente de carboidratos, e o uso de soluções contendo bicarbonato de sódio para melhorar o sistema tampão são os recursos mais citados. Por fim, no TE, o consumo de carboidratos é essencial, sendo recomendada também a suplementação com cafeína e óxido nítrico.

Conclusão: Um plano nutricional equilibrado e bem estruturado é importante para as quatro modalidades. Deficiências nutricionais, principalmente relacionadas aos carboidratos, são frequentemente relatadas, e alguns suplementos demonstram efeitos positivos, como cafeína, creatina, bebidas isotônicas e soluções de bicarbonato de sódio.

PALAVRAS-CHAVE: Treinamento Resistido; Esportes Coletivos; CrossFit; Treinamento de Endurance; Nutrição.

RESUMEN

Objetivo: Esta revisión tiene como objetivo analizar la evidencia actual sobre suplementación e ingesta nutricional en cuatro actividades físicas populares, presentando las investigaciones más recientes sobre nutrición deportiva básica y rendimiento. **Métodos:** Esta revisión narrativa utilizó las bases de datos PubMed, Google Scholar y EBSCO SportDiscus para identificar estudios clásicos y recientes sobre nutrición y suplementación relacionados con Entrenamiento de Fuerza (EF), Deportes de Equipo (DE), CrossFit y Entrenamiento de Resistencia (ER).

Resultados: En el EF, el uso de creatina, beta-alanina y suplementos preentrenamiento con múltiples ingredientes son los suplementos más populares entre los practicantes. Debido a la complejidad y características de los DE, un patrón nutricional equilibrado es fundamental para los atletas; además, el uso de bebidas isotónicas y cafeína se relaciona con una mejora del rendimiento. Entre practicantes y atletas de CrossFit, un mayor consumo calórico, principalmente proveniente de carbohidratos, y el uso de soluciones con bicarbonato de sodio para mejorar el sistema amortiguador son los recursos más citados. Finalmente, en el ER, el consumo de carbohidratos es esencial y también se recomienda la suplementación con cafeína y óxido nítrico. **Conclusión:** Un plan nutricional equilibrado y bien estructurado es importante para las cuatro actividades. Se reportan deficiencias nutricionales, principalmente relacionadas con carbohidratos, y algunos suplementos muestran efectos positivos, como la cafeína, la creatina, las bebidas isotónicas y las soluciones de bicarbonato de sodio.

PALABRAS CLAVE: Entrenamiento de Fuerza; Deportes de Equipo; CrossFit; Entrenamiento de Resistencia; Nutrición.

INTRODUCTION

Nutrition plays an important role in the performance of athletes and daily practitioners of physical activity. From supporting the daily energy needs of physical exercise up to the peak of performance, effective improvements with supplements use, sports nutrition is supposed to allow the athlete to train to his limit, and beyond.

There is a wide range of physical training activities aimed at improving performance of different sports modalities, demanding physical and technical capacities from the athletes. These differences imply specific dietary plans and unique supplementation strategies for each given sport or physical training activity.

Nutrition supplements represent a source of innovation that is supposed to be based on scientific evidence and have the goal to improve athletes' performance. There is a growing number of supplements and different brands with confusing information and sometimes

misleading claims which can be harmful for new athletes and sports practitioners. Those claims might lead them into using a supplement not recommended for his/her sport.

Moreover, athletes and practitioners usually are not familiar or simply don't follow the recommendations for food intake and supplementation, with bad results for their performance and their health. Also, some sports are known for peculiar nutritional strategies or strategies that lack scientific evidence.

The search for performance improvement through new and promising nutritional supplements makes rumor and anecdotal evidence to rise and pose as effective, gaining space in the markets. However, sound scientific studies are essential to prove efficiency of these products and safety to the athletes and consumers.

On the other hand, many articles tend to create limited information because the study uses one determined supplement in a determined sport, giving the impression to the end user that the supplement tested might be useful only for that specific purpose. A broader approach can evidence specific features and associate those to physiological features of the tested sport that can be common to other sports or exercises, or even other metabolic situations where the supplement might be useful.

Thus, the importance of reviewing recent evidence on nutrition and supplementation on a variety of sports, associating the basic concept of each modality to the new evidence regarding nutrition and supplementation.

OBJECTIVE

With that in mind, this article brings a general description of different training activities and sports and approaches nutrition and supplements issues related to these sports modalities.

METHODS

A narrative review, according to Paiva [30] can be described as a methodology that is consistent with data collection of a given subject, where the researcher will find information to understand a phenomenon. Pinnegar and Daynes [32] consider the narrative review as an important method to a broader scientific analysis.

In this narrative review, we will present concepts and basic theory to strengthen some ideas, and to bring new concepts based on recent published research. The basic concepts and new aspects were approached according to the interests of the authors.

We selected 4 sports modalities, Resistance training, Team sports, Crossfit and Endurance Training, we used classic studies for the basic information on the sports modalities and their basic nutrition aspects and we used new studies for the nutritional supplements related to each sport modality.

The following keywords, separated or in combination, were used: "Resistance Training"; "Team Sports"; "CrossFit"; "Endurance Training"; "Sports Nutrition"; "Dietary Supplements". The search took place on Pubmed, Google Scholar and EBSCO SportDiscus databases.

RESULTS AND DISCUSSION

Basic information and features of the four different sports modalities.

Resistance Training

Resistance Training (RT) have some slightly different definitions according to each author, but we can summarize as the capacity to impose tension over a resistance, being able

to overcome, equalize or give in to it. RT is not only about using machines and free weights in the gym, but it can be done with elastic bands and even our bodyweight.

RT has many benefits for the human body, like the prevention of many chronic diseases, increase of bone density and in injuries rehabilitation. For aesthetics it improves muscle tonus, promotes the increase of muscle cell size and decreases fat percentage. When a RT workout is done it works with all the body structure (muscle, tendons, bones, joints and ligaments), with each of those structures responding in a specific timing.

The RT routines, as the sport training routines, promote hypertrophy, in both men and women. The current recommendation for hypertrophy and strength gains in RT is to use intensities of at least 70% of 1 maximum repetition (1RM)[1].

Team Sports (TS)

Sports are cultural manifestations that have their origin in different motor skills and combined abilities. For example, soccer is based on the ability to run and steer the ball. Among the common motor actions of any sport we find movements that are basic for the motor development of the students, and when they are culturally improved, they become technical abilities of sports modalities.

It's the same for perceptive and coordinative abilities that come from the readings of the structure and organization of the games, i.e. the understanding of the space and the place where the game takes place, the number of players, the understanding of playing against others, the rules, the objectives of different games, functions and positions of each player, of defense and offense strategies. After all, from the common logic of team sports, the student manages to focus on understanding the playing action, independently of what game is played, and not in the specificity of one single modality.

With this, the internal logic of those modalities is the beginning of the process of learning of the TS, for example, the interaction with the adversary, with the tactical goals, with the materials that structure the motor activities, and other [31].

CrossFit

CrossFit is not only a training method or some sport, but rather a brand (CrossFit®), with Greg Glassman as the main face of the brand, being one of the founders in Santa Cruz, California. Greg Glassman [14] defines CrossFit as a variation of functional movements performed in high intensity.

CrossFit is considered an extreme physical exercise, because it combines complex movements with barbell and kettlebell, with resistance exercise, along with sprints, jumps, and Olympic Powerlifting exercises. Moreover, CrossFit uses the combination of high intensity with high volume, short resting periods and, in many times, repetitions until failure [37]. Faelli et al. [9], has shown that 30 minutes of CrossFit can be more intense than a 30 minutes session of resistance training, by presenting higher levels of Cortisol, even after 8 weeks of training [9].

Because of the similarities with other types of physical exercise (Endurance, Resistance and HIIT), CrossFit can lead to similar benefits of those other types of physical exercises [2]. Besides that, Crossfit training can create high motivational value and build strong sense of community and satisfaction, among the participants [5].

Although the high intensity with high volume workouts, CrossFit doesn't show a higher incidence of injuries. It can have similar incidence of injuries, or lower, than sports like Olympic Weightlifting, Olympic Gymnastic, Marathons, and Track and Field. The main injuries of CrossFit are related to shoulders and knees joints, and spine injuries, some of the factors associated with higher injury incidence in CrossFit are excessive frequency, lack of proper coaching, and competitive events [13, 24]. Despite that, due to the heterogeneity of

CrossFit boxes, is possible to observed discrepancies among the data, like the found it by Claudino et al. [5], were the number of CrossFit practitioners that have suffer some kind of injury can vary from 19% to 74%, having an injury rate, for every 1000 hours of practices, ranging from 1,9 to 3,1. These discrepancies are the results of biases and poor methodological structures studies [5].

Endurance Training

Endurance training is a long-term event that uses the aerobic metabolic pathway as the predominant one and promotes adaptations like increases in mitochondrial content and in oxidative muscle fiber, using less glucose and oxidizing more fat [19, 20].

Studies have shown that endurance exercises usually last (21-160 minutes) and exert fatigue, heat stress, dehydration, percentage of VO₂max and energy deficit on the body during these activities, so that glycogen stores are degraded. As the activity continues and in order to maintain sports performance, replacement with carbohydrates (such as blood glucose and muscle glycogen) has the advantage of generating more ATP per volume of oxygen (O₂) compared to fat [28, 39].

Basic nutrition and new findings on sports supplements

Resistance Training

Among the classic supplements related to RT, we have Creatine, a well-established supplement in the scientific community, with consensus results that Creatine can improve performance on RT [25]. Creatine is a very well-studied supplement that improves the energy production in the ATP-PC cycle. It is used as a loading dose of 20g/day (divided in 4 doses of 5g) in the first week of use and 5g/day in the next 3 weeks. This strategy is efficient in increasing creatine phosphate in the muscles, yielding more energy to train with consequent better results.

Beta-Alanine, not exactly a new discovery, is shown in recent articles [29] with positive effects after 5 weeks of supplementation of 6.4g per day, along with progressive RT. Beta-Alanine is a non proteogenic amino acid that participates, along with histidine, in the synthesis of Carnosine, a natural buffering agent that occurs in the body and that allows the athlete to cope with stronger efforts.

In general, RT enthusiasts use protein based supplements, in order to achieve the dietary daily need of protein, with the use of whey protein, plant based protein (usually a mix of pea, rice and soy) and other types of protein sources.

New findings

Another supplement gaining space among practitioners and showing promising results, is the use of multi-ingredients pre-workouts (usually reported to be consumed 30~ minutes before sessions). Although popular, their composition is too variable between the available products in the market. Anyhow, most of them have in their list of ingredients Creatine, Caffeine and Beta-Alanine [18]. Caffeine is a well known and studied compound that is well tolerated for most in dosages that range from 2 to 6 mg/kg of body weight. It increases energy, triggers the alert state, helps to burn fat, delays fatigue, that is why it is so popular, being part of several pre workout formulas [16, 18].

Team Sports

When describing TS we refer to a team where players depend on each other to win, besides the general nutritional needs to keep the athletes' good health, there are other specific needs that include individual requirements, position on the team and the way that the athlete

plays. Moreover, different athletes have different body types, with different sizes, body composition and demands. Ideally sport nutrition was supposed to be individualized, to meet everyone's requirements, individually [40].

Furthermore, the performance of the athletes, in a given competition of TS, depends on a series of characteristics, some are intrinsic, like the nutritional state, and some are external, like the weather conditions and the quality of the opponents. These external characteristics may not be controlled, but they can be modulated with the adoption of a good nutritional strategy [40].

Regarding the nutritional needs of TS, Devlin et al. [6] showed an energy expenditure of almost the double amount of calories for Rugby players when compared to Soccer players. The study describes 4132.03 Kcal for Rugby players and 2245.15 Kcal for Soccer players, with the distribution of carbohydrates, proteins and lipids of 30/38/29 for Rugby and 26/38/33 for Soccer, respectively. Even with different distributions and different daily energy needs, the study highlights the differences between the modalities.

One great work published by Leonie and Annik [26] highlights the energy necessities and nutritional strategies applied for TS. The article indicates that tactic performance and abilities can mean victory of one team over another, for that, the training sessions don't only have physical training, but also, techniques/tactical training, meaning that higher nutritional demand helps cognitive abilities and concentration. And during a period with competitions, nutrition should help athletes to adapt to the traveling schedules, different climates, alteration in the calendar, and two different competitions close to each other.

New Findings

Some studies were published in the last five years, under the scope of TS and nutrition. Jimenez et al. [21] made a systematic review, assessing the use of energy drinks in different sports, as a way to provide caffeine to the athletes. The review selected 37 studies. Bringing the minimal efficient dose of 3 mg/kg, the differences between caffeine based drinks during long-term events for rehydration and hydroelectrolytic replacements, and energy drinks that can be used before the training or competition.

Another work, not so recent, but calls for attention is from Sánchez-Díaz et al. [34], that touches on nutritional education for sports teams. Gathering 14 articles about the subject and presenting interesting results. No differences regarding sports modality or sex or type intervention, online or in person, the increase in the levels of nutritional education brought improvements in dietary habits and body composition of the athletes.

Crossfit

A study with Polish CrossFit athletes observed the calories ingestion is below the recommended and below the amount of calories spent in one day of work-out [15]. The same study showed that both men and women have low consumption of carbohydrates, and women have under recommended consumption of vitamin E and calcium.

In another study, that used an online questionnaire, among practitioners and coaches of CrossFit, in the USA, UK, Canada and Australia, found that more than half of the participants used some kind of supplement protein base. Creatine and pre-workout were highly used among the participants, as well [3]. The same study also saw that Macro Counting, Intermittent Fasting and Paleo were the most common diets.

Although CrossFit is a high demanding energy consumption (both calories and in carbohydrates) many of those who perform CrossFit have an energy and carbohydrate intake that is below of the recommendations, and a consumption of lipids that is above the recommendation standards [3, 15, 38].

One hypothesis for why this happens, is the social pressure to be “well fit” just like the other you work-out with. Along with that, nearly 30% of the practitioners of CrossFit, that have a diet, said that they do CrossFit to lose fat mass [3]. For those reasons, many follow the fad diet. In the research of Brisebois et al. [3], 53% of the participants said that they inform themselves about diet and supplementation, through internet searches, 27% of them ask advice to their coaches, and 23% look for peer-review articles.

Going further about diets among CrossFit practitioners, men and women spent about 2800 kcal and 2500 kcal, but have an intake of 2200 kcal and 1700 kcal, respectively, causing a calories deficit and staying below the recommended calories intake to perform exercises, around 2500 kcal [15, 22].

In Polish and Brazilian participants, it was observed that the diet was composed of 44-48% of carbohydrates, 18-24% of proteins and 29-33% of lipids [15, 38]. The recommendations of International Society of Sports Nutrition is that 55-60%, 15-20% and 30% should come from carbohydrates, proteins, and lipids, respectively [22].

New Findings

Caffeine is a stimulant broadly used in different sports and many studies look at their effects on CrossFit performance. Unfortunately, the results are not promising, some clinical trials did not find improvements in strength or power for those practitioners of CrossFit who ingest caffeine [12, 36, 42].

Just like endurance trials, the use of Sodium Bicarbonate (SB) has been hypothesized to be helpful in allowing longer periods performing high intensity movements. Three works were made to analyze the effects of SB on CrossFit performance, two of them did not find positive results [8, 42], but they were looking for acute effects. The third study, observed the effects of SB on performance, after 10 days of SB consumption, on a solution of 150 mg x Kg - 1 of SB. The results were improvements of 3.1% to 6.1% compared to the placebo group, improvements in total number of repetitions, improvements in ventilatory threshold, and bradycardia while in ventilatory threshold [7]. SB is a chemical compound, composed of the union of sodium and bicarbonate. It has an important role in the buffering system, preventing acidosis.

Tribulus terrestris L. (TT) seems to elevate the testosterone levels and help improve performance in some studies. Fernández-Lázaro et al. [10] decided to observe the effects TT, after 6 weeks of supplementation. It saw an increase at testosterone levels and improvement in the bench press, but it wasn't related to better performance in the CrossFit sessions. TT is a plant native from Eurasia and Africa. In the early 80s there were starting to use TT to improve testosterone levels and sexual performance.

Finally, a systematic review saw the main supplementation practices among CrossFit practitioners. And it did find that only SB was effective in improving performance in CrossFit, where the use of caffeine, carbohydrates of quick absorption, and other supplements were not associated with any improvements of performance for CrossFit athletes and practitioners [33].

Endurance training

Carbohydrates are used as a carbon source and play a fundamental role in the production of energy for cellular components, and during physical exercise they are the only macronutrients capable of generating Adenosine Triphosphate (ATP) without the use of oxygen. In adults, carbohydrate is stored in the liver and muscles, in the form of glycogen and, to a lesser extent, in the form of blood glucose. Fatty acids present a much superior reserve in terms of energy quantity, but their conversion into ATP occurs more slowly. It is

estimated that an 80kg man stores around 500g of carbohydrates, 80% in the form of muscle glycogen and 20% in liver glycogen [27].

According to the study by Kerkick et al.[22] carbohydrate recommendations for athletes are 5-10g/kg of body weight per day or 60-70% of daily energy intake. Protein intake consists of 1-2g/kg of body weight, depending on the demand of the sport.

One study examined the eating and supplementation habits of amateur runners (10K or more) who followed omnivorous, vegetarian, or vegan diets. Followers of the three diets ate similarly in the distribution of carbohydrates, proteins and lipids, 58.2%, 24.5% and 17.4%, respectively [41]. The main supplement for omnivorous runners was mineral-based (36%), while vegan and vegetarian runners used more vitamins (66% and 25%, respectively).

A Finnish observational study found that ski cross country athletes consumed low levels of carbohydrates and were associated with low levels of available energy, negatively impacting performance. While athletes with higher carbohydrate and protein consumption achieved better VO² maximum results and better performance results [23]. Showing the importance of a balanced diet in carbohydrates for the energetic disposition of the sport.

In 2021, the International Society of Sports Nutrition (ISSN) published its findings and recommendations for caffeine supplementation [16]. In this case, endurance sports are the modality with the most significant benefits from the use of caffeine. It is recommended to ingest 3-6 mg of caffeine per kilogram of body weight 60 minutes before the race, not exceeding 9 mg per kilogram of body weight. The use of caffeine can be beneficial even in extreme conditions, such as extreme heat and high altitude.

A recent review work brought recommendations on the state of the art of supplementation and nutrition for endurance athletes [39]. In it, carbohydrate supplementation is reinforced, the practice of “carb loading” or glucose supercompensation a few days before the race, is recommended for competitions over 90 minutes. The intake of gels or solutions with carbohydrates during the race is necessary in races longer than 60 minutes.

Protein supplementation can improve performance in sports such as marathon, running on hills or on tracks and obstacle races. It is important to take supplements with all essential amino acids and not just the branched-chain amino acids BCAA [39].

Hydration is also a fundamental element for the performance of marathon runners and other similar sports. Several medical and sports associations recommend drinking 400-800 ml of water per hour during the race, although there may be variations between individuals. Just as sodium intake can bring benefits in the race, it is recommended to ingest 300-600ml per hour in long-term races, again, which may vary between runners [39].

Predominantly aerobic and long-lasting exercise can cause gastrointestinal (GI) symptoms such as nausea and vomiting, heartburn, bleeding and acceleration of bowel movements and upper respiratory tract disorders (URTI) that include the common cold, sinusitis, pharyngitis, laryngitis, epiglottitis, rhinitis and common diseases in the general population and athletes. In this context, probiotic foods, live microorganisms, when administered in adequate quantities, such as yogurt, can bring benefits to those runners who have intestinal problems or upper respiratory tract infections [35].

The set of changes induced by exercise in white cells, cytokines and certain hormones alters immune function. Intense exercise increases the release of catecholamines and stimulates inflammatory responses that cause the release of C-reactive protein, inducing an increase in the release of arachidonic acid from membrane phospholipids. Decreased immune function after intense exercise increases the athlete's exposure to infections and impairs sports performance in competitions.

The ingestion of nitric oxide, for example present in beetroot juice, can bring benefits, such as improving the sustained time to exhaustion, cardiorespiratory performance at the

anaerobic threshold and maximum VO_2 , with the intake of 500ml of beetroot juice being recommended 3 hours before test or daily supplementation of 300-600 mg of nitrate [39]. Nitrate is used by the body to produce nitric oxide which promotes vasodilation.

Furthermore, studies indicate that during moderate exercise, ranging from 30 to 75 minutes, rinsing with a 6-6.4% maltodextrin-based solution can contribute to better homeostasis during exercise training [17]. Maltodextrin is widely used because it is larger than glucose, but with a similar simple structure, which makes maltodextrin one of the easiest carbohydrates to absorb.

Table 1: Daily Consumption Recommendation for each sport

	Carbohydrate	Protein	Lipids	Minerals	Vitamins
Crossfit	6 to 10 g for kg/Body Mass	1.6 to 2g for kg/Body Mass	1 a 1.5g for kg/Body Mass	Phosphorus (700 mg/d)	Vitamin C (men 90 mg/d; women 75 mg/d), Vitamin E (15 mg/d) Vitamin D (5 mcg/d)
Endurance	5 to 8 g for kg/Body Mass	1 to 2g for kg/Body Mass	1 to 2g for kg/Body Mass	Sodium phosphate (4 g/d for 3 days) Sodium (500 mg/da),	Vitamin C (men 90 mg/d; women 75 mg/d), Vitamin E (15 mg/d) Vitamin D (5 mcg/d)
Team Sports	5 to 10g for kg/Body Mass	1 a 1.5g for kg/Body Mass	1 a 1.5g for kg/Body Mass	Zinc (men 11 mg/d; women 8 mg/d)	Vitamin C (men 90 mg/d; women 75 mg/d), Vitamin E (15 mg/d) Vitamin D (5 mcg/d)
Resistance Training	6 to 10 g for kg/Body Mass	1.5 a 2g for kg/Body Mass	1 to 2g for kg/Body Mass	Sodium phosphate (4 g/d for 3 days) Sodium (500 mg/da),	Vitamin C (men 90 mg/d; women 75 mg/d), Vitamin E (15 mg/d) Vitamin D (5 mcg/d)

DR/S: Daily Recommendation for Sports

Table 2: Importance of each Nutrients

	Carbohydrate	Protein	Lipids	Minerals	Vitamins
Crossfit	Main source of energy.	Regeneration of muscle damage and Muscle Mass.	Hormones and other cells repairment	Important for transport of ions (Na, K, B, P)	Vitamin C and Vitamin E (antioxidant)
Endurance	One of the sources of energy.	Preservation of muscle mass.	Main form of energy.	Important for transport of ions (P, Na, K, Se)	Vitamin C Vitamin D and Vitamin E (antioxidant, lipid control,
Team Sports	One of the sources of energy.	Preservation of muscle mass and res	Main form of energy.	Important for transport of ions (P, Na, K, Se)	Vitamin D, Vitamin E and Vitamin K (anticoagulant , antioxidant, lipid control)
Resistance Training	Main source of energy.	Regeneration of muscle damage and Muscle Mass.	Hormones and other cells repairment	Important for transport of ions (Na, K, B)	Vitamin A, Vitamin C and Vitamin E (lipid control, antioxidant)

CONCLUSION

Resistance training is simple, the practitioners use supplements as Beta alanine, creatine or a combination of everything such as pre-workouts to train harder and protein based supplements to fill the muscle synthesis process.

The traditional food organization still represents a problem for team sports, especially in relationship with adequate intake of carbohydrates. The most important food supplementation is the hydroelectrolytic replacements and the caffeine, derived from

energetic drinks, also highly popular. One important note is the proposition of nutrition education, that can be effective on the nutritional choice for the athletes.

In CrossFit, more studies with low bias risk and with stronger methodology are necessary. Based on the evidence above, Crossfit athletes could find benefits on the increase of calories consumptions, especially carbohydrates for greater energy intake. In terms of supplementation, the use of SB, dilute on a water solution, intaked by 10 days, seems to be efficient in improving performance for this sport, probably by improving the buffering system.

For endurance training, carbohydrates are made from carbon sources and play a fundamental role in the production of energy for cellular components during exercise, with 6-10g/kg of body weight being recommended for athletes. In addition, 3-6 mg of caffeine per kilogram of body weight and the ingestion of nitric oxide, via juice drink, are recommended, as it brings benefits, such as improving the sustained time to exhaustion, cardiorespiratory performance without anaerobic limits and at maximum VO^2 and for end up drinking 400-800 ml of water per hour during training,

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