RESUMO

A popularidade dos Recursos Ergogênicos Nutricionais (REN) entre atletas e desportistas é ampla. Acredita-se que o uso desses produtos pode contribuir no desempenho físico, porém, a maioria desses produtos não possui eficácia comprovada cientificamente. Além de existir a controvérsia sobre eventuais malefícios à saúde causada pelo seu consumo, especula-se também o efeito placebo dessas substâncias. Teve-se como objetivo analisar o efeito placebo e/ou maléfico dos REN, e quais dentre os mais consumidos possuem comprovação científica de efetividade. A presente pesquisa trata-se de uma revisão sistemática. Foi realizado uma busca nas bases de dados indexadas na área da saúde, Scientific Electronic Library Online (SCIELO), PUBMED (NCBI) e LILACS, de artigos publicados nos últimos 5 anos. Foram adotados como critérios de inclusão artigos nos idiomas português, espanhol e inglês com resumo disponível que envolvessem apenas humanos. E foram excluídos trabalhos acadêmicos como: dissertações, teses e artigos de revisão de literatura. Acerca dos resultados foi verificado a ocorrência do efeito placebo, e que as expectativas tanto do aplicador quanto do usuário interferem no efeito. Quanto a efetividade, os suplementos Whey Protein, Creatina, cafeína e BCAAs, em ensaios clínicos mostraram ter poder ergogênico. Em relação aos malefícios, sinais gastrointestinal como alteração no peristaltismo foram relatados, além de haver falta de regulamentação por parte dos Órgãos responsáveis pela fiscalização desses produtos. Tendo em vista a escassez de pesquisas na temática abordada novos estudos são necessários sobre os assuntos para elucidação dos mesmos.


ABSTRACT

The popularity of Ergogenic Nutritional Resources (ENR) among athletes and sportsmen is wide. Believes that the use of these products may contribute to physical performance; however, most of these products have no scientifically proven efficacy. In addition to the controversy over possible harm to health caused by its consumption, the placebo effect of these substances is also speculated. The objective was to analyze the placebo and/or malefic effects of the ENR, and which of the most consumed have scientific proof of effectiveness. This research is a systematic review. A search was performed in the indexed databases in the area of health, Scientific Electronic Library Online (SCIELO), PUBMED (NCBI) and LILACS, of articles published in the last 5 years. Have been adopted as inclusion criteria articles in Portuguese, Spanish and English languages with abstract available involving only human. And academic papers were excluded as: dissertations, theses and articles of literature review. On regard of the results it was observed that the placebo effect occurs, and that the expectations of both the applicator and the user interfere with the effect. As for effectiveness the supplements Whey Protein, Creatine, Caffeine and BCAAs in clinical trials have shown to have ergogenic power. In relation to the injuries, gastrointestinal signs such as peristalsis alterations were reported, in addition to lack of regulation by the organs responsible for the inspection of these products. Given the scarcity of research on the subject addressed new studies are needed in order to facilitate the understanding of it.

Key words: Ergogenic supplements. Efficiency. Placebo effect. Malefiction
INTRODUCTION

The popularity of Ergogenic Nutritional Resources (ENR), is among athletes or sportspeople is wide. According to Mendes et al., the majority of the athletes and their coaches, believe that the use of ergogenic resources, such as nutritional supplements, psychological strategies and biochemical procedures may, in some way, contribute to athletic performance.

However, the quantity of products for easy access on the market creates problems, because it is perceived that, in most cases, this use is made so little conscious and without criteria. The rationale for the use of ergogenic resources and food supplements by practitioners of bodybuilding are very diverse, they are athletes or not. Pereira cites gastrointestinal signs reported by consumers of nutritional and pharmacological ergogenic agents, such as vomiting, heartburn, alteration in the peristalsis and bleeding. Another worrying are the sources of indication, especially friends and physical educators, once they are people unprepared for the prescription or indication of such products.

Analyzes as the Castanho and collaborators show on the contamination of supplements, either directly or indirectly, including some substances considered doping, which do not appear on the product label. The use of these products make them be suspended in competitions in doping exam done by the International Olympic Committee (IOC).

In a study on food security of supplements marketed in Brazil, Silva and Ferreira, depict the world industry of supplements invoice annually more than 46 billion dollars, and expose the failure in the regulation of these products, which contains up to compounds that are not recognized with functional property or health, in addition to the products bestsellers contain false record.

In Brazil, regulating the manufacture and marketing of these products is made by the Ministry of Health through the National Health Surveillance Agency (ANVISA), and others also supervised by the Ministry of Agriculture, Livestock and Food Supply (MAPA). In the world the World Anti-Doping Agency (WADA) is the agency that regulates the use of these products to meet the real nutritional needs and assist in physical performance.

After evidence that the carbohydrate could delay fatigue, in 1960 comes the “Gatorade”, a solution of glucose and sucrose in water, first product returned to sports nutrition, designed to improve the performance of a team of american football, the Gators, in the state of Florida, currently this type of drink is available to the public in general.

There are few studies on the prevalence of the use of supplements in all regions of Brazil, but existing estimate a wide use by athletes, and also an expressive consumption particularly among the public practicing physical activity.

In addition, it has been speculated that the placebo effect, caused by a substance or treatment without active principle, inert, or even have any principle, but it is not intended to its specific properties. In this way the placebo effect is the positive result to be used a placebo. The placebo effect is well documented in the medical literature since 1799, but in sporting environment the placebo is generally used for the control group, in tests of effectiveness of food supplements.
Participants who correctly identified the placebo showed possible harmful effects on performance. These results show that the identification of the supplement appeared to influence the outcome of the exercise and can be a source of bias in sports nutrition.

In Ross et al. used a randomized crossover designate to determine the true placebo effect in addition to any order for test purposes. Of the fifteen athletes participating in the study, eleven improved performance in response to placebo group than in the control intervention. The ergogenic effects of placebo in this study can be explained in the context of the psychobiological approach, which postulates that the tolerance to exercise increases when the perception of effort is reduced or the motivation is increased.

In case about the effectiveness of some of the most used supplements, in non-randomized clinical trial on the effectiveness of the creatine Zanelli et al., evaluated the use in practicing bodybuilding. It was used to creatine monohydrate in identical envelopes, in doses of 5g each. The study was composed by three moments (M): M1 - beginning of supplementation 20g/day; M2 - seven days after supplementation and supplementation with 5g/day; M3 - 28 days after supplementation, followed by a protocol of resistance training. Observed that there was an increase in effective measures in participating in the study, even when subject to maintenance phase, there was a decrease was not significant.

It has been well founded the ergogenic effect of creatine in improving performance of strength and body composition, through the reduction of the percentage of body fat and lean mass increase, effects documented in another review on the subject. There are also evidences about the aid in the rehabilitation of injured athletes, such as in the prevention of injuries during long-term training. The increase of body water seems to be one of the main effects caused by creatine supplementation, because she exert an osmotic effect, and with this, is the movement of water into the cell, causing water retention and weight gain.

Caffeine is another substance used as ergogenic resource. In a double-blind, randomized crossover study, conducted by Salicio et al., in which 24 individuals were divided into 2 groups, randomly selected by a person who was not directly involved in the study, received capsules with caffeine (6 mg/kg) or placebo/starch. And as a result the individuals who received caffeine has been shown to have reduced the oxidative stress. However, in a study of Arecoverde et al. caffeine intake during submaximal exercise did not affect the demand for oxygen, and also had no effect on the anaerobic capacity.

In this sense, Silva and Guimarães showed the caffeine as ergogenic resource efficient in reducing the sensation of fatigue. And argue that the results that show no improvement in performance may be related to lack of standardization among studies, such as diet, age, sex, power supply after exercise, intensity of exercise, physical conditioning and habituation, which can be reached with a daily intake of 100mg of caffeine (2.5 cups of coffee). However, Gualano et al. have shown that the effects on acute supplementation of caffeine were not influenced by the level of regular consumption of this substance.
<table>
<thead>
<tr>
<th>AUTHOR, YEAR</th>
<th>JOURNAL</th>
<th>STUDY TYPE</th>
<th>OBJECTIVE</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WILLIAM, B et al, 2016</td>
<td>Brazilian journal of limitation and exercise physiology.</td>
<td>No randomized clinical trial.</td>
<td>Analyze the placebo effect in the performance of practitioners of bodybuilding.</td>
<td>The results indicated that the intake of placebo was effective for individuals.</td>
</tr>
<tr>
<td>SAUNDERS et al, 2016</td>
<td>Scand J Med Sci Sports.</td>
<td>Not randomized clinical trial.</td>
<td>Investigate the effects of the ID of the add-in on exercise performance.</td>
<td>The results suggest that participants who believed to have ingested caffeine, while placebo took seemed to improve their performance.</td>
</tr>
<tr>
<td>ROSS, R et al, 2016</td>
<td>Medicine &amp; Science in Sports &amp; Exercise.</td>
<td>Not randomized clinical trial.</td>
<td>Quantify the magnitude of the placebo effect of a placebo injected that has effects similar to those of recombinant human erythropoietin on endurance performance.</td>
<td>The study results are consistent with the placebo acting to improve the competitive performance, either by reducing the perception of effort and increased motivation potential.</td>
</tr>
<tr>
<td>ZANELLI, J C S et al, 2015</td>
<td>Rev Bras Med Esporte.</td>
<td>Not randomized clinical trial.</td>
<td>Evaluate the effect of creatine supplementation on the hydration and the increase of lean body mass in individuals previously trained and not trained, subjected to a program of resistance training.</td>
<td>Creatine supplementation to resistance training for 28 days brought significant weight gain and hydration of lean body mass.</td>
</tr>
<tr>
<td>WEST D W et al, 2017</td>
<td>Nutrients</td>
<td>Double-blind crossover placebo-controlled.</td>
<td>Determine whether the ingestion of whey protein increases the balance of the liquid protein and recovery of exercise performance during the night (10:00) and 12:00 am recovery after resistance exercise in trained men.</td>
<td>The consumption of 25 grams of whey protein after resistance exercise night tended to improve the balance of the liquid protein over 10 hours of recovery. Consume over 25 g of whey protein in the morning after exercise contributes to the maintenance of a larger protein balance during the recovery period of 24 hours.</td>
</tr>
<tr>
<td>WALDRON M. et al, 2017</td>
<td>Appl Physiol Nutr Metab.</td>
<td>Double-blind crossover placebo-controlled</td>
<td>Investigate the effects of acute supplementation of branched chain amino acids (BCAA) on recovery of exercise-induced muscle damage in trained athletes.</td>
<td>Acute supplementation of BCAAs (0.087 g/kg) increased the rate of recovery in isometric force, height of heel height of contrast and perceived muscle pain compared to placebo.</td>
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In case of rapid increase of lean mass and recovery after exercise, the ergogenic more resources consumed are the basis of proteins. Among them the Whey Protein is believed to be more effective, mainly because of its content of amino acids and easy digestibility and absorption. And to determine whether supplementation with whey promotes greater muscle mass in comparison with soy or carbohydrates, Volek and collaborators\(^{22}\), in randomized study with men and women not trained, observed that the gains of lean mass was significantly higher in individuals supplemented with Whey Protein.

Whereas the effectiveness of Whey Protein, West et al\(^{23}\) in a study with beam double-blind placebo-controlled study, the participants underwent a strenuous struggle one night before consuming a portion of Whey (25g of peptides from whey isolates and concentrates; Fat 2.5g and 3g of carbohydrate, resulting in 130kcal), or placebo combined with carbohydrate (CHO). The supplements were consumed immediately after the fight, as well as the next morning, and concluded that the supplementation with whey protein of milk increases the anabolism, and can improve the acute recovery of performance after an intense exercise of resistance.

The metabolism of branched-chain amino acids (BCAAs) is involved in some specific muscle processes and many studies have been conducted to check if the sporting performance can be improved with the supplementation with BCAAs. According to Ermolao et al\(^{24}\), the contribution of the BCAAs for exercise performance is attributed to the ability to serve as a source of energy. Precisely, they represent the first source of amino acids during intense exercise, however, in the present study, the intake of BCAA by soccer players did not result in better performance, in fact, the protocol may have been relatively short in duration of this mechanism occurs in an efficient extension.

Similar results were found in the study of Kephart\(^{25}\), in which they compared a supplement of CHO with CHO+BCAA, to examine whether the supplement with amino acids could mitigate the post-exercise muscle damage. And reported that supplementation with gaecon has not reduced the decrements in strength or improved markers of muscle damage during three consecutive days of intense training. However, this study has limitations, the supplements were not standardized in content of CHO and calories, the training protocol was short and there was a condition of control does not supplemented.

Different results were found by the abovementioned Howatson\(^{26}\), in a study where 12 men were randomly divided into group supplement (n=6) and the placebo group (n=6), who had muscle damage measured variables, showed that it is likely that the BCAA has provided a higher bioavailability of the substrate to improve the protein synthesis and thus the extent of muscle damage associated with the exercise of resistance. Concluded that if administered before and after the exercise of resistance the BCAA can reduce the indices of muscle damage and accelerate recovery in trained men.

Waldrom M et al\(^{27}\) showed in a project of matched pairs in double blinding, 16 participants who were randomly assigned to a group BCAA (n = 8) or placebo (n = 8). The BCAAs were administered in a dose of 0.087 g/kg of body weight, with a ratio 2: 1: 1 of leucine, isoleucine and valine. Acute BCAAs supplementation (0.087 g/kg) increased the rate of recovery and the extension of muscular pain perceived in comparison with placebo after a training session based on hypertrophy among athletes trained in resistance controlled by diet. These findings question the need for stages of loading.
BCAA more beds and highlight the importance of dietary control in studies of this type.

Still dealing in administration time, RA SG et al\(^2\)\(^8\) in a pilot study, a double-blind placebo-controlled study, 15 men received BCAA (9.6 g · 1 day) or placebo before and after exercise (3 days before and after the day of the year) in three independent groups: The control group (placebo before and after exercise), the group PRE (BCAA before exercise and placebo after exercise) and the placebo group POST (before the exercise and BCAA after exercise). The study confirmed that the supplementation with a BCAA before exercise had a beneficial effect on the attenuation of late, pain and muscle damage induced by exercise, compared the supplementation after exercise.

As regards the possible harmful effects caused by the consumption of supplements, the literature has few studies, but until now it is known that supplements the basis of HCO of high glycemic index alter the microbiota and even alter the output of bile, elevate the bacterial fermentation and the formation of gases. The excess protein is also harmful, because it increases the production of metabolites of evil bacteria\(^2\)\(^9\).

Andrew et al\(^3\)\(^9\) estimated the number of visits to the emergency department because of adverse events associated with dietary supplements in the United States using 10 years of data (from 1\(^{st}\) January 2004 to 31\(^{st}\) December 2013). Cases were defined as visits to the emergency department for medical problems that explicitly assigned to the use of dietary supplements. This analysis included oral nutritional products or complementary administered orally (including botanists, microbial additives and amino acids) and micronutrients (vitamins and minerals), but excluded products that are microbial additives and amino acids) and micronutrients (vitamins and minerals), but excluded products that are microbial additives and amino acids) and micronutrients (vitamins and minerals), but excluded products that are microbial additives and amino acids)

CONCLUSION

The research in the current literature has shown that the effectiveness of the supplements reviewed depends on some variables, such as time of administration, sport and dietary control.

It was remarkable that the expectation of both the subject and the applicator of placebo, interferes in the result, as was observed in the studies cited, hence the importance of the methodology double-blind clinical trials.

In view of the scarcity of studies with methodological standard to avoid sources of bias in the issue addressed, further studies are needed on the subjects covered which should consider some variables, mainly the dietary control, moreover, studies are needed to elucidate the mechanism of action of the placebo effect.

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