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A REVIEW OF THE EFFECTS OF NUTRITIONAL SUPPLEMENTS ON PERFORMANCE RELATED TO JUDO PLAYERS

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ABSTRACT
The dosage of dietary supplements and the kind of exercise performed determine their potential ergogenic effect. A literature search was conducted at the following databases with the goal of reviewing the research literature on sport supplements used in judo to enhance performance: Eleven items in all were chosen after meeting the inclusion requirements. Research has shown that supplementing with creatine, sodium bicarbonate, caffeine, β-alanine, and β-hydroxy-β-methyl butyrate improves performance in judo. Furthermore, there is evidence that several of these dietary supplements may have an additive impact when combined.

Key words:
combat sports performance, ergogenic supplements, and sport nutrition

INTRODUCTION

In the Olympic combat sport of Judo, competitors execute a series of high-intensity, sporadic maneuvers with the goal of either flinging their opponent to the ground or subduing him or her through groundwork. When an ippon (perfect throw) is made or the battle time is reached (four minutes according to the International Judo Federation), a Judo fight is said to be over. Judo fights last about three minutes on average, with 30 seconds of effort and 10 seconds of rest in between. This results in an activity-to-rest ratio of 2:1 or 3:1. Furthermore, because of the way judo competitions are organized, competitors must engage in multiple fights in a single day, with recovery periods ranging from a few minutes to several hours.

Higher performance in judo has been linked to body composition and body mass. Additionally, superior performance test results specific to judo are linked to higher relative bone mass and a larger percentage of muscle mass. To guarantee that opponents have comparable levels of power, strength, and agility, judo athletes are divided into seven weight categories. Before a tournament, judokas use techniques to lose body mass because they understand the benefits of competing against opponents who are weaker, lighter, and smaller.

Judo performance depends heavily on technique and physical fitness, much like in most combat sports. In particular, judo fights demand the use of both the anaerobic and aerobic systems. Effective judo techniques require strength and power, whereas athletes' aerobic ability enables them to recover from specific efforts made during a fight as well as in between. Given that judokas engage in high-intensity intermittent efforts during a fight, with an activity-to-rest ratio ranging from 2:1 to 3:1, it makes sense to assume that phosphocreatine (PCr) and glycolsis play a major role in facilitating ATP availability.

It should be mentioned that only 70% of phosphocreatine stores are restored in the first 30 seconds of recovery intervals; a full restoration takes 3 to 5 minutes. Given that judokas only recover for around 10 seconds during a bout, it makes sense to assume that phosphocreatine depletion is a factor that limits judo performance. Additionally, judo-related performance may be harmed by lower pH levels that follow an increase in H+ ion generation due to the glycolytic metabolism's essential role in judo.

It has been demonstrated that even slight variations in performance can impact an athlete's chances of winning in highly competitive sports. Therefore, a lot of athletes, particularly professional athletes, take dietary supplements in an effort to maximize their performance. It is well known that top athletes take dietary supplements in order to:

1. boost their strength

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2. avoid nutritional deficiencies
3. preserve their health
4. avoid injuries
5. enhance their athletic performance.

Caffeine, creatine, β-alanine, sodium bicarbonate (NaHCO3), and beetroot juice/nitrate are the only dietary supplements for which high-quality scientific evidence for improving athletic performance has been documented. However, because it depends on the kind of effort put out, the possible ergogenic effect of these dietary supplements is linked to the practice of a particular sport modality. As far as the authors are aware, no prior literature study has examined how nutritional supplements affect performance in judo. Thus, the purpose of this study was to review the literature assessing how various dietary supplements affect judo athletes' performance.

METHOD

Concept 1 (judo OR judoka OR "combat sports") AND Concept 2 (supplement* OR nutr* OR "ergogenic aid") comprised the search approach.

Duplicate documents were eliminated after reading the abstract and title of each document that came up as a result of the search method. Only articles authored in English, Spanish, or Portuguese were included; those that did not offer unique interventions were also disqualified.

Following that, a number of exclusion criteria were used, which excluded studies involving animals, research done "in vitro" or with cell cultures, studies without an ergogenic supplementation protocol and a comparison with a placebo condition, studies involving samples without judokas, and studies without a performance variable related to judo registered.

DISCUSSION

Effects of caffeine supplementation

Three metabolites—paraxanthine, theophylline, and obromine—are produced when the liver breaks down caffeine through enzymatic processes. The body absorbs caffeine quickly; it peaks in the blood 5–15 minutes after consumption and peaks 45–60 minutes later. Due to its similarity to adenosine and its ability to compete with it by binding to adenosine A1, A2a, and A2b receptors, caffeine is a significant modulator of central nervous system activity that inhibits parasympathetic nervous system function. Caffeine intake may counteract the effects of adenosine, which causes the central nervous system to sense more pain and tiredness. This could result in a decrease in the subjective rate of perceived exertion and an increase in cognitive function and alertness.

The increases in reaction time that have been seen may have their roots in the decrease in sleepiness, the improvement in mood and attentiveness after supplementation, and possible synaptic transmission improvements. Circadian rhythms may be the cause of variations observed in the Wingate test. Thus, it has been demonstrated that circadian rhythms influence several physiological factors, resulting in a decline in physical performance during the early morning hours as opposed to the afternoon. Therefore, in the Wingate test, greater values have been reported around midday and lower values in the morning. Given the decreased performance brought on by the effect of circadian rhythms, it is plausible that caffeine administration may have a greater ergogenic effect when exercise is performed in the morning.

Impact of Supplementing with β-alanine

Thymine, cytosine, and uracil are broken down in the liver to produce β-alanine, an amino acid that can be consumed through food from a variety of sources (such as supplements or animals). Skeletal muscle contains BA and L-histidine, which combine to generate the dipeptide carnosine, a protein with antioxidant and neurotransmitter properties. However, BA's primary roles include regulating the acid-base balance, demonstrating intracellular buffering capacity, and promoting calcium sensitivity in muscle fibers, which enhances the tissue's excitation-contraction processes.

According to a recent meta-analysis, supplementing with BA enhances performance in efforts lasting one to four minutes, during which time there is a high accumulation of H+ due to increased glycolytic activity. Furthermore, it has been proposed that supplementing with BA entails inhibiting the phosphofructokinase enzyme, which impacts the glycolysis and high-energy phagen system. There is proof that taking BA supplements significantly improves one's subjective assessment of effort on a psychological level. As a result, all of these impacts will demonstrate how muscle contraction affects acidity, which lowers electromyographic activity.

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Effects of NaHCO3 supplementation

The primary regulator of the acid-base balance is NaHCO3. NaHCO3 supplementation raises plasma levels, which raises the gradient concentration between muscle fiber and blood, promoting H+ transport since the sarcolema is impermeable to NaHCO3.By controlling intramuscular pH, this delays the development of exhaustion and permits a larger usage of the glycolytic pathway.NaHCO3 supplementation has demonstrated an ergogenic effect in response to high-intensity intermittent efforts, much like β-alanine. In these situations, lower pH levels are a performance limiting factor because they permit a higher utilization of the glycolytic pathway until they reach critical pH levels that impact phosphofructokinase activity.

However, with greater dosages (500 mg/kg), NaHCO3 supplementation has also produced ergogenic effects in response to a single Wingate test. The greater effect of 500 mg/kg in response to a single all-out sprint workout cannot be disregarded, indicating that supplementing with 300 mg/kg of NaHCO3 could be regarded as an ergogenic practice for judokas who will compete in multiple fights on the same day.NaHCO3 dosages may therefore differ based on the requirements of judokas during competition. Lastly, NaHCO3 is known to have certain adverse effects, primarily gastrointestinal distress, which can be prevented by using sodium citrate as a substitute, consuming it in smaller dosages, or co-ingesting it with carbohydrates.

Creatine

Athletes participating in combat sports frequently take creatine supplements. Arginine, glycine, and methionine are nonessential amino acids that combine to form creatine, which is mostly produced endogenously in the kidney and liver. It has been proposed that healthy people need 2 grams of creatine each day.

Creatine supplementation has been linked to a number of processes, including the stimulation of muscle protein synthesis, the stabilization of biological membranes, the encouragement of ATP resynthesis, and the management of intracellular acid-base balance.

HMB, or β-hydroxy β-methylbutyric acid

After this important amino acid is transaminated to α-ketoisocaproic acid (α-KIC), dioxygenases transform it into the leucine metabolite β-Hydroxy β-methylbutyric acid (HMB).

Among the positive benefits of consuming HMB include increases in the production of anabolic hormones, acetyl Co-A, and cholesterol. In this sense, HMB activates moter signaling pathways; however, this activation is less pronounced than that shown following leucine consumption, and more significantly, it only occurs in specific catabolic circumstances.

It is crucial to develop dietary plans that emphasize muscle capability and muscle mass preservation because judo athletes frequently participate in weight loss programs that may have an impact on their muscle mass and performance. This study looked at the effects of 3 g/day of HMB supplementation over three days in female judo competitors who were on a hypocaloric diet. They found that the athletes' fat mass decreased while their blood urea nitrogen, uric acid, and total cholesterol increased. On the other hand, the Wingate test results for muscle mass and sprint performance did not alter.

Effects of combination supplementation on ergogenic performance

The usage of athletic supplements by sportsmen is very common. It's interesting to note that the majority of these athletes take many supplement kinds concurrently, even though the effects of most of these interactions are still unclear. Only two research have examined the combined impact of various supplements in judo. Because combat sports have significant glycolytic demands, muscle pH buffering capacity is essential for maintaining performance in Judo. In this context, the buffering ability of NaHCO3 has been assessed with β-Alanine and caffeine.

Thus, consuming NaHCO3 along with BA or caffeine encourages an extra ergogenic impact that appears to indicate a greater stimulation of glycolysis, which improves judo athletes' performance both specifically and generally.

CONCLUSION

According to the data analyzed in this study, nutritional supplements might enhance performance in judo. In light of the available data, it may be said that:

In addition to improving judo-related performance metrics (such as the number of throws, peak power, and mean power), supplementing with 5–6 mg/kg of coffee reduces reaction time and the RPE during judo combat

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simulations. Furthermore, there is evidence that caffeine consumption in the morning produces greater gains in judo-related performance than caffeine consumption in the afternoon.
t is likely because of its indirect effects on muscle contraction that supplementing with 6.4 g/day of β-alanine has been shown to have an ergogenic effect on judo-related performance. Supplementing with β-alanine is linked to higher muscle carnosine stores, which promote the production of cross-bridges in muscle fibers and control intracellular acid-base balance, both of which enhance muscle strength.
-It has been demonstrated that supplementing with 300–500 mg/kg of NaHCO3 improves judo-related performance by raising blood pH levels, which in turn promotes H+ transport to the extracellular space and increases the glycolytic pathway's utilization. Small doses, co-ingesting with carbohydrates, or using sodium citrate as a substitute are advised to prevent the gastrointestinal.
Supplementing with 3 g of HMB per day has been shown to improve performance in judo. Long-term (12-week) HMB supplementation improves body composition, increases cardio-respiratory function, and increases the ability to execute high-intensity exercises.
-Research indicates that taking 3-5 grams of creatine per day as a supplement may improve body composition, maximum power, and time to maximum power when performing high-intensity activities.
-Additional ergogenic effects on body composition and high-intensity performance have been documented when NaHCO3 and caffeine, as well as NaHCO3 and β-alanine, are supplemented.

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