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Comparing the Effect of a Course of Creatine and Glutamine Supplementation on Anaerobic Power of Elite Wrestlers in Khorramabad

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Abstract in Persian

The present study aimed to compare the effect of a course of creatine and glutamine supplementation on anaerobic power of elite wrestlers in Khorramabad. For this purpose, 45 elite wrestlers from Khorramabad with an average age of (23.3±3.3 years), average weight (73.6±7.2 kg) and average height (172.8±4.8 cm) were selected voluntarily and conveniently and randomly divided into three groups of 15: creatine supplementation, glutamine supplementation and control group. Creatine and glutamine supplementation was administered for 10 sessions (0.3 g of supplement per kilogram of body weight per day for five days) for both groups. 24 hours before the start of the study and 24 hours after the last supplement loading session, the anaerobic power of the three groups was calculated using the Wingate test (30 seconds). Data analysis was performed using the dependent t-test, one-way analysis of variance, and Tukey's post hoc test using SPSS version 16 software. Data analysis showed that the consumption of creatine and glutamine supplements caused a significant increase in the anaerobic power of the two experimental groups. However, there was no significant difference between the aerobic power of the two groups (P = 0.37).

Keywords: Creatine, Glutamine, Anaerobic Power, Wrestler

Introduction

The progress and improvement of sports records, techniques, and tactics in the past century is a sign of the expansion and expansion of scientific awareness and knowledge of sports researchers and coaches. Scientific findings in this field have played an important role in the organization and implementation of training programs for sports champions. Since new records are set every day in various sports disciplines in world competitions and the Olympic Games, sports physiologists test numerous programs to determine the minimum and maximum effective stimuli in improving athletes' performance. Because, in addition to hereditary factors and training programs and methods, the use of nutritional and sports supplements also play a decisive role in sports performance. However, there is little information about the optimal amount of these supplements and the superiority of each over the other in achieving the best level of performance.(13)

One of these supplements is creatine (17). Creatine is a dietary supplement that has become the most widely used supplement among athletes today (8, 12, 22). Creatine or methylguanidine acetic acid is a substance that is naturally present in meat and fish and is abundantly found in the skeletal muscles of the human body. The body requires 0.3 grams per kilogram of this substance daily to replace the creatine used up by muscle contractions (3). Creatine is a natural element in the diet; it is also synthesized in the body by the liver. Creatine supplementation loads the muscle with creatine and increases its total stores in the free and phosphorylated forms (called creatine and phosphocreatine). Theoretically, this loading leads to an increase in the ability to produce energy during periods of intense exercise and also to an increase in the ability to recover from intense exercise.(13)

Another sports supplement that has recently attracted the attention of athletes is glutamine. Glutamine is one of the most abundant free amino acids in the human body, constituting 50–60% of the total free amino acid pool in skeletal muscle and approximately 20% of the plasma amino acid pool (22); its primary source is skeletal muscle, from where it is released into the bloodstream and transported to various tissues.(14)

Glutamine is known to play a regulatory role in several specific cellular processes, including metabolism (such as oxidative fuel, gluconeogenesis precursor, and lipogenesis precursor), cellular health (apoptosis, cell proliferation), protein synthesis and degradation, contractile protein mass, redox potential, respiratory burst, insulin resistance, insulin secretion, and extracellular matrix (ECM) synthesis (20). Glutamine is also involved in the transfer of nitrogen from one organ to another and directly affects the balance of protein synthesis and degradation.(11)

The beneficial effects of high doses of creatine supplementation during high-intensity exercise have been confirmed, although the same investigators reported inconclusive results in another study. Evidence suggests that creatine increases the substrate available during aerobic exercise and may improve aerobic performance. The evidence in this regard is conflicting.(5)

Since glutamine is the most abundant free amino acid in the body, constituting 50–60% of the total free amino acids in skeletal muscle and approximately 20% of plasma amino acid pools, it is essential for homeostasis (including fluid balance, pH, and regulation of body temperature and heart rate) and the optimal function of a number of body tissues, especially the immune system and intestines.(13)

In their study, Abdi et al. (2010) examined the effect of creatine supplementation on peak power in runners and found that creatine supplementation significantly increased peak power in runners (1). Kashef et al. (2012) investigated the effect of creatine supplementation on the anaerobic power of male athletes aged 15-18 years and showed that creatine, in addition to its positive effects on anaerobic performance (2). Insab et al. (2003) evaluated the effects of creatine supplementation on aerobic power, body composition, strength and found that a significant increase was observed in the vertical jump record.(27)

Wrestling is a native sport of our country, which is also practiced in some other countries with different Few studies have been carried out and this has made this sport one of the most popular sports in the Olympic Games. For this reason, various competitions at the general and international levels are held in this sport every year in our country and some other countries. One of the regulations of this sport is the athlete's participation in several heavy and intensive competitions in one day, which, given the nature of the energy supply systems in this sport (lactic acid and phosphagen), requires rapid restoration of lost energy reserves after each competition.

Given the current rules of wrestling, where the athlete is required to perform several high-intensity bouts on the day of the competition, and given the limited time after weigh-in until the start of the competition, finding ways to prevent the loss of lean body mass and other negative effects that occur in most wrestlers following rapid pre-competition weight loss, as well as restoring energy reserves and producing more power and maintaining it for subsequent stages of activity, is of particular importance for athletes who are losing weight, especially wrestlers.

On the other hand, it has always been important for researchers, coaches, and wrestling athletes to accelerate the recovery period by rebuilding and restoring lost ATP reserves so that the athlete can quickly regain lost energy reserves so that his performance is not impaired. However, proper and principled nutrition is very important in achieving the stated goals. Although the use of energy-boosting nutritional supplements such as creatine by athletes has been going on for several years, not all aspects and areas of its function are yet well understood, and many more studies and research are needed. The effects of creatine and glutamine supplementation (as previously mentioned) on aerobic capacity and the cardiovascular system require further study and investigation. Its beneficial and harmful side effects still contain many unknown and ambiguous points. The effects of taking this supplement along with resistance training, weight training, and other exercises have been identified to some extent by various researchers in this field, but as mentioned, there are still many unknowns about the use of these supplements, their effects on the human body, and the priority of each over the other.

On the other hand, considering the current wrestling regulations, where athletes must complete several high-pressure and heavy matches in one day, as well as the intense training that wrestlers do to improve their sports performance, it is essential to find strategies to maintain the health and well-being of athletes and prevent the adverse effects of intense competitions and training on the athletes' bodies. Similarly, the use of nutritional supplements that can maintain the normal functioning of the body's physiological systems, including the immune system, after intense activities also plays an important role in the success of wrestlers. Therefore, undoubtedly, conducting such applied research can open a new perspective on the use of sports supplements to prevent problems

in championship sports and be effective in raising athletes' awareness about the use of sports supplements and their consequences.

Considering the above, the present study will be conducted with the aim of comparing the effect of taking a course of creatine and glutamine supplements on the anaerobic power of elite wrestlers in Khorramabad.

Research Methodology

The present research method is semi-experimental and applied in terms of purpose. The statistical sample of the research consisted of 45 elite wrestlers from Khorramabad who voluntarily participated in this research project and after matching were divided into three groups of 15 people:

1. Creatine consumption group with activity (common wrestling exercises)

2. Glutamine consumption group with (common wrestling exercises)

3. Control group without supplement consumption and only doing common wrestling exercises

The independent variables in the present study include the consumption of a course of creatine and glutamine supplements and the dependent variable is anaerobic power.

Creatine and glutamine supplement loading was carried out for 10 sessions for both groups. And it was as follows: 0.3 grams of the supplement was consumed daily per kilogram of body weight for five days. In most of the studies conducted, the dose of creatine was 20 grams per day for each person, which was consumed in the form of 4 doses of 5 grams. Considering the weight of the subjects in these studies, it is clear that the amount of creatine consumed was about 0.3 grams per kilogram of the subjects' body weight, which is considered an average dose according to the research literature (23; 26). Therefore, it was decided to use a dose of 0.3 grams in this study as well. Creatine was given to the subjects in the form of a white powder and dissolved in water in 4 doses (the amount of water in each dose was 200 cc) after breakfast, lunch, afternoon snack, and dinner. Since the use of glutamine and creatine supplements is accompanied by exercise, especially resistance training, and athletes who do strength sports usually use this supplement, therefore, in the present design, the subjects also performed their daily wrestling exercises at high intensity along with the supplement loading during the protocol. In other words, during the protocol, which included 10 days of supplement consumption, the athletes performed their wrestling exercises continuously and at high intensity. 24 hours before the start of the study and 24 hours after the end of the supplement loading, the subjects were given an anaerobic power test.

Anaerobic power assessment (30-second Wingate test):

30-second Wingate test To measure the peak, average, minimum, and fatigue index anaerobic power in the 30-second Wingate test, a Monarch 864 ergometer made in Sweden was used. Before the test, the height of the wheelchair was adjusted to the length of the subjects' lower limbs (knee angle 170 to 175 degrees) and the required load for the test was adjusted to the subjects' body mass (75 grams per kilogram of body mass) (2). The subjects started pedaling at full speed to reach maximum speed. After that, the desired load was applied for 30 seconds. At the end of the test, peak power, average peak, and minimum peak indices were calculated using special ergometer wheel software.

Kolmogorov-Smirnov test, Levine test, dependent t-test, one-way analysis of variance, and Tukey's post hoc test were used to analyze the data.

Research findings

Descriptive data

The age, height, weight, and anaerobic power variables of the subjects are presented in Table 1.

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Table 1: Mean and standard deviation of age, weight, height, and anaerobic power of the subjects

Control group	Glutamine intake	Creatine intake			Variables
23/4 ± 3/54	24/4 ± 3/42	24 ± 3/14			Age (in years)
174/3 ± 5/8	172/1 ± 4/4	171/9 ± 4/04			Height (in centimeters)
73/33 ± 6/99	73 ± 7/42	74/53 ± 7/69			Weight (in kilograms)
9/58 ± 88	9/58 ± 0/52	9/27 ± 0/95	Pre-test	Peak Power	Anaerobic power (W/Kg)
9/85 ± 0/35	9/82 ± 0/6	9/82 ± 0/45	Post-test		
2/92 ± 0/39	2/84 ± 0/18	2/89 ± 0/32	Pre-test	Min Power	
2/95 ± 0/39	3/09 ± 0/18	3/09 ± 0/31	Post-test		
6/25 ± 0/41	6/17 ± 0/26	6/08 ± 0/52	Pre-test	Average Power	
6/4 ± 0/27	6/46 ± 0/32	6/46 ± 0/29	Post-test		

The results of the study indicated that there was no significant difference between the effects of creatine and glutamine supplementation on the peak anaerobic power of elite wrestlers in Khorramabad (P=0.37). Also, a period of creatine (P=0.014) and glutamine (P=0.036) supplementation had a significant effect on the anaerobic power of elite wrestlers in Khorramabad (Table 2).

Table 2: Comparison and study of the effect of creatine and glutamine consumption on the peak anaerobic power of wrestlers

One-way analysis of variance (ANOVA)		t dependent		Mean and standard deviation		Anaerobic power (W/Kg)
Sig.	F	Sig.	t	**Post-test**	Pre-test	
0/37	1/02	0/014	-2/81	9/82 ± 0/45	9/27 ± 0/95	Creatine intake
		0/036	-2/31	9/82 ± 0/6	9/584 ± 0/52	Glutamine intake
		0/18	-1/41	9/853 ± 0/35	9/58 ± 88	Control group

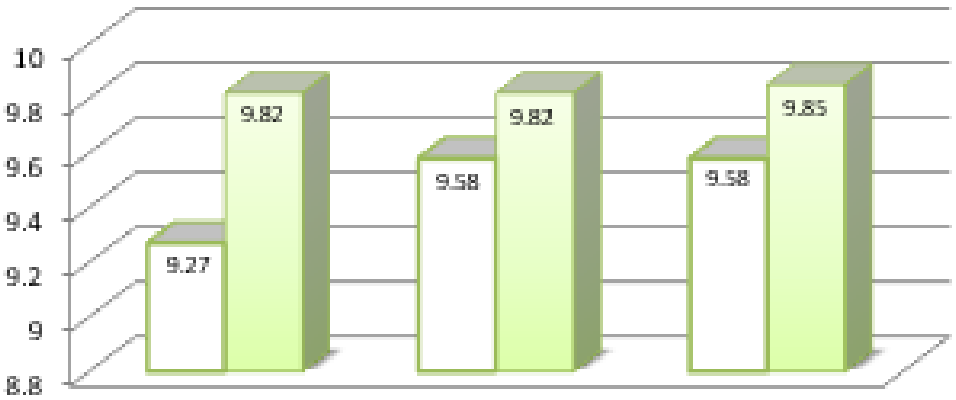

Figure 4-1: Comparison of pre-test and post-test changes in anaerobic power in the three study groups

Discussion and Conclusion

Analysis of the research findings showed that a period of creatine supplementation has a significant effect on the anaerobic power of wrestlers. The above result is consistent with the findings of Kashef et al. (2012), Izorido et al. (10), Hoffman et al. (11).

Possible adaptations resulting from short-term use of creatine supplementation can be due to metabolic adaptations such as an increase in the rate of phosphocreatine regeneration, an increase in the amount of free creatine, phosphocreatine, Pcr/ATP, and muscle glycogen (7, 21, 14,). Increasing intracellular creatine concentration probably allows for the increase in the function of the calcium ion-dependent ATPase enzyme at its highest functional efficiency and, in addition, allows for more and faster separation of myosin cross-bridges and muscle relaxation (7). Some researchers have suggested that molecular and metabolic adaptations may be the result of increased training volume. In addition, the buffering properties of creatine may contribute to fatigue resistance (15, 21).

Neurological factors, cell membrane stability, and hormonal changes are among the factors influencing these adaptations. In a general summary, Rasan et al. (21) reported that the possible mechanisms of metabolic and molecular adaptations and training models are more important than other factors. Merv et al. (18) suggested in their study that in interval tests after creatine supplementation, the power of the subjects increases probably due to the potential for higher energy production and increased rate of PCr regeneration during the return to the initial state and increased blood buffer capacity, but in single tests, especially with a duration of less than 10 seconds, due to the natural filling of PCr-ATP reserves before the start of the activity and the use of available resources by the muscles and the lack of high stress on the acid-base system, creatine supplementation and bicarbonate consumption do not have a significant effect on muscle power (19).

Most studies that have examined the energetic value of creatine supplementation have reported a significant increase in power or work done during muscle contractions with maximum effort (Vitasalo, 1987; Bekiu, 2000). Creatine supplementation results in increased activation of creatine kinase isoenzymes and increases muscle ATP and creatine stores. The discovery of different creatine kinase isoenzymes has led to the development of the hypothesis that PCr has multiple functions in muscle. The first, and probably most important, is its entry and function as a transient buffer to maintain cellular ATP concentration and the ATP to ADP ratio, which plays a role in maintaining cellular adenine concentration and cellular energy-charging activity. A second, more hypothetical function is that PCr may act as a spatial energy buffer, i.e., an energy transport system between the site of ATP production (mitochondria) and the site of ATP consumption (e.g., myofibrils). This role has been proposed to explain the PCr shuttle. A third role proposed for PCr is that PCr may couple to several other reactions and facilitate the integration of energy metabolism during muscle contraction. Therefore, it is clear that both aerobic and anaerobic muscle performance can be increased by PCr consumption, especially when the individual is under pressure and is also limited. On the other hand, increasing muscle PCr can also prevent a drop in pH and delay fatigue by reducing anaerobic glycolysis, thus accelerating the regeneration of ATP needed for more intense activities (28).

The findings of the study showed that a period of glutamine supplementation has a significant effect on the anaerobic power of wrestlers. The above result is consistent with the findings of Insab et al. (9).

The possible reason for this increase could be the necessity of the amino acid glutamine for the body in certain conditions such as stress, overtraining syndrome, and times when the natural process of nutrition is disrupted (especially during weight loss in wrestlers). Glutamine, as a substrate, plays a constructive role in glucose formation and regulation of this process, which increases glucose production and muscle glycogen storage. Glutamine also exerts an anti-catabolic effect on muscle tissue by counteracting the degradative effect of cortisol and reduces degradative mechanisms, which can be effective in preventing muscle breakdown in athletes during weight loss (6; 15). The results of this study on the use of a combined supplement of glutamine and creatine show that the anaerobic capacity of the subjects increased significantly from the pre-test to the post-test. There was also a significant difference between this group and the control group. These positive effects on exercise performance could theoretically be associated with increased TCr reserves, increased ATP regeneration during contraction, and increased PCr regeneration during the recovery period.

Research has also shown that glutamine plays a constructive role in glucose regulation. After exercise, muscle and liver glycogen stores are depleted, and glutamine plays a key role in glucostatics as a substrate for glucose formation and regulation of its levels through the process of gluconeogenesis, which may have a significant effect on increasing anaerobic power in this process. Maintaining the body's reserves and production of glucose and glycogen can increase anaerobic power (25).

The results of the study also showed that there was no significant difference between the use of creatine and glutamine supplements on the anaerobic power of wrestlers.

The improvement in anaerobic power during consecutive performances in the groups consuming both creatine and glutamine supplements could be due to the increase in the rate of muscle PCr regeneration and their buffering properties. Therefore, it can be said that the use of these supplements in disciplines where the athlete must participate in several competitions during one day (e.g. (especially in final competitions). Also, the results of the study showed no significant difference in anaerobic power between the supplement groups, which could be due to almost identical changes in maximum and minimum relative anaerobic power in all three groups (22).

According to the results obtained, it is suggested that creatine and glutamine supplements be used for athletes who, like wrestlers, have to perform several intensive competitions during the day. It is also recommended that martial arts coaches, such as wrestling, use creatine and glutamine supplements for their athletes during the competition season to increase their anaerobic capacity.

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