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Original Article

Effect consumption of Glutamine supplement on aerobic power, anaerobic power and body composition of soccer players

MOHSEN GHANBARZADEH[1], MEHDI SEDAGHATPOUR[2]
[1]*Islamic Azad University, Sosangeard Branch, Iran*
[2]*Teaching and Education organization of Boushehr Provence, Iran*

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Abstract
The aim of the present study was to determination the effect of eight weeks exercise combined with glutamine supplement on aerobic capacity, anaerobic power (peak, mean and maximum) and body composition of soccer players. It is hypotheses that the glutamine supplement has effect on the aerobic capacity, anaerobic power and body composition (total body mass, lean body mass and body fat percentage) of football players. The study was semi-experimental that done in pre and post-test phases on control (n=10) and training (n=10) groups on 2010 in boushehr, Iran. One day before beginning of the study protocols, subjects accomplished aerobic and anaerobic power and body composition testes. Afterwards, the subjects underwent exercise protocol for 8 weeks, 3 sessions per week, and 90 minutes per session of training. Half hour before each training session, the training group consumed glutamine supplement (0.1 g. glutamine saluted in 300 mg water and 300 mg sugar for 1 kg of body weight) and the control group consumed placebo (0.1 g. sugar per 300 mg water for 1 kg of body weight). Data were analyzed through independent t test. The results showed that there were significant differences in post-test of aerobic and anaerobic capacity and body composition of football players. These results indicated that consumption of glutamine supplement combined with exercise leads to increase in aerobic power, anaerobic power, total body math, lean body math and decrease in body fat percentage.
Key words: Glutamine, Aerobic power, Anaerobic power, Body composition

Introduction

Glutamine is the most frequent amino acid in plasma and internal environment of cells and is the less frequent in skeletal muscles as free position. Glutamine stores in the muscles and releases in the blood duration metabolism. some physiological roles of the glutamine are anabolism in liver, kidneys and immune cells and considered as an unessential amino acid in human body that the body capable to produce it and applies as intermediate metabolic which changes and moves amino acid branches. Although, the researchers emphasis on the catabolic role of the glutamine (Lacey and Wilmore, 1990).
The studies that were done on people who had surgery operation on their spinal cord had shown that glutamine is an anti anabolic factor (Blomqvist et al, 1995), preventative factor against to protein breaking in those children who born with low body weight (Neu et al, 2002). In addition to, consumption of 0.28 g for 1 kg of body mass establishes nitrogen balance and decrease free glutamine of muscles that indicate protein catalysis (Hammarqvis et al, 1989).
On the other side, football is one of the most favorite sport fields that can affect economic position of societies. Football is a competitive game that performs in long duration. Football is a multi dimension sport that includes various movements with different intensities and all three systems of energy. Today, soccer players move with high velocity and cover approximately10 to 14 kilometers in soccer game that related to player position and game importance, however relative distribution of distance keeps by velocity relatively (Di Salvo et al, 2007, Stolen et al, 2005). Currently, the profile of high demands of football applies in new strategies such as nutrition that considered as the reparative mechanism for the consumed energy duration training and soccer game. So, nutrition supplements apply in order to elevate energy producing and repair metabolical demands of athletes in different sport fields (Schneiker et al, 2006, Able et al,2005).
Glutamine is a metabolic intermediate factor in Crebs cycle, so, by reserve the phosphocratine (pc) and glycogen in muscle fibers especially in oxidative fibers (type 1), glutamine can increase exercise tolerance (Owen et al, 1986, Tsintzas et al, 2001). It is hypnotized that the glutamine supplement has effect on motor performance and body composition. However, in comparison with different types of exercise, there are not many studies available that were done on effects of glutamine consumption on motor performance and body composition of soccer players. The present study aimed at assessing the effect of glutamine consumption on aerobic capacity, anaerobic power (peak, mean and maximum) and body composition of soccer players.

Correspondence: *Mohsen Ghanbarzadeh,* Email: ghanbarzadeh213@gmail.com

Materials and Methods

Subjects

The present study was performed in order to assessing the effect of glutamine supplement consumption combined with 8 weeks exercise on the aerobic capacity, anaerobic power and body composition of soccer players. All subjects were informed about the purpose, requirements and the experimental protocol of the investigation and completed confirm form. Twenty subjects were selected from the bushehr league for participants of the study. Afterward, they randomly assigned into two groups; control (n=10, consumed glutamine supplement) and training (n=10, consumed placebo). The age, height and weight of the subjects were recorded before beginning the exercise protocols.

Dietary program: duration the exercise protocol, all subjects (control and training groups) were informed about nutrition information and dietary program. So, both groups get similar program and consumed same food diets. The subjects underwent exercise protocol for 8 weeks, 3 sessions per week, and 90 minutes per session of training. Each exercise session included warm up, ball training, training without ball, tactical training, competition and cool down.

Glutamine supplement: Each subjects of training group consumed 0.1 gram of saluted (with 300 milligrams sugar and 300 milligrams water) glutamine for 1 kilogram of body weight half hour before each exercise session. Each subjects of control group consumed placebo (300 milligrams sugar and 300 milligrams water without glutamine) half hour before each exercise session.

Measures: aerobic power measured by using Cupper test and calculated by using this formula:

$$\text{Vo2 max(ml/kg/min)} = \frac{\text{covered distance (m)} - 504.9}{44/73}$$

Peak, mean and minimum anaerobic power measured by using the Rast test and calculated by using this formula:

Anaerobic power = weight (kg)×[distance (m)]^2/[time(s)]^3

Mean of anaerobic power = sum of 6 time peak anaerobic power devided 6

Body composition measurements were done by using the body composition apparatus Aviss 333 made in South Korea which measure total body mass, lean body mass and body fat percentage.

Statistical analysis

Statistical analysis was performed using the independent t-test. Values of $p<0.05$ were considered significant. Statistical analyses were performed using the 17 release version of SPSS for Windows

Results

The results of the study are shown in tables 1,2,3,4,5 and 6 show that consumption of the glutamine supplement has statistically significant increasing effect on aerobic power, peak, mean and minimum of anaerobic power, total and lean body mass and has significant decreasing effect on body fat percentage of training group in comparison with control group.

Table1. Comparison of aerobic power *between tow groups*

Groups	*n*	*mean*	*SD*	*df*	*t*	*p*
Control	*10*	*0.98*	*3.34*	*18*	*2.83*	*0.011*
Training	*10*	*5.35*	*3.55*			

The results of t test in table 1 show that there is significant differences between training and control group (p=0.011).

.Table2. Comparison of peak anaerobic power between tow groups

Groups	*n*	*mean*	*SD*	*df*	*t*	*p*
Control	*10*	*-25.92*	*72.18*	*18*	*2.78*	*0.012*
Training	*10*	*52.82*	*52.96*			

As shown in table2 the results of t test show that there is significant differences in peak anaerobic power between training and control group (p=0.012).

Table3. Comparison of minimum anaerobic power between tow groups

Groups	*n*	*mean*	*SD*	*df*	*t*	*p*
Control	*10*	*-15.09*	*127.56*	*18*	*2.19*	*0.042*
Training	*10*	*80.8*	*53.9*			

The results of t test that shown in table3 show that there is significant differences in minimum anaerobic power between training and control group (p=0.042).

Table4. Comparison of mean anaerobic power between tow groups

Groups	*n*	*mean*	*SD*	*df*	*t*	*p*
Control	*10*	*-6.53*	*86.75*	*18*	*2.33*	*0.031*
Training	*10*	*64.22*	*40.67*			

The results of t test that shown in table4 show that there is significant differences in mean anaerobic power between training and control group (p=0.031).

Table5. Comparison of total body mass between tow groups

Groups	*n*	*mean*	*SD*	*df*	*t*	*p*
Control	*10*	*0.71*	*1.32*	*18*	*2.37*	*0.029*
Training	*10*	*2.2*	*1.48*			

The results of t test in tble5 show that there is significant differences in total body mass between training and control group (p=0.029).

Table6. Comparison of body fat percentage between tow groups

Groups	*n*	*mean*	*SD*	*df*	*t*	*p*
Control	*10*	*-0.32*	*1.56*	*18*	*2.35*	*0.03*
Training	*10*	*-2.33*	*2.21*			

The results of t test in tble6 show that there is significant differences in body fat percentage between training and control group (p=0.03).

Discussion

The aerobic power the training group in this study increased significantly after 8 training program. Glutamine supplement has significant increasing effect on aerobic capacity of experimental group in comparison with control group. Favano et al (2008) showed that the subjects who consumed glutamine supplement, showed significant increase in aerobic capacity. According to the Bassini - cameron (2008) consumption of glutamine prevents accumulation of ammonium Glutamine is a metabolic intermediate factor in Crebs cycle, so, by reservation the phosphocratine (pc) and glycogen in muscle fibers especially in oxidative fibers (type 1), glutamine can increase exercise tolerance. Besides, Akbarnead et al (2006) did not find any significant relationship between glutamine supplement and aerobic power. The possible mechanism may be the short duration of the training program and high intensity of exercise training that resulted in body weight losing.

The peak, mean and minimum anaerobic power of experimental group increased significantly in comparison with the control group after 8 weeks consumption of glutamine supplement. There are not many studies available on assessing the effect of glutamine supplement in order to comparison with the present results. Anaerobic power and explosive power are the maximum effort of muscle in very short time (5-6 seconds) (revasi 2004). Glutamine is a metabolic intermediate factor in Crebs cycle and glucogenezasion can increase the muscles energy releasing. Favano et al (2008) so, it can elevate anaerobic power .

Consumption of glutamine supplement has significant effect on total body mass and lean body mass of training group in comparison with control group and leads to increase in total and lean body mass. These results supported by the findings of the Colker et al (2000), Mark et al (2003), Falk et al (2003) and Darmaun et al (2004) (.

In order to be more effective the supplement, internal reception must be elevate the plasma glutamine higher than control group, this means that duration stress times, the consumption of plasma glutamine leads to increasing in muscles glutamine synthesis (Boelens et al, 2001).

Regarding to the strong relationship between level of glutamine and protein synthesis rate of muscle (Jepson et al, 1998) reservation of muscle glutamine may be an essential factor in maintaining total and lean body mass duration 8 weeks training. According to the literatures 30 minutes after consumption of glutamine (0.1 g for 1 kg of body mass), the level of plasma glutamine elevates. So, the dose of glutamine that used in this study is enough to temporary increasing in plasma glutamine level. However the results of the present study have rejected by the findings of Jepson et al (1998) and Fiin et al (2003) . The possible reasons for contradictory results may be body weight losing affected by intense training program of the study.

Consumption of glutamine supplement has significant decreasing effect on body fat percentage of exercise group in comparison with control group. This result supported by the findings of the Fiin et al (2003). acording to the Gaeini et al (2000) who found inverse relationship between aerobic power and body fat percentage in addition to this fact that glutamine can mediate fats metabolism (Filips, 2006) so it can be concluded that glutamine supplement leads to decrease in body fat percentage of training group after 8 weeks training.

These results are rejected by the findings of Jepson et al (1998), Falk et al (2003) and Colker et al (2000). The possible reasons for differences in results may be the differences mixtures that used combined with glutamine.

Glutamine is an effective factor for increasing the exercise tolerance and duration time of training of athletes. In addition, glutamine delays exercise fatigue in those who use the glutamine supplement rather than other athletes. So, glutamine consumption improves the performance and physical capability of soccer players. In the present study, glutamine supplement used in prolong time but in small sample and we achieved to beneficial results. However it is not cleared that using the glutamine supplement leads to good results in conditioning period or in large population. So, it is suggested that more studies must be do to response this question that if the glutamine supplement has other effects on the soccer players in different condition of exercise.

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