The Effect of Ginseng and Glutamine Supplementation on Anaerobic Power in Handball Players

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Abstract

The aim of this study was to investigate the effects of ginseng and glutamine supplementation on peak and mean anaerobic power output. Handball players (n=40) were volunteered for this study. Weight and height of the players were measured and the age range was between 17-24 years old (20.7±4.3). The Experimental Group (n=20) that n=10 for ginseng supplementation and n=10 for glutamine supplementation was given glutamine treatment of 0.3g/kg/day of glutamine for a period of six weeks and 400 mg ginseng daily. Control Group (n=20) for two supplementations had no treatment. Each participant performed the Wingate Test on a Monark 894e arm ergometer. Peak power and mean power were determined as the highest and average power achieved during any 30s of the test. There was a significant effect (p<0.05) of the supplementations on W max producing a higher value post-test than the pre-test. The ginseng supplement had more significant effects (p<0.05) on the mean and peak power under anaerobic circumstances in compare to the glutamine supplementation. It concluded to suggest other dosages of ginseng and glutamine should be investigated. Further research could assess the influence of ginseng and glutamine intake and intensive physical exercise involving athletes of other sports and using other performance traits, such as athletic skill elements.

Keywords: anaerobic power, ginseng supplementation, glutamine supplementation, handball players, mean power, peak power.

Introduction

Ginseng is used as a dietary and medicinal herb in different parts of the world (1). Panax ginseng (Family - Araliaceae), often called as Asian or Korean ginseng, is the most widely used best grade of ginseng compared to the other species (2). The root of this perennial herb has been used in oriental medicine since ancient times and it has become a popular tonic worldwide (3, 4). Ginseng supplementation has been reported to impact physiological functions in a manner similar to that of endurance training (5). There is evidence that ginseng may exert a stimulating effect by changing carbohydrate and lipid mobilization and utilization. Due to its potential ergogenic effect, many people have attempted to use ginseng to enhance physical performance (6). Most of the studies performed on the effects of herbs on physical exercises are related to ginseng and are conducted...
with different methodologies (7). A lot of mechanisms are introduced for ginseng influence. For example, ginseng may stimulate insulin production in pancreas and decrease the amount of plasma glucose in diabetic patients (8, 9, 10). The increase in the immunity system and memory of animals and humans is the effect of another ginseng mechanism (11, 12). Glutamine is one of the most abundant amino acid in the body. The consumption of glutamine increases under stresses such as exercise and disease conditions (13). Glutamine plays a role in many important biological processes and its availability can be limited during exercise (14). Handball has been drawing more attention in the last few years and has merited more studies that characterize the physiological profile of its players. Rannou et al. (2001) determined the physiological profile of handball players compared to sprinters, both enduring trained and untrained subjects. They performed a Wingate anaerobic test to determine maximal power (Wmax) (15). The Wingate Test has been used as a major test of muscle power whereas isokinetic devices have been used to determine muscle strength (16). The Wingate Test is commonly known as a method for measuring peak anaerobic power (PP) and mean anaerobic power (PM) (17).

**Objective**

Increasing the power of players in a handball team is useful and important because handball playing requires speed and strength, especially under anaerobic conditions. In preparing handball players to attain high levels of performance, attending to the provision of sufficient supplementation could be beneficial. Accordingly, the aim of this study was to assess the ginseng and glutamine supplement loading effects on the anaerobic power and body mass of handball players during 30 seconds of performing exercise under pre and post-test condition.

**Materials and Methods**

Ethical approval was obtained from the University before the study commenced. Forty male handball players who played in the handball team volunteered for this study and all the players signed the consent forms for athletes. All players belonged to this handball team and did not play for any other team. Some physical characteristics of the players, such as weight and height were measured and their ages noted (Table 1). The mean age for the total group of handball players was 20.7±4.3 years and the ages varied between 17-24 years.

<table>
<thead>
<tr>
<th>Supplementation</th>
<th>Group</th>
<th>Age (years)</th>
<th>Height (cm)</th>
<th>Body mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutamine</td>
<td>Experimental Group (n=10)</td>
<td>20.1±4.5</td>
<td>180.4±4.7</td>
<td>77.3±2.8</td>
</tr>
<tr>
<td></td>
<td>Control Group (n=10)</td>
<td>21.1±4.1</td>
<td>180.5±4.4</td>
<td>77.3±3.1</td>
</tr>
<tr>
<td>Ginseng</td>
<td>Experimental Group (n=10)</td>
<td>20.5±3.5</td>
<td>179.4±4.2</td>
<td>76.3±2.3</td>
</tr>
<tr>
<td></td>
<td>Control Group (n=10)</td>
<td>20.8±3.9</td>
<td>181.4±4.2</td>
<td>76.8±2.4</td>
</tr>
</tbody>
</table>

**Research design**

The forty players were randomly assigned to an Experimental (n=10) and a Control Group (n=10) for each supplementation (Glutamine and Ginseng). All of the groups were exposed to a pre-test and six weeks later to a post-test testing session. All players in the same group were tested on the same day. The Experimental Group received glutamine treatment of 0.3 g/kg/day and ginseng as 400 mg daily, 200 mg in the morning and 200 mg in the afternoon for the six weeks, while the Control Group received no treatment of the supplementations. All subjects were asked to follow their normal diet for the duration of the study.

**Measurement tools and protocol**

The Wingate Test served as dependent variable. Each participant performed the Wingate test on a Monark 894e ergometer (Varberg, Sweden) using the Monark Anaerobic Test Software (Version 2.24.2, Vansbro, Sweden). The seat height was adjusted to fit each participant. The participants were asked to wear the same sportswear and shoes for all tests and to report any departures from this instruction to the experimenters. The Wingate protocol has five distinct periods: (1) prior exercise; (2) recovery interval; (3) acceleration period; (4) Wingate Test (18); and (5) cool-down/recovery period. As with all anaerobic tests and due to the stressful nature of this test, prior exercise was provided as a warm-up phase that included some all-out pedalling at the test F-setting to accustom.
the subject. After this period, a relief interval of 2-5 minutes was observed to allow for recovery but maintain muscle temperature. Although the measurement period is 30 seconds, the actual test period is really 45 seconds as the 15-second acceleration phase is crucial.

A standard Wingate 5-minute warm-up was performed at a resistance of 3 % body weight with three 30-s sprints. During the warm-up, participants could adjust their horizontal position from the arm crank ergometer if necessary. Participants were instructed to keep their feet shoulder-width apart with their knees at 90° to the floor and not to move their feet during each exercise test. The Wingate test was performed under normal room temperature conditions. Performance indices of peak power (PP) and mean power (MP) were calculated for each analysis system where PP was the highest power and MP was the average power achieved during any 30s-cycle of the test and the anaerobic power was measured. Minimum power was recorded and the Fatigue Index was calculated as a percentage.

Statistical analyses
Statistical software SPSS (version 17 for windows, Inc., Chicago, IL) was used for data analysis. Mean and standard deviation values were calculated for each variable. For the evaluation of the data, the Levene’s Test of equality of error variances tests and Manova multivariate analysis was employed. To examine the variance error between the variables, Peak Power and Mean Power Levene’s test coefficient test was used. The Manova multivariate analysis tests were applied for the repeated measures and glutamine and ginseng treatments effect (Pre-test vs. Post Test) for the Experimental Group (EG) and the comparison of the groups (experimental and control groups) under the pre- and the post-test condition. Significance was accepted at the level of p<0.05, however, where greater significance (p<0.01) was attained, it was specifically noted.

Results
The analysis of the ginseng and glutamine treatment data showed non-significant difference for the peak power between the two groups (control and experimental) under pre-test condition (F=3.1; p<0.05) (Fig. 1).

![Figure 1. Peak power amounts under pre-test condition for the control and experimental groups](image)

There was significant difference between the control group and experimental groups for the peak power of Ginseng supplementation at 5 % probability level, F= 0.002 and also the results showed the significant difference between the control group and experimental group of Glutamine supplementation at 5 % probability level, F=0.004 under the post-test condition. According to the Ginseng and Glutamine supplementation was shown significant difference between these two supplementation experimental group and Ginseng caused to increase peak power more than Glutamine supplementation under post-test condition at 5% probability level and F=0.0001. The results indicated the most effects of Ginseng on peak power (Fig. 2).
There was not significant difference for the mean power between the two groups (control and experimental) under pre-test condition (F=2.51; p<0.05) (Fig. 3).

There was significant difference between the control group and experimental group of Ginseng supplementation at 5 % probability level, F=0.003 and also the results showed the significant difference between the control group and experimental group of Glutamine supplementation at 5 % probability level, F=0.0001 under the post-test condition. According to the Ginseng and Glutamine supplementation was shown significant difference between these two supplementation experimental group and Ginseng caused to increase peak power more than Glutamine supplementation under post-test condition at 5 % probability level and F=0.0001. The results indicated the most effects of Ginseng on mean power (Fig. 4).
Discussion
According to the Bassini-Cameron et al. (2008), consumption of glutamine prevents ammonium accumulation and glutamine can increase exercise tolerance and power. The peak, mean and minimum anaerobic power of the Experimental Group (EG) increased significantly after the six weeks of the consumption of the glutamine supplement when compared to the Control Group (CG) (19). Handball is a sport with high anaerobic demands (15). National and international handball players and sprinters have produced significantly higher peak power in the legs Wingate test compared to that produced by endurance athletes and untrained subjects (20). There was no significant improvement, under the control condition without any supplementation, in the basic mechanical variables, such as total work (\(W_{tot}\)) and maximal power (\(P_{\text{max}}\)) achieved in the Wingate test for the handball players (21). Rannou et al. (2001) evaluated professional French Handball players who trained for 120 minutes a day, 5 times a week for 7 years. The authors disclosed an absolute maximum power of 1067 W and a relative maximum power of 14.5 W/Kg. In contrast, the values of the Handball team found in our study were inferior to those encountered by Rannou et al. (2001), corresponding to 879.45 and 11.46 for absolute and relative MP, respectively. The fatigue rate of this modality in our study was 47.82% (15). Glutamine supplementation managed to prevent a decrease of maximum and minimum power. It has been shown that ingestion of pure glutamine promoted muscle glycogen re-synthesis during recovery from exhaustive exercise (22). Glutamine supplementation affects the increase of exercise tolerance (23). P. ginseng has been shown to augment the endurance performance (24). Oxygen uptake increased significantly compared to the corresponding resting values to meet the excess metabolic demands of the exercising muscles during the endurance running performances. However, oxygen uptake during the exercise did not show any significant difference between the two trials as also reported in other studies (25).

Conclusion
The results of this study confirm previous reports of the significant and positive effect of glutamine and ginseng supplementation on anaerobic power. In the case where there was no glutamine and ginseng supplementation, there was not significant difference under the pre-test and post-test (Control Group). The intake of ginseng and glutamine had a regulating and increased effects on the peak and mean power. As studies about the effect of ginseng and glutamine intake on anaerobic power are limited, it is recommended that more research should be done on the effect of glutamine and ginseng supplementation during exercise using the Wingate test of anaerobic power, also, the interaction of these supplementation can be studied. Via this study is suggested that other dosages of glutamine and ginseng should be investigated. Further research could assess the influence of glutamine and ginseng intake and intensive physical exercise involving athletes of other sports and using other performance traits, such as athletic skill elements or level of performance.

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