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# The effect of ginseng supplement on General Health indices and ratings of perceived exertion to acute resistance training in trained males

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**Abstract:**

**Background:** Ginseng is one the most natural popular ergogenic aid, which enhances mental operation and makes a positive sense of well-being. The aim is to examine the effect of ginseng supplement on perceived exertion and psychological parameters after resistance training in trained athletes.

**Methods:** Twenty-four active young men, who had trained for 3 months with the age range 18 to 27 years old, participated in this study. Subjects randomly allocated in to 2 groups: Intervention group (GIN, n=12) and placebo group (PLA, n=12). Each of them received 2 capsules daily for 4 weeks. Before intervention psychological parameters by using of General Health Questionnaire (GHQ-28) and perceived exertion by the Borg's scale for rating of perceived exertion (RPE) at rest (TRE, time rest), immediately after exercise (TTE, time test), 15 (T15), 30 (T30), 45 (T45), and 60 (T60) min after exercise were measured. Then they performed training program with ingestion of ginseng for 4 weeks. Again GHQ-28 and RPE at those time points which are mentioned above were taken.

**Results:** The finding of ANOVA test and repeated measure showed that treatment of athletes with ginseng caused significant difference in only anxiety/insomnia subscale ($p \leq 0.05$). Also, there was significant difference in the Borg 6-20 scale after training with treatment of ginseng in athletes ($p \leq 0.05$).

**Conclusion:** We find that ginseng supplement may improve anxiety/insomnia parameters in athletes and rise endurance time to exhaustion on resistance training.

**Keywords:** Dietary supplement, exercise, mental health.

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**Introduction**

Ginseng is one of the most famous herbal supplemental in the Far East there are several variations of ginseng, such as American, Asian Panax Ginseng, and Siberian. Ginseng is used as a tonic to improve efficiency the mind and body.

The General Health Questionnaire that includes 28 questions (GHQ-28) is a tool to evaluate current status of person physically and psychologically. Anxiety and stress can contribute to physical problems such as heart disease which reduce the strength of the immune system and decrease person's ability to withstand the pressures of the body and finally impair sport performance athletes. Depression is a common illness that impairs mental status and performance of person.

One study has been examined ginseng in postmenopausal women; it showed that ginseng has positive effect to reduce fatigue, insomnia and depression [1]. Ingesting of ginseng in tapping test which was carried out by fatigued night nurses and also was performed Rant Memory Test in a cohort with memory impairment showed significant improvement [2].

Herman et al [3] studied the efficiency of ingesting ginseng on oxygen consumption and perceived exertion and they found no effect in those variables. Allen et al [4] investigated the effect of ginseng supplement on workload and rate of perceived exertion in graded exercise test and they found that ginseng does not affect those variables.

The most important component of ginseng consists of GK501 and G115. Kennedy et al [5] have examined mood and cognitive performance of 10 male and 10 female healthy young adults with intervention of 320, 640, or 960 mg combination G115 and *Ginkgo* biloba; GK501 ginseng during 1 day and they have shown that ginseng results in improved cognitive performance. Also, Kennedy et al [6] have evaluated the effectiveness of 200, 400, or 600 mg G115 on mood and cognitive performance in 20 healthy young adults for 1 day and they found that ginseng causes modulation of mood but has no linear effect.

No prior study has examined the effect of ginseng on general health status and rate of perceived exertion along with training resistance. The general aim of this study was to investigate the effect of daily ginseng consumption with special dose of capsule ginseng on psychological scales and general health in trained males.

## Subjects and Methods

### Subjects

This was a double-blind randomized clinical trial. Twenty-four healthy male athletes with at least 2 months of resistance training experience participated in this study voluntarily. The criteria for inclusion of the participants were having a good general health, no smoking, no sport supplement and having the age range of 18 to 27 years. Individuals with hypertension, asthma, diabetes, bronchitis, anemia, cardiac problems, kidney or liver diseases or any other major diseases, and also with body mass index ≥24 kg/m2 were excluded from the study. Figure 1 shows the Consolidated Standards of Reporting Trials flow diagram.

All subjects were informed about this protocol and finished health history questionnaire. All subjects were randomly assigned to the ginseng and placebo group. Subjects were asked to maintain daily eating habits and restrict the use of caffeine and vitamin supplementations. Both of the groups performed the same exercises during one month. The characteristics of subjects at baseline have been shown in Table 1.

**Table1.** Subject characteristics

| | **GIN (n=12)** | **PLA (n=12)** |
|---|---|---|
| **Age (yr)** | 23.92±1.975 | 24±1.758 |
| **Height (cm)** | 174.83±6.118 | 175.92±4.699 |
| **Weight (kg)** | 84±11.449 | 85.00±8.485 |
| **BMI(Kg/m$^2$)** | 27.44±3.19 | 27.51±3.06 |

**Data are mean ± SD**

### Measures

This study performed in Isfahan city, city of Esfahan state in Iran. In the first session, the subjects were familiarized with general protocol. During this session, the subjects initial characteristics such as; age, height, weight were measured, which are shown in Table 1 and completed the 28-item General Health Questionnaire. For each item four possible responses were: 1-not at all, 2-no more than usual, 3-rather more than usual, 4-much more than usual. The GHQ-28 was developed by Goldberg in 1987 that include 28 questions. It categorized to four subscales: somatic symptoms: items 1 - 7; anxiety/insomnia: items 8-14; social dysfunction: items 15 - 21; severe depression; items 22 - 28.

Previous studies have shown that inter-rate and intra-rate reliability both were excellent; cronbach's 0.9-0.95 [7]. This questionnaire was translated into Persian which is the official language of Iran. Iran, Noorbala et al [8] which was showed validity and reliability. This study was performed on adolescents and adults that a cut-off point of 6 reported the sensitivity; specificity and misclassification rate for this questionnaire were 84.7%, 93.8% and 8.2%, respectively.

Also, in the first session, after starting of training program, subjects were asked to answer the Borg 6-20 scale. They were given a list from food program that they should consume daily: carbohydrate (40%), protein (30%), fat (30%) and water.

The Borg's RPE scale, the scale for rating of perceived exertion made [9]. Borg and Dahlström [10] were acted the first studies of perceived exertion in heavy physical activity in the end of the 1950's. the scale values range from 6 to 20; 6-7 value identified as very, very light intensity, 8-9 very light intensity, 10-11 fairly light intensity, 12-13 Somewhat hard intensity, 14-15 hard intensity, 16-17 very hard intensity and 18-20 very, very hard intensity.

They finished the GHQ-28 and Borg 6-20 scale as a pre-test. After ginseng treatment and training period; 30 days later, subjects finished them just after training as a post-test. During 30 days, they received a form which they had to mention their entire food consumption during a day and at the end of day these form were collected and if needed subjects were warned of not changing their regular diet.

**Resistance training program**

Subjects trained three days a week on non-consecutive days for 4 weeks. Weekly program was designed to upper -body and lower-body exercises. included 5 sets with 7 repetitions with 65% 1RM in bench press, arm included leg press, bench press, leg curl, triceps push down exercises on Saturday; 4 set in 7 repetition with 70% 1RM repetitions with leg extension, dumbbell arm curl, dumbbell triceps, seat row exercises on Monday; 4 set with 6 repetitions with 70% 1RM bench press, arm curl, lat pull down on Wednesday. The resistance training program sessions lasted 35 minutes. Rest interval between sets was 2 minutes.

Before taking ginseng capsules, the subjects performed the pre-test, which consisted of a warm-up set consisting of eight repetitions with 50% of the load used in the protocol in the leg press, bench press and seated row exercises. Then, three sets from the eight repetitions were performed for each exercise. The loads used in the leg press, bench press, seated row and leg curl exercises in the first; second, third sets were 80%, 70% and 60% of 1RM, respectively. In arm extension; triceps press and arm curl; barbell curl exercises, the loads used in the first, second, third sets were 70%, 60% and 50% of 1RM, respectively. After pre-test, they trained in the training program and took ginseng capsules concurrently for 30 days. They performed post-test the same way like pre-test protocol. The study protocol was approved by the Ethics Committee of University of Isfahan.

**Ginseng Supplement**

Each subject took either two ginseng or placebo capsules; 200mg/day daily for 30 days. Previous studies that examined the effectiveness of ginseng are from the shortest duration 1, 8 days to, 3, 4, 6 and 8 weeks. Different dose of ginseng used in previous studies. Ziemba et al [11] have studied the effect of 350 mg/day ginseng for 6 weeks in 15 of young male soccer players to evaluate psychomotor performance and the results of this study has shown that ginseng causes a decline in reaction time.So, like authors such as Engle and Hsu et al we used 400 mg ginseng supplement. Each ginseng capsule contained: standardized Ginkobiloba,

extract GK501; 60 mg adjusted to 24% ginko-flavone-glycosides, standardized Panax ginseng Meyer extract G115; 100mg adjusted to 4% ginsenosides, Excip. Pro caps. Gelatine.

Other ingredients: Rice powder, magnesium stearate, cellulose.

Both Placebo capsule and ginseng capsule produced by the same factory. Placebo capsule is similar to ginseng capsule in appearance and has all ginseng capsule ingredients except for Panax ginseng Meyer extract G115.Subjects were instructive to take two capsules after eating breakfast with one glass of water. They were asked to recall if they had digested problems during the month.

In our study, ginseng capsule did not have phytochemical analysis by HPLC.

**Statistical analyses**

To determine differences in four subscales of GHQ-28; somatic symptoms, severe depression, social dysfunction and anxiety/insomnia, and the Borg 6-20 scale values among and in two treatment groups, we used two-way analyses of variance (ANOVA) with repeated measures, by using the statistical program SPSS (version 16.0). A scheffe's post hoc test was used to determine any significant difference. The alpha level was set at 0.05 for all statistical analyses. All data are presented as mean ± SD.

## Results

### The QHG-28 questionnaire

There was no significant difference in somatic symptoms, social dysfunction, severe depression subscales between ginseng group and placebo group ($p > 0.05$). Treatment of athletes with ginseng caused significant difference in anxiety/insomnia subscale ($p \leq 0.05$). Results of the QHG-28 analysis are shown in table 2.

**Table2.** The GHQ-28 subscales before and after treatment of ginseng with training for 30 days.

| | **Somatic symptoms** | | **Social dysfunction** | | **Anxiety/Insomnia** | | **Severe depression** | |
|---|---|---|---|---|---|---|---|---|
| **Group** | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test | Pre-test | Post-test |
| **Ginseng (N=12)** | 2.6±0.53 | 1.55±0.43 | 2.21±0.26 | 1.77±0.36 | 2.51±0.36 | 1.81±0.65* | 2.75±0.49 | 1.92±0.66 |
| **Placebo (N=12)** | 2.49±0.23 | 1.83±0.59 | 2.24±0.22 | 1.74±0.37 | 2.57±0.28 | 2.36±0.55 | 2.63±0.47 | 2.38±0.61 |

**The value is expressed as mean ± SEM.**

*Significantly different from placebo group ($p \leq 0.05$).

**The Borg 6-20 scale**

Comparison between two groups showed significant difference in the Borg 6-20 scale after training with treatment of ginseng in athletes ($p \leq 0.05$). Results of the Borg 6-20 scale analysis are shown in table 3.

**Table3.** The Borg 6-20 scale

| | Borg | |
|---|---|---|
| **Group** | Pre-test | Post-test |
| **Ginseng (N=12)** | 14.67±1.37 | 9.5±1* |
| **Placebo (N=12)** | 14.83±1.26 | 14.42±1.31 |

The value is expressed as mean **± SEM.**

*Significantly different from placebo group ($p \leq 0.05$).



## Discussion

This study was designed to determine whether ginseng treatment with training resistance for 30 days would have an effect on perceived exertion and psychological features in athletes.

The result of the current study show that consumption of ginseng has an can effect on psychological feature of quality of life which include aspect of anxiety/insomnia while no effect was observed on any other aspect of psychological such as somatic symptoms, social dysfunction and serve depression. Also, ginseng supplement has an effect on perceived exertion

We divided our findings into two categories. The first finding is about relation between ginseng and perceived exertion. Ginseng has a reputation in people that cause a raise in human capacity in strength and intellectual performance [12]. Filaretov et al [13] found that one administration of ginseng rises time of tolerance to exhaustion, and the ACTH basal level and corticosteroids while subjects performed a treadmill running test by the end of 7 days treatment. Ginseng has also been reported in athletes who performed intense exercise following consumption of 4% ginsenoside decreased lactic acid metabolism [14].

Local factors such as sensors from the active muscles and central factors from the cerebral and cardiopulmonary systems also can affect in perception of exertion [15].

Exercise physiologists have reported that during prolonged exercise, fatigue occurred when glycogen stores were exhausted and start to build-up of lactic acid, both in skeletal muscle and in the liver. Conserving body carbohydrate stores happen when fatty acids mobile and oxidize, so that exhaustion perception time becomes longer. Ginseng also has contributed to conserving muscle glycogen stores by increasing fatty acid oxidation during prolonged exercise. Ginseng has been showed to have an important role in metabolic functions in the central nervous system (CNS), and affect the hypothalamus-pituitary-adrenal axis [16]. Morgan`s research [17] showed that there is significant positive correlation between perceived exertion and anxiety. In our study, resistance training exercises were carried out at higher intensities. So, glycogen stores were used with more speed to provide the required energy in performing muscles, finally perceived exhaustion feeling quickly. Ginseng delays exhaustion perception with conservation of glycogen stores.

The second finding is about influence of treatment of ginseng on psychological features by using of 28-GHQ. The other qualities of ginseng include the treatment of insomnia and neurasthenia [14]. The similar to our result, Forgo et al [18] observed that a ginseng extract had positive effective on intellectual evaluation of mood and, concentration. However, Ellis et al [19] have investigated the effect of ginseng supplement on mood state and mental performance in 30 young people against the control group for four weeks and they found no effect on their mood state and mental performance. One study reported that treatment with $Rb_1$ ;one of the major ginsenosides (2.5, 5 and 10 mg/kg, i.p) reduced the neuronal damage and cognitive impairment that has been created by stress following 60 repeated days of stress [20].

Nitric oxidation (NO) has an important role in neuronal operations including, differentiation of progenitor cells, signalling and neurotransmitter release [21]. Ingesting of ginseng in cells overall and body tissues result in increasing of synthesis of NO that may positively has effects on behavioural performance [13].

If the CNS received more information from the afferent nerves, the athlete exerts exercises more cautiously, so shows cognitive action better [22]. In our study, athletes endured more force and pressure in resistance training. Possible mechanism that we can attribute to the action of ginseng components on CNS in resistance training is that ginseng induces more neurotransmitters between afferent and efferent neurons in CNS. So, CNS received more information from skin surface and outside environment and led to increase awareness of athletes.

## Conclusion

As we know many athletes use herbal supplements to improve their exercise performance. This study showed that consumption of ginseng can be useful for improving insomnia /anxiety scale in athletes. It is useful for athletes who participate in Consecutive competition and they should endure the pressures and stresses of racing. Ginseng can promote rating of perceived exertion in human. RPE scale was a useful measurement for evaluating the mount of intensity in performance. It means that athletes can put into effect more exercises without early exhaustion.

## Limitation and clinical implication

In this study, we can't assess mental confounders' factors that affect one's performance such as family arguments, job problems etc. completely. This study was performed with using of questionnaire, which is not an evaluated clinical measure. Even though food regular program were given, daily diet of subjects can't be controlled completely. Ginseng capsule used to decreases factors of causing stress and, it can be used in prevention of neurological disorder.

## Declaration of potential conflicts of interest

The authors state that there are no conflicts of interest as regards to the content of this article.

## Abbreviations

ginseng group (GIN), placebo group (PLA), General Health Questionnaire (GHQ-28), rating of perceived exertion( RPE), time rest (TRE), time test (TTE), 15 minute (T15), 30 minute (T30), 45 minute (T45), and 60 minute (T60), *Ginkgo (GK),* body mass index (BMI), central nervous system (CNS), Nitric oxidation (NO).

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