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Research Article

Effect of Whey Protein Supplementation on GH-1 and IGF-1 in Taekwondo Men Athletes

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Abstract

Background: Improving athletic performance has been one of the issues that athletes have long faced. Hundreds of sports supplements for athletes have been introduced to the market in recent years. The overall aim of the present study was to investigate the interactive effect of whey supplementation and resistance training on growth hormone and IGF1 levels in Men athletes.

Materials and Methods: The method of the present study was a quasi-experimental and clinical trial. 24 male working bodybuilders (mean age 26.4 ±5.3, height 173.9 ± 7.7, weight 92.3 ± 11.6 and body mass index 28.8 ± 5.4), randomly divided into 2 complementary groups + Practice and practice were divided. Before and after 8 weeks of combined exercise program and whey supplementation (50 grams daily in the supplement group), selected body composition indicators of insulin-like hormone and plasma growth hormone and physical fitness factors including lower and upper limb muscle strength, speed, endurance Upper torso muscle, and agility were assessed. To compare the results before and after supplementation and exercise in each group, paired t-test was used, and to compare the results of the two groups with each other, an independent t-test was used using SPSS software version 20 and the significance level was P≤0.05 was considered.

Results: In both groups, after eight weeks of training and consumption of whey protein, the levels of growth hormone and insulin-like growth factor 1, muscle strength, and endurance increased significantly (P <0.05), but in comparison between groups in the post-test, there was a significant difference. Not observed (P <0.05).

Conclusion: Whey supplementation probably does not affect growth hormone and insulin-like growth factor-1 levels and fitness factors in Men athletes.

Keywords:
Resistance training, whey Supplements, Growth Hormone, Insulin-like growth factors and fitness factors

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1. Introduction

Sports organizations such as the American Sports Medicine Association (ACSM) and the International Sports Nutrition Association (ISSN) recommend that adult athletes receive more protein (1). Having a balance between building lean muscle and consuming high-quality protein using the strategies used through exercise to have the right body composition and lean muscle mass has been highly regarded (2). In all sports, especially bodybuilding training, access to the upper limits of physical fitness requires a lot of practice and extensive effort in sports fields. During exercise, the body faces many demands that cause many physiological changes (3). In this regard, the nervous system and the endocrine system, in a coordinated action, initiate and control the movement and all the physiological processes involved. The hormonal system is responsible for various metabolic functions in the body, such as the synthesis and activation of cellular enzymes, changes in cell membrane permeability, protein synthesis, and changes in cellular metabolism (4). Research suggests that non-tropical hormone secreted by the anterior pituitary gland, growth hormone (GH), is a potent metabolic factor that promotes muscle growth and hypertrophy by facilitating the transport of amino acids into cells. The secretion of this hormone has an intermittent pattern and various stimuli affect the amount and frequency of its secretion. It is thought to exert its effects directly or indirectly on the body through the production of intermediate proteins in the liver and other cells called insulin-like growth factor-1 (IGF-1) or somatomedin c. The structure of IGF-1 is similar to proinsulin and is therefore called insulin-like (5). Its levels are adjusted by physiological factors such as sleep, hormones, exercise, etc. and pathological factors such as disease, stress, etc (6).

It is now well established that systemic strength training, by combining several factors such as mechanical stress, neurological control, metabolic needs, and endocrine activity, has strong effects on increasing muscle size (hypertrophy) and muscle strength. A strength program based on the principle of increasing exercise leads to acute responses such as increased concentrations of anabolic hormones and a temporary decrease in neuromuscular function (7). Therefore, the amount of acute hormonal and neuromuscular response is a criterion in determining the effects of resistance training with different intensities. Kramer et al. (1990) reported that the acute hormonal response to a resistance training session is an important criterion in muscular hypertrophy in long-term strength training. The acute hormonal response depends on the type of resistance training program, which in turn is affected by variables such as training load, number of courses, number of repetitions, amount of rest between courses, muscle mass involved, and number of training sessions per week (8). It seems that in addition to the above, the use of protein supplements may also be involved in the rate of acute and chronic responses to hormones involved in muscle building. Accordingly, the use of dietary supplements has expanded in high-level athletes who expend a lot of energy due to daily exercise (9). whey protein is a high-quality milk-derived protein source and a common supplement in the sports community. These proteins and amino acid supplements have a good position in the sports nutrition market based on the quality of protein and amino acids they make. Most people with high physical activity tend to use special supplements and diets to improve their health and physical function (10).

Unlike other essential amino acids, branched-chain amino acids are metabolized directly in the muscle and are the first amino acids to be used during exercise and resistance training (11). whey protein is believed to provide the body with depleted branched-chain amino acids quickly, repairing and rebuilding muscle tissue. (10). There is some evidence that fast food intake after exercise (especially protein) is beneficial and perhaps necessary to increase muscle mass, although there are other studies that suggest that to increase strength and build muscle, it is necessary to Do not to use protein supplements (12). Extensive research has been done on the effects of various exercises and supplements on blood factors. The results of most studies show that different exercises can have different effects on the concentration of hormones and other blood factors. Although the physiological significance of many of these changes is already known, the fact that these variables react to sports activities is significant, It is important (13). Previous research has shown the effect of protein on appetite control, muscle growth, and fat metabolism in healthy and overweight people (14-15). However, limited information is available on the effect of his protein on hormones, especially growth hormone and insulin-like growth factor in athletes, especially male bodybuilders. Therefore, the aim of this study was the interactive effect of whey supplementation and resistance training on growth hormone and IGF1 levels in male bodybuilders.

2. Materials and Methods

The method of the present study was applied in terms of purpose and quasi-experimental in terms of data collection and as a randomized clinical trial with pre-test and post-test design and unilaterally blind.

An independent variable (combined exercise and supplementation) was applied between pre-test and post-test. After the initial call of 24 working men in Tehran in the age range of 18 to 29 years after completing the forms of the medical questionnaire and written consent in a simple randomly divided into two groups of supplement + exercise (12 people) and exercise (12 people) were placed They were not bony and had not taken a sports supplement in the past 6 months. Before and after the exercise program by the research groups, body composition including height, weight, the thickness of subcutaneous fat was measured at three points (thigh, supraspinatus, and triceps) and using Jackson and Pollack equation and fitness level. Physicality in lower and upper limb muscle strength factors was measured and recorded through chest and leg press tests, speed through 100 m running test, upper torso muscle endurance through the horizontal bar, and agility test by 9⊆4 running method. To determine the level of IGF1 and GH in all subjects before and after training, blood samples were taken at 8 am in the laboratory after 10 to 12 hours of fasting. 3 to 5 cc of blood was taken from the brachial vein from each subject. To measure growth hormone in terms of micrograms per liter, a radium kit made in Switzerland with an accuracy of 0.2 mg / dL and an internal measurement coefficient of variation (cv) equal to 2.38% and ELISA method were used. Also, the amount of IGF1 in nanograms per ml of each blood sample was measured using the Enzyme immunoassay DRG IGF-1600 kit made in Germany and ELISA method. The research groups then practiced three sessions a week for eight weeks. The conditions for excluding the subjects from the study were the absence of more than three consecutive sessions in the exercises.

Exercise protocol

Resistance training included 8 weeks and three sessions per week. The duration of each training session was 80 minutes. The resistance training program includes 10 minutes of warm-up (jogging, stretching, and flexibility) and then 60 minutes of doing ten movements with weights, in three stations and in a circle in which the subjects experienced a variety of exercises with different exercises per week. Stations include barbell chest presses, barbell top barbells, boat armpits, barbell forearm, back chain chains, deadlifts, barbell head-to-head, back-leg with the machine, leg squats, and sit-ups (belly) Each session consisted of four sets with a maximum of 8 repetitions and an intensity of 65 to 70% of the maximum repetition. The rest time between stations was 30 seconds and the rest time between each set (end of each round of the circle) was 90 seconds. The overload principle was designed so that after each training week, a maximum repetition test was performed for each person at each station and the amount of weight was adjusted accordingly. The cooling step was 15 minutes using stretching and jogging. The maximum strength of the subjects was obtained using the following equation (15).

$$1Rm=\frac{\text{weight}}{1-(0.02\times\text{Repetition})}$$

Nutrition program

The supplement group consumed 50 grams of her protein with 400 ccs of water immediately after training for two months in each training session and the second group did not receive any supplement (7).

In order to reduce some of the interfering and confounding factors affecting the research results and in order to reduce the effects of food type on research variables, in the initial session, subjects were asked to eat ready meals for at least 48 hours before the exercise program and blood sampling. Also, avoid caffeinated beverages.

Calories received

Data on the number of calories received by the subjects using two questionnaires of the food recall and 24-hour food note questionnaire in three days (two days at the beginning of the week and one day at the end of the week) and also in three times (first week, fourth week and week Eighth) was recorded and collected. Food models, measuring cups, spoons, and other tools were used to accurately estimate the amount of food eaten. In order to analyze the data, first, the consumed food was converted to hot and then using Dorosty Food Processor (NШ, FP2) software, dietary information was analyzed and the number of macronutrients was determined. During the training period, in order to even out the diet, the subjects were instructed to use the replaced diet. In addition, the need for fuel energy and the construction of the base based on age, sex, and weight; According to the formula of Harris and Benedict, after adjusting the activity factor, the total daily energy required was obtained, but to further control nutrition, subjects were asked to keep the three-day form of their recall questionnaire before blood sampling and up to three days left. At the time of blood sampling, have the same initial diet. Finally, by determining the daily calorie intake, it was shown that the caloric intake of the subjects was not significantly different from each other.

Statistical analysis

Descriptive statistics for calculating central indices, Kolmogorov-Smirnov test to determine the normal distribution of data, to compare the results before and after supplementation in each group, paired t-test and independent t-test were used between the two groups. For data analysis, SPSS software version 20 and the level of significance of the tests were considered at the level of P≤0.05.

3. Results

The characteristics of the subjects including age, height, weight, and body mass index are presented in Table 1.

Table 1. Demographic characteristics of the subjects (n = 12)

Variable	Complement and Training group	Training group
Age	۲۶/۴±۵/۳	۲۵/۳±۴/۵
Weigh (kg)	۷۳/۳۵±۱۱/۶	۷۱/۷±۷
Height	۱۷۳/۹±۷/۷	۱۷۶/۶±۶/۲
BMI (Kg per square meter)	۲۱/۸۹±۴/۷	۲۲/۳۰±۵/۳

Table 2 shows the changes in research variables in both groups. Findings showed that IGF1 and GH levels in both groups increased significantly compared to pre-workout. The two groups had no significant effect. However, no significant difference was observed between the two groups in the post-test in any of the dependent variables.

Table 2. Correlated t test results

Variable	*group*	*T*	*Degrees of freedom*	*Sig.*
IGF1(mg/dl)	Supplements and Training	۸.۱۰۹	11	0.001*
	Training	۷.۷۶۱	11	0.002*
GH(ngr/mll)	Supplements and Training	8.۴۵۳	11	0.001*
Lactate(mmol/L)	Training	6.۵۶۴	11	0.001*
High power body (kg)	Supplements and Training	7.۲۳۶	11	0.001*
	Training	6.۳۵۶	11	0.001*
Lower power body (kg)	Supplements and Training	9.۱۰۴	11	0.001*
	Training	10.۳۲۸	11	0.002*
Speed (s)	Supplements and Training	1.۶۵۱	۱۱	0.457
	Training	1.۱۲۸	۱۱	0.234
Upper body muscular endurance (number of repetitions)	Supplements and Training	7.۳۷۰	۱۱	0.003*
	Training	6.۲۹۸	۱۱	0.002*
Agility (s)	Supplements and Training	6.۳۸۹	۱۱	0.003*
	Training	8.۴۳۲	۱۱	0.001*

*. **Significant difference compared to pre-test**

Also, the results of the independent t-test (Table 3) showed that there was a significant difference between the post-test results of the research variables in both groups in IGF1, GH, muscle strength, and endurance. That is, resistance training in both groups caused a significant improvement in the studied variables and supplementation did not affect them. Considering that there is no significant difference between the post-test results of the research variables, it can be concluded at least that his supplementation did not have a significant effect on body composition and physical fitness factors of professional male bodybuilders, or that it was significant.

Within the group in the supplement and exercise and exercise group, supplementation may have exerted a significant effect, but it has been overlapped with the significant effect of exercise.

Table 3. Results of independent t-test between two groups in

Variable	Degrees of freedom	Mean difference	t	Sig.
IGF1	22	8.102	2.654	0.564
GH	22	1.24	2.238	0.115
High power body	22	5.123	1.004	0.216
Lower power body	22	2.123	1.114	0.321
Speed	22	-0.42	1.126	0.430
Upper body muscular endurance	22	4.101	1.761	0.276
Agility	22	-0.543	0.671	0.176

4. Discussion

The results of the present study showed that the levels of growth hormone and IGF1 in both groups increased significantly compared to pre-workout and it was shown that there was no significant difference between the post-test in the two groups and therefore his supplementation on the levels of these two hormones. It was ineffective and the changes observed were probably due to resistance training. Results of the present study with the research of Fiatoregh et al. 2006; Borest et al. 2010 was consistent with Halmea et al., 2009; Verdich et al., 2010 inconsistent. It should be noted that; Growth hormone (GH), Insulin-like growth factor-1 (IGF-) are some of the metabolic, anabolic, and protein molecules that are affected by exercise and are associated with muscle growth. Testosterone, cortisol, lactate, and the proteins myostatin and full statin (16).

Possible reasons for the discrepancies include the intensity of training, duration of resistance training, different levels of physical fitness of the subjects who were athletes in the provincial league in the present study and can affect the results of the study. Ruth et al, (1963) first showed that physical activity increases growth hormone levels.

It has also been reported that growth hormone response depends on the intensity and duration of the training session, the level of fitness, blood sampling time, and other determinants. Determinants of elevated serum IGF-1 in response to exercise are not well understood. However, the main mechanism is increased hepatic IGF-1 release in response to exercise-induced GH increase. However, other researchers suggest that the increase in serum IGF-1 levels is not due to GH-dependent exercise because GH levels increase only in response to strenuous exercise. However, the increase in IGF-1 blood circulation in both intense exercises And low intensity is observed (17). According to previous research, a significant increase in GH has been observed in resistance training programs with more training load, more training volume, short rest between sets, and more muscle mass. Therefore, given that the concentration of GH stimulates the production of IGF-1 in tissues, it can be expected that with the production of more GH in such programs, more IGF-1 will be produced. However, what prevents the increase in IGF-1 after moderate-intensity physical activity is the time required for tissue stimulation to produce IGF-1, which must be done in the presence of GH. Although more research is needed to elucidate the link between GH production and IGF-1 following resistance training, some researchers reject this direct link and others offer reasons for the close link between the two variables. However, IGF-1 production after exercise appears to be dependent on GH concentration levels (18).

Muscle strength and endurance

The results of the present study also showed that in both groups, the strength of upper and lower torso muscles, as well as muscle endurance, did not show a significant increase, and speed and agility did not show significant changes. The results of the present study are consistent with those of Darren et al., 2008, and were not consistent with those of Jason et al., 2006. There is a huge gap in the published literature on the role of exercise variables in increasing strength and muscle hypertrophy. Nevertheless, it is obvious that how to exercise variables are used in the structure of a resistance training program affects strength, power, muscle hypertrophy, and the range of neuronal adaptations achieved (19). Although it is well established that neural adaptation is a major factor in increasing strength in the early stages of resistance training, the interaction between intensity and volume of training may play a major role in determining the optimal range of adaptation to resistance training (20).

It has been shown that strength training with maximum loads improves strength by altering neural muscle activity. Nervous adaptation occurs naturally when the nervous system becomes tired and inactive under pressure due to unfamiliar load movement. This neuromuscular fatigue can be measured by a decrease in muscle productive force by maximal isometric contraction immediately after load transfer (21).

Most research has acute responses such as; Neuromuscular fatigue and accumulation of metabolites in one session of resistance training have been attributed to long-term adaptations in strength, along with regular resistance training. The results of these studies suggest that a training protocol that provides more muscle activity and glycolytic function in response to a resistance training session is an appropriate training protocol for optimal strength enhancement and muscle hypertrophy (22).

5. Conclusion

Contrary to many claims of his protein-producing companies for athletes, the results of the present study showed that his protein intake had no significant effect on growth hormones and insulin-like factors. The results also indicate that there are no significant changes in the variables of strength, speed, agility, and endurance. Therefore, it is suggested that a similar study be performed on a larger number of these samples, and in addition, protein supplementation may require more time or fundamental changes in the design of the exercise pattern, so it is suggested that a similar study with Do it for a longer time. Finally, considering the effect of resistance training in reducing fat mass and increasing the physical fitness factors involved in bodybuilding, it is recommended that trainers use resistance training in their training programs more than before to improve the physical fitness levels of athletes.

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Compliance with ethical standards

Conflict of interest the authors declare that they have no conflict of interest.

Ethical approval the research was conducted with regard to the ethical principles.

Informed consent Informed consent was obtained from all participants.

Author contributions

Conceptualization: M.A., A.T., B.D., E.Z., SH.M.H.; Methodology: B.D., E.Z., SH.M.H.; Software: M.A., A.M., B.D., SH.M.H.; Validation: A.M., E.Z., B.D., A.T.; Formal analysis: B.D., E.Z., A.M.; Investigation: M.T., SH.M.H., B.D., M.A.; Resources: M.A., A.T., B.D., E.Z., SH.M.H.; Data curation: M.A., A.T., B.D.; Writing - original draft: A.T., SH.M.H., B.D., M.A.; Writing - review & editing: SH.M.H., A.T., B.D., M.A.; Visualization: A.M., A.T., SH.M.H.; Supervision: A.T., E.Z., B.D., SH.M.H.; Project administration: A.M., SH.M.H., B.D., M.A.; Funding acquisition: A.M., M.A., A.T.;

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