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Comparing effects of two creatine loading methods along with 6 weeks of resistance training on strength and some anthropometric indices of experienced bodybuilders

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ABSTRACT

The purpose of this study was to compare effects of two creatine loading methods along with 6 weeks of resistance training on strength and some anthropometric indices of resistance experienced bodybuilders. Twenty seven male athletes with mean age of 22.26 years, height of 178.41 cm and weight of 50.80 kg were randomly divided to three groups in a double-blind design; the first experimental group was creatine loading (n=9), an second experimental group was creatine consumption without loading (n=9) and the last one was placebo group (n=9). Then, muscle strength test including chest, arms and legs was done at 1RM with free weights. Body composition and size of different body parts were measured for each exercise protocol. The training protocol was similar for all three groups, which included a three resistance training programs per week. The loading group received 20 g creatine in four 5 g servings for 6 days on a daily basis and then continued with 10 g creatine per day until completion of the program. The no-loading group received 10 g creatine every day. Also, the placebo group acted like the protocol of group 2; but, it used starch instead of ceratin. To compare the groups, ANOVA and Tukey's post hoc test were run in $SPSS_{16}$. The findings of this study showed that creatine supplementation loading significantly increased muscle strength in bench-press, biceps and dead lift. Also, femur and biceps circumference significantly increased in creatine loading group compare with the two other groups. Body fat percentage had no significant change in three groups. Therefore, it can be concluded that creatine loading method could lead to increased strength and improvement of lean muscle mass compared with two other groups.

INTRODUCTION

Scientific sport requires taking advantage of all sciences such as nutrition and food supplements; thus, all professional athletes use these cases in order to maximize their performances. Awareness of nutrition science and correct use of food stuff plays a significant role in athletes' success. Among the existing supplements, creatine supplementation has attracted many researchers' attention and led their questing minds towards analyzing effects of this supplementation on body composition, muscle strength and physiological mechanisms [1].

Today, creatine is one of the most common and widely used food supplements among athletes [2].

In human body, there are three main systems for restoring ATP reserves: phosphocreatine or ATP-PC system, lactic acid system and aerobic system. Phosphocreatine plays a major role in supplying fuel for the training muscles. This substance donates its phosphate group in order to rapidly rebuild and use cellular ATP reserves while phosphocreatine is stored and rebuilt again during recycling after the sport. This is the most important energy source for 1-10 sec of intensive task [3].

Therefore, the most significant performance of creatine is to support ATP rebuilding and increase values of muscle phosphocreatine; however, not all people benefit from this process [4].

In this regard, most researchers have confirmed that creatine is harmless and has various advantages; also, diverse studies have been conducted while almost none of them have pointed out any special complications for that [5,6]. Creatine is one of the supplements that is highly considered by various athletes in today's world. The studies performed on creatine have reported its energizing effects such as increased presence of creatine, high level of phosphocreatine in the sport onset, increased level of phosphocreatine rebuilding during return periods to the primary state in alternative activities and, as a result, increased level of performed task, and power and strength [7, 8]. It has been claimed that creatine could raise muscle strength and, by postponing exhaustion, enable athletes to train harder and more intensely and thus acquire compatibilities beyond their muscles' natural capacity [9].

Moreover, the creatine-producing companies have claimed that creatine can help to burn more fat and increase muscle [4]. Bemben and Lamont [18] studied creatine supplementations and training performance. They stated that the most prevalent method of creatine usage was 20 g per day for 5 to 7 days (loading period) and 3 to 5 g at various times from 1 week to 6 months (maintenance period). When maximum energy or strength is the result of creatine consumption, it generally seems that creatine significantly affects energy production regardless of sport type, gender or age [18].

The performed studies have reported creatine's energizing effects such as its increased presence, high phosphocreatine level at the start of training, increased phosphocreatine rebuilding during recovery periods in alternative exercises and, consequently, increased task, power and strength [10, 11]. In recent decades, great success of some athletes has been attributed to creatine supplementation, which has led to this common belief that creatine consumption is useful for sport performance [12].

Anyway, after preparing creatine, the most remarkable raised question is related to its consumption manner. Besides, various views exist in terms of creatine loading; some researchers believe that creatine loading is not necessary while some others think that creatine supplementation is useless without doing loading period and even believe that if creatine consumption is stopped for one day due to any reason during the maintenance course, loading course should be repeated in order to optimally use creatine [13,14]. Thus, it seems that the accurate method for consuming creatine supplementation is still controversial among the researchers. Therefore, the athletes who tend to use creatine might endanger their health in case of incorrect consumption. In addition, they may undergo economic costs and, more importantly, may not observe any improvement in their sport performance.

Considering all the mentioned issues, it is essential to do practical research on creatine supplementation loading for maximizing muscle compatibilities like increasing strength and lean mass. The present study tried to answer the following question: what differences can be created in strength and some anthropometric indices after consuming creatine supplementation by loading and non-loading methods?

This study's major goal was to analyze effect of two creatine loading methods along with 6 weeks of resistance training on strength of resistance trained bodybuilders. Also, the effect of two loading methods on size of muscles and fat percentage of resistance trained athletes was analyzed. Body composition (body fat percent, lean mass), body volume (arm and thigh circumferences), maximum muscle strength (leg, arm front, dead lift and chest 1RM) were measured as dependent variables in two pre and post test stages.

MATERIALS AND METHODS

Research Method

The present study had pretest-post test double-blind semi-experimental designs with control group and was conducted in order to compare effect of two methods of creatine consumption (with and without loading) along with 6 weeks of resistance training on strength and some anthropometric indices of resistance trained male athletes.

This study's statistical population consisted of 50 male bodybuilders from city of Sari who regularly participated in training sessions. They did not have the background of using energizers or creatine supplementation since at least 6 months prior to the beginning of this research. Moreover, they had no record of cardiac, renal and liver problems, diabetes or any kind of injury. Out of the statistical population who volunteered to participate in this research, 27 bodybuilders were randomly selected as statistical sample and divided to 3 groups with 9 people; experimental group 1 was loading group, experimental group 2 was non-loading one and group 3 was placebo group. All the three groups performed 6 weeks (3 sessions per week) of selected resistance exercises.

Measurement Tools

For measuring the participants' fat percent, dermal thickness metric (caliper) device (Miekosha model) made by Japanese Yagumi Company was used to measure thickness of their skin wrinkles. To measure strength of their different body parts (1RM), bodybuilding devices such as standard chest press table, standard dumb-bells and halters, halter plate, lorry table and bent halter bar for performing lorry arm front movements, bar fix, boat device and belly and underbelly movements, all of which were made by Mobarez Company were used to perform the test the considered training program of the study.

Measurement Methods

One day before consuming creatine supplementation, placebo and training, all three groups had a pre test including measurement of height, weight, size of different body parts, body fat percent (to estimate fat weight and lean weight) and muscle strength of various body parts (chest press, scout, dead lift and arm front) were performed by a maximum repetition (1RM). Also, at the end of the 6th week, all the participants had a post test.

Measuring Body Fat Percentage

To determine the participants' body fat percent, caliper device and Dal and Vanger's [15] three-point formula (arm triceps, belly and under-shoulder) were used on the body's right side. After determining thickness of skin wrinkles using these two devices, the mean of twice measurement of each point of the body was placed in the following formula, using which each participant's body fat percent was obtained.

Creatine Loading Program

To this end, first, the desirable amounf of consumed supplement of monohydrate creatine type (made in Germany and distributed and packed by Pouyan Nutrition Company (P.N.C)) was purchased from an accredited pharmacy under Official permit of Ministery of Health in 100 and 300 g packages.

Experimental group 1 (loading group): In the first week, every individual was given a 5 g creatine solution four times per day and they were asked to take it at 8 and 12 am and 4 and 8 pm. After termination of the loading week, the participants received a 5 g creatine solution for three times and were recommended to consume it once 30 to 45 min before the training and another time immediately or up to 10 min after the training on training days. Also for the third time, they were asked to consume half of it (2.5 g) at 8 am another half (the remaining 2.5 g) at 12 pm on the days they have no training; i.e. on the days other than the training ones, they consumed only 5 g creatine [2, 4, 16].

Experimental Group 2 (Non-loading Group): Their creatine consumption was similar to that of group 1, except that they had no loading in the first week and did not consume creatine.

Group 3 (Placebo Group): Their creatine consumption was similar to that of group 2, except that they used corn powder instead of creatine supplement which could not be distinguished from monohydrate creatine supplement in terms of flavor, color or smell.

Training Program

Training program was considered in such a way that almost all body muscles had training pressure at least once per week by doing various multi-joint movements like chest press, scout, lift and barfix and the training had optimal quality. Each session's maximum training period was one h

RESULTS

The results of this study indicated that creatine supplementation loading (experimental group 1) could significantly influence strength index in chest press movement (F=4.95, p=0.016), lift (F=6.46, p=0.006) and arm front (F=6.00, p=0.008) in comparison with non-loading method (experimental group 2) and the method without using supplementation (control group). However, this effect was not significant in scout (F=2.38, p=0.11).

Chart 1. Scott's record changes in pre-and post-test with loading and non-loading creatine and placebo groups

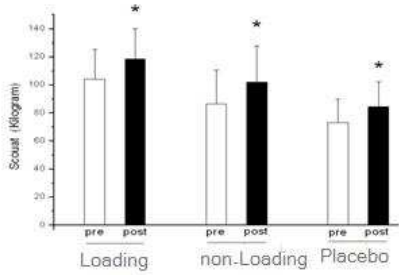


Chart 2. Ddlyft record changes in pre-and post-test with loading and non-loading creatine and placebo groups

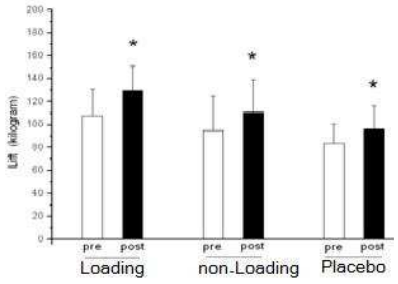


Chart 3. bench press record changes in pre-and post-test with loading and non-loading creatine and placebo groups

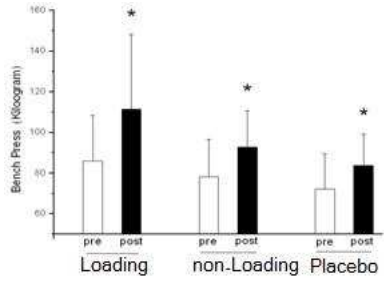


Chart 4. Larry biceps record changes in pre-and post-test with loading and non-loading creatine and placebo groups

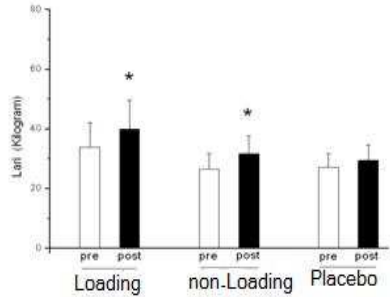


Chart 5. Percent body fat changes in pre-and post-test with loading and non-loading creatine and placebo groups

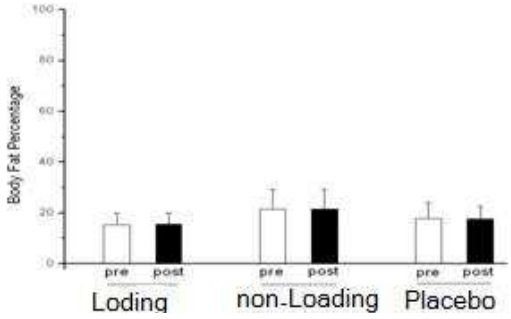
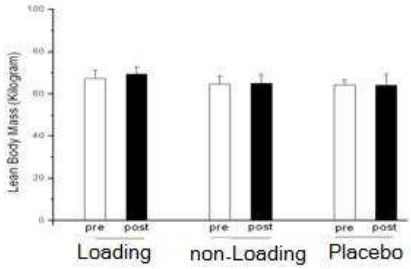


Chart 6. Lean body mass changes in pre-and post-test with loading and non-loading creatine and placebo groups



Also, the participants of these three groups did not show any significant changes in fat percent (F=1.51, P=0.24). In both of the experimental groups, after implementing the training protocol using creatine supplement, body net mass increased, which was higher in loading group than the non-loading one (F=46.11, P=0.001). Mean of arm and thigh circumferences increased in loading and non-loading groups but it did not change in placebo group. The increase in creatine loading group was remarkably higher than the non-loading one (F=42.51, P=0.001, for arm circumference, F=21.06, P=0.001 for thigh circumference).

DISCUSSION

In short, this study demonstrated that creatine supplementation loading (experimental group 1) could significantly influence strength index in chest press, lift and arm front movements compared with non-loading method (experimental group 2) and not using supplement method (control group); but, this effect was not significant for scout. It seems that non-significance could be due to the reason that initial strength for complex movements like leg exercises which involves multi-joint ones was not caused by hypertrophy; however, it was the result of nervous compatibilities or learning. Gaining initial strength in exercises with less complexity such as those including movement in one joint (e.g. arm front movement) was mostly the result of hypertrophy [17]. More increase in all three groups (almost to a similar ratio of 1RM) in scout movements compared with lorry arm front might be due to this muscle's larger size which has more strength than smaller muscles; also, since the participants had shown less interest in doing leg movements in the past, being placed in a regular program with more leg movements caused more increase due to nervous compatibilities or "learning effect" and vice versa; because mono-joint movements such as arm front had been their common movements during previous training programs, this increase might be due to muscular hypertrophy. In fact, increased strength in chest press, dead lift and lorry arm front movements was significant in loading group compared with non-loading and placebo groups.

Besides, there was no significant change in terms of fat percent of the participants of these three groups. In both experimental groups, after implementing training protocol and consuming creatine supplementn, body net mass raised, which was significantly higher in loading group than non-loading one. Mean of arm and thigh circumferences incaresed in loading and non-loading creatine groups and did not change in placebo group. Incarese in creatine group with loading method was noticeably higher than that of non-loading one.

In a study by Johnson et al., effect of creatine supplementation and resistance training on muscle strength and displaced weight was analyzed and it was concluded that consuming creatine supplement during resistance training resistancewas more effective in terms of increased muscle strength and displaced weight compared with resistance training alone; however, the responses were very different [6]. Also, numerous reports have been made on short-term supplementation effect (4-7 days) of creatine on the participants' different body composition [19]. Frederico et al. [1] found that consuming a high amount of creatine and caffeine had no effect on sedentary or trained mice's LMB composition; nevertheless, caffeine alone resulted in decreased fat percent [1]. In another research, Robert et al. discovered that 28 days of consuming creatine supplementation increased phosphocreatine of resting muscle, muscle's glycogen content and plasma volume during training [3]. Saremi et al. [4] studied effects of edible creatine and resistance training on serum myostatin and GASP-1 [4].

Brinkwill et al. demonstrated that lean mass increase caused 80% of body weight in creatine group. Increase in arm's muscle level confirmed this lean mass increase that was in line with the results of the present research [17]. Bemben et al. [18] studied the effect of 7 weeks of monohydrate creatine consumption, resistance training and both on wrestlers' body composition; their results indicated a significant difference between experimental group and other two groups in terms of lean weight [18]. In addition, researchers have concluded that combination of creatine supplementation and resistance training can create a better effect on wrestlers' body composition compared with resistance training alone [16], which was in line with the achieved results.

In another study, difference of weight and lean mass was not significant between two creatine and placebo groups [10]. This study did not support the results obtained from the present study. Also, increase in the maximum isometric strength in placebo group and a part of this increase in creatine group can be attributed to the familiarity of participants with the test, their high motivational level in post test and also irrefutable psychological impact of placebo usage.

Bemben and Lamont studied the increase of lean weight and size of muscular fibers following creatine supplementation in weight lifters and concluded that it was due to the improved muscle strength and their ability in lifting heavier weights after creatine supplementation [18]. In another study, Cornish observed that four days of creatine supplementation (taking 4 g for 5 times) increased 1.2% of lean weight in the studied participants [9]. The

results of these two studies were congruent with those of the present research and increased body mass has been reported as one of the most stable findings in terms of creatine supplementation.

Various studies have reported weight and body mass increase in the range of 0.9 to 2.5 kg following 5-7 days of creatine supplementation (20-25 g per day) [18]. Many investigations have confirmed positive effect of creatine loading on muscle's isometric and isotonic strength performance [18]. The reason explained for this increase is that creatine supplementation incareses creatine concentration and intramuscular phosphocreatine and subsequently increases ATP rebuilding capacity, which is directly related to the increased force. Increased accessibility to high ATP level during maximum task might explain improved muscle strength after consuming creatine supplement [18]. Some believe that, since creatine makes athletes work out more intensely, stimulation for their increased training severity could result in higher hypertrophy and thus leading to increased body weight and lean weight [18]. Generally, it seems that improvement and increase in muscular mass is probably the result of combining all three the mentioned cases.

The results of present study implied that creatine consumption in loading method was more useful for athletes; but, the existence of numerous contradictory information about effect of creatine supplementation on athletes' performance and extensive and growing use of this substance, particularly by teenagers and young people who have recently developed growing interest in sport (especially, bodybuilding) due to their belief in highly positive effect of this substance emphasize the necessity of more extensive studies in this field.

CONCLUSION

Possetive efecct of the results: creatine supplementation brings Changes in muscle strength Weight and volume And body composition And considering the fac the international organization of sport Creatineas A chemical unauthorized It is not known , The Coaches Athletes Officials and team sports nutrition recommended This Article Added to the diet.according to the results of the present studies it is recommended .for more effect use Loading methodis,However there are still many questions about the effects of cratine. we hope in the future researchers could answer to these questions.

Suggestions for future research

1- This study is Just for Bodybuilders; therefore this Research on Other sports in which Creatine use is common can be beneficial.

2- This study is Just for Gentlemen was performed, that similar to this study In the case of women Can be effective.

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