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The effect of short-term consumption of creatine monohydrate supplement on anaerobic performance in male wrestlers (16-20 years old)

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ABSTRACT

The purpose of this study is the effect of a short-term consumption of creatine monohydrate supplement along with selected plyometrics training on some anaerobic performance of wrestlers aged 16-20 in wrestling schools team of Toyserkan city. Twenty-four qualified wrestlers were selected out of 62 wrestlers in high school team, and they were grouped randomly in three equal groups; creatine (8), placebo (8) and control group (8). In creatine group the subjects consumed creatine along with selected trainings for the purpose of creatine loading, in a way that they required to daily consume 20 grams of creatine monohydrate supplement, and following their consumption with daily 5 grams of creatine for two weeks. The placebo group were treated as same as the creatine group, the only difference was that they consumed wheat flour instead of creatine. The results analysis were conducted at a significant and meaningful level ($p < 0/05$) using independent and dependent *t* implicational statistics. Results showed that muscle strength in leg press movement, body weight, circumference of arm and right thigh and lean body mass increased significantly but fat percentage, reduced clearly.

Key terms: creatine supplement, plyometrics trainings, anaerobic.

INTRODUCTION

In today's world in which science is progressing at a high rate and a new gates of science are opening to people every day, sports sciences and physical education is not an exception to this category and it uses all relevant sciences in order to achieve its goals. Different experts attempt to help athletes to gain the best performance by deriving benefit from sciences related to sports. An athlete cannot obtain all required nutrition necessary for his/her body from daily foods, due to some limitations, therefore, investigators have studied about the consumption of supplements required for athlete's body; and it was revealed that their right consumption could be useful.

One of these supplements is creatine supplement. Creatine raises the muscles' power and by delaying fatigue enables the athletes to exercise harder and more intensively and achieve adaptations beyond their muscles' natural capacity [11, 14]. Also; some researchers have mentioned that consumption of creatine increases the power in elders and individuals suffering from muscle or heart diseases [11].

One of the creatine supplements which has become popular and very common is creatine monohydrate (CrH_2O) which produces energy, influences general health and also raises muscles' mass in athletes [10].

Researchers have conducted a lot of studies in relation with the consumption of creatine supplement in different sports with different time periods and different doses and its influence on increasing of muscles' power and mass.

Ghare- khanloo [6] studied the short-term effect of daily use of 20_{grs} to 30_{grs} of creatine supplement on anaerobic performance and blood lactate in male wrestlers; the results indicated that the consumption of creatine supplement makes muscles more massive, increases performance in power and speed sports and raises phosphocreatine resources of muscles and as a result increases the reconstructing rate of ATP [6, 10, 11].

In a study, Robert Hickner [7] investigated creatine supplement for 28 days (daily 3_{grs}) in 12 male cyclists; the findings of this study indicates that total rate of whole body's creatine (Tcr) has increased for 24.5% and phosphocreatine has increasing of 38.5%. Studies show that oral consumption of creatine monohydrate in liquid form, daily 20_{grs}, for two weeks, increases intracellular compression of creatine and free phosphocreatine up to 30% and this rate remains at high level in the body several weeks after consumption of creatine [2],

The increasing phosphocreatine in the muscles improves recovery period in intensive and short-term activities such as speed running and causes increasing in the amount of accomplished work in following activities (Cassy1996)[3]. Considering the fact that wrestling sports field is among alternative activities whose main energy sources are provided by phosphogen and acid lactic system; it requires immediate reconstruction of resources after consumption (scientific and right principles of training by Dr. Ramezanpoor)[12]. Consumption of creatine supplement could possibly be an effective factor on the performance of wrestlers; thus this study focuses on the effects of creatine monohydrate 0.7_{grs} for per kilogram of athletes' body weight in loading period and consumption of 0.07_{grs} for per kilogram of athletes' body weight in maintenance period, on anaerobic performance, explosive might, power and speed of wrestlers.

MATERIALS AND METHODS

Present study is of semi experimental type which has been conducted using three subject groups (creatine and training, placebo, training and control) in double blinded form. The protocol of this investigation was in such a way that the subjects in two groups, creatine and placebo, conducted the given plyometrics trainings in completely similar conditions, the only difference was that the creatine group consumed it for 5 days, 0.7_{grs} for per kilogram of athletes' body weight (around 20_{grs}) and in loading period, 0.07_{grs} for per kg of athletes' body weight (around 5_{grs}) during maintenance period which lasted for two weeks. In placebo group, neutral substance (hygienic wheat flour) was consumed. In control group no training or supplement was used and subjects only attended in pretest and posttest.

Statistical community of this study consisted of 24 wrestlers aged 16-20 years old in schools of Toyserkan city who attended this study voluntarily. Then, they completed the consent form and then were randomly divided into three groups each consisting of 8 subjects: 1- creatine group 2- placebo group 3- control group; they attended the pretest which consisted of vertical jump of Sargent, 45-meters speed running and muscle strength in leg press test. Both groups, creatine and placebo, attended the plyometrics training programs in equal conditions including location, time, number and frequency for 19 days and the only difference was that creatine group consumed creatine monohydrate supplement four times: 1- before breakfast 2- before training 3- after training 4- before sleeping, for 5 days, which named, loading stage.

In maintenance period which lasted for two weeks, they consumed around 5 grams of creatine at once before training. In placebo group exactly the above procedures were followed except that a neutral substance, wheat flour, was used instead of creatine supplement. Creatine supplement and wheat flour were packed in similar parcels and the investigator had emphasized the subjects to mix the contents with juice or sugar syrup and not to use caffeine, tea or coffee, and in return, raise the consumption of water during this 19 -day's period.

Table 1-characteristics of subjects in two groups; creatine and placebo (M&SD)

Variable	Creatine (N=8)	placebo (N=8)
Age(years)	18.37±1.18	17.75±1.16
Height (CM)	174±8.85	171.81±5.89
Weight(kg)	68.62±12.87	65.5±9.5
Fat (percent)	5.97±2.3	5.93±2.36
lean body mass (kg)	63.86±7.06	61.62±8.12

In the morning of day 20, pretest and posttest were conducted under same conditions. To compare each of the tests and study the results before and after consumption period of each group the dependent t-test and for the purpose of comparing mean of each test between creatine and placebo groups, independent t-test were used; $P \leq 0.05$ was considered to study the significant difference (meaning fullness) level.

After collecting data, the mean of individual characteristics of subjects in age, height, weight, fat percentage and lean body mass variables in two creatine and placebo groups has been demonstrated, completely in table1.

Also, the results and findings of present study for two groups, creatine and placebo, in three anaerobic factors, I- explosive might through sargent jump test assessment, II-speed using 45-meters running test and III- muscular power through leg press test have been shown in table 2 and 3; but since there was no difference in the results of control group, its analysis are not presented here.

Table 2- The results of pre and post-tests of variables in creatine groups.

Variables	N	df	Mean and std .deviation		T	Sig
			Pre test	Post test		
Power (N/S)	8	7	102.12±17.42	114.62±18.44	3.863	0.006
Speed (S)	8	7	6.61±0.39	6.27±0.29	2.991	0.020
strength (kg)	8	7	145.62±27.31	155.62±23.36	2.756	0.042

Table 3-The results of pre and post-tests of variables in placebo groups.

Variable	N	df	Mean and std .deviation		T	Sig
			Pre test	Post test		
Power (N/S)	8	7	99.75±7.12	98.25±6.87	0.728	0.49
Speed (S)	8	7	6.71±0.31	6.73±0.39	0.345	0.740
strength (kg)	8	7	131.25±33.67	132.50±35.15	1.528	0.170

As it is regarded in table (2), the findings of pre and post-tests of creatine group in Sargent jump test indicates 1.165 percent increase which is significant or meaningful, through observed T ($p < 0.05$). But in placebo group the results of pre and post-tests in Sargent jump test shows 0.687 percent decrease which is not statistically significant through the results of observed t. Also, the comparison of post-tests of both groups and the results of independent T shows that the differences of two groups, creatine and placebo, are not significant.

Considering tables 2 and 3 and using of independent dependent t-test conducted on both creatine and placebo groups separately, revealed that in the factor of speed in 45-meters test in creatine group, the record of wrestlers improved significantly; but in placebo group, the record of subjects and results obtained were not statistically significant.

Thus, this reveals the effect of a short-term consumption of creatine supplement on the wrestlers, speed and improves the performance of them in 45-meters running record.

As it is observed in tables 2 and 3, the increase in power performance of subjects in creatine group ($p = 0.042$) by using dependent t-test was statistically significant while this increase in placebo group ($p = 0.170$) was not significant. Also, comparison of post-tests in both groups and significant level obtained from independent t-test findings shows that the differences between creatine and placebo groups were not meaningful.

DISCUSSION AND CONCLUSION

Discussion

Comparison of Sargent jump test record in pre and post-tests of creatine group with 102/12 and 114/62 kg/m/s means shows that a short-term period of creatine monohydrate supplement consumption can improve explosive power of wrestlers which statistically is significant. This Findings of present study confirms those of Lehmkuhl [9] and Jon Yeansub Lim [8], Eckerson [4,5], but these findings are different from those of study conducted by Asadi[1]. Probably the un-similarities about duration and period of supplement consumption, gender, type of sports field, characteristics and physical qualifications of wrestlers, type of exercises or trainings in two studies could caused the differences. Or it may be related to the consumption dose of creatine supplement in a way that in Asadi's study the creatine supplement consumption dose was 0.3_{grs} for per kilogram of body weight but in present study it was 0.7_{grs}.

Through comparing the record of 45-meters speed running in pre- and post-tests of group it is observed that short-term consumption of creatine monohydrate supplement can have significant effect on speed factor of wrestlers. Statistical results of this study showed that the rate of record changes in 45-meter speed running in creatine group has 0.136 percent reduced which is statistically significant and this may be due to the type of sports field and lack of using training outside the wrestling gym.

Considering the fact that wrestling gyms have limited dimensions, it is possible that using track and field court improves performance record of wrestlers in 45-meters running. Also, comparing results obtained between means of post-tests in groups, creatine and placebo, and 45-meters speed running record using t-test; it was revealed that there is no statistically significant difference between two groups. This may be due to the experience or training of wrestlers and their physical properties. Also, speed factor is an inherited talent and if athletes are trained or experienced, a short-term period of creatine supplement consumption and conducting plyometrics trainings cannot have significant effect on their records.

The results of this study are in agreement with those of Eckerson study [5], Lehmkuhl [9], and Rudondo [13]. But study by Asadi [1] conducted on female physical education students for one week, with 0.3_g for per kg of body weight did not conform to above ones. The reason for this difference could be due to gender, consumption dose and duration of creatine monohydrate supplement consumption.

The results of leg press test in creatine group revealed that consumption of creatine monohydrate supplement and performing selected plyometrics trainings increases muscular power in leg press movement up to 10_{kg} which is statistically significant. Comparing post-tests of both groups and acquired significant levels may show the positive effect of creatine monohydrate on increasing muscular power in wrestlers.

It should be mentioned that considering the direct impact of creatine supplement on reconstructing energy resources and increasing of phosphor-creatine of muscles and, as a result, the increasing of ATP; in most conducted studies, the increasing of muscular power could be observed.

CONCLUSION

In general, short-term consumption of creatine monohydrate supplement along with performing selected plyometrics training is very useful in improving some anaerobic performances of wrestlers.

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