



## Comparing the Short-Term Effect of Creatine, Beta-Alanine, Combine Creatine\*Beta-Alanine on Torque of Knee Extensor Muscles

### KEYWORDS

Creatine, Beta-Alanine, peak torque, knee extensor muscles

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**ABSTRACT** *The aim of this study was to compare the short-term effect of Creatine, Beta-Alanine, combine Creatine-Beta-Alanine on peak torque, time to peak and torque development of knee extensor muscles in speeds of 60 and 180 degree/seconds. torque parameters of 40 healthy university athletes dominant leg knee extensors in angular velocity of 60 and 180 degrees per second in the isokinetic machine in 40 subjects in the pre-test and post-test were measured. Analysis of covariance was used to data analysis. No significant changes in peak torque, time to peak and torque development of knee extensor muscles after short-term use of Creatine, Beta-Alanine, combine Creatine\*Beta-Alanine at any rate in speeds of 60 and 180 degrees per second. short- term consumption (5 days) of Creatine, Beta-Alanine, combine Creatine\*Beta-Alanine cannot lead to peak torque, time to peak and torque development of knee extensor muscles in speeds of 60 and 180 degrees per second improvement.*

### Introduction

Creatine and Beta-Alanine has become a popular nutritional supplement among athletes. Short-term creatine supplementation has been reported to improve maximal power/strength; work performed during sets of maximal effort muscle contractions, single-effort sprint performance, and work performed during repetitive sprint performance(1-3)

Recently, attempts have been made to enhance the effects of creatine by adding  $\beta$ -alanine to its formula.  $\beta$ -alanine, an amino acid derivative, has been shown to increase carnosine concentrations within skeletal muscle(6). Carnosine has been shown to enhance the buffering capacity during high-intensity exercise(5). Although creatine supplementation alone has been shown to improve fatigue rates in anaerobic exercise(7), additional benefits supplied by  $\beta$ -alanine may further reduce the rate of fatigue in muscle providing for a greater training stimulus. The endocrine system has been shown to respond to changes in exercise intensity, volume, and rest(8). Considering that creatine supplementation is thought to improve the quality of the workout, it may have important implications to endocrine function and influence on muscle remodeling. Although limited research has indicated that creatine supplementation does not influence the acute responses to an exercise stress(4,7), its' ability to change resting hormonal concentrations is less understood. Volek and colleagues have indicated that alterations in resting hormonal concentrations are unable to explain performance and body composition changes during a 4 wk resistance training program(11). However, the aim of this study was to compare the short-term effect of Creatine, Beta-Alanine, combine Creatine\*Beta-Alanine and amount of consumption on peak torque, time to peak and torque development of knee extensor muscles in speeds of 60 and 180 degree/seconds.

### Methods

40 active healthy subjects without disease and the lack of any special diet or taking any type of supplement voluntarily were selected to participate in the study. After explanation of the study objectives and complete the consent form, the subjects were randomly divided into five groups: creatine(n=8), placebo(n=8), beta-alanine(n=8), or placebo(n=8) and control(n=8). All participants signed an informed consent form before participating in the study.

Ethics approval center for study was Tehran medical university that this center ethic review board previously reviewed the study protocol and then study were done.

Subjects were familiarized with the isokinetic device and several times were trained the isokinetic test conditions and repeated the knee extension with maximum power. Three days later than the subject's familiarization with the testing, the subjects' height and weight measured with a digital scale and stadiometer Model Es-1200 respectively and the pre test of biodex isokinetic Pro. 3 were taken.

To obtain parameters related to the torque of the knee extensor muscles the dominant leg(a foot which subject strikes the ball), isokinetic machine was set so that each subjects performed knee extension at angular velocities of 60 and 180° per second six times with a maximal power.

Creatine supplementation was performed on 5 consecutive days. Placebo group received glucose supplements as placebo. The beta- alanine Supplement consumed as a capsules three times daily along with major meals by the experimental group. Finally, the post test of the knee extensor muscle torque was done in speeds of 60 and 180 degree per second immediately days after the end of supplementation. The covariance analysis used for statistical analysis in alpha level at  $\leq 0.05$  in SPSS program version 16.

### Results

Means and standard deviations of demographic characteristics in studied groups are shown in table 1.

**Table1. Means and standard deviations of demographic characteristics in studied groups.**

	Age(years)	Height(cm)	Weight(kg)
Creatine	19.78 $\pm$ 1.12	178.73 $\pm$ 3.34	76.46 $\pm$ 12.23
Beta-Alanine	18.26 $\pm$ 3.55	179.66 $\pm$ 8.62	77.44 $\pm$ 15.69
combine Creatine*Beta-Alanine	18.00 $\pm$ 2.06	178.11 $\pm$ 3.34	78.46 $\pm$ 15.23
Placebo	19.00 $\pm$ 3.23	179.73 $\pm$ 8.34	76 $\pm$ 12.03
Control	17.71 $\pm$ 1.32	178 $\pm$ 3.04	77.06 $\pm$ 15

Covariance analysis results for supplements effect on peak torque in speeds of 60 and 80 degree are shown in table 2 respectively.

**Table2. Covariance analysis results for supplements effect on peak torque in speeds of 60 and 80 degree**

	Sum of squares	Df	Mean squares	F	Sig
Pre test	75143.629	1	75143.629	127.321	0.000
group	2002.013	4	500.503	0.848	0.500
speed	1198.414	1	1198.414	2.031	0.159
group *speed	767.027	4	191.757	0.325	0.860
error	40723.085	69	590.190		
sum	4709111.51	80			

Based on the obtained results of the table 2, the creatine, beta-Alanine, combine creatine\*Beta-Alanin supplementation hasn't significant effect on peak torque of the knee extensor muscles in 60 and 180 degree per second speeds.

**Table3. Covariance analysis results for supplements effect on time to peak torque in speeds of 60 and 80 degree**

	Sum of squares	Df	Mean squares	F	Sig
Pre test	64807.228	1	64807.228	14.714	0.000
group	23573.155	4	5893.289	1.338	0.266
speed	130429.412	1	130429.412	29.612	0.000
group *speed	11400.055	4	2850.014	0.647	0.631
error	303917.772	69	4404.605		
sum	14995200.0	80			

Based on the obtained results of the table 3, the creatine, beta-Alanine, combine creatine\*Beta-Alanin supplementation hasn't significant effect on time to peak torque of the knee extensor muscles in 60 and 180 degree per second speeds.

**Table4. Covariance analysis results for supplements effect on torque development in speeds of 60 and 80 degree**

	Sum of squares	Df	Mean squares	F	Sig
Pre test	0.168	1	0.168	2.550	0.115
group	0.371	4	0.093	1.404	0.242
speed	1.207	1	1.207	18.272	0.000
group *speed	0.294	4	1.073	1.112	0.358
error	4.558	69	0.066		
sum	48.148	80			

Based on the obtained results of the table 4, the creatine, beta-Alanine, combine creatine\*Beta-Alanin supplementation hasn't significant effect on torque development of the knee extensor muscles in 60 and 180 degree per second speeds.

## Discussion

One of the main aims of this study was the effects of short term creatine, beta alanine and combined creatine- beta alanine supplementation on peak torque of knee extensor muscles in speeds of 60 and 180 degree/seconds. The results showed that there isn't significant effect due to these supplementations on peak torque of knee extensor muscles. Our results in this regards is consistent with Cornish et al(2006) and Hoffman et al(2005).

Creatine monohydrate supplementation has been shown to enhance high-intensity exercise performance in some but not all studies. Part of the controversy surrounding the ergogenic effect(s) of creatine monohydrate supplementation may relate to design issues that result in low statistical power. A further question that remains unresolved in the creatine literature is whether or not males and females respond in a similar manner to supplementation. reported increased peak and relative peak anaerobic cycling power, dorsi-flexion

MVC torque, and increased lactate with no gender specific responses after Creatine supplementation(2). Tarnopolsky et al concluded that short-term Creatine supplementation can increase indices of high-intensity exercise performance for both males and females.<sup>20</sup> Biwer et al(2003) in studying the effect of creatine on treadmill running with high-intensity intervals stated that there was a significant treatment effect of creatine supplementation on body mass in the men; however, no significant differences were observed in the women(2). There were no treatment effects on time to exhaustion, ratings of perceived exertion, or blood lactate concentration. There was a tendency for blood lactate levels to be lower after short-term creatine supplementation in the women, but this was not statistically significant. Based on these results, it appears that creatine supplementation does not improve performance in submaximal running interspersed with high-intensity intervals(2).

Our results in the regards that creatine supplementation hasn't effect on torque development is consistent with Cornish et al(2006) and Hoffman et al(2005). The probable cause to align results with results of previous studies can be attributed to this fact that previous studies did not use creatine supplementation with glucose, insulin and creatine supplementation need to enter the muscle cells with the protein and carbohydrate intake, because its intake will help to insulin increase(3,5,6). The other reason is that this study was conducted on athletes and the most of them athletes commonly used these supplementations that the body may accommodate to these supplements.

Also our results in the regards that beta-alanine supplementation on torque development is consistent with Cornish et al(2006)(3). Probable cause to align their results with the results of previous studies is consuming time. The 5 days of taking the supplements is low and the studies with long duration have better results. Combined creatine- Beta alanine supplementation results on torque development was not significant in our study, there wasn't direct study in this area.

## Conclusion

it can concluded that short-term use(5 days) of supplements does not improved the torque, time to peak torque and torque development of knee extensor muscle at speeds of 60 and 180 degrees per second.

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