

EFFECTS OF TWO DIFFERENT DOSAGE OF BCAA SUPPLEMENTATION ON SERUM INDICES OF MUSCLE DAMAGE AND SORENESS IN SOCCER PLAYERS

Payam Mohamad-Panahi¹, Soran Aminiaghdam², Navid Lotfi^{3*} and Khaidan Hatami¹
Department of Physical Education, Sanandaj Branch, Islamic Azad University, Sanandaj, Iran¹
Department of Physical Education, Saghez Branch, Islamic Azad University, Saghez, Iran²
Department of Physical education, Ghorveh Branch, Islamic Azad University, Ghorveh, Iran^{*3}

Annotation. The purpose of this study was to investigation of the effects of two different dose of BCAA supplementation on serum indices of muscle damage and soreness in soccer players. 30 male soccer players (age: 20.2±0.6 yr) participated as subjects in this study. Subjects were randomly divided into three groups (double-blind design). All subjects performed lower- body resistance exercise (6 sets, 10 repetitions, 70% 1RM). The BCAA was given at doses of 200 and 450 mg.kg⁻¹ BW for supplemental groups 1 and 2, respectively, 30 minutes before and after to exercise tests and carbohydrate was given at dose of 200 mg.kg⁻¹ BW for placebo group. To identify enzymes activity (IU/L), venous blood samples were collected 30 min prior to exercise and at 24 and 48 hrs post exercise. Data were statistically analyzed using repeated measures ANOVA and Bonfferoni test. Baseline CK, CK-MB and muscle soreness were determined 30 minutes before the exercise test. Baseline serum values for CK, CK-MB and baseline muscle soreness were not different between groups in the 30 minutes before the exercise test ($p>0/05$). However, there were significant increases between the pre-exercise and post-exercise values for CK, CK-MB and muscle soreness from 24 hrs to 48 hrs post-test ($p<0/05$), but there were no significant differences between two groups ($p< 0.05$). These results suggested that two different dosages of BCAA supplementation did not affect muscle damage and muscle sureness during resistance exercise bout in soccer players.

Key words: branch-chain amino acid, soccer, muscle damage, muscle soreness.

Introduction

Exercise-induced muscle damage has been reported to result in a number of local and systematic changes including disruptions to the sarcolemma, myofibrils and excitation-contraction coupling processes, swollen mitochondria and an elevation of muscle proteins in the blood and muscle soreness [3-13]. Studies have shown that intense repetitive exercise especially when it involves a large eccentric component is typically associated with damage to connective or contractile tissue of skeletal muscle [19-10].

Leucine, isoleucine, and valine possess a similar structure with a branched-chain residue and therefore are referred to as BCAAs. All are essential amino acids for animals and share a common membrane transport system and enzymes for their transamination and oxidative decarboxylation [24]. Recent studies have demonstrated that free BCAAs, especially leucine, play a very important role in protein metabolism [24]. Therefore, BCAAs may play an important role in injury prevention and faster recovery. Recently branched-chain amino acid has been considered by researchers in decrease this exercise-induced muscle damage [9, 14, 17,18]. Recent studies have demonstrated that BCAA supplementation administration before and during endurance exercise may attenuate the clinical signs of fatigue and muscle damage [11]. In contrast, Zebblin (2007) showed that BCAA supplementation administration before mild resistance exercise had no effect on serum CK activity.

Factors in reducing muscle damage have been investigated in many studies and conflicting results have been reported. But to date there are no published studies to support the effects of BCAA damage on indicators of muscle damage after resistance training. Therefore, the purpose of this research was to determine the effects of two different dosage of BCAA supplementation on Serum Indices of Muscle Damage and Soreness in Soccer Players.

Methods.**Subjects.**

Thirty young soccer (age (yr): 20.2±0.6, weight (kg): 74.2±2.4, height (cm): 177.36±1.13 and body fat (%): 16.2±0.8) participated as subjects in this study. All subjects in a randomized and double-blind design were divided into three groups: supplemental 1 and supplemental 2 and placebo groups. They have 3 training session per week. Subjects were instructed to refrain from unaccustomed exercise during the course of the study starting 48 h before the exercise session.

Nutritional supplements design.

The supplemental group consumed the BCAA supplementation (50% leucine, 25% isoleucine, 25% valine (Pooyan Nutrition Company)) for 9 days. In addition to this amount, 200 and 450 mg.kg⁻¹ of drug were consumed 30 minutes before and after the exercise test by the supplement groups 1 and 2, respectively .

The placebo group consumed 68 mg.kg⁻¹ dextrin three times a day, instead of BCAA, with an additional 200 mg.kg⁻¹ given directly 30 minutes before and after the exercise test.

Exercise protocol.

Subjects were requested to avoid exercise the day of the test session. The training sessions consisted of 3- different resistance exercises (leg press, knee extension and knee flexion). Subjects performed 6- sets × 10 reps at 70%

1RM for each resistance exercise (One-minute rest intervals between each sets and three-minute rest intervals between exercises).

Experimental design.

Body composition was estimated using the sum of three skinfolds (chest, abdomen, and thigh) following the procedures outlined by Jackson and Pollock. Subjects were given up to 4 maximal attempts to achieve 1RM. Rest periods of 3 to 5 minutes were given between trials. Subjects were instructed to perform a 10 minute warm-up on a cycle ergometer. Baseline muscle damage was evaluated using the measurements of serum CK, CK-MB levels and muscle soreness. Baseline muscle soreness was evaluated using the visual analogue scale (VAS) which has been utilized as a valid indicator of pain in several studies (24, 25) has correlated with other indices of muscle damage including MVC, and CK (24), and has obtained reported reliability scores as high as $r = 0.97$ for assessing soreness (26).

Statistical Analyses.

The Kolmogorov-Smirnov test was used for testing normality. All descriptive data are expressed as means \pm SD. Data were analyzed using two-way repeated-measure ANNOVA. Statistical significance was set at $P < 0.05$. Statistical analysis was conducted using SPSS 18.0 for Windows.

Results

Subjects' data are presented in Table 1. There were no differences among groups for age, bodyweight, height, percent body fat and lean mass (Table 1).

Table1. Subject Characteristics (n = 30)

Characteristics	Supplementation1	Supplementation2	Placebo	P
Age (yr)	20.2 \pm 0.9	20.1 \pm 0.7	20.3 \pm 0.6	0.63
Height (cm)	177.3 \pm 1.1	178.5 \pm 1.2	176.2 \pm 1.0	0.81
Weight (kg)	74.1 \pm 2.3	75.3 \pm 2.9	74.9 \pm 2.6	0.3
Body Fat (%)	16.1 \pm 0.9	16.3 \pm 0.8	16.2 \pm 0.7	0.7
Leg press (kg)	227.1 \pm 12	231.4 \pm 11.1	235.6 \pm 11.7	0.69
Knee extension (kg)	52.7 \pm 4.1	52.1 \pm 3.1	53.9 \pm 3.9	0.74
Knee flexion (kg)	86.1 \pm 5.3	84.3 \pm 3.7	83.4 \pm 5.1	0.51

9-day diet analysis revealed no differences in the energy, protein, fat and carbohydrate intake between groups throughout the study (table 2). Subjects were instructed to maintain their normal eating habits during the study.

Table 2. Diet Analyses

Characteristics	Placebo (n=10)	Supplementation 1 (n=10)	Supplementation 2 (n=10)	P
Energy Intake (kcal/kg/day)	2464.2 + 292.1	2460.1 + 303.81	2505.38 + 271	0.51
Protein Intake (g/kg/day)	68.9 + 9.7	67.4 + 9.6	68.5 + 11.3	0.91
Fat Intake (g)	71.9 + 9.7	70.1 + 11.3	74.5 + 10.5	0.54
Carbohydrate Intake (g)	362.7 + 74.1	365.3 + 72	366.44 + 73.6	0.9

Serum Creatine kinase activity.

Mean serum CK level before and 24 and 48 hrs after the exercise is presented in Fig1. CK level reached its peak activity 24 hours after exercise (659.8 \pm 154.8 U/l for the placebo-supplemented group, 607.5 \pm 155.4 U/l for the high dose BCAA supplement group and 625.4 \pm 153.4 U/l (mean \pm SE) for the low dose BCAA supplement group). In all groups, CK was significantly elevated at the 24 and 48 hrs.

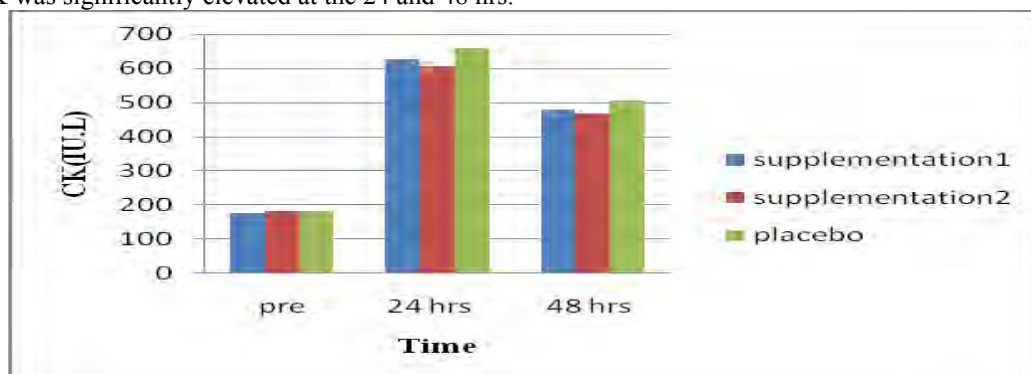


Fig 1. Serum creatine kinase concentration during 48 hours

Serum CK-MB activity

Mean serum CK levels before and 24 and 48 hrs after the lower-body resistance exercise is presented in Fig1. Serum CK-MB activity was elevated in three groups 24 and 48 hrs after resistance exercise. Approximately 24 hrs after resistance exercise, CK-MB activity reached peak (659.8 ± 154.8 U/l for the placebo-supplement group, 607.5 ± 155.4 U/l for the high dose BCAA supplement group and 625.4 ± 153.4 U/l for the low dose BCAA supplement group). CK-MB was significantly elevated in all groups at 24 and 48 hrs.

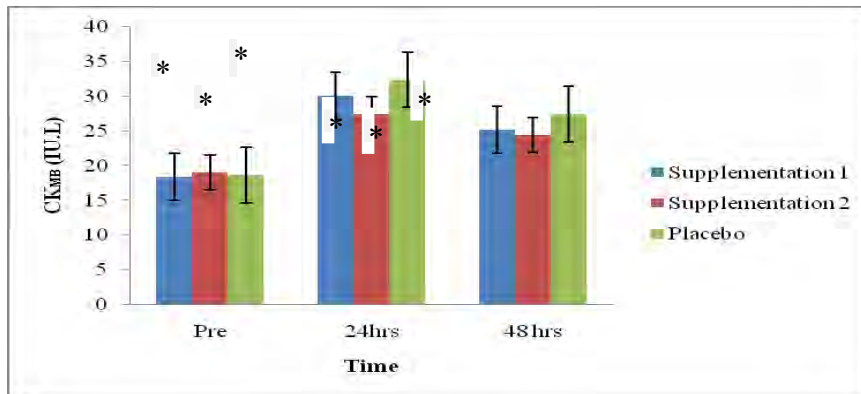


Fig 2. Serum creatine kinase (CK-MB) concentration during 48 hours

Muscle soreness.

Pre exercise values were not different among groups for muscle soreness. Muscle soreness significantly increased above baseline in all groups at all time points ($p < 0.05$; Fig 3). Peak soreness occurred in all groups at 48 hrs after exercise. Also, the two different dose of BCAA supplementation had no effect on soreness scores.

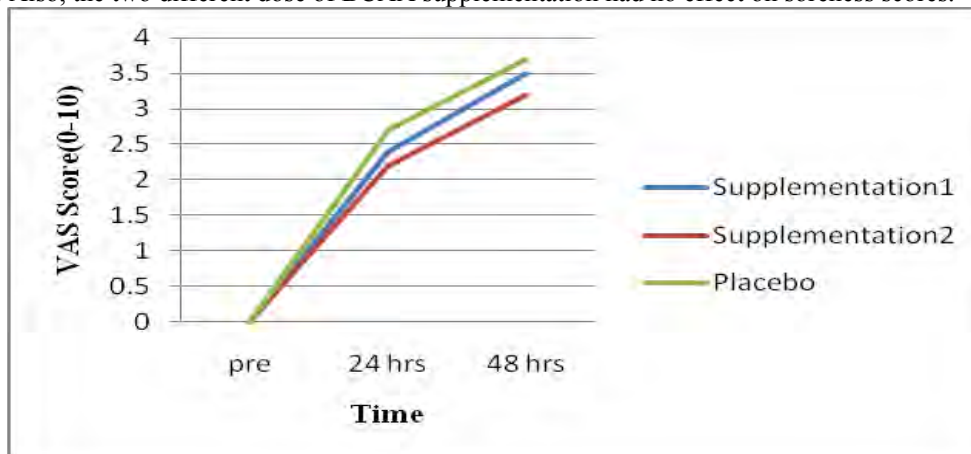


Fig 3. Visual Analogue Scales (VAS) during 48 hrs

Discussion

The results of our study showed no differences between groups in the serum CK, CK-MB activity and muscle soreness. Creatine kinase increased at all time among three groups. However, no significant differences were found between groups at any point in time. These data are not in agreement with Coombes et al (2000) and Koba et al (2005, 2007) [11, 20]. They reported that BCAA intake before and during endurance exercise reduces indirect markers of muscle damage [11, 20]. Possible explanations for differences between our findings and other published data could include age of subjects, exercise protocol and intensity of exercise.

Serum creatine kinase (CK) and lactate dehydrogenase (LDH) are indication of the degree of metabolic adaptation to physical training of skeletal muscles [6, 7]. These enzymes are involved in muscle metabolism, and their serum concentration is normally very low. They increase considerably after intensive exercise. Changes in serum activity of muscle enzymes have been reported in normal subjects and athletes after strenuous exercise. The amount of enzyme efflux from muscle tissue to serum can be influenced by physical exercise. [6, 7].

These results showed that the use of two different dose of BCAA do not reduce serum CK-MB activity 24 and 48 hrs after heavy resistance exercise. Serum CK-MB activity was elevated in all groups after exercise and was highest in the placebo group. Serum CK-MB activity gives useful information regarding the extent and severity of

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Information about the authors:

Payam Mohamad-Panahi: navid_lotfi2008@yahoo.com; Islamic Azad University; Janbazan Sq, 66619-83435, p.o.Box: 161, Ghorveh, Iran

Soran Aminiaghdam: navid_lotfi2008@yahoo.com; Islamic Azad University; Janbazan Sq, 66619-83435, p.o.Box: 161, Ghorveh, Iran

Navid Lotfi: navid_lotfi2008@yahoo.com; Islamic Azad University; Janbazan Sq, 66619-83435, p.o.Box: 161, Ghorveh, Iran

Khaidan Hatami: navid_lotfi2008@yahoo.com; Islamic Azad University; Janbazan Sq, 66619-83435, p.o.Box: 161, Ghorveh, Iran

Cite this article as: Payam Mohamad-Panahi, Soran Aminiaghdam, Navid Lotfi and Khaidan Hatami Effects of two different dosage of bcaa supplementation on serum indices of muscle damage and soreness in soccer players. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.6, pp. 64-68. doi:10.6084/m9.figshare.715675

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Received: 28.04.2013
Published: 30.06.2013