

# The effects of branch-chain amino acids on fatigue in the athletes

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**Abstract:** Research has shown that injection of a mixture of amino acids into humans led to stimulation of protein synthesis about 30 min after injection, and the synthesis rate remained at a high level for up to 90 min. Various theories have been proposed to justify this effect, such as increasing the availability of amino acids in the body to increase their transmission to muscle, and this increase in transmission can stimulate the synthesis of protein in muscle cells. A total of 30 volunteers with a history of 2–3 years in the field of Athletics were participated in this study. The experimental group (15 subjects) used BCAAs supplement during 6-week athletics training. Control group (15 subjects) participated in athletics training for 6 weeks without any supplementation. Blood was taken before and after 6 weeks supplementary. The findings of the *t*-test showed that basal levels of lactate and ammonium had not changed significantly after 42 days of supplementation. The results of this study showed that BCAAs supplementation has no effect on the reduction of lactate and ammonium indices as indicators of fatigue.

**Keywords:** BCAAs, lactate, ammonium, exercise training, athletics

## Introduction

Branch-chain amino acids (BCAAs) containing leucine, isoleucine, and valine are essential amino acids for humans, and among athletes, many people use high amounts of these amino acids.

Research on human muscle shows that BCAAs have anabolic effects on protein metabolism by increasing the rate of protein synthesis or decreasing its decomposition rate, or both [1, 2].

The research has shown that injection of a mixture of amino acids into humans led to stimulation of protein synthesis about 30 min after injection, and the synthesis rate remained at a high level for up to 90 min [3]. Various theories have been proposed to justify this effect, such as increasing the availability of amino acids in the body to increase their transmission to muscle, and this increase in transmission can stimulate the synthesis of protein in muscle cells [4].

Today, it is known that leucine stimulates the release of insulin from the pancreas and generally applied the effect of leucine in this way [5]. Although little information is still available on the activity of signals on protein synthesis, this makes it difficult to accurately determine the mechanism of BCAAs' effect on protein synthesis [6]. Therefore, the reasons for the effect of BCAAs on increased muscle protein synthesis and, ultimately, increased muscle mass, which lead to decreased fatigue in exercise, are still uncertain [7].

## Materials and Methods

Thirty track and field athlete volunteers with a history of 2–3 years in the field of Athletics participated in this study. The experimental group (15 subjects) used BCAAs supplement during 6 weeks training. Control group (15 subjects) participated in training program for 6 weeks

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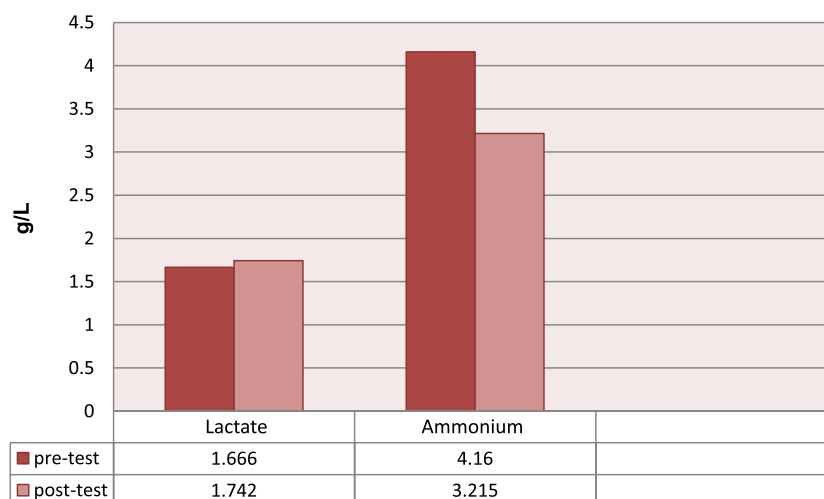


Fig. 1. Lactate and ammonium concentration in BCAAs group

without any supplementation. The blood sampling took before and after 6 weeks of training and immediately after participating in the Astrand test on an ergometer. All samples were obtained to determine the concentration of lactate and ammonium. The data were analyzed by *t*-test (SPSS 16).

## Results

The findings of the *t*-test showed that although basal levels of lactate in this group increased slightly after 42 days of supplementation, this difference was not statistically significant.

In addition, although the base levels of ammonium index in this group decreased slightly after 42 days of supplementation, this difference was not statistically significant (*Fig. 1*).

## Discussion

Central fatigue theory was introduced in 1987 as an important mechanism of communication with increasing fatigue during long training in sports science societies [8].

Therefore, research on the impact of supplements containing amino acids, including BCAAs, in this area has began and continued ever. Spodaryk et al. [9] first investigated the impact of BCAAs on physical functionings on 193 marathon athletes in Sweden and received significant reductions in marathon time in the BCAAs consumer group. Another study reported that the effect of this amino acid on athletes during exercise in hot weather increased by 14% in the intensity of exercising with low intensity (40% maximal oxygen consumption) [10].

On the other hand, two other studies that did not consider BCAAs effects on cyclists had any significant effect on performance capacity [11, 12]. In another study, two different BCAAs doses were observed in cyclists and no significant change was observed in performance capacity [13]. However, in another study, 40 kg of cyclists and 12% of BCAA per day for 2 weeks reported a decrease in fatigue [14].

Colombani et al. [15] examined the effect of BCAAs using in athletes, although they did not see a significant effect on their athletic performance, but a significant change was observed in recovery and immune system. Also, McConell et al. [16] measured the effect of BCAAs on Rhymes' immune responses and reported that BCAAs' use led to an increase in interleukin 2 (IL-2) and interferon production after exercise, and IL-4 decreased. Also, Shimomura et al. [17] examined the effect of this amino acid on Scott's motion in non-athletes and reported lesser bruising in the BCAA consumer group than in the control group.

## Conclusions

The results of this study showed that BCAAs supplementation has no effect on the reduction of lactate and ammonium indices as indicators of fatigue. Although some studies have reported significant changes in this regard, these differences may occur for the following reasons:

- The difference in the community of participant in the studies mentioned in this research.
- Differences in BCAAs supplement alone or in combination with other supplements.
- Differences in the type of exercise practice.

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