

THE EFFECTS OF BETA-ALANINE ON INDOOR BOULDERING PERFORMANCE

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Exercise induced blood acidosis is an acute physiological condition brought on by extended bouts of high intensity exercise and is regarded as one of the main causes of falls within climbing. Beta Alanine (B-ALA) has been shown to reduce blood acidosis in high intensity exercise therefore could have potential ergogenic effect upon climbing performance. The aim of this study was to assess the effects of B-ALA on indoor bouldering performance in an amateur competition setting. With institutional approval, 10 climbers graded V3-V5 (B-ALA: n=5, Placebo: n=5) were recruited and assessed with a climbing performance trial (CPT) and climbing related fitness with an anaerobic fatigue trial (AFT) before and after a 4-week supplementation of 4g/day B-ALA or placebo (cornflour). The CPT involved the completion of 10 problems, and the AFT involved the performance of a battery of climbing related callisthenic exercises. B-ALA improved s-RPE significantly compared to placebo ($P < 0.05$). There were no significant differences found in any other variables measured. This suggests that B-ALA has potential as a training and competition aid within amateur bouldering to suppress perceived effort and therefore improve performance psychosomatically through training. Although much more research is required in this area.

Keywords: IRCRA2018; Rock Climbing; Nutrition, Blood-Acidosis; Supplementation

Acknowledgments: Thank you to Dr Julien Louis for translating the abstract of this manuscript for this submission also thank you to the all those who either took part in or aided in the completion of this study.

EFFETS D'UNE COMPLÉMENTATION EN BETA-ALANINE SUR LA PERFORMANCE EN ESCALADE DE BLOC EN SALLE

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L'acidose sanguine est un phénomène physiologique aigu induit par des séquences d'exercice à haute intensité et est reconnu comme une des principales causes de chute en escalade. Grâce à son pouvoir tampon, la beta-alanine (B-ALA) pourrait réduire l'acidose sanguine lors d'activités physiques intenses permettant alors d'améliorer la performance en escalade. L'objectif de cette étude était d'évaluer les effets de B-ALA sur la performance en escalade en salle dans le cadre d'une compétition amateur. Suite à l'accord du comité d'éthique, 10 grimpeurs classés 6A-6C (B-ALA: n=5, Placebo: n=5) étaient recrutés et évalués lors d'un test de performance en escalade (CPT) et un test de fatigue anaérobie (AFT) effectués avant et après 4 semaines de complémentation en B-ALA (4g/jour) ou placebo (farine de maïs). Le test CPT impliquait la réalisation de 10 passages, alors que le test AFT consistait en une batterie d'exercices calisténiques (à poids de corps). Les sensations d'effort perçu (s-RPE) diminuait significativement pour le groupe B-ALA comparativement au groupe placebo ($P < 0,05$). Aucune différence n'était enregistrée pour toutes les autres variables mesurées. Ces résultats suggèrent l'efficacité d'une complémentation en B-ALA pour améliorer les capacités physiques à l'entraînement et en compétition d'escalade, principalement médié par une réduction de l'effort perçu. D'autres études expérimentales sont nécessaires pour confirmer ces résultats.

Mots clés : IRCRA2018 ; escalade sur bloc ; nutrition ; acidose sanguine, complémentation

Introduction

Beta-Alanine (B-ALA) has been shown to improve the performance of cyclists, and reduce exercise induced blood acidosis by 19% in physically active males (Hill et al., 2007; Baguet et al., 2009). B-ALA functions by increasing the quantity of the intracellular buffer carnosine in muscle tissue and must be consumed chronically for a minimum of 4 weeks to show any performance benefits (Trexler et al., 2015). There is also research within rat models that suggests B-ALA increases Ca²⁺ sensitivity, improving muscular contractile ability, although research is limited (Dutka & Lamb, 2004).

Rock climbing provides an almost unique physiological challenge, as athletes regularly have to navigate vertical obstacles designed to test their strength, balance, aerobic and anaerobic endurance (Fryer et al., 2016). Such challenges include vertical overhangs greater than 45° where the athlete's legs can no longer support their entire mass vertically (Watts, 2004; MacLeod et al., 2007). Campusing and other techniques like it, place great exertion onto the upper body (MacLeod et al., 2007) and are regarded as key training tools, used regularly by elite and recreational climbers alike (Phillips et al., 2012). Bouldering ascents last between 30 seconds to 2 minutes dependent upon difficulty (La Torre et al., 2009; Phillips et al., 2012) with a high demand for prolonged, powerful movements, blood acidosis and oxidative stress are prevalent. Both considered by athletes and literature to be an indicator of fatigue especially in the forearm, greatly associated with falls (MacLeod et al., 2007; Valenzuela et al., 2015; Fryer et al., 2016).

Despite the potential benefits nutrition interventions have been studied very little in relation to climbing, especially in the area of ergogenic aids. Hence, the purpose of this study was to identify the effect of a 4-week B-ALA supplementation programme on rock climbing performance, specifically indoor bouldering.

Methods

Participants

With ethical approval of Leeds Beckett University, 10 male amateur competitive climbers, aged 20-45 were recruited for this study. All participants were required to be male, between the ages of 18-45, have at least 6 months climbing experience and climb competently at V3-V5 bouldering level (as that was the range used for the CPT). Potential participants had the study and any potential benefits of participating, explained to them verbally and electronically before informed consent was gained alongside a health screen for potential risk factors.

Procedure

Each participant attended 4-5 sessions over a 5-week period (including screening and unblinding). During this time, they were required to continue their training and lives as normal. As the focus of this study was on the effect of supplementation on climbing performance, not its integration with specialised training, which could be an avenue for future study. Participants underwent baseline testing a climbing performance trial (CPT) which consisted of completing 10 set problems (V3-V5) and an aerobic fatigue trial (AFT) consisting of a callisthenic exercise battery designed to test climbing specific fatigue. After this, participants were given either a B-ALA

supplement or cornflour placebo (4 x 1g capsule.day-1) to consume over 4 weeks. During this intervention participants were regularly monitored for adherence to the supplement protocol and for any adverse effects.

Results

Of the 10 participants to pass health screening, all 10 participants completed both CPTs and 6 participants (B-ALA n = 3; PLB n = 3) completed both AFTs. Blood data was collected on all 6 in AFT1 but only from 2 in AFT2 (both placebo). This was due to limited participant and facility availability at the Carnegie Research Institute (CRI). All other AFT's were performed with the same equipment, under the same conditions at the climbing facility but without blood measures.

Of the measures taken only mean s-RPE was significantly different between groups and interventions $p=.001$ & $p=.005$ respectively. Mean s-RPE dropped from 228.0 (26.8) AU to 186.0 (25.1) AU in the B-ALA group compared to 228.0 (26.8) AU - 240.0 (0.0) AU within the placebo group.

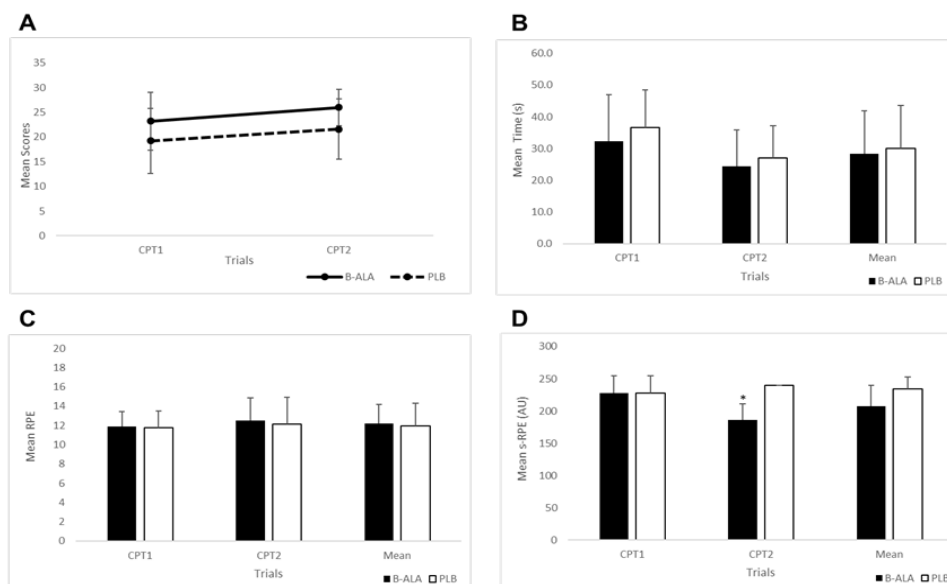


Figure 1. Mean CPT values by intervention (a) Score. (b) Time. (c) RPE. (d) s-RPE).

Discussion

The current study set out to determine the effects of a 4-week B-ALA supplementation programme on climbing performance in a group of amateur bouldering athletes.

The main finding of this study is that the 4-week supplementation programme did not improve climbing performance as expected. From statistical analysis it is apparent that all score values were not significantly different between trials or groups in both the CPT & AFT ($p>.05$). This was most likely the result of a training effect over the 4-week protocol which was predicted as part of the original hypothesis. The only measure that was significantly different between groups was that of s-RPE within the CPT which was lower in the B-ALA group compared to baseline and placebo ($p=.001 <.05$). To fully understand these findings, it is essential to critically examine the limitations of the present study.

Firstly, this research did not use a rigorously validated method for the measurement of performance, as the resources for such methods (for example a climbing treadmill, lattice board or moon board) were not available.

As such, the score marker may not be the best measure of performance in this instance. Another limitation with the usage of the CPT was the grading of each problem. Although designed to accommodate all those within the sample some individuals proved to surpass the limits of the test, especially in the B-ALA group. For example, although all the climbers within the B-ALA group reported to have increased their climbing repoint and Onsite grades (noted as monitoring tool) CPT for two individuals did not change as one was a perfect score in both trials and the other near perfect. When considering the small size of the groups within this study this will have greatly affected the mean scores in the CPT.

When considering these findings with those of La Torre et al (2009) and Hill et al (2007) it is possible that there is an accumulative effect of exercise induced blood acidosis upon skeletal muscle within competition style bouldering between bouts. Although only an effect on perceived exertion has been demonstrated with this study, the use of a B-ALA intervention and other nutritional interventions should be further investigated to provide the best possible insight for climbers in the competitive, recreational and adventurous disciplines of the sport.

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