Effects of Beta-Alanine & Recovery Methods on Lactate Levels & Anaerobic Capacity in Resistance-Trained Males

Author: B. Smilie
Faculty Sponsor: J.R. Wilson Ph.D., Brad Heddins, M.S., and Mark Ricard Ph.D
KINE 4400 Cardiovascular Research Laboratory, Department of Kinesiology
The University of Texas at Arlington

Abstract

EFFECTS OF BETA-ALANINE AND RECOVERY METHODS ON LACTATE LEVELS AND ANAEROBIC CAPACITY IN RESISTANCE-TRAINED MALES.
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INTRODUCTION: Beta-Alanine, an ergogenic aid, is a nonessential amino acid that is naturally occurring in the human body that contributes to hydrogen buffering during high-intensity exercise (Hobson et al., 2012). High-intensity exercise causes an increase in the metabolite, lactate, or hydrogen ion concentration. This will then cause premature fatigue due to impaired contractile function. This buffering agent will be of use to athletes, fitness enthusiasts and bodybuilders looking to delay fatigue and increase performance. Active recovery was found to significantly reduce blood lactate concentration when compared to passive rest (Martin et al., 1998).

PURPOSE: The purpose of this research study was to compare the effects of beta-alanine on exercise capacity and lactate levels using passive and active recovery between-training.

METHODS: Nine resistance-trained males participated in the study and were randomly placed into two different groups. Four males were placed into the passive recovery group, (age 22.5 ± 0.5 years) and five males placed into the active recovery group (age 21.8 ± 1.9 years). Subjects performed three Wingate Anaerobic Tests (WAnT) with four minutes of rest in between each WAnT on two separate occasions. Two blood lactate samples were obtained each session, before and after. The lactate levels in the blood were determined using the Accusport Lactate Analyzer. Following baseline testing, each subject supplemented with beta-alanine three times a day for six-seven days and then the WAnT were repeated. Variables recorded by the Lode Cycle computer: Peak Power (PP), Fatigue Index (FI), and Relative Peak Power (PPr). Data were analyzed using SPSS version 22.0 for Windows. Separate 2 x 2 repeated measures ANOVA with one between subjects factor group (passive, active) and one within-subjects factor time (pre, post) was used to determine the effects of beta-alanine on the following dependent variables: change La, PP, FI, and PPr. Follow-up tests of significant ANOVA effects were compared using the Sidak post hoc test. The level of significance was set at $P \leq 0.05$.

RESULTS: The time (pre, post) effect for change in La was not significant $F(1,7) = 0.44$, $p = 0.53$. The interaction between time and method of recovery (passive, active) was not significant, $F(1,7) = 0.28$, $p = 0.61$. The passive recovery group had an increase in La difference by an average of 1.4mmol/L compared to 0.16mmol/L in the active group. The time (pre, post) effect for change in peak power (PP) for all subjects combined was significant $F(1,7) = 5.8$, $p = 0.047$. The PP increased from1009 ± 165 W to 1073 ± 171 W between times. However, PP did not improve in the interaction between time and group significantly, $F(1,7) = 0.45$, $p = 0.52$. The time effect for change in fatigue index (FI) approached significance, $F(1,7) = 3.8$, $p = 0.09$. On the other hand, FI did not improve as the interaction between time and method of recovery was not important, $F(1,7) = 1.1$, $p = 0.32$. The time effect for the change in relative peak power (PPr) was nearly significant, $F(1,7) = 5.4$, $p = 0.054$. Lastly, no significance was found between time and group in the difference in PPr, $F(1,7) = 0.46$, $p = 0.52$.

CONCLUSION: The results of this study indicate that beta-alanine does improve anaerobic capacity, but with no difference between groups. Beta-alanine affected both groups equally.

Purpose

The purpose of this research study was to compare the effects of beta (β)-alanine, a hydrogen buffer, on exercise capacity and lactate levels using between-training recovery methods and whether or not beta–alanine simulates active recovery .

Methods

Participants
- 9 males (4 Passive and 5 Active) participated in this study.

Measurements
- Blood Lactate: Accusport lactate analyzer
- Peak Power: Lode computer system
- Fatigue Index: Lode computer system
- Relative Peak Power: Lode computer system

Protocol
- Each subject was randomly placed into two groups (passive and active). On two separate occasions, with one week between, subjects performed three Wingate Anaerobic Tests (WAnT), on a Lode Excalibur cycle ergometer, with four minutes of rest in between each WAnT. Two blood lactate samples were obtained before and after each session. Sessions lasted roughly 12 minutes. Blood lactate levels were measured using the Accusport Lactate Analyzer. In between sessions, each subject supplemented with beta-alanine 3x/day for 6-7days.

Methods (cont'd)

Data Analysis
- All 4 variables (BLa difference, PP, FI, and PPr) for every bike test, at pre and post, was averaged and reported as a mean ± standard deviation. Each variable was then averaged and reported as either passive or active mean ± standard deviation.

Statistical Analysis
- Data were analyzed using SPSS version 22.0 for Windows.
- Separate 2 x 2 repeated measures of ANOVA with one between subjects factor group (passive, active) and one within-subjects factor time (pre, post) was used to compare the 4 variables between the interaction of time and group.

Results

Table 1: Demographic Variables

Variable	Passive (4 Males)		Active (5 Males)	
	Mean	± SD	Mean	± SD
Age (yrs)	22.50	± 0.50	21.80	1.94
Height (m)	1.79	± 0.03	1.74	0.08
Weight (kg)	78.90	± 8.05	75.80	5.20
BMI (kg/m^2)	24.80	± 2.80	25.20	1.90

Values expressed are mean ± standard deviation. BMI, body mass index.

Table 2: Results of Measured Variables

Variable	Passive (4 Males)		Active (5 Males)	
	Mean	± SD	Mean	± SD
Pre-La Diff. (mmol/L)	12.63	± 2.54	14.16	± 2.04
Post-La Diff. (mmol/L)	14.03	± 3.58	14.32	± 4.38
Pre PP (W)	1041.78	± 215.24	983.20	± 71.32
Post PP (W)	1125.85	± 199.35	1030.68	± 103.86
Pre FI (W/sec)	25.68	± 8.30	24.70	± 2.97
Post FI (W/sec)	30.40	± 7.80	26.10	± 4.69
Pre PPr (W/kg)	13.10	± 1.76	13.11	± 0.67
Post PPr (W/kg)	14.21	± 1.89	13.72	± 1.43

BLa Diff., Blood Lactate Difference; PP, Peak Power; FI, Fatigue Index; PPr, Relative Peak Power.

Results (cont'd)

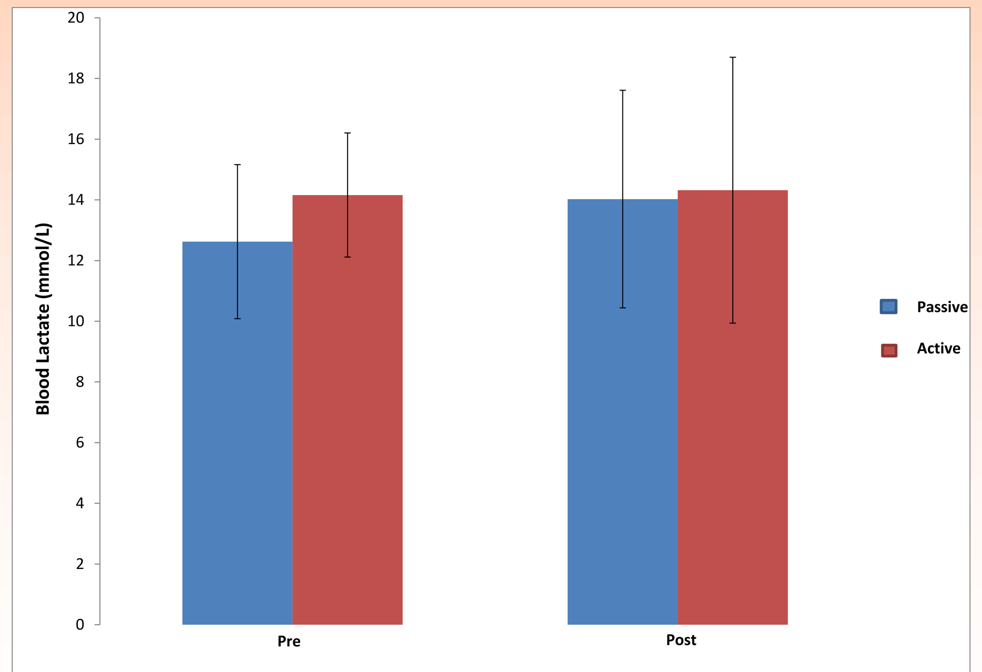

Figure 1: Comparison of Pre & Post La Difference Between Passive & Active Recovery.

Figure 1. shows the insignificant ($p = 0.53$; $p = 0.61$) comparison of the lactate difference between passive and active recovery within the time factor (pre and post supplementation).

Figure 2. shows the significant ($p = 0.047$) comparison for the time effect (pre and post) of supplementation, but insignificant between groups ($p = 0.52$).

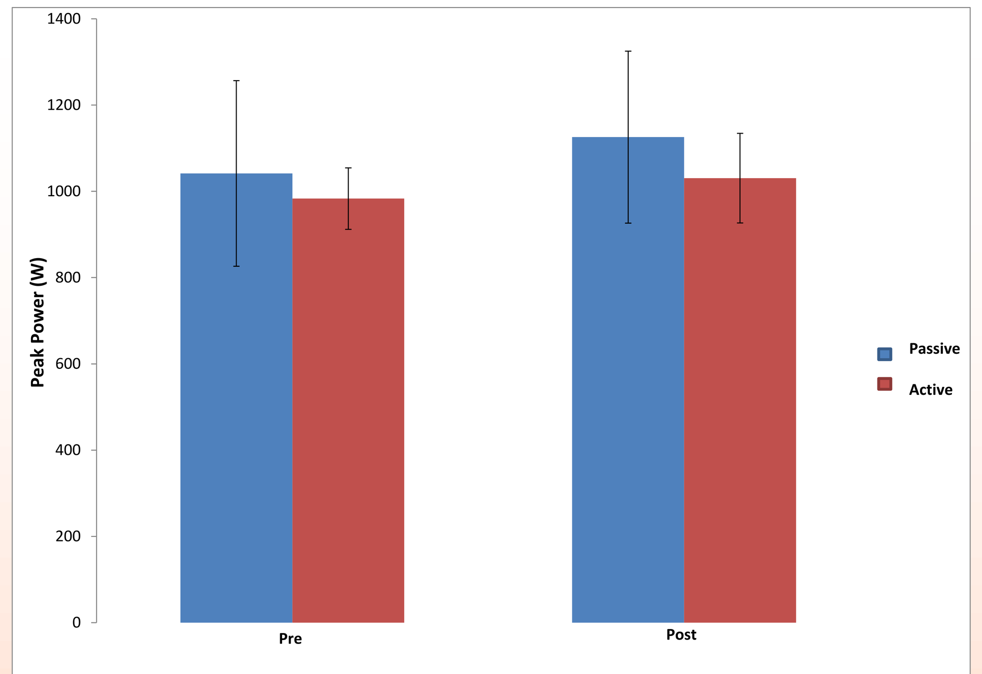

Figure 2: Comparison of Pre & Post PP Between Passive & Active Recovery.

Conclusions

- Because β-alanine affected both groups equally, it appears β-alanine can mimic active recovery in those performing passive exercise. However, due to errors made in the study, additional measures are necessary to test the legitimacy of β-alanine acting as an active recovery method.
- Additionally, further studies are warranted to investigate the effects of β-alanine on lactate levels and recovery methods compared to a placebo.
- As hypothesized, putting groups aside, these data demonstrate that β-alanine can increase anaerobic exercise capacity, but not decrease the BLa difference.