



THE EFFECTS OF SODIUM BICARBONATE SUPPLEMENTATION ON BLOOD LACTATE ACCUMULATION.

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Abstract

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Introduction: Blood lactate accumulation (BLa) is the byproduct of the anaerobic metabolism of glycogen. Muscle glycogen is readily used as an energy source from two to five minutes following the onset of exercise. Blood lactate is expressed as an absolute number in mmol of lactic acid per liter of blood (mmol/L). Research suggests that sodium bicarbonate supplementation is beneficial to high intensity exercise, which include: lower blood lactate levels, lower rate of perceived exertion, higher muscular power, and longer time to exhaustion.

Purpose: The purpose of this study was to determine the effects of sodium bicarbonate supplementation on blood lactate and muscle soreness.

Methods: Five students (three males, two females; combined age 22.4 ± 0.55 years, height 183.9 ± 5.3 cm, weight 86.4 ± 14.5 kg) of the UTA Kinesiology department, volunteered to participate in this study. Each subject had body composition assess by three site skinfolds (M – chest, abdomen, thigh; F – triceps, suprailliac, thigh). Each subject ingested a drink (placebo (P) or supplement (S)) and performed a 60-second Wingate (WAnT) test on a cycle ergometer with constant resistance for exactly 60-seconds in two sessions separated by at least two days. During each test heart rate (HR), blood pressure (BP), rate of perceived exertion (RPE), and blood lactate (BLa) levels were recorded over time.

Results: The percent body fat calculated from the three skinfold sites was $17.6 \pm 7.3\%$ with no significant difference ($p > 0.05$) between genders. The initial values: HR (P: 78.6 ± 12.4 bpm; S: 82.3 ± 13.4 bpm); BP (P: $120.8/79.8 \pm 3.6/6.4$ mmHg; S: $125.3/76.8 \pm 8.6/1.1$ mmHg); and BLa (P: 3.9 ± 0.3 mmol/L; S: 4.7 ± 1.8 mmol/L) were not statistically different between treatments ($p > 0.05$). The values immediately after exercise: HR (P: 177.6 ± 7.3 bpm; S: 159.6 ± 24.0 bpm); BP (P: $157.8/73.0 \pm 21.0/6.4$ mmHg; S: $144.8/76.8 \pm 16.8/1.8$ mmHg); RPE (P: 17.2 ± 1.6 ; S: 16.8 ± 1.6) and BLa (P: 10.9 ± 1.7 mmol/L; S: 9.9 ± 1.3 mmol/L) were not statistically different between treatments ($p > 0.05$). The final values: HR (P: 117.4 ± 7.0 bpm; S: 118.4 ± 10.2 bpm); BP (P: $133.6/75.0 \pm 21.1/8.0$ mmHg; S: $129.2/77.2 \pm 8.1/2.3$ mmHg); and BLa (P: 9.04 ± 3.0 mmol/L; S: 10.2 ± 3.2 mmol/L) were not statistically different between treatments ($p > 0.05$).

Conclusion: The results of this study confirmed the effects of exercise on HR, BP, RPE, and BLa. However, there are no additional benefits to sodium bicarbonate supplementation on blood lactate levels as related to muscle soreness.

Purpose

The purpose of this study was to determine the effects of sodium bicarbonate supplementation on blood lactate and muscle soreness.

Introduction

- Previous literature suggests that supplementation could lead to a decrease in blood lactate accumulation (mmol/L), lower perceived exertion (RPE), and longer exercise duration.
- Blood lactate is the byproduct of the anaerobic metabolism of glycogen during the first five minutes of exercise.
- Sodium bicarbonate is thought to work as a buffer in the cardiovascular system.
- Sodium bicarbonate ingestion improved Judo-related performance in repeated bouts when compared to placebo (Artioli et al, 2007).
- Sodium bicarbonate supplementation was an effective buffer for high intensity swimming leading to increased performance for young athletes (Zajac et al, 2009).

Methods (continued)

- Five recreationally active subjects (three males, two females) from University of Texas at Arlington Kinesiology Department volunteered for this study

Age	Height	Weight
22.4 ± 0.55 years	183.9 ± 5.3 cm	86.4 ± 14.5 kg

- Instruments used for this study were Monark Exercise AB 828E Ergomedic Exercise Bike, blood lactate analyzer, heart rate monitor, and Borg scale for rating of perceived exertion.
- Subjects completed two days of testing separated by at least two days time.
- Exercise Protocol:
 - Ingestion of sodium bicarbonate or placebo (sugar pill)
 - Rest period followed by measurement of HR1, BP1, and BLa1
 - Completion of 60-second Wingate test
 - Measurement of HR2, BP2, RPE, and BLa2
 - 5 minute rest period followed by measurement of HR3, BP3, and BLa3

Results

Table 2: Mean results for placebo and supplement trials

	Sugar Pill (P)	Sodium Bicarbonate (S)
HR1	78.6 ± 12.4 bpm	82.3 ± 13.4 bpm
HR2	177.6 ± 7.3 bpm	159.6 ± 24.0 bpm
HR3	117.4 ± 7.0 bpm	118.4 ± 10.2 bpm
BP1	$120.8/79.8 \pm 3.6/6.4$ mmHg	$125.3/76.8 \pm 8.6/1.1$ mmHg
BP2	$157.8/73.0 \pm 21.0/6.4$ mmHg	$144.8/76.8 \pm 16.8/1.8$ mmHg
BP3	$133.6/75.0 \pm 21.1/8.0$ mmHg	$129.2/77.2 \pm 8.1/2.3$ mmHg
BLa1	3.9 ± 0.3 mmol/L	4.7 ± 1.8 mmol/L
BLa2	10.9 ± 1.7 mmol/L	9.9 ± 1.3 mmol/L
BLa3	9.04 ± 3.0 mmol/L	10.2 ± 3.2 mmol/L
RPE	17.2 ± 1.6	16.8 ± 1.6

Results (continued)

- Dependent t-tests showed no significant differences between trials ($p > 0.05$).

Figure 1: Heart rate, blood pressure, blood lactate, and rating of perceived exertion response immediately following exercise bout.

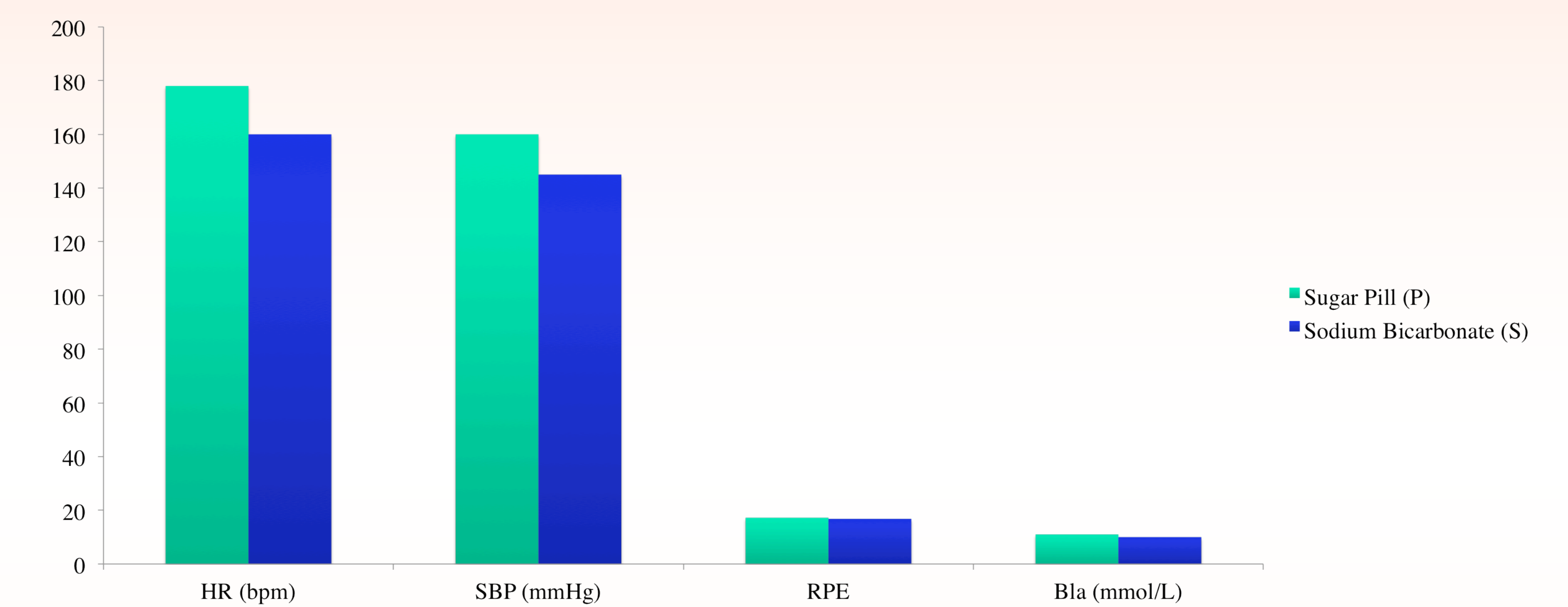
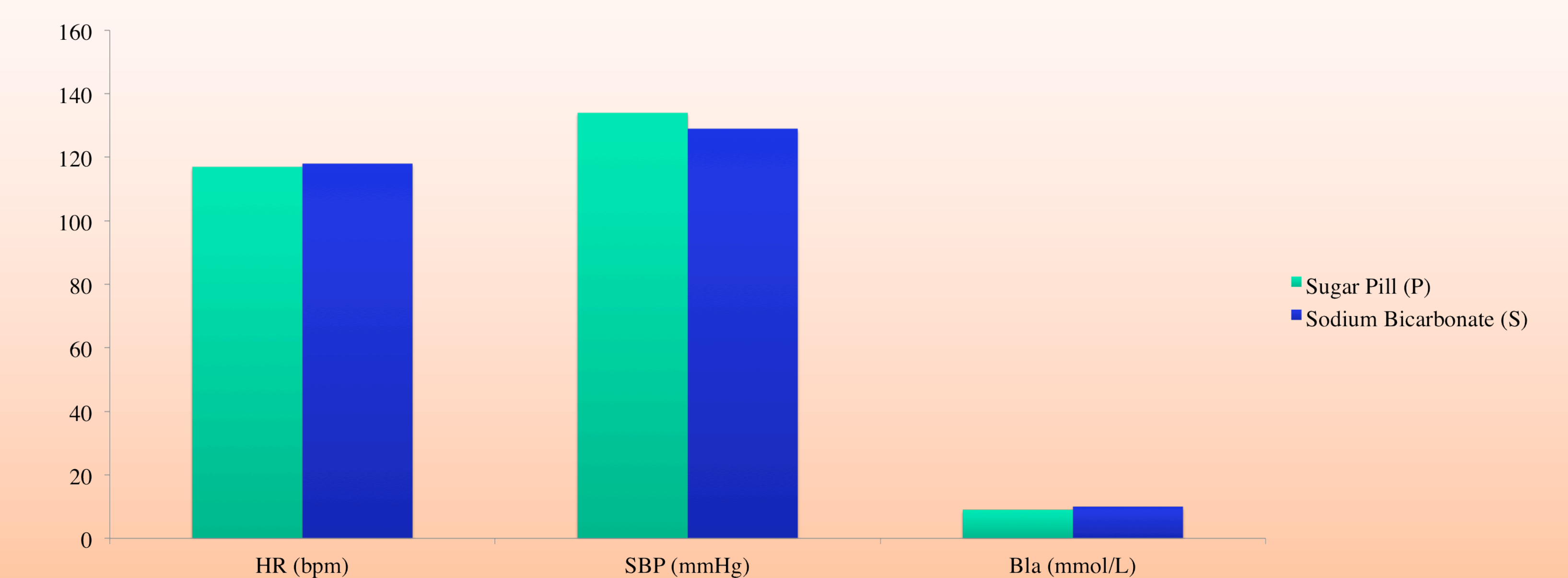


Figure 2: Heart rate, blood pressure, and blood lactate response 5-minutes post exercise bout.



Conclusion

- Based on the results of this study, there are no additional benefits to sodium bicarbonate supplementation on blood lactate accumulation as it relates to muscle fatigue.
- Suggestions for future studies: larger sample size, training program, and insertion of control group.