



Comparing the Efficacy of Pre Carbohydrate Supplements in Drink and Chew Form on VO₂ max, Lactate, Glucose, and Heart Rate

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Abstract

Introduction: Reducing fatigue is the number one priority in sports. There has been countless research on this topic alone, because people will pay anything to gain an edge over their opponents. The most widely used method of trying to increase performance and reduce fatigue is by consuming sports drinks. Research has been done on sports drinks such as Gatorade to test how effective they are in reducing fatigue. Results indicate that Gatorade reduces lactate accumulation, and keeps the heart rate lower thus delaying fatigue. This is thought to be due to the blend of carbohydrates which help maintain the blood glucose concentration in the blood, thus allowing the body to have a constant supply during exercise. Gatorade also has electrolytes that are necessary to continue muscle contractions and that are readily depleted during exercise. Recently there has been a surge in Pre Carbohydrate Chews (Gatorade sports chews, Jelly Belly Sports Beans, etc.) usage by athletes, because of the portability of such form, and the promises they provide.

Purpose: The purpose of this study was to determine if a pre exercise carbohydrate in a chew form was more beneficial towards maximal exercise performance than carbohydrate consumed in drink form.

Methods: Six male (age 21.83 ± 1.602 yrs.; height 71 ± 3.74 in; weight 77.5 ± 14.16 kg) students of UTA, volunteered to participate in this study. Each subject had body composition assessed by seven site skinfolds (triceps, subscapular, chest/pectoral, midaxillary, abdomen, suprailiac, thigh). Each subject was weighed, and then given 3g of the supplement per 5kg of bodyweight. Depending on the supplement the subjects resting blood glucose and lactate were taken after 20min. (Gatorade) or 30min. (Jelly Belly Sport Beans). Subjects performed a graded exercise test (Bruce Protocol) on the treadmill with increasing elevation and speed until exhaustion. Heart rate (HR) and rate of perceived exertion (RPE) were recorded along with the relative maximal oxygen consumption (VO_{2Max}) measurements obtained with a metabolic cart. Subjects performed a cool down for 5 min., then blood glucose and lactate measurements were taken.

Results: The percent body fat calculated from the skinfold sites was $12.4 \pm 3.04\%$. The Maximal Values: HR (G: 188.67 ± 8.6 bpm; J: 163.07 ± 9.9 bpm); RPE (G: 16.83 ± 2.2 ; J: $16.83 \pm .75$); VO₂ (G: 43.83 ± 8.5 ml/kg/min; J: 45 ± 6.01 ml/kg/min) showed no significant difference. Glucose pre (G: 128.83 ± 16.4 ; J: 130 ± 21.6) and post (G: 92.17 ± 24.6 ; J: 96.17 ± 23.4) measurements along with Lactate pre (G: 4.35 ± 2.4 ; J: 5.35 ± 2.1) and post (G: 11.9 ± 4.3 ; J: 12.3 ± 3.2) measurements showed no significant difference also. However, there was a significant difference between glucose pre and post (G: $p = 0.003$; J: $p = 0.005$), and Lactate pre and post (G: $p = 0.02$; J: $p = 0.003$) measurements.

Conclusion: The results of this study demonstrated that there was no difference in maximal performance when consuming carbohydrate in either chew or drink forms. Even though each supplement showed a significant difference between there own respective pre and post measurements, these changes were expected. Glucose levels decreased during workouts, while lactate levels increased during workouts.

Purpose

The purpose of this study was to determine if a pre exercise carbohydrate in chew form was more beneficial towards maximal exercise than in drink form.

Methods

1. Six male students of UTA, volunteered to participate in this study.
2. Subjects fasted 12 hours before the testing.
2. On the first day a series of 7 skinfold (triceps, subscapular, chest/pectoral, midaxillary, abdomen, suprailiac, thigh) measures were taken on the right side of the body, along with weight, height, and body fat (BF)%.
3. The pre carbohydrate chews (Jelly Belly Sport Beans) were taken 30 min. before maximal exercise with a cup of water. The pre-carbohydrate drink (Gatorade) was taken 20 min. before maximal exercise. Both supplements had a carbohydrate ratio to body weight, which was 3g of carbohydrates per every 5 Kg of body weight.
- 5 After 20 to 30 min. (depending on the supplement) the subject was asked to sit down. Resting blood glucose and lactate were then measured.

Methods (cont'd)

6. A heart monitor was placed on the subjects chest to take their resting heart rate levels.
7. The subject then stood on the treadmill and once it was indicated they were ready, the VO₂ Max test (Bruce Protocol) was initiated. blood pressure was taken during each workload along with a rate of perceived exertion score (RPE) with ratings from 6 (rest) to 20 (maximal exercise). The treadmill protocol increased speed and elevation every three minutes until the subjects could not go any further.
8. After the max test ended the subjects performed a 5 min cool down.
9. Once the 5 min. cool down was over blood lactate and glucose were measured.
10. When the subjects heart rate was below 120 bpm and/or the subjects systolic blood pressure was below 130 mmHg and the subjects felt recovered, the subject were allowed to leave.
11. The same measurements and test were repeated with the other supplement the subjects were not given the first time.
12. Rest period was at least 48 hours before the other test.
13. Statistical analysis was done by using a two tailed t-test

Results

Table 1: Demographics of 6 Male Subjects				
	Average	SD	Min	Max
Age (yrs.)	21.83	1.602	20	24
Height (in.)	71	3.74	65	75
Weight (Kg.)	77.5	14.16	54.5	91.8
BF%	12.41	3.704	6.74	16.9029

HRMax showed no significant difference ($p > 0.05$) between the two conditions (G: 188.67 ± 8.6 bpm; JB: 163.07 ± 9.9 bpm). RPEMax was also no significantly different ($p > 0.05$) between the two conditions (G: 16.83 ± 2.2 ; JB: $16.83 \pm .75$). VO₂ Max, while slightly higher with the jelly beans also showed no significant different between the two conditions (G: 43.83 ± 8.5 ml/kg/min; JB: 45 ± 6.01 ml/kg/min).

Results (cont'd)

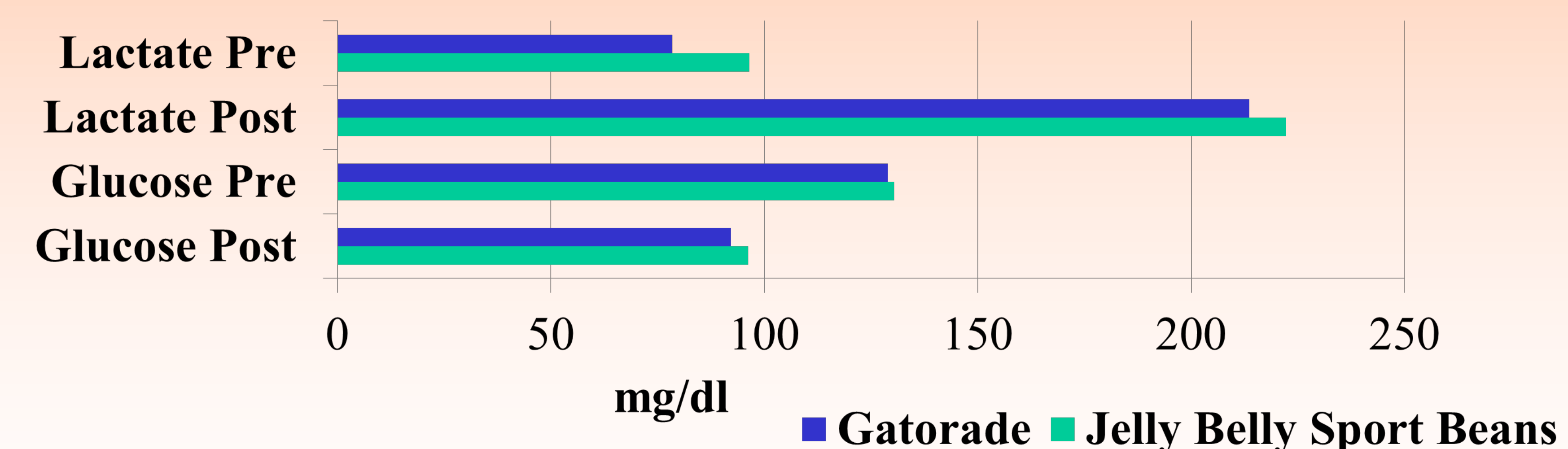


Figure 1: Pre and Post Measurements of Glucose and Lactate When Taking Gatorade and Jelly Belly Sport Beans

Glucose:

Pre exercise G: 128.83 ± 16.4 mg/dl and JB: 130 ± 21.6 mg/dl.

Post exercise G: 92.17 ± 24.6 mg/dl and JB: 96.17 ± 23.4 mg/dl

Lactate:

Pre exercise G: 4.35 ± 2.4 mmol/l and JB: 5.35 ± 2.1 mmol/l

Post exercise G: 11.9 ± 4.3 mmol/l and JB: 12.3 ± 3.2 mmol/l

There were significant increases in glucose and lactate irrespective of the pre carbohydrate consumed pre exercise to post exercise: Glucose – (G: $p = 0.003$; J: $p = 0.005$); Lactate - (G: $p = 0.003$; J: $p = 0.005$). However, there were no significant differences between the two conditions at maximal levels for either glucose or lactate.

Conclusions

The results from this study show that there was no difference between a pre-carbohydrate chew and drink before and after maximal exercise. Even though the lactate pre- exercise when compared to the post exercise, and the glucose pre- exercise when compared to the post exercise showed a significant difference this was expected. Lactate is a by product of glucose produced during high intensity exercise. So there is normally a decrease in glucose during exercise, and an increase in blood lactate. Now through training people can decrease their blood post-exercise lactate levels. Further research can be done on the time waited between the pre-carbohydrate chew ingestion and maximal exercise.