No Effect of Carbohydrate Ingestion on Fatigue During Long-Duration Cycling in Women

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Abstract

PURPOSE: We have previously shown, in men, that carbohydrate ingestion during prolonged cycling attenuates central fatigue. The purpose of this study was to investigate the mechanisms of fatigue during cycling in women.

METHODS: 9 women [41.6±2.4 yr, VO2peak 46.5±2.7 ml/Kg/min] were assigned, in a double-blind crossover design, to 2 commercially available sports drink [commercially available sports drink [Gatorade; CHO] at a rate of 1% of body weight each hour. Subjects cycled for 2 hours at their ventilatory threshold [82% of VO2peak] with 5-1 minute sprints interspersed. Followed by a 3-minute rest interval. Intensity was then increased to the workload at their respiratory compensation threshold [83% VO2peak] and subjects were encouraged to pedal as long as possible. Ratings of perceived exertion [RPE] were measured throughout using a Borg scale. Blood glucose, lactate and quadriceps muscle glycogen levels may provide feedback to the CNS, preventing developed central fatigue by the end of the time trial [time, p<0.001] which preserved body mass well, increased carbohydrate oxidation and blood glucose levels. However, it failed to preserve central drive, attenuate strength loss or improve performance in competitive women cyclists.

METHODS: 9 pre-menopausal, female cyclists, 4222 years

Tested on 3 separate days, no more than 4 weeks between visits:

• Day 1 - maximal cycle ergometry with respiratory measures [Parvo Medics, TrueOne 2400].
• Days 2 and 3 - Subjects were randomized to receive either a non-caloric, artificially-sweetened beverage with electrolytes [4C, Totally Light 2 Go; PL] or a commercially available sports drink [Gatorade; CHO]. Beverages were consumed at a rate of 1 body mass per hour throughout the first 2 hours of cycling.

Results

• Isometric strength testing of the quadriceps with the knee fixed 60°:
  - Two 5-s maximal voluntary contractions (MVC).
  - Magnetic stimulation of femoral nerve at 40 Hz [MagStim Corp, Wales, UK].
  - Two contractions with stimulations superimposed on 5-s maximal voluntary contractions [MVC + PMS].

• Central Activation Ratio [CAR] was defined as the ratio of max voluntary force : max volitional effort with PMS superimposed.

• 2 hours at 62% VO2peak, with 5-1 minute sprints interspersed.
• 3k time trial.
• Strength testing repeated.
  - Ride to exhaustion at workload at respiratory compensation threshold [+83% of VO2peak].
  - Final strength measures made.
• Ratings of Perceived Exertion throughout, blood lactate and glucose at 4 time points.

Statistics

- Changes over time and between drinks were analyzed with repeated measures ANOVA.

Conclusions

These results demonstrate that carbohydrate ingestion as a sports drink during exercise did not improve performance or affect central drive in well-trained women cyclists during prolonged exercise.

References


Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8