

The effect of a carbohydrate-electrolyte sports drink on intense endurance exercise performance

Kenneth Graham, John Marsden, Nathan Versey, David Bourke

The NSW Institute of Sport, Sydney Olympic Park, Australia

Subjects

6 trained male rowers (22.0 ± 4.0 years, 89.1 ± 9.4 kg, 193.1 ± 6.6 cm) were recruited as subjects for the study. All rowers trained for a minimum of 10 hours per week and had competed in one of the past two national championships and had also completed the national 6000 metre ergometer trial in January 2006.

All procedures and protocols had been approved by a properly constituted ethics committee and all subjects gave written informed consent prior to their commencement in the study.

Protocol

Subjects completed 2 open-ended tests to fatigue at a power output equivalent to the average power output from their most recent 6000 metre ergometer test. The tests were completed subsequent to the ingestion of either a sports drink (Powerade Isotonic) or a similarly flavoured and coloured placebo provided at a volume of $13\text{ml}\cdot\text{kg}^{-1}$ in a double-blinded randomised cross-over design.

Subjects were required to follow a standardised diet and fluid intake protocol for the 24 hours prior to each testing session. This diet and fluid intake protocol was developed with the rowers by an experienced sports dietitian and included snacks, drinks and a set dinner menu at a hotel for the evening meal prior to testing. All subjects slept at the hotel next to the laboratory to facilitate their attendance the next morning.

Subjects arrived at the NSW Institute of Sport laboratory at either 6:30 or 7:10 AM fasted and hydrated. They were then weighed and the sports drink (Powerade Isotonic) or placebo was provided in 3 equal aliquots, totalling $13\text{ml}\cdot\text{kg}^{-1}$, over a 30 minute period. The volume of Powerade Isotonic consumed provided $1\text{gm}\cdot\text{kg}^{-1}$ bodyweight of carbohydrate.

Both drinks were stored at 2 degrees for 24 hour pre-test and removed 30 minutes prior to initial ingestion.

Subsequent to ingestion of either drink the subjects then waited a further 90 minutes prior to starting the exercise test. Rehrer et al (1990) have previously shown this period to be sufficient to allow for complete gastric emptying.

Exercise test

All tests were performed on a Concept 2D rowing ergometer with the drag factor set appropriate to the weight of the subject. Subjects set their foot position on the initial test which was then maintained for the second test. Subjects completed a 10 minute warm-up between 13 and 3 minutes pre-test. Environmental conditions were constant for all tests (temperature = 20 ± 0.5 degrees Celsius and relative humidity range 45-50%).

The subject was required to hold a power output equivalent to the average power output ("Test Power") from their most recent 6000 metre ergometer test. The test continued until either the subject voluntarily stopped or the average power output dropped to 1% below the "Test Power". The test was timed by both a researcher using a stopwatch and by the use of the internal clock of the Concept 2D.

Results

The results were collected in 2 forms; time to exhaustion (seconds) and total work (kilojoules) completed. Total work was calculated from the average power and time to exhaustion and analysed to correct for any differences in the average power output at the time of cessation of exercise.

Data was analysed using the Systat Statistical programme (Version 11). A paired t-test with Bonferroni adjustment was used with both analyses. Significance was set at $p < 0.05$.

Mean time to exhaustion (Graph 1) was 10% greater in the Powerade Isotonic trial relative to the placebo trial (1156 vs 1052 seconds) with Mean total work (Graph 2) being 9% greater in the Powerade Isotonic relative to the placebo trial (327 vs 300 kilojoules). Percent data has been rounded to the nearest integer for clarity.

Both time to fatigue and total work was significantly greater ($p < 0.05$) after the ingestion of Powerade Isotonic.

Conclusion

Powerade Isotonic significantly increased the capacity to sustain intense endurance exercise. The mostly likely cause was the extra carbohydrate provided by the Powerade Isotonic.

Reference

Rehrer, N. J., F. Brouns, et al. (1990). "Gastric emptying with repeated drinking during running and bicycling." *Int J Sports Med* **11**(3): 238-43.

