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Effects of carbohydrate intake during a 1-h heavy intensity cycling exercise on subsequent running economy – a single-blinded pilot study

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INTRODUCTION:
The energy cost of running (Cr) is one of the key predictors of performance for long distance races [1]. A study in triathletes has demonstrated that after exhaustive cycling Cr has increased in moderately-trained triathletes [2] and another study has found that gross efficiency in cycling was also impaired after prolonged exercise [3]. On the downside, carbohydrate (CHO) intake during prolonged cycling exercise is considered to improve performance [4]. Therefore, the aim of this study was to assess the effect of CHO intake during 1-h cycling on subsequent Cr.
METHODS:
Six moderately-trained triathletes (maximal oxygen uptake: 53±4 mL/min/kg) performed three trials on an ergometer (Cyclus2, RBM electronics, Germany) and a treadmill (Saturn, h/p/cosmos, Germany): (1) a cycling graded exercise test to determine respiratory compensation point (RCP) after a 10-min baseline determination of Cr at 2.78 m/s (BL); (2 and 3) a 1-h cycling trial at 90% of RCP power-output (PO) followed by 10 min running at 2.78 m/s. Trials 2 and 3 were randomised and athletes had to drink either a 1-L placebo drink (PL) containing <7 g CHO/L or a 1-L CHO drink (CARB) containing 60 g CHO/L. Respiratory gases (MetaMax 3B, Cortex, Germany) were measured continuously during running and the last 2 min of the running trials were used for analysis. A repeated measures ANOVA was used to detect changes between the treatments as well as effect sizes expressed as partial eta-squared. Significant main effects were followed-up by Bonferroni post-hoc procedures. Significance was set at $P<0.05$.
RESULTS:
Mean Cr was 4.42±0.47, 4.56±0.50, and 4.32±0.46 J/kg/m for BL, CARB and PLA, respectively. Significant differences were found between the treatments ($F_{2,10}=6.80$; $P=0.014$; effect size=0.576). Post-hoc tests revealed differences only between PLA and CARB ($P=0.013$). Mean respiratory exchange ratio during running was 0.91±0.02, 0.89±0.04, and 0.88±0.03 for BL, CARB and PLA, respectively. No significant differences were found between treatments ($F_{2,10}=3.18$; $P=0.085$, effect size=0.389). Contribution of CHO during running was 73.1±6.4%, 64.0±14.8%, and 63.7±11.4% and of fat was 26.9±6.4%, 36.0±14.8%, and 36.3±11.4% for BL, CARB and PLA, respectively. No significant differences were found between treatments ($F_{2,10}=2.85$; $P=0.105$; effect size=0.363 for CHO and fat, respectively).
CONCLUSION:
The novel finding of this pilot work was that drinking CARB during 1 h cycling at 90% of RCP PO significantly increased Cr, also demonstrated by a moderate effect size. In contrast, PLA did not significantly alter Cr. Even though participants ingested 60 g CHO during cycling, a shift from CHO to fat oxidation during subsequent running was evident with no significant differences to PLA. In summary, CHO ingestion during cycling elevates sub-maximal Cr, however, it is still unclear if this notably affects running performance in a triathlon race.

1. Jones (2006) 2. Millett et al. (2000) 3. Hopker et al. (2016) 4. Currell & Jeukendrup (2008)

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