Short-term effects of carbohydrate versus carbohydrate protein ingestion on subsequent resistance training performance in male rugby players

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Introduction
A recent investigation into glycogen replenishment following exercise by Ivy et al. (2002) reported that glycogen restoration during 240-min of recovery was significantly greater with a carbohydrate-protein supplement (49%) compared with an iso-caloric (31%) and iso-carbohydrate equivalents (28%). However, Van Hall et al., 2000 and Carrithers et al., 2000 have disputed the benefits of carbohydrate-protein supplements in short-term restoration of glycogen stores. The present study investigated the short-term effects of carbohydrate and carbohydrate-protein beverages on subsequent resistance training performance.

Methods
Resistance trained male academy rugby players (n=10, mean±SD: age 20±2 yr, mass 93±12 kg, height 181±8 cm, % fat 15±4%) volunteered for this single-blinded study investigating the short-term effects of different carbohydrate and carbohydrate-protein drinks on subsequent exercise performance. The four trial arms were: Low CHO (L) containing 66g.L⁻¹ CHO, High CHO (H) containing 89g.L⁻¹ CHO, CHO-Fructose (F) containing 66g.L⁻¹ CHO and 25g.L⁻¹ fructose and CHO-protein (P) containing 66g.L⁻¹ CHO and 23g.L⁻¹ protein, drinks H, F and P were iso-caloric and trials were separated by 7 to 14 days. Following an initial 120 min resistance training (RT) circuit involving 6 sets x 12 reps at 70%, 1 set x 10 reps at 75% and 1 set x 8 reps at 80% of individual 1-RM for squat, bench press, leg press, lat pull-down, leg curl and arm, players rested for 240 min. During this rest phase they consumed 1 L of test drinks at 10 and 120 min, following this phase they undertook repeated circuits of the same exercises (8 reps at 80% of 1-RM) to failure (TTF). Venous blood samples collected pre- and post-RT, 120 and 240 min into rest phase and post–TTF were immediately analysed for blood glucose and lactate (mmol.L⁻¹) haemoglobin (g.dL⁻¹) and haematocrit (%). Plasma samples were batch analysed for non-esterified fatty acids (NEFA in mmol.L⁻¹), interleukin-6 (IL-6 in pg.mL⁻¹) and osmolality (mosm.L⁻¹). Data were analysed using single and 2 factor (drink by time) repeated measures ANOVA, with post-hoc quantification of significance using Tukey HSD tests.

Results
Despite a trend of increasing total work capacity (TWC) and mass lifted within each exercise during TTF, no significant differences were observed across drinks (P>0.05). Mean TWC performed post-ingestion of P was greatest, with decreasing mean data recorded for H, F and L (2379±2181 vs. 2328±2019, 2379±2181 and 1997±1383 kg), respectively. Plasma NEFA recorded post-TTF were significantly higher pre- compared to 120 and 240-min during recovery (P<0.05). In addition, mean IL-6 data were not significant across test drinks.

Discussion
Despite a lack of statistical significance, ingestion of P resulted in a greater mean TWC compared to F, H and L after a standard RT circuit and a 240 min recovery period. Mean TWC after ingestion of P was 16, 10 and 2% higher than after ingestion of H, F and L, respectively. Ivy et al. (2002) observed significantly greater glycogen restocking after 240min with carbohydrate-protein, compared with iso-caloric and iso-carbohydrate supplements in fasted, glycogen-depleted subjects. In this study, glycogen stores may not have been fully depleted following RT, as subjects were not fasted prior to the non-endurance exercise. However, it is possible that had glycogen stores been fully depleted the difference in CHO uptake due to insulinotropic stimuli may have resulted in a significant performance outcome as postulated by Ivy et al. (2002).

References

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