A Comparison of the Effects of Moderate-Intensity Continuous Cycling and High-Intensity Interval Cycling on Postprandial Lipemia and Glycemia

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ABSTRACT

Both moderate-intensity continuous exercise (MICE) and high-intensity interval exercise (HIIE) has been reported to reduce the magnitude of postprandial lipemia and glycemia. It is unclear if performing MICE or HIIE of similar duration and work would have a comparable effect on postprandial lipemia or glycemia. **PURPOSE:** Examine the postprandial lipemic and glycemic response following the completion of high-intensity interval cycling (HIIC) and moderate-intensity continuous cycling (MICC) that is of equal duration and comparable work output. **METHODS**: Participants were mildly active males (n = 12; age = 21.9 ± 1.8 yrs; body mass = 90.1 ± 16.8 kg; BF% = 25.9 ± 8.6). Each participant completed a graded exercise test on a cycle ergometer to determine their maximal work rate (WRmax). For the study, each participant completed a bout of 1) REST, 2) MICC, and 3) HIIC in a randomized order. Each bout was performed for 20 minutes on the afternoon of Day 1. Each bout was separated by at least 1 week. Rest involved sitting quietly in the laboratory. MICC required continuous cycling at 60% WR_{max}. HIIC involved 15-second cycling sprints at 120% WR_{max} followed with 45 seconds of cycling at 40% WR_{max}. A mixed meal (50% carbohydrate (CHO), 35% fat, 6.4 ± 1.2 kcal/kgBW) was provided 30 minutes following the completion of each bout. Blood samples were acquired just prior to each bout and at 0, 0.5, 1, and 2 hours following the completion of the meal (post-meal). The next morning (Day 2), following a 10-hour fast, a 2nd mixed meal was provided. Blood samples on Day 2 were acquired at 0, 2, and 4 hours post-meal. Blood samples were analyzed for glucose, insulin, and triglyceride (TG) concentration. The postprandial (PP) response was quantified via the total (AUC_T) and incremental area under the curve (AUC_I) using the trapezoidal method. Significant differences (p<.05) in the exercise heart rate (beats per min) and the work output (Watts) between the MICC and HIIC were determined using a student's paired T-test. Significant differences (p<.05) in the PP response between Rest, MICC and HIIC were determined using a one-way, repeated measures ANOVA and Bonferroni post-hoc test. **RESULTS:** The average heart rate was significantly higher (p=.037, ES = 1.1) during HIIC (163.3 ± 7.3) compared to MICC (154.4 ± 8.5). Average work output (Watts) was similar between MICC (122.5 ± 25.4) and HIIC (110.3 ± 14.7) (*p* = .091, ES = .51). On Day 1, there was no significant difference in the PP glucose, insulin, or TG response between the 3 bouts. On Day 2, there was no significant difference in the PP glucose or insulin response. On Day 2, MICC did reduce the TG AUC_T (442.9 ± 76.4mg $\cdot dl^{-1} \cdot 4hr^{-1}$) when compared to rest (487.4 ± 104.4mg $\cdot dl^{-1} \cdot 4hr^{-1}$) (*p* = .02, ES = .43). HIIC did not reduce the TG AUC_T on Day 2 (454.8 ± 72.3mg $\cdot dl^{-1} \cdot 4hr^{-1}$), (*p* = .076, ES = .31). There was no difference in the AUC_I between the 3 bouts for any of the postprandial measurements on Day 1 or Day 2. C**CONCLUSION:** A brief bout of MICC and HIIC does not influence the PP response when completed just prior to a mixed meal. There may be a delayed response to exercise as MICC reduced the postprandial triglyceride (PPTG) concentration when completed approximately 16 hours prior to a mixed meal. While HIIC did not reduce PPTG on Day 2 there was a trend towards a significant reduction. The delayed reduction in the PPTG concentration may be associated with a delayed increase in lipoprotein lipase activity which may occur 4 – 18 hours following the completion of exercise. The lack of change in the PP glucose and insulin response might be explained by a wide inter-individual variance as half of the participants appeared to have responded to the exercise bouts based on their PP glucose and insulin concentration.