TACSM Abstract

Muscle Glycogen Depletion and Replenishment: A Meta-Analytic Review

IAN T. MACKLIN, FRANK B. WYATT, MALAENI RAMOS and GRANT RALSTON

Department of Athletic Training and Exercise Physiology; Midwestern State University; Wichita Falls, TX

Category: Masters

Advisor / Mentor: Wyatt, Frank (frank.wyatt@msutexas.edu)

ABSTRACT

Muscle glycogen depletion and replenishment rates have been associated with sport performance, biomechanical movement and immune system alterations. **PURPOSE**: the purpose of this study is to determine, through a meta-analytic review, the mechanisms of muscle glycogen depletion and replenishment. **METHODS**: A systematic literature review and meta-analysis research design was utilized. Inclusion-exclusion criteria were the following: Glycogen depletion- replenishment studies; subjects in studies had no pathologies; human and animal studies were accepted; Studies with diet manipulation were accepted; articles accepted for coding were peer reviewed, original publications. Coded studies were summarized and statistically analyzed. Coded variables were presented as means and standard deviations (SD). Rates of muscle glycogen depletion and replenishment were analyzed through the Cohen's d effect size (ES) calculation: = (M2 - M1)/SDpooled where SDpooled = √((SD12 + SD22)/2). **RESULTS**: Eighteen (18) studies were coded allowing for a total sample size of n=149. Subject demographics were: age, 29.0 (2.9) y; height, 180.4 (5) cm; weight, 74.7 (3.6) kg; maximal oxygen consumption (MVO2), 61.2 (4) ml*kg-1*min.-1. Pre-Post depletion rate ES was 10.29, considered large. Pre-Post replenishment rate ES was 4.39, considered large. Mechanisms of muscle glycogen depletion in rank order from high to low were: high intensity intervals, endurance-run followed by sprints, low intensity cycling to exhaustion, 90 min. intermittent work, cycling for 2 hours at 60% MVO2, 30 min. run at 70% MVO2. Mechanisms of glycogen replenishment within a 24-hour period in rank order from high to low were: high carbohydrate (CHO) diet through two high kcal meals, high CHO with 7 low kcal meals, mixed diet (CHO, protein, fat) with two high kcal meals, and low CHO with two high kcal meals. **CONCLUSION**: High intensity work led to the greatest depletion rates. High CHO, with high kcal per meal showed the greatest replenishment rates. Consumption of kcal within the first two hours post exercise facilitated replenishment. Variations in simple vs. complex sugars eaten over a 24-hour period influenced total muscle glycogen replenishment. Lastly, high MVO2 significantly associated with glycogen replenishment.