DATA SET 6
EXPLORE 1C LESSON 18

Food and Agriculture Center for Science Education

Study 1

Intense exercise has unique effects on both insulin release and its roles in glucoregulation: implications for diabetes

Publish Date: 2002
Journal: Diabetes
Authors: Marliss, E.B., and Vranic, M.
Link: https://doi.org/10.2337/diabetes.51.2007.S271

Overview of the Study

Scientists wanted to examine the effects of intense exercise on blood glucose and other related variables to better understand how blood glucose levels change in healthy individuals in response to exercise. Glucose is a small molecule that can be broken down by all cells in the body to produce cellular energy. The scientists performed the study on healthy, young male subjects before, during, and after workouts. Subjects completed 40 minutes of moderate-intensity exercise (50% max effort) and 15 minutes of intense exercise (87% max effort) followed by a rest period. Blood samples were taken from catheters inserted into leg muscles. Blood samples were drawn from the participants at 2-minute intervals.

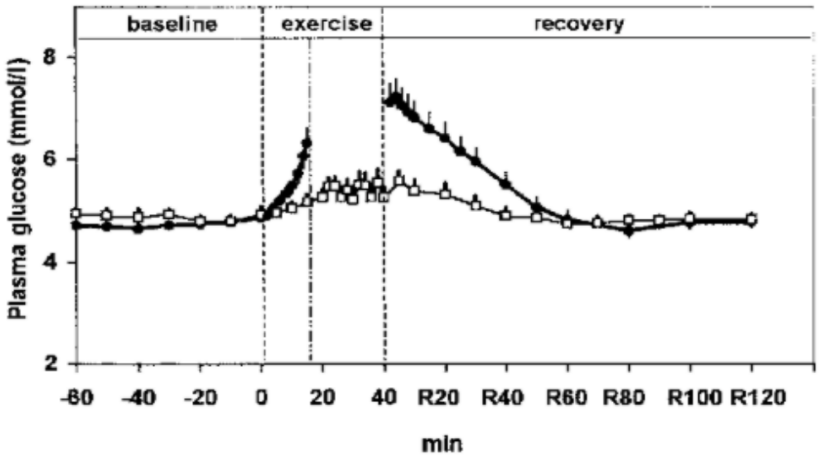

Figure 1: Comparison of responses during 40 minutes of moderate-intensity exercise at 50% max intensity (light squares) and 15 minutes of intense exercise at 87% max intensity (dark squares) in normal young male subjects. A rest period termed baseline was followed by exercise of the two different durations, as shown between the broken vertical lines. The break in the line for intense exercise is to permit plotting the recovery (R) period (R0-R120) starting from cessation of exercise. Data are presented as a means of +_SE.

Study 2

The effect of exercise intensity on skeletal muscle stress kinase and insulin protein signaling

Publish Date: February 9, 2017
Journal: PLoS ONE
Authors: Parker L, Trewin A, Levinger I, Shaw CS, Stepto NK
Link: https://doi.org/10.1371/journal.pone.0171613

Overview of the Study

Scientists set out to determine how blood glucose levels changed over time in a sample of 8 "recreationally active" adults. They selected people with approximately the same fitness levels, weights, and BMIs. Two were female, and four were male. Glucose is a small molecule that can be broken down by all cells in the body to produce cellular energy.

On three separate occasions, participants reported to the laboratory in the morning after an overnight fast. A resting muscle biopsy and venous blood sample were taken prior to participants undergoing their randomized exercise protocol (SIE, HIIE, or CMIE). Immediately following the acute session of exercise, a muscle biopsy and venous blood sample were taken, and participants rested on a bed for three hours. A third muscle biopsy was taken 3 hours after exercise, and venous blood samples were taken in the middle of the exercise session, immediately after exercise, and 10 minutes, 30 minutes, 1 hour, 2 hours, and 3 hours after exercise.

Each participant completed three total workouts, including CMIE (continuous moderate-intensity exercise), HIIE (high-intensity interval exercise), and SIE (sprint interval exercise). The workouts were separated by about a week for recovery. Researchers collected blood samples prior to exercise on each workout day. Blood samples were also taken in the middle of the exercise session, immediately after, and 10 min, 30 min, 1 hour, 2 hours, and 3 hours after exercise. The levels of glucose were measured in each of the blood samples collected.

All exercise sessions were performed on a Velotron cycle ergometer. The SIE protocol consisted of 4 x 30 second all-out cycling sprints interspersed with 4.5-minute passive recovery periods. The HIIE protocol consisted of 5 x 4-minute cycling bouts at 75% of max effort, interspersed with 1-minute passive recovery periods. The CMIE protocol consisted of continuous cycling for 30 minutes at 50% of max effort, equating to the same total work performed (294 ± 23 kJ) in the HIIE protocol. Venous blood was collected from an antecubital vein via an intravenous cannula and analyzed immediately for blood glucose using an automated analysis system.

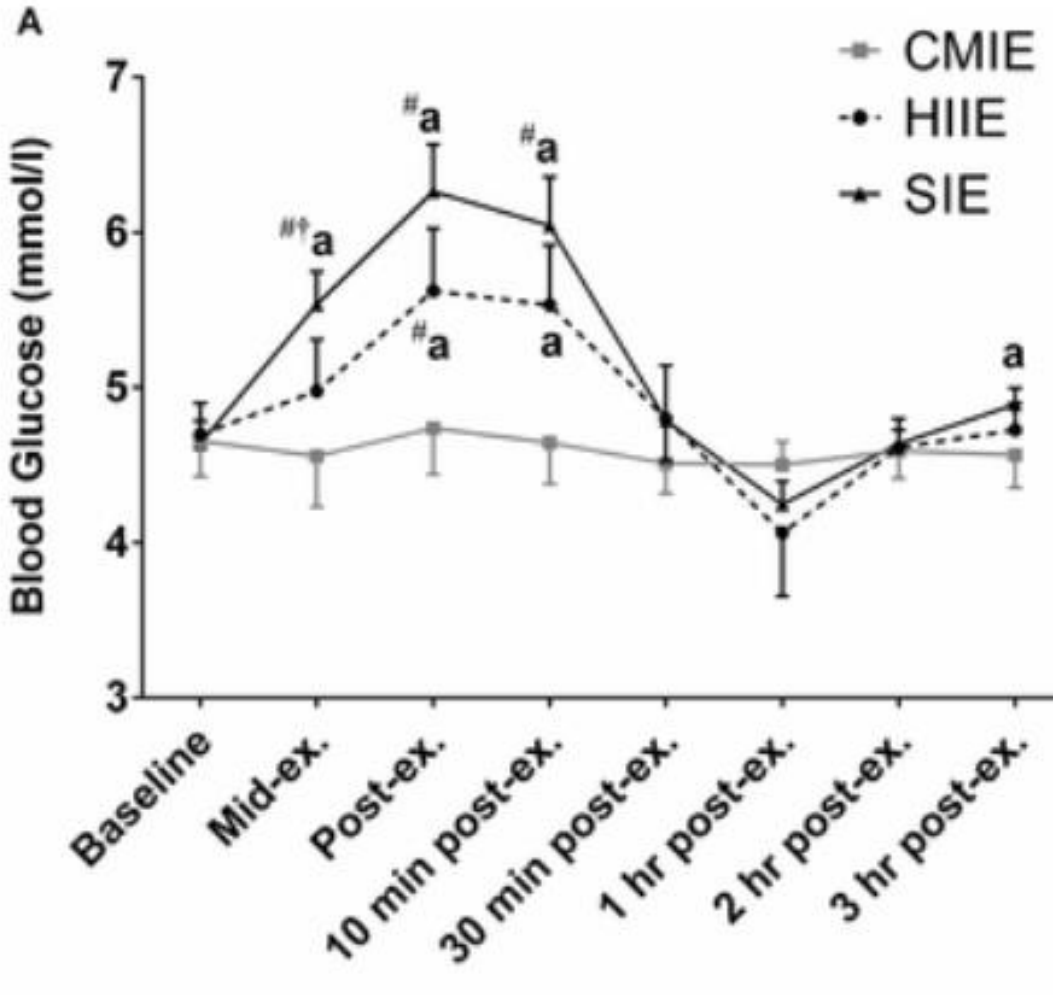

Figure 2 Blood glucose response to high-intensity interval exercise (HIIE, circles), sprint-interval exercise (SIE, triangles), and continuous moderate-intensity exercise (CMIE, squares). a = $p < 0.05$ compared to baseline. Significantly different ($p < 0.05$) at equivalent time point vs # = CMIE and † = HIIE