

DATA SET

EXPLORE 1A LESSON 16



Study 1

Influence of exercise intensity on skeletal muscle blood flow, O₂ extraction and O₂ uptake on-kinetics

Publish Date: 2012

Journal: The Journal of Physiology

Authors: Andrew M. Jones¹, Peter Krstrup, Daryl P. Wilkerson¹, Nicolas J. Berger, José A. Calbet and Jens Bangsbo

Link: <https://doi.org/10.1113/jphysiol.2012.233064>

Overview of the Study

Researchers wanted to compare the delivery and uptake rates of oxygen to skeletal muscle during lower-intensity exercise as compared to high-intensity exercise in seven healthy males with an average age of 25, similar body compositions, and fitness levels. They were said to be “untrained” or recreationally active.

Subjects were placed in the supine position, and one arterial and two venous catheters were placed under local anesthesia. The arterial catheter, used for collection of blood samples, was inserted into the femoral artery of the right leg (experimental leg) with the tip positioned ~2 cm proximal to the inguinal ligament. The second catheter, used for the collection of venous blood samples, was placed retrograde in the femoral vein of the left leg with the tip positioned 6 cm distal to the inguinal ligament. The third catheter, used for measurements of thigh blood flow, was placed antegrade into the femoral vein with the tip positioned 2 cm distal to the inguinal ligament.

Subjects performed dynamic single-legged knee-extension exercises in a semi-supine position that permitted the exercise to be confined to the quadriceps muscle. The exercise protocol consisted of four 6-minute LI bouts (EX 1–4) followed by four 6-minute HI bouts (EX 5–8). The LI bouts and HI bouts were interspersed with 30 min and 45 min rest periods, respectively. These recovery durations were selected to ensure recovery before the commencement of the next exercise bout.

An occlusion cuff placed below the knee was inflated (240 mmHg) 30 s prior to exercise and remained inflated throughout exercise in order to avoid contribution of blood from the lower leg. Before and during EX1–2 and EX5–6, blood flow was measured and femoral arterial and venous blood samples were obtained. During EX3 and EX6, venous blood samples were obtained at rest, during passive exercise and frequently during exercise.



Data collected is shown in Figures 1a and 1b.

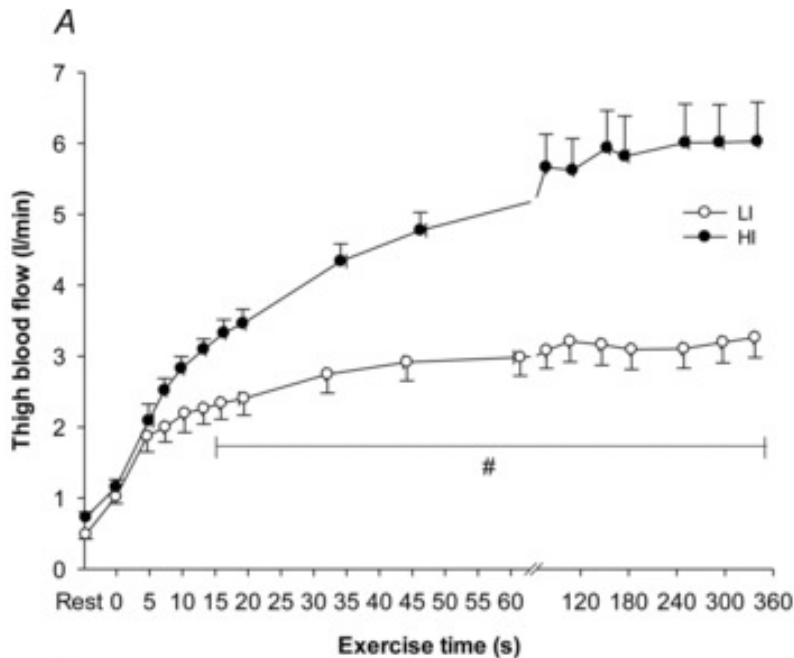


Figure 1a. Thigh blood flow before and during 6 min of low-intensity (LI, filled symbols) and high-intensity (HI, open symbols) single-legged knee-extension exercise. Values are mean \pm SEM. #LI significantly different from HI.

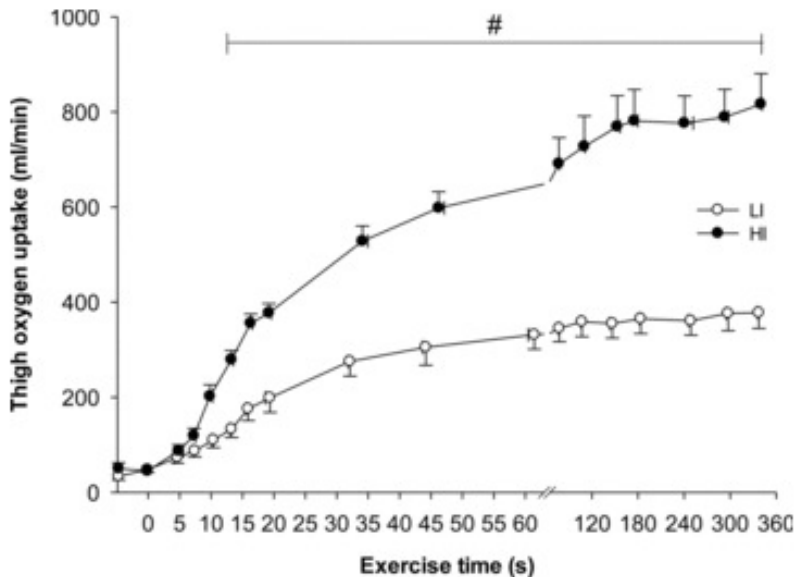


Figure 1b: Muscle oxygen uptake before and during 6 min of low-intensity (LI, filled symbols) and high-intensity (HI, open symbols) single-legged knee-extension exercise. Values are mean \pm SEM. #LI significantly different from HI.

Study 2

Changes in oxygen uptake, shoulder muscles activity, and propulsion cycle timing during strenuous wheelchair exercise

Publish Date: 2007

Journal: Spinal Cord

Authors: S M Bernasconi, N Tordi, J Ruiz & B Parratte

Link: <https://doi.org/10.1038/sj.sc.3101989>

Overview of the Study:

In this study, scientists wanted to determine the effect of strenuous wheelchair exercise on the amount of inhaled oxygen in the breath. Eight male participants were around 25 years of age and had no prior experience in sitting in a wheelchair and pushing the wheels to propel the chair. Participants engaged in two exercise sessions in a standard wheelchair. Participants sat in the wheelchair while it was on an industrial treadmill and rolled the wheels with their arms to propel the wheelchair forward on the treadmill. Each of the two exercise sessions was 6-min duration and was performed at one of two constant workloads: (1) non-fatigable exercise (moderate workload) and (2) fatigable exercise (heavy workload). The intensity was measured by watts. The average for the moderate-intensity workout was 28 watts, and the 38 watts for the high-intensity workout. The watts assigned for each person were set based on fitness testing completed by the participants prior to the day of the workouts.

During each exercise session, oxygen uptake was measured using an oxygen sensor within a breathing mask. Measurements were averaged every 30 s. O_2 sensors were calibrated together with signal volume according to manufacturer instructions before each test session using reference gasses of known concentrations and a 3-L calibration syringe.

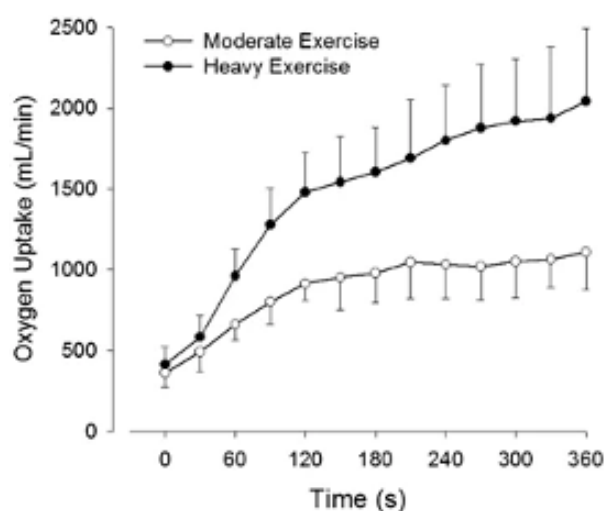


Figure 2: Oxygen uptake during moderate (o) and heavy (•) exercise sessions.