Topic category: Teaching

Muscle Metaboreflex Activation via Post-Exercise Ischemia as a Tool for Teaching Cardiovascular Physiology for Undergraduate Students

André L. Teixeira, Milena Samora, Lauro C. Vianna

NeuroV̇ASQ̇ – Integrative Physiology Laboratory, Faculty of Physical Education, University of Brasília, Brasília, DF, Brazil.

Introduction: The cardiovascular responses to exercise is mediated by several interactive neural mechanisms including central command, arterial baroreflex and skeletal muscle mechano- and metaboreflex. In humans, muscle metaboreflex activation can be isolated via post-exercise ischemia (PEI) which increases sympathetic nerve activity and partially maintains the exercise-induced increase in arterial blood pressure (BP). Although skeletal muscle metaboreflex is considered one of the principal mediators of the cardiovascular response to exercise, PEI was widely used in scientific reports, but its use as a tool for teaching cardiovascular physiology has not been previously reported.

Objective: To describe a practical lesson methodology used in an undergraduate exercise physiology laboratory class that can guide teachers to demonstrate several aspects of cardiovascular regulation during exercise and report the perceptions of the students after the laboratory class.

Material and Methods: We hypothesized that our practical laboratory class will improve the student's perceptions of their understanding of the cardiovascular regulation during exercise. In an undergraduate exercise physiology class (n=47), a traditional 4-h lecture was conducted discussing the neural control mechanisms of cardiovascular regulation during exercise. Thereafter, eight students (4 men and 4 women) were selected to participate as a volunteer of a practical laboratory class. Each participant performed 90 s of isometric handgrip (IHG) exercise at 40% of maximal voluntary contraction followed by 3 min of PEI. Arterial BP and heart rate were measured by digital monitors at rest, during IHG, PEI and recovery. In addition, blood samples were collected from the tip of the exercising finger for blood lactate analyses. After the laboratory class, a survey was given to determine the perceptions of the students through a questionnaire consisting of 10 items on a 5-point Likert scale.

Results: The findings demonstrate that, before the laboratory class, some students were not confident of their understanding of cardiovascular regulation during exercise. Overall, the students self-related that the activity improved their level of understanding regarding *1)* the cardiovascular responses to exercise; *2)* the role of skeletal muscle metaboreflex as an important mediator of cardiovascular responses to exercise; *3)* the role of blood lactate as a trigger of muscle metaboreflex activation; and *4)* the sex-related differences in cardiovascular responses to exercise. In addition, the majority of students believed that the activity reinforced their appreciation for the importance of the subject matter, enhanced their desire to learn the subject matter, and improved their approach for studying the content for the course exam. In summary, this laboratory class has proved to be highly popular with students, who self-reported a significant improvement in their understanding of several aspects of cardiovascular regulation during exercise.

Conclusions: These findings could encourage exercise physiology teachers to incorporate the use of PEI as a tool for teaching cardiovascular physiology for undergraduate students.

Keywords: muscle metaboreflex activation, post-exercise ischemia, teaching Cardiovascular Physiology, undergraduate students