Notice of the Final Oral Examination
for the Degree of Master of Science
of
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BA (University of Victoria, 2013)

“Consistency of Near-Infrared Spectroscopy chromophores during vascular occlusion of the thigh over 5 consecutive days”

Department of Exercise Science, Physical and Health Education

Monday, June 20, 2016
9:30am
Medical Sciences Building
Room 210

Supervisory Committee:
Dr. Kathy Gaul, Department of Exercise Science, Physical & Health Education, University of Victoria
(Supervisor)
Dr. Lynneth Stuart-Hill, Department of Exercise Science, Physical & Health Education, UVic
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External Examiner:
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Chair of Oral Examination:
Dr. Megan Swift, Department of Germanic & Slavic Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

The purpose of this study was to examine the consistency of near-infrared spectroscopy (NIRS) measures during vascular occlusion of the thigh during 5 consecutive days. A secondary purpose was to examine if the repeated daily occlusions modify the vascular response to such occlusions. The NIRS chromophores of oxygenated hemoglobin (HbO₂), deoxygenated hemoglobin (HHb), total hemoglobin (tHb), hemoglobin difference (HbDiff), and total saturation index (TSI) were monitored at the vastus lateralis muscle during each testing session. Participants were female (age 18-30) and were randomly assigned to one of two groups. The Test Group (age 23 +/- 2 yrs) completed an occlusion test every day for 5 consecutive days while the Control Group (age 21 +/- 1.6 yrs) was tested on days 1, 3 and 5. Each testing session involved 10 minutes rest in a supine position, 10 minutes of femoral artery occlusion (preset at 250mmHg), 10 minutes of recovery. At onset of occlusion, the rapid cuff inflation system inflated in 0.3 seconds to the preset 250mmHg. Following the 10 minutes of occlusion, the cuff was deflated in 0.3 seconds. Heart rate was monitored throughout all testing sessions and mean arterial pressure was calculated and compared between groups.

There were no significant group or day main effects found, nor any significant interactions for the following hemoglobin chromophores measures: HbO₂, HHb, HbDiff, and TSI. In all participants, the NIRS response pattern to rest, occlusion and recovery was consistent for all testing days regardless of group. The response pattern to the occlusion initiated by the rapid cuff inflation was as follows: HbO₂, tHb, HbDiff, and TSI decreased then slowly plateaued over the 10 minutes while HHb increased initially and then plateaued. Following the rapid cuff deflation, HbO₂, tHb, HbDiff and TSI increased to their maximum reperfusion levels and then plateaued over the remainder of the 10 minutes of recovery. During that same period, HHb decreased initially upon reperfusion and then plateaued. Unlike the other measures, TSI and tHb demonstrated inconsistencies in their response pattern regardless of group or day.

The consistency of hemoglobin chromophores response pattern to daily vascular leg occlusions over 5 consecutive days is an important finding of this study. This response indicates that there is no apparent change in vascular response to repeated occlusions and has implications for exercise studies that use occlusion in their methodology. The study emphasizes the inconsistency of tHb and TSI as primary hemoglobin response measures to occlusion. Similarly, the results demonstrate the potential misinterpretation of results if only relying on one hemoglobin measure during occlusion.