



**University
of Victoria**

Graduate Studies

**Notice of the Final Oral Examination
for the Degree of Master of Science**

of

EMILY MEDD

BSc (University of Ottawa, 2008)

**“Power output and tissue oxygenation of women and girls during
anaerobic cycling and recovery”**

Department of Exercise Science, Physical and Health Education

Friday, December 18, 2015

8:30am

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
(Member)

External Examiner:

Dr. Leigh Anne Swayne, Division of Medical Sciences, UVic

Chair of Oral Examination:

Dr. John Dower, Department of Biology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The purpose of this study was to compare the exercise and recovery muscle oxygenation response of Women and Girls during two 30s Wingate anaerobic tests separated by two minutes of active cycling recovery (resistance \approx 2.5% body weight, 60-80rpm). Oxygenated hemoglobin (HbO₂), deoxygenated hemoglobin (HHb), total hemoglobin (tHb), and tissue saturation index (TSI) were monitored at the right vastus lateralis muscle using near infrared spectroscopy (NIRS) throughout exercise, recovery, and a post-exercise femoral artery occlusion to TSI plateau. Pressure was preset at 250mmHg for Women and 210mmHg for girls, achieved by rapid inflation in 0.3 seconds, and maintained until a 2 minute TSI plateau occurred or 10 minutes had passed. Twenty Women (23.8[2.12] yrs) and 13 Girls (9[1] yrs, combined Tanner stage <4) completed all tasks excepting 1 girl who did not complete occlusion.

Significant group, time, and group by time interaction effects were observed for peak and mean power (Watts/kg FFM). Women had significantly greater power output compared to GIRL for both Wingates. While both groups had reduced power output in Wingate 2, the reduction was significantly greater in Women compared to Girls. No significant group differences were found for resting TSI, recovery TSI, minimum TSI during either Wingate test, or for minimum TSI during occlusion, however a time main effect for Women was observed with minimum TSI being significantly lower in Wingate 1 compared to Wingate 2. Girls had similar minimum TSI for both Wingate tests. Women also demonstrated a significantly greater difference between Wingate minimum TSI and occlusion minimum TSI in Wingate 2 compared to Wingate 1. During Wingate 1, HHb increase was greater in Girls compared to Women and remained elevated during recovery compared to women. Changes in HbO₂, HHb, and tHb were reduced in Wingate 2 for both groups, more so in Women for tHb and in Girls for HHb. Recovery was not different between groups with the exception of a faster TSI time constant of recovery in Women (τ =20.25 [13.01]s) compared to Girls (τ =36.77 [13.38]s) which is attributed to a faster HHb time constant in Women (τ =13.6 [0.44]s) compared to Girls (τ =30.77[19.47]s).

Both groups demonstrated similar power output results and TSI response across the two Wingate tests but Girls were better able to repeat the anaerobic performance with a consistent TSI minimum between the two tests despite a faster recovery of HHb and TSI. These findings, in the context of observed Hb variable differences between groups, provide evidence of greater oxidative metabolism in Girls during a high intensity exercise.