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Two-visit Repeatability Of VL and PFC Hemoglobin Thresholds In Ramp Exercise

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able-bodied subjects at a cadence of 115 steps per minute; oxygen consumption was analyzed using a Parvo Medic TrueOne 2400 Metabolic Cart (Sandy, UT). Analysis of the expired gases occurred every 10 seconds. Heart rate was recorded using a Polar monitor as well as by 3-lead EKG. RPE was recorded using the Borg 6-20 scale.

RESULTS: There was a positive correlation between predicted and observed VO_2 peak in able-bodied subjects using RPE ($\rho = 0.86$; $p \leq 0.05$) and RPE + watts ($\rho = 0.88$; $p \leq 0.05$). SCI subjects were able to perform both, the maximal and submaximal protocols, with a cadence of 80 steps per minute.

CONCLUSION: The results of this study are in agreement with previous investigations showing the validity of RPE-based protocols to predict $\text{VO}_{2\text{max}}$. The results of this pilot study show promise for the development of submaximal protocols for the prediction of $\text{VO}_{2\text{max}}$ in this population. Future directions include the examination of protocols ending at RPE 13 and RPE 15 as well as to develop prediction equations for a larger group of individuals with varying levels and severity of SCI.

589

Board #4

May 28, 2:00 PM - 3:30 PM

Two-visit Repeatability Of VL and PFC Hemoglobin Thresholds In Ramp Exercise

Goutham Ganesan, Shlomit Radom-Aizik, Scott Graf, Albert Cerussi, Bruce Tromberg, Dan Cooper, Pietro Galassetti. *UC Irvine, Irvine, CA.*
(No relationships reported)

PURPOSE: TR-NIRS and related technologies have been used to measure tissue hemoglobin (Hb) oxygenation in exercise, as reflective of vascular function. Here, we assessed repeatability of muscle (vastus lateralis, VL) and prefrontal cortex (PFC) Hb dynamics during incremental exercise in adolescents, using time-resolved near infrared spectroscopy (TR-NIRS).

METHODS: 3 adolescents (2 F) performed cycling incremental ramp tests on two different days. A 2-channel TR-NIRS instrument (TRS-20, Hamamatsu) was used to record tissue Hb oxygenation in the right VL and left PFC. Data was averaged into 20-s bins. VL total Hb (THb) and PFC deoxyHb (dHHb) were further analyzed with piecewise regression. Transition times between phases were expressed as fraction of time to test cessation.

RESULTS: VL THb followed three phases: an initial decrease, an intermediate increase, a final plateau. In the 3 subjects, the fractional time to the plateau phase in the two visits was: 1) .87 and .79, 2) .57 and .60, and 3) .68 and .71. PFC dHHb could be described using two phase behavior, with an initial plateau followed by an increase. The time to transition for PFC cTHb was 1) .56 and .49, 2) .62 and .70, and 3) .54 and .63.

CONCLUSIONS: It appears that TR-NIRS can describe VL and PFC hemoglobin dynamics on repeated experimental trials in the individuals studied during ramp exercise. While the mechanisms of the observed transitions events is not fully known, our data suggests that in VL, the THb plateau represents the upper limit of blood volume increase with exercise. The PFC dHHb increase may indicate increased cerebral O₂ extraction/cortical activation. These findings highlight the utility of TR-NIRS in ramp exercise.

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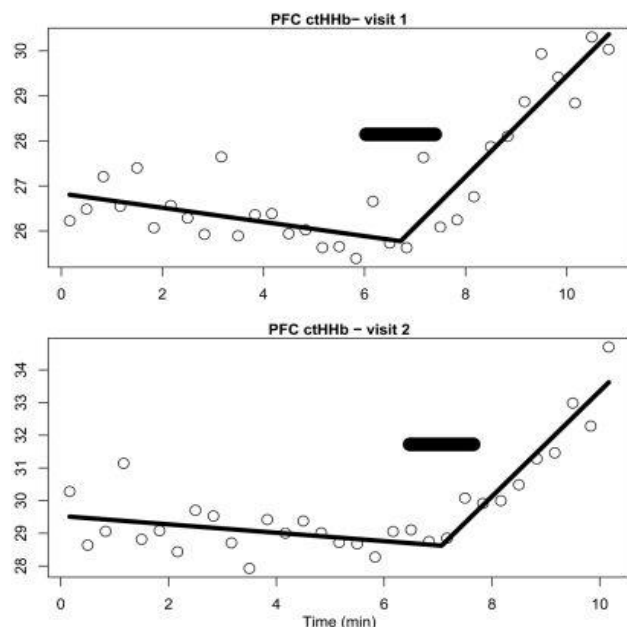


Figure: Representative tracings of PFC cTHb in one subject over two visits performing incremental exercise under similar conditions. Two-phase piecewise linear regression was applied and demonstrates that transition points occur at overlapping time points. Thick black dash indicates 95% confidence intervals of time to transition between phases.

590

Board #5

May 28, 2:00 PM - 3:30 PM

Perceived Exertion and Energy Cost of Physical Activity during Pregnancy

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(No relationships reported)

The decline in maternal physical activity across gestation may be related to altered perception of physical activity intensity as pregnancy progresses, which may be modified by physical activity participation history.

PURPOSE: We determined whether a woman's rating of perceived exertion (RPE) during treadmill exercise changes at a given energy expenditure during pregnancy and postpartum. Additionally, we evaluated the influence of prepregnancy physical activity behavior on this relationship.

METHODS: Fifty-one subjects were classified as either exercisers (N = 26) or sedentary (N = 25) based on physical activity history. Participants visited our laboratory three times: at 20 weeks and 32 weeks gestation and at 12 weeks postpartum. At each visit, following a light warm-up, women performed five minutes of treadmill exercise that they deemed to be moderate and vigorous. Heart rate (HR), oxygen consumption (VO_2), and RPE (6-20 Borg scale), were measured at each intensity.

RESULTS: At moderate intensity, postpartum VO_2 was higher compared to 20 or 32 week VO_2 (17.0 ± 2.7 mL/kg/min vs. 15.7 ± 2.3 and 14.8 ± 2.4 , respectively), but there was no difference for HR (119.3 ± 12.4 bpm vs. 122.8 ± 8.1 and 123.0 ± 8.3) or RPE (11.3 ± 1.6 for postpartum vs. 11.2 ± 1.6 and 11.4 ± 1.5). For vigorous intensity, postpartum HR (150.7 ± 10.6 bpm) and VO_2 (24.0 ± 5.3 mL/kg/min) were higher than at 32 weeks (142.4 ± 7.8 bpm and 19.3 ± 3.4 mL/kg/min), but RPE was not different at any time points. RPE/ VO_2 was higher at 32 weeks pregnancy compared to other time points, particularly during vigorous exercise. Results were similar when subjects were stratified by prepregnancy physical activity levels.