



## Mid Atlantic Regional Chapter of the American College of Sports Medicine

Annual Scientific Meeting, November 1<sup>st</sup> – 2<sup>nd</sup>, 2019  
Conference Proceedings

International Journal of Exercise Science, Volume 9, Issue 8



### Comparison of Portable to Laboratory-based Near Infrared Spectroscopy Sensors for Assessing Muscle Health During Exercise

Julie S. Rekant, April J. Chambers

University of Pittsburgh, Pittsburgh, PA

A cost-effective and non-invasive way to monitor muscle health is with near infrared spectroscopy (NIRS). NIRS uses the concepts of light scattering to assess muscle blood flow continuously during functional activities to provide information on muscle nutrition and oxygenation. How newly developed, commercially available, portable NIRS sensors perform compared to the gold standard laboratory-based NIRS technology is unknown. **PURPOSE:** To determine the validity of a wireless NIRS sensor in monitoring changes in vascular muscle health during an exercise protocol.

**METHODS:** Nine healthy adults (age:  $25 \pm 3$  yrs, BMI:  $27 \pm 3$  kg/m<sup>2</sup>) completed a structured exercise routine while equipped with a portable NIRS sensor and a gold standard laboratory-based NIRS sensor on either medial gastrocnemius. Percentage of oxygenated haemoglobin in the muscle tissue (SmO<sub>2</sub>) was calculated for both systems. Agreement between the signals was quantified with root mean square error (RMSE) for each subject over the whole trial and during each activity (walking, brisk walking, and stair stepping). The effect of activity on signal agreement was evaluated with a repeated measures ANOVA with RMSE as the dependent variable and activity type as the independent variable.

**RESULTS:** Over the whole trial, RMSE of SmO<sub>2</sub> across all subjects was  $21.5\% \pm 14.4\%$  indicating poor overall agreement of the portable NIRS signal to the laboratory NIRS signal. RMSE during walking, brisk walking, and stair stepping were  $20.2\% \pm 18.6\%$ ,  $19.1\% \pm 12.8\%$ , and  $21.0\% \pm 14.8\%$ , respectively. Signal agreement was not affected by activity type ( $F=0.18$ ,  $p=0.84$ ). **CONCLUSION:** Direct comparisons between the portable and laboratory NIRS devices should be done with caution due poor agreement between the two signals. Differences between system estimates are likely due to different light emitter and detector technologies, different assumptions made for the SmO<sub>2</sub> calculations, and differences in fit of the sensors and skin contact. The validity of the portable NIRS device is not activity-dependent. Future work should explore how to best compare data between the two devices so the portable NIRS sensors can be reliability implemented for at-home monitoring of muscle health.

Supported by University of Pittsburgh Healthy Lifestyle Institute Pilot & Feasibility Funding Program