



Mid Atlantic Regional Chapter of the American College of Sports Medicine

45th Annual Scientific Meeting, November 4th- 5th, 2022
Conference Proceedings

International Journal of Exercise Science, Issue 9, Volume 11



Establishing the Reproducibility of Mitochondrial Capacity using Near-Infrared Spectroscopy

Grace E. Dietz, Gregory L. Chartier, Nicolas D. Knuth, Rian Q. Landers-Ramos. Towson University, Towson, MD

Near infrared spectroscopy (NIRS) has been used as a valid measure of skeletal muscle oxidative capacity. Some studies have indicated non-uniform measures of NIRS-derived measures of oxygen consumption within a specific muscle bed. Thus, determining standardization of protocols and reproducibility of NIRS-derived muscle oxidative capacity is critical to ensure trusted responses. **PURPOSE:** Establish the reproducibility of NIRS-derived skeletal muscle oxidative capacity within the medial gastrocnemius muscle. **METHODS:** Eight healthy participants (35 ± 10 years old) participated in two visits to the lab scheduled 2-7 days apart. For each visit, a NIRS device was placed on the belly of the medial gastrocnemius muscle of the subject's dominant leg. A pneumatic cuff capable of rapid inflation was placed on the same leg proximal to the tibiofemoral joint. Laying supine, participants were instructed to voluntarily plantarflex their foot against an exercise band for 30s followed immediately by 6 rapid arterial occlusions lasting 5s each with 5s recovery between occlusions. The protocol was repeated four times, and a physiological calibration was performed to correct for changes in blood volume. Differences in oxygenated and deoxygenated hemoglobin (HB_{Diff}) were collected continuously using NIRS. Recovery rate constants (min^{-1}) following the plantarflexion exercise were derived from analyses of HB_{Diff} signals to estimate skeletal muscle oxidative capacity. Location of the device was marked, and the protocol was repeated 2-7 days later. Intraclass correlation coefficients (ICC) was used to determine intra- and inter-day reproducibility of results. **RESULTS:** The recovery rate constant for oxygen consumption was $1.55 \pm 0.37 \text{ min}^{-1}$ on Day 1 and $1.72 \pm 0.41 \text{ min}^{-1}$ on Day 2 ($p=0.62$). Day 1 and 2 ICCs for four repeated trials were 0.888 and 0.932, respectively. The ICC between days 1 and 2 was 0.908. **CONCLUSIONS:** The intra- and inter-day ICC for mitochondrial capacity measures of the medial gastrocnemius indicated good reproducibility using NIRS. These data support the use of NIRS to reliably assess mitochondrial capacity in younger adults.

Supported by Towson University School of Emerging Technology, Summer Undergraduate Research Institute, and the College of Health Professions