**Measured Recovery Time Constant, as Measured by Near Infrared Spectroscopy in the Upper Trapezius of Normal Subject, is Affected by Weight Lifted**

M. Neary², M.Zaazhoa² and S. Sikdar¹

¹ Bioengineering Department, George Mason University, Fairfax, VA, USA
²College of Humanities and Social Sciences, George Mason University, Fairfax, VA, USA

**Introduction**

Near infrared spectroscopy (NIRS) is a noninvasive, continuous, and direct method used to determine oxygenation and hemodynamics in tissue. It enables the study of local differences in muscle O₂ consumption. The data collected using NIRS in allow for a better understanding of the physiological and vascular properties in the muscle.

NIRS is based on the relative tissue transparency for light in the near-infrared region and on the O₂-dependent absorption changes of hemoglobin and myoglobin. The absorption coefficients of oxygenated and deoxygenated hemoglobin and the absolute scattering of the blood in the muscle are measured.

Absorption measurements are converted into oxygen saturation and total hemoglobin concentration.

The time constant is the time required for the muscle to adjust to changes in the amount of work put on the muscle, including uptake of oxygen.

**Methods and Materials**

Four normal volunteers (2 women and 2 men) with no previous history of chronic neck pain in the upper trapezius muscle were enlisted.

Subjects were asked to sit upright and were given a 12, 14 and then an 18 lb weight. The subjects were scanned at rest and then instructed to perform an isometric contraction (i.e. a shoulder shrug) while holding the weight. Two trials for each weight on both the left and right sides were taken.

A NIRS system was used to collect oxygen saturation, hemoglobin concentration, oxygenated hemoglobin and deoxygenated hemoglobin. The NIRS sensor was placed in the medial third of the upper trapezius.

The time constants for % Oxygen Saturation (%StO₂) and Oxygenated Hemoglobin (OxyHb) were analyzed using ANOVA.

**Results and Discussion**

- Preliminary data suggests that although time constants were consistent throughout the trials, weight did not have a great influence on the time constants for StO₂ and OxyHb.
- Averaging StO₂ time constants trials 1 and 2:
  - There is no significant difference in time constants between weights for the right side (t = 1.574)
  - There is a significant difference in time constants between weights for the left side (t = 6.694)
- Averaging OxyHb time constants trials 1 and 2:
  - There is no significant difference in time constants between weights for the right side (t = 41.431)
  - There is no significant difference in time constants between weights for the left side (t = 2.073)

**Conclusion**

Preliminary data suggests that although time constants were consistent throughout the trials, weight did not have a great influence on the time constants for StO₂ and OxyHb.