

## ONE-MONTH TEST-RETEST RELIABILITY OF fNIRS DURING VERBAL FLUENCY IN A SUBJECT WITH DISCRETE LESION OF THE LEFT FRONTAL LOBE

Anthony C. Ruocco<sup>1</sup>, Anna C. Merzagora<sup>2</sup>, Sarah L. Allen<sup>1</sup>, Maria T. Schultheis<sup>1,2</sup>, Lori-Ann Tuscan<sup>1</sup>, Tiffany Lake<sup>1</sup>, Farzin Irani<sup>1</sup>, Hasan Ayaz<sup>2</sup>, Banu Onaral<sup>2</sup>, & Douglas L. Chute<sup>1,2</sup>

<sup>1</sup>Department of Psychology, Neuropsychology Program, Drexel University

<sup>2</sup>School of Biomedical Engineering, Science and Health Systems

**Objective.** To examine one-month test-retest reliability of functional cerebral blood flow as measured by functional near infrared spectroscopy (fNIRS) during a verbal (phonemic) fluency task. **Method.** The subject was a 59-year old right-handed male with a discrete evacuated subdural hematoma in the dorsolateral region of the left frontal lobe extending to insula and left temporal pole. The 18 cm × 6 cm × 0.8 cm probe consisting of four light sources surrounded by 10 photo-detectors was placed over standard EEG placements F<sub>7</sub>, F<sub>p1</sub>, F<sub>p2</sub>, and F<sub>8</sub>. The subject completed the Controlled Oral Word Association Test over two sessions separated in time by 25 days. **Results.** Behavioral performances fell within the High Average range of function. For the first session, relative to a resting (cross-hair) condition, significant increases in relative concentrations of oxygenated hemoglobin (oxy-Hb) were observed in the spared left medial area of the prefrontal cortex. During the second session, significant increases in oxy-Hb were measured in the right frontopolar area. Time courses of the signals in significantly activated voxels were strongly correlated between the first and second testing sessions ( $r = +.71$  and  $+.50$ , respectively). **Conclusions.** Results suggest reasonable test-retest reliability of fNIRS time courses of hemodynamic activity in cortical areas involved in verbal fluency; however, spatial localization of activity was less reliable. No voxels were activated in lesioned areas of the left frontal lobe. Overall, the findings provide preliminary support for the test-retest reliability of the temporal course of the fNIRS signal, whereas further investigation of factors accounting for differences in spatial localization is warranted.