POWERNAP
Experimental Test Plan – Calibrating the Pulse Oximeter
Progress as of 2/8/2018

- ✓ Set up Arduino board and MAX Particle Sensor using SparkFun tutorial and Arduino software
- ✓ Purchase standard hospital grade pulse oximeter
    - ✓ Verify data acquisition capabilities for purchased pulse oximeter
    - ✓ Update: We have ordered one model and acquired an additional natal pulse oximeter for additional data point acquisition if it is compatible with data acquisition software

PRE EXPERIMENT VALIDATION STEPS

- o Before starting calibration of the Particle Board, verify operation of purchased pulse oximeters.
    - o Place the ordered pulse oximeter and the Nellcor Natal pulse oximeter on the index finger of each hand (one on the left, one on the right, and record which is on each hand. NOTE: Only the operator should record data. Face the subject away from the monitors/readout screens)
    - o Take data points every 30 seconds from each pulse oximeter for 5 min (you will need 2 operators)
    - o Switch which hand the pulse oximeters are on and repeat the measurements
    - o Data analysis: Are there measurable differences between right/left hand? Do they correlate to dominance? Do the pulse oximeters have similar readouts? Since these are medical-grade pulse oximeters, we are quantifying the target as no more than 5% different at each data point. Do both pulse oximeters have data acquisition capabilities? Verify before continuing. Determine which pulse oximeter to use for testing (one of them, both of them, neither of them). Determine which hand should be used in testing procedures (dominant, left, right, both?)

MAIN EXPERIMENT STEPS

- o Configure Particle Board with Rubber Bands/Bungee Cord to stabilize unit on finger of interest
- o Place constructed pulse oximeter on the index finger of one hand and stabilize. Place the reference pulse oximeter on the index finger of the other hand.
    - o NOTES: Be sure to face the subject away from the readout screens. Have each subject sit comfortably with their legs uncrossed in a relaxed position. Note down which pulse oximeter is on which hand before beginning tests.
- o Begin the Data acquisition software for the pulse oximeters, and have the subject sit comfortably for 3 minutes
- o At the end of three minutes, instruct the subject to begin to hyperventilate. Have the subject hyperventilate for 3 minutes (NOTE: If the subject feels dizzy at any point, they will be instructed to verbally say "Stop" and the hyperventilation portion will end).
- o At the conclusion of the hyperventilation period, instruct the subject to breathe normally for another 3 minutes and cease data acquisition.
    - o NOTE: If data acquisition technology is not available for the reference pulse oximeters, manually take data points at time intervals of 10 seconds for both pulse

oximeters. Continue collecting the data points from the software for the constructed one, but manually take data points at the same times in order to better correlate the raw readouts.

- o Allow subject to rest as needed before moving into the hypoventilation stage. (2-5 minutes). Record rest time.
- o Once the rest period is over, a hypoventilation trial will begin.
- o Begin the Data acquisition software for the pulse oximeters, and have the subject sit comfortably for 3 minutes
- o At the end of three minutes, instruct the subject to begin to hypoventilate. Have the subject hypoventilate for 3 minutes (NOTE: If the subject feels dizzy at any point, they will be instructed to verbally say "Stop" and the hypoventilation portion will end).
- o At the conclusion of the hypoventilation period, instruct the subject to breathe normally for another 3 minutes and cease data acquisition.
  - o NOTE: If data acquisition technology is not available for the reference pulse oximeters, manually take data points at time intervals of 10 seconds for both pulse oximeters. Continue collecting the data points from the software for the constructed one, but manually take data points at the same times in order to better correlate the raw readouts.
- o Repeat as needed for all combinations of pulse oximeters and all subjects.