Somatosensory and Motor Function in Individuals with Cerebral Stroke Following Patterned Pneumocutaneous Stimulation

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This study will involve approximately 60 adult participants diagnosed with chronic, single hemisphere cortical stroke, and is intended to expand our understanding of the effects of sensory stimulation on sensorimotor impairment in adults who have survived cortical infarct. The proposed study plans to investigate the effects of a new form of patterned somatosensory "touch" stimulation on motor rehabilitation.

Recent studies in neuroscience and rehabilitative literature have demonstrated that somatosensory stimulation can induce brain plasticity and improved motor function. The data obtained in this project will be used to validate pulsed pneumatic stimulation for use in sensory or motor rehabilitation, or to build on scientific standards that support the use of sensory stimulation for the development of new therapeutic modalities.

The “touch” stimulus generation system to be used was engineered in our laboratory (Communication Neuroscience Laboratories, SECD, University of Nebraska-Lincoln). The commercialized version of our pneumatic stimulus is known as the “Galileo” (Epic Medical Concepts & Innovations Inc.)

The experimental protocol will consist of one pre-therapy, ten therapy, and two post-therapy session(s).

**Pre-Therapy Evaluation (Day 1):**

- Edinburgh Handedness Inventory
- Montreal Cognitive Assessment
- Fugl-Meyers Assessment of Upper Extremity Function
- Vibrotactile (touch) thresholds (face and hand)
- Fine force (finger and lower lip) parameters
- Oral pressure/velopharyngeal resistance during diadochokinetics
- Timed finger tapping
- Pin board timed test

**Therapy Sessions (Days 2-11):**

- 1 hour/session for 5 days/week for a total of 10 days
- The pneumatic stimulator used in this study consists of 8 small, plastic air-filled stimulating probes measuring about 1/2 of an inch in diameter. The probes will be placed on the skin of the lower face and affected hand using double-adhesive tape collars. A series of brief pressure pulses (perceived as a light touch or tap and lasting 1/20th of a second) will be delivered for 30 minutes to the surfaces of each skin site at computer generated velocities. These touch stimuli are gentle with subjects reporting it feels like a series of taps from a pencil eraser.

**Two Post-Therapy Evaluations** (The first within 48 hours of therapy completion, the next within one month of therapy completion; same as Pre-Therapy).
Preliminary Studies Utilizing TAC-Cell Pneumotactile Stimulation:


EEG: Adaptation of the cortical somatosensory evoked potential following pneumatic stimulation of the face in adults (Custead, Oh, Barlow, 2014, in process).

<table>
<thead>
<tr>
<th>Study Design:</th>
<th>Day</th>
<th>1</th>
<th>2 - 11</th>
<th>12</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Pre-Test</td>
<td>SHAM Cells placed, no stimulus</td>
<td>Post-Test 1</td>
<td>Post-Test 2</td>
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<td>(N=30)</td>
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<tr>
<td>Group 2</td>
<td>Pre-Test</td>
<td>TAC-Array Therapy</td>
<td>Post-Test 1</td>
<td>Post-Test 2</td>
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<td>(N=30)</td>
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Participant Fees: $50 $50 $200 $50