Client 24-023

Meeting time: 03/19, Tuesday, 10:30 AM

Current stage: Design (Presently collecting data)

Expected completion date: 8/01/2024.

Supported by a grant or contract: Yes. Partially funded: Center for Aging and the Life Course Grant and Greulich Gift Fund (Awarded to Advisor)

Background:

The client is a master’s student in the SLHS department, they want to identify and describe neuromuscular amplitude and timing components of typical swallows in patients with idiopathic Parkinson’s disease. Specifically, by comparing neuromuscular amplitude and timing components of rehabilitative swallowing maneuvers (Mendelsohn maneuver, effortful swallow, isometric tongue contraction) with typical swallows in patients with idiopathic Parkinson’s disease.

The client will collect data from a group of patients with idiopathic Parkinson’s disease and dysphagia (n=15). The response of submental muscle activity will be measured using a wearable sEMG (surface electromyography) sensor system developed by the I-EaT lab (i-Phagia system).

The current set up of the experiment has the participants performing two trials of five tasks:

a) typical swallows (two consistencies, 5ml thin liquid, and 5cc pudding)

b) swallows using a swallow maneuver (Mendelson maneuver),

c) swallows using maximum effort (effortful swallow)

d) maximum isometric tongue press.

Submental muscle activity will be measured during these four tasks.

The experimental factors are the patient population (idiopathic Parkinson’s), in addition to the 4 different Swallowing tasks (effortful swallow, Mendelsohn maneuver, tongue resistance, and typical swallows).

The Surface EMG will be used to quantify muscle activity in the study and will measure three outcome variables in the study: Normalized mean sEMG amplitude, time to peak sEMG amplitude, and burst duration.

1. The normalized mean sEMG amplitude is measured in % of maximum effort and indicates the level of muscle contraction and force.
2. Time to peak sEMG amplitude is the duration from the onset of contraction to the time the peak amplitude value is reached (measured in seconds) which indicates how quickly a muscle reaches the maximal activation from the onset of the muscle activity. It is calculated by the duration between the onset of muscle activity and the peak amplitude value for each swallowing task.
3. The burst duration is the total duration of the muscle contraction during an event (measured in seconds) detected on the EMG device.

Research questions from client:

The client wants to compare the data from three measured outcome variables to see:

1. What are the timing and amplitude components of normal swallows for PD patients’ (just descriptive data).
2. Is there any difference in timing and amplitude components of the swallowing maneuvers compared to the typical swallows.

Statistical issues

* The client would like to discuss what statistical methods should be used to answer their research questions.

Discussion points:

1. Is the fifth task a control group?
2. What programming language do they want the work to be completed in.
3. The new wearable sEMG patch provides measurements at three different muscle locations on both the left and right side. Do we average these effects?