

Wearable Submental sEMG Sensors for the Treatment of Dysphagia; A Pilot Study

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Swallowing is a complex physiological process that is essential for survival and quality of life. When disrupted, it leads to oropharyngeal dysphagia. This is a common affliction which can have massive implications on health, including an increased risk for pneumonia and malnutrition.

Rehabilitative therapy is effective in improving swallowing function, but usually requires clinic visits with a speech language pathologist weekly or multiple times per week. Making treatment more accessible could improve follow-through among the disadvantaged patients with the greatest need for therapy.

To address this need, the Purdue I-EaT lab is developing a wearable submental surface electromyography (sEMG) sensor system (i-Phagia) for remote treatment of dysphagia. To evaluate the feasibility of using this device for a single-visit treatment, a pilot pre-post study is being conducted. Participants are evaluated with videofluoroscopic swallowing studies (VFSS) and sEMG before and after a 45-minute treatment session, involving two rehabilitative swallowing exercises, using i-Phagia. Following the post-treatment evaluation, feedback is collected regarding the tolerability of the sensor, including presence of any skin irritation. Outcome variables include normalized mean amplitude, time to peak amplitude of the sEMG signal, and patient satisfaction and safety.

As of now, five participants (ages 21, 21, 71, 69, 80) have participated. sEMG analysis was completed in four participants due to data loss for one. Pre-post sEMG analysis of neuromuscular activity showed an increase in normalized amplitude post-treatment in three of four analyzed participants. Four of five participants reported high satisfaction (average score 88/100) and one moderate, and all reported no pain (Wong-Baker pain scale).

These results show the feasibility and preliminary effectiveness of using the i-Phagia for in-clinic treatment visits in a small sample of healthy participants. Further research is ongoing to examine the feasibility for use in patients with Parkinson's disease and for remote use outside of clinic.