Effects of Surface Electromyographic (sEMG) Biofeedback Training During the Mendelsohn Maneuver vs. the Mendelsohn Maneuver

### Introduction
- Swallowing is a biochemical process characterized quantitatively by "displacement of oropharyngeal structures and associated timing and duration of movement during a swallow" (Wheeler-Hegland, Rosenbeck, & Sapienza, 2008).
- Problems with swallowing is known as Dysphagia, which can be a result of a TBI, stroke, cancer, or other neurologic diseases.
- Surface electromyographic (sEMG) feedback biofeedback on the timing of selected muscle contraction patterns during swallowing on the amplitude of electric activity of the muscles.
- The Mendelsohn maneuver is a type of behavioral treatment that requires the patient to learn to swallow by voluntarily prolonging the hyalinearyngeal elevation at the peak of the swallow. It is designed to prolong the duration of muscles forces during swallowing.

### Clinical Scenario
- I am a new graduate student of Speech Language Pathology at the University of Nevada, Reno and am interested in working in a acute care or rehabilitation setting with adults with dysphagia.
- After observing diagnostic evaluations and therapy at the University of Nevada, Reno, I have learned different compensatory techniques for swallowing to reduce residue and aspiration by elevating the larynx.
- In the different evaluations observed, different techniques were used to minimize residue and aspiration yielding different amounts depending on the technique used.

### Purpose
To determine if sEMG biofeedback with a Mendelsohn Maneuver compared with only a Mendelsohn Maneuver in adults with neurogenic dysphagia improves swallowing as measured by larynx elevation and quantity of residue post swallow?

### Methods

#### Search Terms:
- Dysphagia, Mendelsohn Maneuver, surface electromyographic feedback, swallowing disorders, aspiration, swallowing therapy, swallowing rehabilitation, neurogenic dysphagia.

#### Databases:
- PubMed and ASHA (40 articles).

#### Rating System:
- Critical Appraisal of Treatment Evidence (CATE) form was used to appraise validity and clinical significance with interrater reliability; 15 point rating scale; 10 articles appraised.

#### Reliability:
- Interater reliability for 8 articles with 85% accuracy. Four selected for EBP decision.

### Results

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Research Design</th>
<th>Purpose of Investigation</th>
<th>Number and Description of Participants</th>
<th>Dependent Variable</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coyle</td>
<td>2008</td>
<td>Quasi-Experimental</td>
<td>To evaluate whether supplementing surface electromyographic biofeedback with the Mendelsohn maneuver, creates lasting effects to the initial efficacy of volitional prolongation of muscle activity responsible for upper esophageal sphincter opening (UES) during the swallow</td>
<td>N = 27</td>
<td>Duration</td>
<td>sEMG and Mendelsohn alone demonstrate increased swallowing efficiency, but Mendelsohn with sEMG produced greater effect.</td>
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<td></td>
<td></td>
<td>Peak amplitude</td>
<td>[2.03 (0.45) vs. 4.58 (3.32)]</td>
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<td></td>
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<td></td>
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<td></td>
<td>Average amplitude</td>
<td>3.36 (1.75) vs. 4.33 (1.53)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>Minimum amplitude</td>
<td>1.10 (0.48) vs. 1.51 (0.94)</td>
</tr>
<tr>
<td>McCullough, Kamenos, Mann, Schmidly, Robbins, &amp; Crary (2012)</td>
<td>2012</td>
<td>Quasi-Experimental</td>
<td>Describe the functional outcomes, cost per unit of functional change, and time in therapy who used sEMG Biofeedback for pharyngeal dysphagia therapy</td>
<td>N = 45</td>
<td>Duration</td>
<td>sEMG and the Mendelsohn maneuver increased efficiency of hyoid movement (these results were significant) but opening of esophageal sphincter for bolus flow, (though trending to statistical significance) was not significant.</td>
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<td>Peak amplitude</td>
<td>2.09 (0.46) vs. 4.21 (1.63)</td>
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<td>Average amplitude</td>
<td>3.88 (1.09) vs. 4.41 (2.32)</td>
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<td></td>
<td>Minimum amplitude</td>
<td>1.33 (0.65) vs. 1.64 (0.87)</td>
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<td><strong>Results indicate all duration measures improved during training and sEMG training, though greater effect was caused by use of sEMG.</strong></td>
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</tbody>
</table>

**Results:**
- FOIS: Overall, 87% of patients increased FOI by at least one scale; 92% of stroke patients and 80% of head and neck cancer patients. The difference was trending statistically significant (p = 0.079).
- NS: Average sessions for stroke: 12.32, Average for head and neck cancer: 9.3, statistically significant (p = 0.0043).
- Cost: Stroke: $549, HN Cancer: $716 per unit of functional change. This trended toward statistical significance (p = 0.079).

### Discussion

The results indicate that both the Mendelsohn maneuver with sEMG and Mendelsohn alone demonstrate increased swallowing efficiency, but Mendelsohn with sEMG produced greater effect. sEMG can not only improve swallowing efficiency but as a strong training treatment for the submental muscles. sEMG and the Mendelsohn maneuver increased efficiency of hyoid movement (these results were significant) but opening of esophageal sphincter for bolus flow, (though trending to statistical significance) was not significant.

### References


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**PICO** (patient, intervention, comparison, and outcome) framework (Gillam & Gillam, 2008) was used to develop the following clinical question:

To determine if sEMG biofeedback with a Mendelsohn Maneuver compared with only a Mendelsohn Maneuver in adults with neurogenic dysphagia improves swallowing as measured by larynx elevation and quantity of residue post swallow?

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**References**


