A Comparison of Lingual-Palatal Pressure in Healthy and Dysphagic Adults

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**Introduction**

- Speech-language pathologists (SLPs) provide an essential foundation for the successful evaluation and treatment of dysphagia in children and adults associated with medical problems (ASHA, 2016).
- During swallowing, the tongue plays an important role in generating pressure for the purpose of transporting liquids and foods through the mouth (Fei et al., 2013).
- Patients with neurogenic disorders that result in tongue weakness or reduced lingual pressure will present with dysphagia symptoms that can compromise an individual's safety and inhibit their overall quality of life (Youmans, Ysufian, & Stierwalt, 2009).
- The Iowa Oral Performance Instrument (IOPI) is used to measure tongue strength and/or weakness with the purpose of assessing tongue strength and amplitude in order swallow effectively (Adams, Mathison, Barnes, Lazarus, & Calister 2013).
- Researchers use different data points of lingual pressure, specifically lower or higher amplitudes, to make therapy determinations.
- The purpose of this study is to determine if lowered amplitudes of lingual pressure compared to higher amplitudes of lingual pressure indicates an effective swallow.

**Case Scenario**

Kim is a speech-language pathologist who works for a local hospital. Recently, she has had a surge of swallowing evaluations for clients who will be discharged from inpatient and are heading to a rehabilitation facility. Kim's job is to assess the swallowing function of each of her patients and to recommend lingual strengthening therapy if necessary. Currently, Kim has a 78-year-old male named Fred who was suffered from a stroke post a recent surgical procedure on his throat to remove a non-malignant tumor. Kim is concerned about the effectiveness of his swallow for a regular oral diet to transport the food and to clear his oral cavity. Fred needs to have his lingual strength assessed before he can be moved to a rehabilitation facility. Kim is wondering if she should make her recommendation based on lower or higher lingual pressure. Kim now knows that lingual strength and pressure generation lessens with age, and that the IOPI is an adequate tool to help determine young adult swallowing effectiveness.

**PICO Question**

A PICO (patient, intervention, comparison, outcomes) framework (Gillam & Gilliam, 2008) was used to formulate the following research question:

*In healthy adults, does a high amplitude of lingual-palatal pressure, as measured by the Iowa Oral Performance Instrument (IOPI), compared to a low amplitude of lingual-palatal pressure indicate a more effective swallow?*

**Method**

### Search terms:
- Typical swallow, atypical swallow, lingual pressure, & IOPI

### Databases Searched:
- PubMed, ERIC, & Web of Science

### Articles:
- Ten research articles were appraised with either a CADE, CASM, or CATE form (Gillam & Gilliam, 2008).
- Each article was evaluated for validity and reliability. Categories for points include: Compelling (6-8), Suggestive (3-5), & Explanatory (2-3).
- Eight articles received an interrater reliability of 87% or better.
- Four studies were selected to make an evidence-based practice (EBP) decision that cited direct relevance to the purpose of therapy determinations.

### References

<table>
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<tr>
<th>Author(s), Year, Research Designs, &amp; Appraisal Category</th>
<th>Participants (N, # of groups, participants, &amp; ages)</th>
<th>Purpose</th>
<th>Dependent Variable</th>
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</table>
  - # of groups: 4
    - G1: 16 participants, 7 males, 9 females, ages: 19-39 years
    - G2: 27 participants, 14 males, 13 females, ages: 40-59 years
    - G3: 43 participants, 25 males, 18 females, ages: 60-79 years
    - G4: 13 participants, 6 males, 7 females, ages: 90-96 years | To determine the relationship of increased age and gender on tongue strength. | Tongue Strength | Tongue strength by age G4 had statistically significant lower tongue pressure than G1, 2, & 3 combined (p = .001). |
| Fei, Polacco, Hori, Molfenter, Paladeau-Pigeon, Tsang, and Wolfe (2013) | N = 78
  - # of groups: 2
    - G1: 40 participants, 19 males, 21 females, ages: 40+ years
    - G2: Mature group, 38 participants, 16 males, 22 females, ages: 60-80 years | To clarify whether older adult participants have reduced tongue palate pressures in comparison to younger participants on maximum isometric pressure (MIP) and regular effortful swallows. | Tongue-Palate Pressure MPWs (age) G1 had significantly higher MIPs with a large effect size than G2 (p = .0001, d = 0.99). |
| Youmans, Ysufian, and Stierwalt (2009) | N = 96
  - # of groups: 3
    - G1: Younger, 32 participants, 16 males, 16 females, ages: 20-39 years
    - G2: Middle, 32 participants, 16 males, 16 females, ages: 40-59 years
    - G3: Older, 32 participants, 16 males, 16 females, ages: 60-80 years | To investigate normal swallowing physiology and to determine whether tongue strength reserves in maximum isometric pressure (MIP) diminished according to age or gender. | Tongue-Palate Pressure reserve (age) G1 had significantly higher MIP in 3P (p = .0001). G2 had a significantly higher difference in MIP than G3 (p = .0006). |
| Stierwalt and Youmans (2007) | N = 250
  - # of groups: 3
    - G1: Control group, 200 participants, 80 males, 120 females, ages: 19-91 years
    - G2: Experimental group, 50 participants. No specific gender distribution, 44-91 years
    - G3: Matched Pair group, 42 participants, 16 pairs of males, 26 pairs of females, ages: 26-90 years | To provide information on measures of tongue strength in a group of people with oral phase dysphagia and compare them to normal swallowers. | Tongue strength | Tongue strength reserve (gender) G1 had significantly higher difference in MIP than G3 (p = .0001). G2 had no significant difference in MIP between groups (G1,G2-G3) were found based on gender (p = .025). No significant interaction between groups (G1, G2, G3) were found for age and gender on MIP (p = .64). |

**Discussion**

- **External evidence:** Lingual pressure in healthy adults, as measured in strength, naturally becomes weakened with age. This decrease puts adults at a higher risk for oral phase dysphagia following a neurological incident; therefore, declines in lingual pressure in dysphagic adults indicates a risk in swallowing effectiveness.
- **Evidence internal to my clinical practice:** Kim now knows that lingual strength and pressure generation lessens with age, and that the IOPI is an adequate tool to help measure tongue strength. Kim feels comfortable administering and interpreting results from the IOPI. Her hospital has the equipment to conduct an IOPI evaluation.
- **EBP decision:** Kim recommends that Fred make an individualized evaluation of lingual pressure using the IOPI. This will determine if he needs lingual therapy in order to increase his lingual strength. Kim now knows that lingual strength and pressure generation lessens with age, and that the IOPI is an adequate tool to help measure tongue strength. Kim feels comfortable administering and interpreting results from the IOPI. Her hospital has the equipment to conduct an IOPI evaluation.