

# A new ultrasound probe stabilizer for speech therapy

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**Background:** There is a growing body of research using ultrasound as a visual biofeedback technique for treatment of persistent speech sound errors (Furniss & Wenger, 2018; McAllister Byun et al., 2014; Preston, Leece & Maas, 2017). Such speech sounds (i.e., /r/) present significant challenges in treatment because the articulatory postures are concealed within the oral cavity and thus, are extremely difficult to explain to individuals with speech sound disorders seeking to improve their speech. Intervention using ultrasound as a visual biofeedback tool offers advantages over traditional methods because it allows the individual to alter articulatory postures in real-time. However, effective use of an ultrasound requires careful and stable positioning of the probe during speech production in order to capture optimal, high-quality images for treatment purposes. It can be challenging for clinicians and/or clients to hold the ultrasound probe and monitor the screen output while a client is speaking. In the absence of an ultrasound stabilizer, users must manually hold the ultrasound probe during speech therapy sessions; however, this may result in an unstable/poor ultrasound image. The proposed method of ultrasound probe stabilization offers an alternative to existing probe stabilization via head-bracing models used for conducting speech research and/or speech sound therapy.

**Methods:** The current summary describes a customizable stabilization unit for ultrasound probe use in speech therapy. The customizable stabilizer is a vest-like device designed to sustain appropriate placement of an ultrasound probe for use in speech therapy. Once the ultrasound probe is placed in the stabilizer, it is positioned on the user's chest and the hook and loop straps are secured to hold the stabilizer firmly in place. The probe can be positioned to show both a sagittal (side) view and coronal (front) view of the user's tongue. The view of the tongue allows the user to view correct and incorrect lingual postures (tongue positions) concealed within the oral cavity. Use of the chest probe stabilizer provides an alternative to the head-mounted stabilization units while eliminating the need for manually holding the ultrasound probe, leaving the clinician and the user free to focus on the ultrasound image. The ultrasound chest stabilizer is shown in Figure 1. The chest plate (1), available in two sizes, is attached to

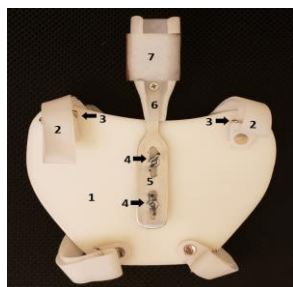


Figure 1: Chest stabilization unit

the back plate by hook and loop straps (2). This chest stabilization unit is adjustable on the individual by loosening and tightening the hook and loop straps over the shoulders and around the abdominal cavity through the use of the D-rings (3) located on the chest plate. Also located on the chest plate are 2 screws/wing nuts (4) that stabilize the aluminum strut (5) through the chest plate. The aluminum strut has slots cut in it to allow the strut (6) to be raised and lowered into position on the patient. At the other end of the strut is the probe carriage (7) which is unique to the probe

the clinician selects for treatment. The probe is secured into the probe carriage by the use of an elastic retainer (8). When the stabilizer is used in conjunction with an ultrasound probe, it allows hands-free ability to identify the most favorable location for the ultrasound probe beneath the individual's chin for optimal viewing of the tongue position. The



Figure 2: Chest stabilization unit-side and rear views

following method of using the chest-mounted stabilization unit is suggested: situate the chest plates on the user and secure the hook and loop straps to hold the front and back vest plates in place. The hook and loop straps are adjustable to fit a range of chest sizes. Once the chest is securely fitted on the user, insert the ultrasound probe into the probe carriage in the desired sagittal or coronal view and secure with the elastic retainer. Speech treatment can begin once the ultrasound probe is inserted in the probe carriage. The chest-mounted probe stabilization unit has been successfully piloted with 11 participants, ages 9;4-18;6 (mean age 12;11) as part of a large-scale multi-site federally funded research study.

**Results and discussion:** The customizable chest ultrasound probe stabilizer is unique because it is the only ultrasound probe stabilizer that secures the probe position via chest-bracing (vest-like device) for speech sound therapy. Ultrasound images collected during speech intervention were clear and easily obtained. Participant survey data indicated participants reported no discomfort from wearing the unit. Preliminary success in the current research study justifies ongoing use in future research. The probe stabilizer allows for hands-free, stable positioning of the probe for optimal ultrasound imaging. Importantly, the current stabilization unit can also be customized to fit any ultrasound probe device and provides an alternative to existing probe stabilization options.

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## References

- Furniss, R., & Wenger, T. (2018). Seeing the big picture. The use of ultrasound in treating functional speech disorders in school-aged children in a community health setting. *Journal of Clinical Practice in Speech-Language Pathology*, 20(2), 76-82.
- McAllister Byun, T., Hitchcock, E. R., & Swartz, M. T. (2014). Retroflex versus bunched in treatment for rhotic misarticulation: Evidence from ultrasound biofeedback intervention. *Journal of Speech, Language, and Hearing Research*, 57(6), 2116-2130.
- Preston, J. L., Leece, M. C., & Maas, E. (2017). Motor-based treatment with and without ultrasound feedback for residual speech-sound errors. *International Journal of Language & Communication Disorders*, 52(1), 80-94.

## Keywords:

- Visual biofeedback
- Ultrasound probe stabilization
- Speech sound intervention/therapy