Visual Feedback in Articulation: /r/
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Visual Feedback and /r/ Therapy

Visual feedback has been used to facilitate correct articulation of /r/ sounds.

- **Ultrasonography**
  Accurate /r/ production secondary to ultrasound-assisted speech therapy (Shawker & Sonies, 1985; Adler-Bock, 2007; Bacsfalvi, 2010).

- **Spectrographic Display**
  Majority of participants made measurable gains in articulation of /r/ (Shuster, 1992; Shuster, 1995; Byun, 2012).

Acoustics and Lingual Placement

The gestural targets necessary for production of /r/ can be achieved by following three basic principles, **pharyngeal constriction**, non-approximating **lip roundedness**, and non-constricted central approximation of the **tongue to the roof of the mouth**. Acoustically, the /r/ is identified by F3 < 2kHz.

F1 is inversely correlated with **tongue height**; F2 is directly correlated with **tongue advancement**, as shown in the images below, where the left image is based on formant frequencies (Peterson & Barney, 1952), and the right image reflects lingual position during articulation (Jones, 1964).

Baseline measures were taken, shown at time point (1), with two participants at 0% pretreatment accuracy and one at 60%. Treatment was applied at time points (2), (3), and (4).

All participants demonstrated significant improvement, as judged by perception of vocalic /r/ forms by a trained phonetician, with the first use of Vowel Viz, shown at time point (2). Continued use of the app, at time points (3) and (4), showed favorable results with respect to the baseline.

Case Study: Vowel Viz

Vowel Viz, an app that maps tongue placement using the lowest two formant frequencies, was used with three school-aged children with persistent /r/ errors.

Students received five minutes of treatment per session for three sessions. The visual feedback included accuracy judgments (in the “R” circle) and prompts to improve production (“raise your tongue”).

Results

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Conclusions

The Vowel Viz app was successful in aiding the production of accurate vocalic /r/ phonemes among the three school-aged children who participated.

However, Vowel Viz only plotted F1/F2, guiding the placement of the tongue to approximate the roof of the mouth. This sometimes led to the participants producing a /u/ that appeared to be within the range of acceptable /r/ values. This limitation would be corrected through concurrent plotting of F3 to determine whether the sound is “rhotic” at F3 < 2kHz. Glottal constriction would have to be taught concurrently with use of the app to produce the rhotic sound.

This app may be helpful in the schools to support the work of SLPs who are teaching /r/ placement, whether during therapy or at home as student homework.

References


