INTRODUCTION

- Approximately 30% of children with a history of speech sound disorder still show delays at 9 years, while 9% continue with errors at 12-18 years [1].
- American English /r/ is among the most common residual speech sound errors, the latest acquired sounds, and the hardest to treat [2,3].
- Acoustic biofeedback makes resonant frequencies of the vocal tract visible.
- For /r/, focus is to lower the 2nd peak (F3) to match a correct target.
- Biofeedback using the Computerized Speech Lab (KayPentax) is reported to be efficacious [4,5]. Nevertheless, it is not widely used.

CHALLENGES

1. Requires expensive equipment
2. Clinician training needed for target selection and use
3. Does not permit home practice

PILOTING

METHODS

- "Hannah" (12 year-old with residual /r/ errors)
- Had completed ten weeks of acoustic biofeedback [5].
- Was successful producing syllabic /r/ while viewing biofeedback, but did not generalize outside therapy.

TARGET CALCULATION

- How do we choose a custom target for each child?
- F3 of /r/ varies based on child's age, sex, and height.
- Selecting the best target requires trial and error and expertise.
- Individual's F3 in correct /r/ generally falls below 80% of the average of an individual's corner vowels (/æ/, /i/, /æ/, /u/), and /r/ [8,9].
- But not all /r/ may fall even lower.

RESULTS

- "Hannah" did not demonstrate gains in word probes without biofeedback from baseline to maintenance sessions (Fig. 1).
- Acoustic measure (F3-F2 distance) was accuracy metric [4].
- However, she did show gains in syllables/words within treatment, marked by reduced F3-F2 distance (Fig. 2).
- Progress plateaued as biofeedback was faded and clinician support reduced in higher levels of challenge point framework.
- Needed more time practicing with biofeedback to generalize gains to contexts without the visual support.

DEVELOPMENT

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FITTING THE TREATMENT

- A future goal is to incorporate an automated scoring routine for home practice.
- Scoring should correspond with ratings by speech pathologists.
- It is not yet established which acoustic metric correlates most strongly with clinician ratings.
- Data set included four biofeedback treatment studies [4-5, 12-13].
- Fit a statistical model for each potential acoustic measure including child-level (age and sex) and word-level factors [14].
- Best model included normalized F3-F2 in interaction with age and sex.
- This measure is a starting point for automated scoring.

REFERENCES

1. T. McAllister Byun, "Efficacy of visual biofeedback from baseline to maintenance sessions (Fig. 1).
2. This research was supported by an ASHFoundation clinical research grant.