

Case Study: Phoneme Specific Nasal Replacement for 'r'?

Cynthia A. Bridge, M.S., Joan Kwiatkowski, M.A., CCC-SLP, Gary Weismer, Ph.D.
University of Wisconsin–Madison

SUBJECT

- > 20-year-old college student
 - Self-referred to the University of Wisconsin–Madison Speech and Hearing Clinics
 - Concerns regarding 'r' production
 - Seen weekly for one hour

PROBLEM

- > Error for consonant and vowel 'r' in all contexts perceived as a dorsal non-specific vocalization that was typically nasal
- > Error significantly affects intelligibility of entire word
- > Anticipation of 'r' words during connected speech leads to articulatory posturing that affects intelligibility of surrounding words that do not contain 'r'¹
- > Remarkably adept at avoiding words that contain 'r'²

¹ Demonstrated in a 15-second segment from the Rainbow Passage

² Demonstrated in a 15-second segment from a 7-minute connected speech sample

BACKGROUND

- > Articulation therapy from grade one through seven

- Targeted sounds: /s, z, θ, ð, ʃ, l, r/
- Grade four: first reference to nasal distortion of 'l' and 'r' with sounds produced correctly at word level only
- Grade five: nasal distortion of /l/ resolved
- Grade seven: nasal distortion of 'r' at all linguistic levels; not stimulative for correct production
- Grade eight: monitored for the school year and then dismissed from treatment because nasal distortion of 'r' was not "socially, emotionally or academically" handicapping

- > No report of speech change following tonsillectomy and adenoidectomy at age 7

- > History of chronic otitis media with effusion; placement of bilateral pressure equalization tubes on at least five occasions and ruptured right tympanic membrane at age twelve

- > Assessment of velopharyngeal function in 1995 at University of Wisconsin Hospital–Madison identified normal structure and function of the velopharyngeal port

- > Unsuccessful private treatment at a local hospital during a 2-week period while in high school

- > Client reported SLPs were puzzled by his replacement for 'r' and lacked the strategies to resolve it

TREATMENT STEPS AND OUTCOMES

- Evocation of /ɜ/ using the /l/ to /ɜ/ *Evoke* procedure described by Shriberg (1975)
 - Selected /ɜ/ *Evoke* because client produced /l/ with oral air-direction
 - During /ɜ/ *Evoke* repeatedly reminded client to focus on /l/ as he moved his tongue back into placement for /ɜ/

Outcome

 - Production of /ɜ/ with /ɜ/ *Evoke* procedure by the ninth trial
 - Consistent production of /ɜ/ without the /ɜ/ *Evoke* procedure by session three
- Production of /ɜ/ in the initial and final position^{3,4}

Outcome

 - Consistent production of /ɜ/ in single syllable words at the word and short phrase level by session four
- Production of consonant /r/ in the final position as /ɜ/ preceded by the vowels: /i/ as in "ear," /e/ as in "air," /a/ as in "are," /ɔ/ as in "or"^{3,4}

Outcome

 - Consistent production of /ar/ and /ɪr/ in single syllable words by session four
 - Inconsistent production of /er/ in single syllable words
 - Inability to produce /ɔr/
- Production of the consonant /r/ in the initial position^{3,4}

Outcome

 - Approximated production of /r/ in single syllable words only when supported by production of /ɜ/ (e.g., "er-right" for "right") by session six
- Production of consonant /r/ in clusters^{3,4}

Outcome

 - Approximated production of /r/ in initial position clusters in single syllable words only when supported by production of /ɜ/ (e.g., "ger-een" for "green") by session six

- ³ **Challenges** associated with rhotic production in single syllable words:
- Physiological and cognitive fatigue
 - Excessive stress
 - Phonetic context of /w/ (e.g., "were")
 - Difficulty judging production accuracy

- ⁴ **Strategies** used to facilitate accurate production:
- Slight amplification using headphones
 - Visual placement cues using a mirror plus pictorial and gestural representations
 - Verbal placement cues
 - Explicit verbal feedback regarding accuracy of production
 - Self-monitoring of "sound and feel" of rhotic production

- Resolution of challenges for stabilization of consonant and vocalic 'r' in all contexts^{5,6}
 - From session eight through fifteen, a different list of 12–15 words was practiced during each session⁷

Outcome

- Dorsal non-specific nasal and non-nasal vocalization no longer replaces consonant and vocalic 'r'
- Current errors during conversational speech include: 1) "Nasalized" approximations of 'r'
- 2) Exaggerations of 'r' marked by excessive stress and failure to link sounds within the word
- Correct production during conversational speech includes: 1) Consistent production of /ɜ/
- 2) Inconsistent production /r/ in the final position in /ar/, /ɪr/ and /er/ contexts
- 3) Occasional production of /r/ in /dr/ clusters⁸

- ⁵ **Challenges** associated with stabilization of rhotic production:

- Completing daily home practices
- Keeping mindful of 'r' successes rather than focusing on failures
- Remembering to use the Decision Tree for specific self-evaluation rather than providing vague evaluative feedback such as "good" or "bad"

- ⁶ **Strategies** used to stabilize accurate production:

- Continuation of the already mentioned strategies
- Home practice, which included auditory bombardment of the word list for the week (recorded on compact disc at the word and short phrase level) and production practice of the same words
- Negative practice
- Use of light touches and shorter duration to resolve excessive stress
- Use of light touches and linking sounds to resolve "choppiness"
- Shaping multi-syllabic words from manageable single syllable units
- Use of the Decision Tree (Fig. 1) for identifying and correcting specific errors to facilitate self-correction

⁷ **Sample word list:** boring, careful, darker, floor, graduate, ground, large, merry, period, quarter, read, run, serious, speaker

⁸ Demonstrated in the provided 15-second segment from the Rainbow Passage

Fig. 1

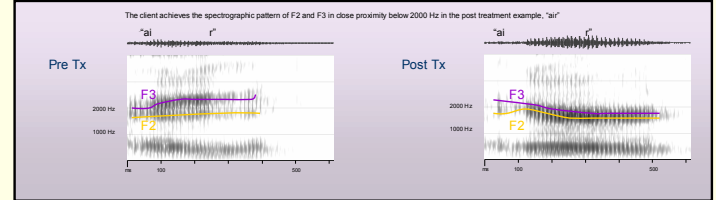


DISCUSSION

- > **Is the client producing a phoneme specific nasal replacement for 'r'?**
Evidence for:

- While there are no reports in the literature, Peterson-Falzone and Graham (1990) did report on three children who, in addition to using a nasal replacement for sibilants and affricates, used a nasal replacement for initial position /tr/ and /dr/; they described these errors as related because /t/ and /d/ are fricated in the context of /r/ clusters
- Frequent perception of hypernasality during client's production of his replacement sound
- Normal structure and function of velopharyngeal port (1995 University of Wisconsin Hospital report)
- Client able to modify error as an adult after described treatment (Fig. 2)

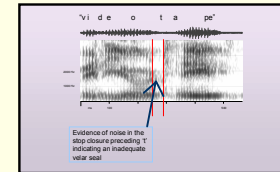
Fig. 2



Evidence against:

- Spectrographic evidence of difficulty coordinating velar movement with other articulators
 - Inadequate velar seal during stop closures (Fig. 3)

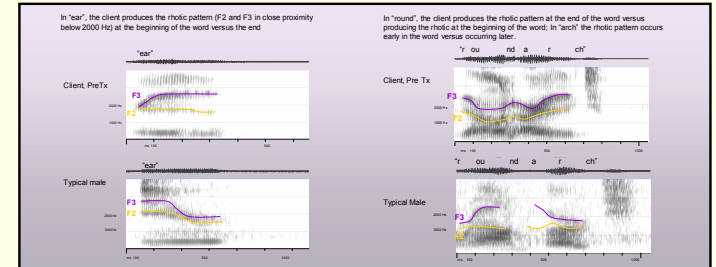
Fig. 3



- Spectrographic evidence of relatively flat formants with F2 and F3 in close proximity for vowels suggesting limited movement of articulators (Fig. 4)

- Spectrographic evidence of misplaced rhotic elements (Fig. 4)

Fig. 4



CONCLUSIONS

- > The evidence for a phoneme specific nasal replacement is equivocal
 - Rapid modifiability of the error with treatment clearly supports a functional basis for velar control issues
 - In contrast, spectrographic data suggest motoric involvement
- > If the error can broadly qualify as a phoneme specific nasal replacement, this report can be used to support a phonetic explanation rather than a phonological explanation
 - Phonetic Explanation** (Peterson-Falzone and Graham, 1990): Nasal emission which occurred early in phonological development due to inadequate velopharyngeal control did not resolve when adequate control was later achieved
 - Phonological Explanation** (Russello et al; 1991): Phoneme specific nasalization may represent an idiosyncratic rule learned early in phonological development and not resolved

References

- Peterson-Falzone, S. J., & Graham, M. S. (1990). Phoneme-specific nasal emission in children with and without physical anomalies of the velopharyngeal mechanism. *Journal of Speech and Hearing Disorders*, 55, 132-139.
 Russello, D. M., Shabar, L. L., & Sanvickh, A. (1991). Modification of contrast-specific nasal emission. *Journal of Speech and Hearing Research*, 34, 27-32.
 Shriberg, L. D. (1975). A response-evocation program for /ɜ/. *Journal of Speech and Hearing Disorders*, 40, 92-105.

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