AUDITORY AND SOMATOSENSORY SKILLS OF CHILDREN WITH AND WITHOUT RESIDUAL SPEECH=SOUND DISORDER

Samantha Ayala, MS, CCC-SLP[1]; Amanda Eads[1], Heather Kabakoff, PhD, CCC-SLP[2]; Jonathan Preston, PhD, CCC-SLP[3]; Elaine R. Hitchcock, PhD, CCC-SLP[4]; Tara McAllister, PhD, CCC-SLP[1]

1 NYU 2 3 Syracuse University 4 Montclair State University

INTRODUCTION

- Residual speech sound disorders (RSSD) affect ~2-5% of the population [1]
  - Decreased intelligibility can negatively impact academic and social outcomes [2]
- Theories of speech motor control include both auditory and somatosensory goals for speech sounds [3]
- On average, children with RSSD show lower acuity than typically developing (TD) peers in both auditory and somatosensory perception (e.g., [4-5]), but there is considerable individual variability in both domains
- **This study examined multiple measures of sensory acuity in children with and without RSSD affecting /ɹ/**
- **Goal: Identify sensory profiles to allow more tailored treatment recommendations for children with RSSD**

METHODS

Participants

- 59 children with RSSD ages 9;0 - 15;11 (mean age 11.2 years)
- 97 TD children ages 9;0 - 15;11 (mean age 12.8 years)

Auditory Acuity Measurement Tasks

- Auditory Identification: Identify stimuli on a synthesized continuum from *rake* to *wake*.
- Auditory Discrimination: Discriminate stimulus pairs from the same continuum in an AXB task.
- Category Goodness: Judge accuracy of various speakers' productions of /ɹ/ in words.

Somatosensory Acuity Measurement Tasks

- Oral stereognosis: Identify letters of different sizes using tactile search with the tongue [6]
- Phonetic Awareness: Produce different sounds/pairs of sounds and answer questions about relative articulator position [7]

RESEARCH QUESTIONS

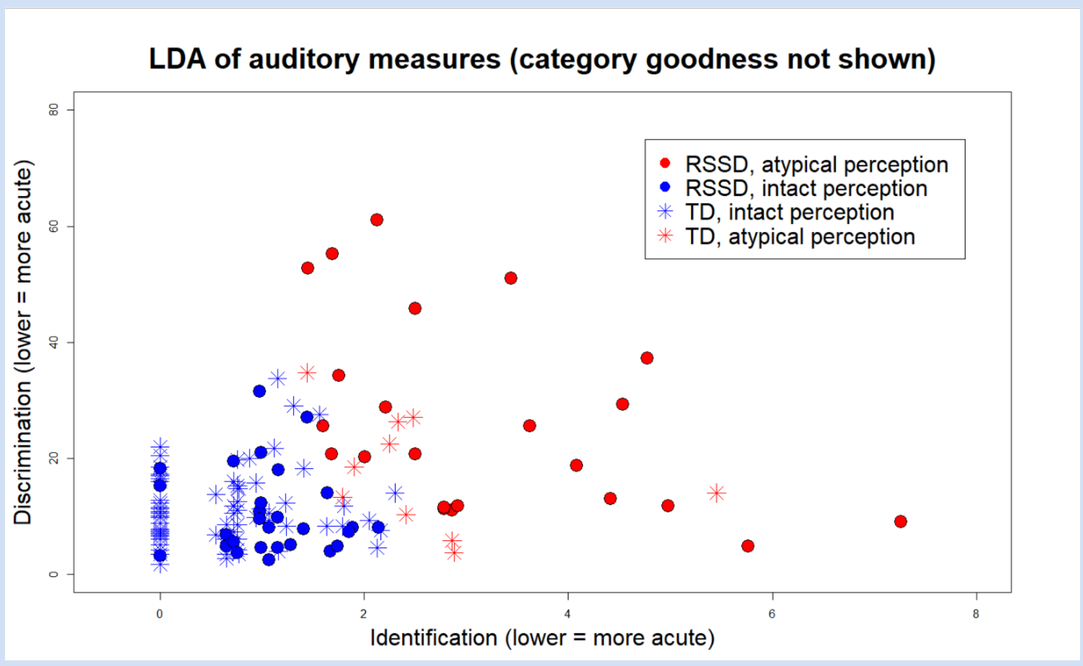
How do children with RSSD compare to TD peers on **auditory** and **somatosensory** tasks?

- Independent samples t-tests for comparison at the group level
- Linear Discriminant Analysis (LDA) to classify individuals as typical or atypical in a given domain

ANALYSES AND RESULTS

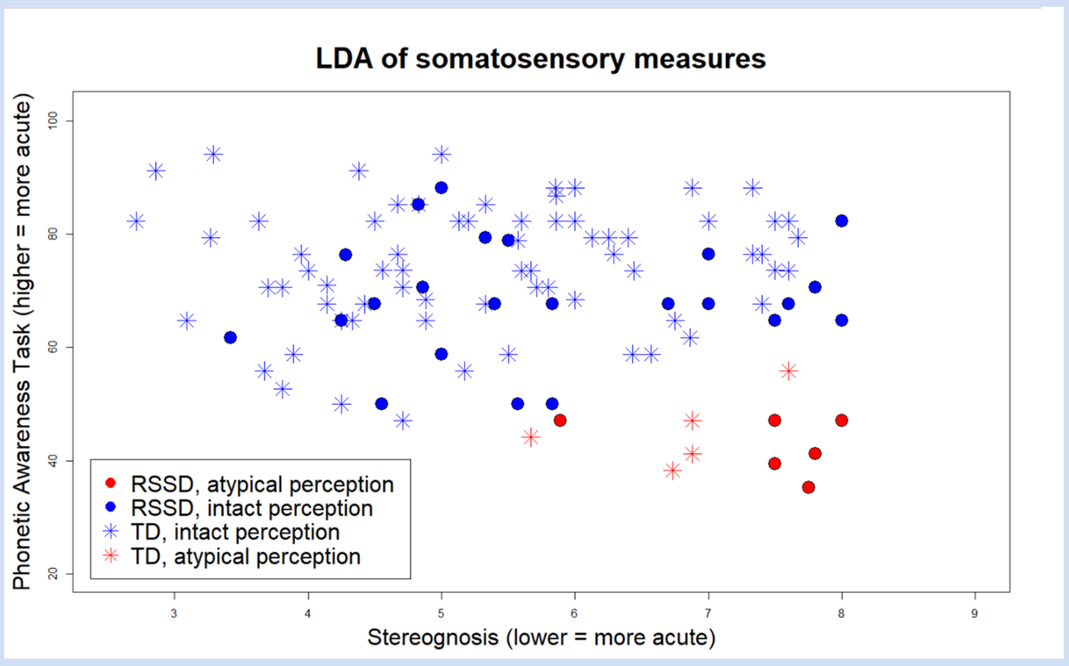
1. Auditory domain

- T-tests showed significant between-group differences for all three measures
- LDA: 45.1% of RSSD participants were classified as having atypical perception, versus 11.4% of TD participants



2. Somatosensory domain

- Due to COVID masking requirements, complete data were available for only 29 participants with RSSD and 76 with TD
- T-tests showed significant group differences for both measures
- LDA: 20.7% of RSSD participants were classified as having atypical perception, versus 6.6% of TD participants



CONCLUSIONS

- On average, children with RSSD score lower on sensory tasks than TD children in both domains
- Significant heterogeneity in performance, with some children with RSSD performing similar to TD peers
  - Highlights the importance of a personalized approach where treatment is tailored to the sensory needs of each child
  - e.g.: Input-oriented treatment for weak auditory function; ultrasound biofeedback for weak somatosensory function

FUTURE DIRECTIONS

- Auditory deficits more prevalent than somatosensory in the RSSD group
  - Possibly limited by the nature of task, somatosensory tasks were not tailored to the speech sound error of the RSSD group (/ɹ/)
  - Consider using more comparable measures of auditory and somatosensory function (e.g., weights derived from SimpleDIVA)
- Compare clinical outcomes when treatment for RSSD is matched or not matched to the sensory profile of participating children

REFERENCES

[1]Culton, G. L. (1986). Speech disorders among college freshmen: A 13-year survey. Journal of Speech and Hearing Disorders, 51(1), 3-7.
[2] McCormack, J., McLeod, S., McAllister, L., & Harrison, L. (2009). A systematic review of the association between childhood speech impairment and participation across the lifespan. *International Journal of Speech Language Pathology*, *11*(2), 155–170.
[3] Guenther, F. H. (2016). Neural control of speech. Cambridge, MA: MIT Press.
[4] Cialdella, L., Kabakoff, H., Preston, J., Dugan, S., Spencer, C., Boyce, S., Tiede, M., Whalen, D., & McAllister, T. (2021). Auditory-perceptual acuity in rhotic misarticulation: baseline characteristics and treatment response. *Clinical Linguistics & Phonetics*, *35*(1), 19–42.
[5] Fucci, D. J., & Robertson, J. H. (1971). "Functional" defective articulation: An oral sensory disturbance. *Perceptual & Motor Skills*, *33*(3), 711–714.
[6] Steele, C. M., Hill, L., Stokely, S., & Peladeau-Pigeon, M. (2014). Age and strength influences on lingual tactile acuity. *Journal of Texture Studies, 45*(4), 317–323.
[7] Gritsyk, O., Kabakoff, H., Li, J. J., Ayala, S., Shiller, D. M., & McAllister, T. (2021). Toward an index of oral somatosensory acuity: Comparison of three measures in adults. *Perspectives of the ASHA Special Interest Groups*, *6*(2), 500–512. https://doi.org/10.1044/2021_persp-20-00218.
8] Brosseau-Lapré, F., & Roepke, E. (2022). Implementing Speech Perception and Phonological Awareness Intervention for Children With Speech Sound Disorders. *Language, Speech, and Hearing Services in Schools*, 1-13.