The Role of Exposure to Accented English on Novel Speech Sound Acquisition

Emily Virok, F. Sayako Earle PhD.
University of Delaware

Background

- Research suggests that the speech sounds that children are exposed to during the critical period of language acquisition become the foundation for future language learning (Kuhl, 1993).
- In the early stages of language development children can detect phonemic variation across languages. However, with increased exposure to speech they become less sensitive to phonemic differences outside of their native language, and they show increased sensitivity towards the language with which they are most exposed (Werker & Tees, 1984).
- This sensitivity specialization is demonstrated by the difficulty adults have learning speech sounds of a second language (Strange & Dittman, 1984).
- Through my research I aim to see if perceptual exposure to accented language plays a role in perceptual flexibility by testing if individuals with significant accent exposure acquire novel speech sounds more efficiently than those who lacked significant accent exposure.

Research Question

Does having a parent with a native language other than English improve ability to learn non-native speech sounds?

Participants

Participants were selected based on prior participation in a MAPS lab study. Qualifications for the study required that participants be:

- Between 18-24 years old
- A monolingual speaker of English
- Have no history of neurological disorders
- Have normal hearing and vision
- No history of socio-emotional, attentional, or cognitive impairment

Any participant who completed all sessions of a speech sound training study through the MAPS were eligible for this research**. All monolingual English speaking participants who reported having a parent with a native language other than English were selected for the Accent Exposed cohort of this study. We matched participants with parents who are native speakers of English by baseline discrimination ability, to ensure that there were no initial differences between cohorts in auditory acuity.**

Demographics

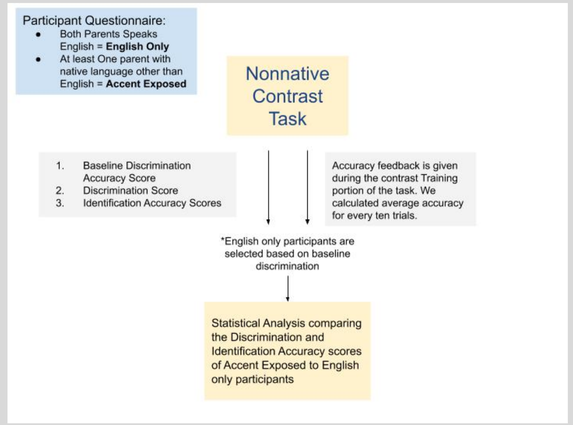
	Accent Exposed	English Only	Total Population
Size	12	12	172
Avg. Age	20	20	21.49
Age S Dev.	1.67	1.48	2.32
Gender	75% Female 25%Male	92% Female 8% Male	80% Female 20% Male
Parental Language	German,French, Italian, Portuguese, Spanish (3), Tagalog (3), Swahili	English	86% English 14% Another Language
Race/ Ethnicity	50% White 8% Hispanic/Latino 8% Black/ African American 25% Asian	100% White	90% White 5.5% Hispanic/Latino 2% Black/African American 8% Asian 0% Pacific Island 1% Native American/ Alaskan

Figure 1. Demographic information for this research and all MAPS lab participants

Stimuli

5 unique tokens each of the **dental /d̪ug/** and **retroflex /ɖug/** were spoken by a native speaker of Hindi in a sound-proof booth. The tokens were cut to the onset of the burst and resampled to match on mean amplitude.

Procedure



Identification

Participants are presented with nonreal objects that match the contrast sounds. They are asked to match the word they hear to the correct nonreal object on the screen. Participants complete 200 trials of this task with feedback during training, and complete 50 trials without feedback during the test phase. tests.

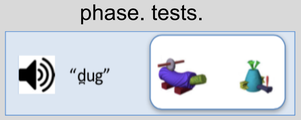


Figure 2.Visual Representation of task from Earle Study Design (Earle & Myers, 2015)

Discrimination

Participants are hear two tokens consecutively (1second interstimulus interval). They are then asked to decide if the sounds were the same or different. Participants completed 64 trials of this task without feedback, both before training (D1) and after training (D2) .

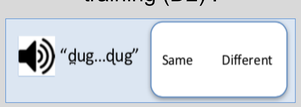
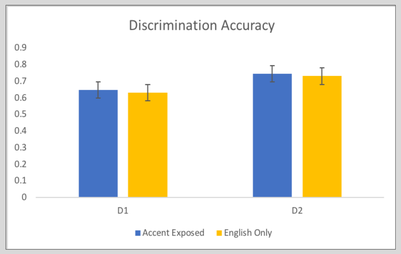


Figure 3.Visual Representation of task from Earle Study Design (Earle & Myers, 2015)

- Our measure of 'learning' was based on average accuracy on the post-training tests
- In order to determine if there were any differences in the post-training identification scores by accent exposure, we conducted an independent samples t-test on the average post-training accuracy of the two groups.
- We also conducted a 2x2 mixed analysis of variance (ANOVA) to determine if changes in discrimination ability between pre and post-tests differed by group.
- In order to determine if there were potential differences in training rate, we plotted average accuracy (in bins of 10 trials) per group.

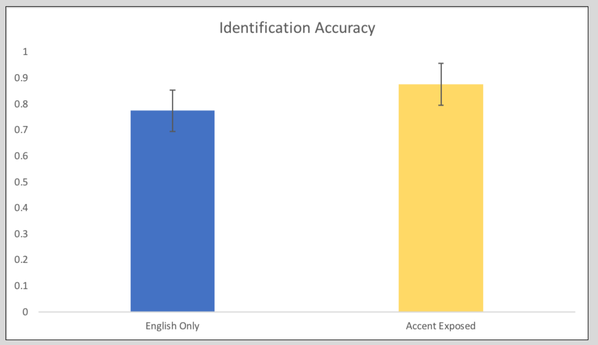
Results

Discrimination Task



- Both cohorts' discrimination accuracy improved between their baseline and second discrimination score.
- Between groups there were **no statistically reliable differences in discrimination scores.**
- These results suggest accent exposure has little effect on the ability to discriminate between nonnative contrasts.

Identification Task



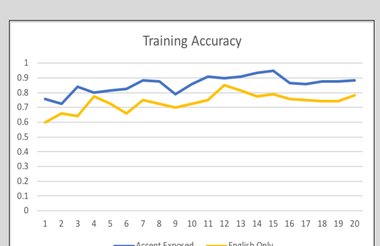
Independent Samples T Test	
T Score	2.214
Df	22
p	0.037

Figure 5. Results of an Independent Samples T Test

- On the Identification portion of the task, **participants from the Accent Exposed cohort achieved significantly higher accuracy scores than those in the English Only cohort,** based on a comparison of average total identification accuracy.
- Additionally an independent sample t test shows that the difference between cohorts occurs at a rate different from chance.
- These results suggest participants who have been exposed to an accent can learn to identify nonnative speech sound contrasts more accurately than those without exposure to an accent, given the same amount of exposure

Training Trials

- During the Nonnative Contrast training task, participants complete 200 trials of training in which they receive feedback on whether their answer was correct or incorrect.
- Across these trials, Accent Exposed participants were on average always more accurate than the English Only cohort.



Discussion

- The Accent Exposed cohort's significantly higher accuracy scores for the Identification task and Training Accuracy supports the hypothesis that accent exposure plays a role in perceptual flexibility.
- The increased ability of Accent Exposed individuals to learn speech sounds outside of their native language may indicate that accent exposure during language development provides advantages to learning speech contrasts later in life.
- These results suggest that perceptual experience through accent exposure impacts the way in which new speech sounds are learned. These results further provide reason to expect that perceptual experience is a factor in the variability we see in an individual's ability to learn speech sounds.
- Additionally the findings of this study provide credible reason to further explore the role of perceptual exposure on perceptual flexibility through future studies.

Acknowledgements

This work was supported by the University of Delaware's Summer Scholars Undergraduate Research Award to Emily Virok, as well as the NIH grant R21DC016391 to F. Sayako Earle. Poster printing provided as a courtesy of DRI. The authors are responsible for this work and this research does not necessarily reflect the views of our sponsoring institutions or sources of funding.

References

Earle, F. S., & Myers, E. B. (2015). Sleep and native language interference affect non-native speech sound learning. *Journal of Experimental Psychology: Human Perception and Performance, 41*(6), 1680-1695.

Flege, J. E. (1995). Second language speech learning: Theory, findings, and problems. *Speech perception and linguistic experience: Issues in cross-language research*, *92*, 233-277.\

Kuhl, P. K. (1993). Innate predispositions and the effects of experience in speech perception: The native language magnet theory. In *Developmental neurocognition: Speech and face processing in the first year of life* (pp. 259-274). Springer, Dordrecht.

Strange, W., & Dittmann, S. (1984). Effects of discrimination training on the perception of/rl/by Japanese adults learning English. *Perception & psychophysics*, *36*(2), 131-145.

Werker, J. F., & Tees, R. C. (1984). Cross-language speech perception: Evidence for perceptual reorganization during the first year of life. *Infant behavior and development*, *7*(1), 49-63