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PLOSIVE ASPIRATION OF BILINGUAL, HARD-OF-HEARING CHILDREN

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This preliminary research is an examination of the language acquisition of bilingual (Spanish and English) children with and without hearing disorders over a two-semester period (Fall 2017 and Spring 2018). Stop consonants /p/, /t/, and /k/ demonstrate a burst of energy measured as VOT. In English, these include aspiration (notated as [p^h] [t^h] and [k^h]). VOT is the time between the start of the consonant and the vibration of the vocal tract and average VOT ranges differ across languages (Appendix A). In English, average ranges are 20-90 ms for [p^h], 30-100 ms for [t^h], and 50-100 ms for [k^h] (Lisker 1970). In Spanish, these values are much shorter and average ranges are 0-20 ms for [p^h], 0-10 ms for [t^h], and 10-50 ms for [k^h]. As VOT is measured most clearly before vowels, consonant clusters in the data were excluded for this project.

In the literature, it states that bilingual (English and Spanish) children may express English /p, t, and k/ tokens with shorter VOT's (Fabiano-Smith & Goldstein, 2010b). In addition, deaf individuals showed abnormally short VOT's pre-cochlear implant with some post-implant improvement (Lane & Perkell 2004). My research questions were the following: What effect(s) does bilingualism/hearing impairment have on VOT? What effect(s) do bilingualism and hearing impairment, together, have on VOT?

The two variables are bilingualism and hearing impairment and the duration is a two-semester period from Fall 2017 to Spring 2018. There are three groups with 24 children total from grades pre-kindergarten to second grade. Control group one (C1) was made up of hard-of-hearing, monolingual English speakers, the target group (T) was hard-of-hearing, bilingual (English and Spanish) speakers, and control group two (C2) was made up of bilingual (English and Spanish) speakers with no hearing disorder. To capture the speech of the children, recording software was set up on a stable surface and the kids were prompted to tell a story to the data collector about pictures in a book without words. If needed, the collector would suggest possible actions taking place in the scenes to elicit more vocabulary output in order to obtain word-initial /p/, /t/, and /k/ tokens. In order to measure the duration of VOT, the recordings were transcribed and analyzed using the audio recordings and PRAAT, a computer software used for speech analysis. All the children were becoming English dominant as other research performed by Dr. Flores and I showed increasing difficulty with pronunciation of Spanish vocabulary and a growing English vocabulary. Various factors, such as Spanish-language influence, are included in the overall analysis.

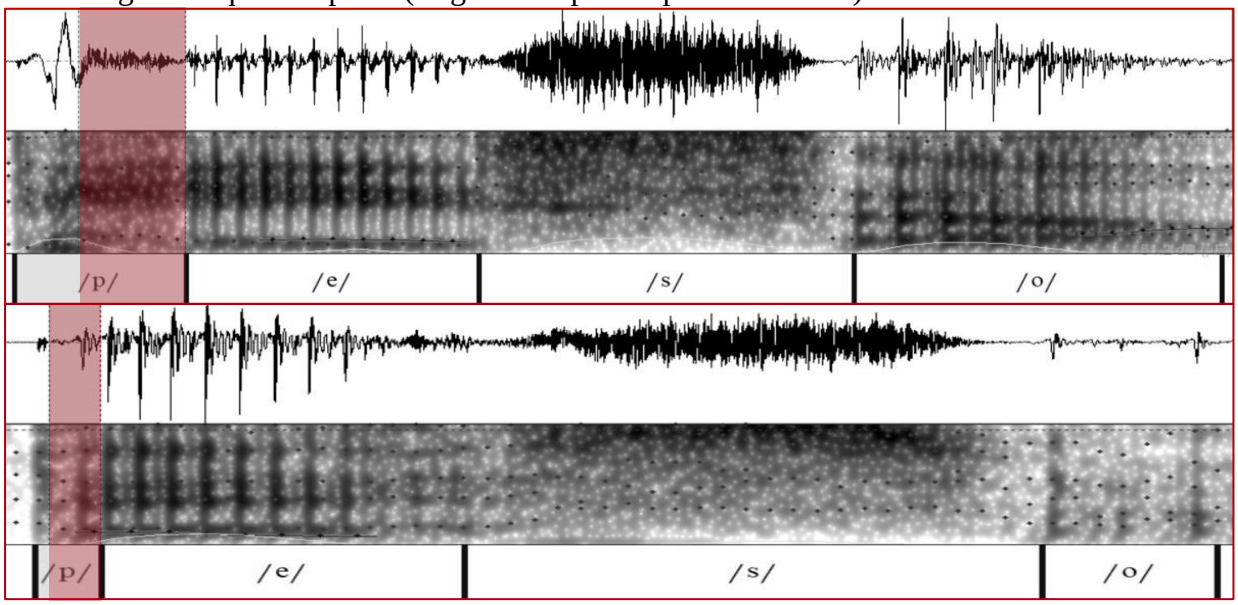
The results are preliminary. Overall, there was more production for all groups in the Spring, yet only 6 of the 24 children produced in both Fall and Spring (Appendix B). There was a large variation in the values for /k/ VOT across all groups and within group, some of which is expected due to language development and bilingualism in two of the three groups (Appendix C). Across the semesters, both the C1 and T groups' phonetic systems were constrained with little production and limited ranges for /p,t,k/ VOT values. I would hypothesize that this trend is due to the hearing impairment(s) of the children, however further testing would be needed to confirm.

Future research is needed to collect more tokens of data and answer the research questions. Future experiments would involve word tasks that are English specific with only /p,t,k/ word-initial prompts. It would also be worthwhile to explore intervocalic and word-final tokens in addition to solely word-initial position. These modifications would expand the amount of data collected and it would be possible to compare aspiration in the same words, over time, by the various participants.

Citations:
Fabiano-Smith, L., & Goldstein, B. A. (2010b). “Phonological acquisition in bilingual Spanish English-speaking children”. *Journal of Speech Language and Hearing Research*, 53, 160-178.
Johnson, K. (2012). *Acoustic and auditory phonetics*. Chichester: Wiley-Blackwell.
Ladefoged, P. (2003). *Phonetic data analysis: an introduction to fieldwork and instrumental techniques*. Malden, MA: Blackwell Pub.
Ladefoged, P. (2006). *A course in phonetics*. Southbank, Victoria, Australia Boston, MA: Thomson, Wadsworth.
Lane, H., & Perkell, J. (2004). “VOT and hearing impairment”. The Journal of the Acoustical Society of America, 115.5, 10.1121/1.4782383. Retrieved from https://asa.scitation.org/doi/10.1121/1.4782383
Lisker, L., & Abramson, A. (1970). “The Voicing Dimension: Some Experiments in Comparitive Phonetics”. Proceedings of the Sixth International Congress of Phonetic Sciences, 6, 563-567.

Appendices:

(A) Measuring technique for /peso/ (English & Spanish pronunciations)



(B) Mean VOT in ms for 6 participants (tokens recorded)

		/p/		/t/		/k/	
	ID	Fall 17	Spring 18	Fall 17	Spring 18	Fall 17	Spring 18
Control 1	4M2MC	53 (2)	-	-	65 (2)	59 (2)	88 (1)
Target	8FUSDB	-	-	83 (1)	48 (5)	96 (2)	74 (5)
Control 2	11F2E	58 (2)	120 (3)	67 (3)	70 (8)	112 (1)	83 (11)
	12FPMC	-	41 (1)	11 (1)	-	98 (6)	54 (4)
	13FPMC	-	-	-	-	41 (5)	54 (3)
	1FKMC	-	66 (2)	62 (2)	47 (1)	96 (3)	51 (15)

Mean VOT in ms (number of tokens recorded)

(C) /k/ VOT range