Noa Attali

Proposal for Cognitive Science Undergraduate Thesis

Effects of Training Cantonese Speakers in Phonological Production of English Plosives

Primary Advisor: Dr. Karin Stromswold, Professor, Psychology

Secondary Advisor: Ana Rinzler, PhD student, Cognitive Psychology

**Abstract**

We are investigating the Critical Period Hypothesis (CPH) of second language (L2) acquisition, which claims that L2 acquisition depends on the learner's age. CPH posits that biological predispositions provide younger speakers with an advantage over older speakers, such that younger learners acquire L2 with greater ease (cite). Alternatively, an immersive L2 environment may matter more. In collaboration with Terry Au (ms), we hypothesize that amount of good L2 input can influence the timing factor in L2 acquisition. We propose to test this hypothesis by analyzing the effects of training versus age in L2 phonology. We are conducting acoustic analyses using PRAAT software of production data from Cantonese speakers of differing ages intensively training their pronunciation of English words. Our analyses focus on the speakers' production of English plosives /b, p, d, t, k, g/ in phonological minimal pair words (e.g., *bag* and *back*) to test whether training improves a speaker's ability to produce the contrast between these plosives. As a future goal, we want to investigate the acoustic cues most important in helping speakers make these distinctions.

*Keywords*: critical period; second language acquisition; phonology; perceptual training)

**Introduction**

Folk wisdom claims that younger speakers tend to acquire a second language (L2) with greater ease than older speakers. For instance, adults of immigrant families often have to exert more effort and develop a stronger accent than their children when acquiring a second language. Does this phenomenon occur due to biological and maturational or environmental factors? That is to say, does the brain lose flexibility with age such that late learners are biologically predisposed to attain lower levels of L2 proficiency than early learners, or do the environment and linguistic input, the individual’s first language (L1), as well as the individual’s motivation and subjective fit to the environment, influence L2 proficiency?

**Research on Maturational Factors Affecting Language Acquisition**

The Critical Period Hypothesis (CPH) posits that biological and maturational factors are responsible for the discrepancies in language acquisition proficiency between older and younger learners. The exact nature of the biological proponents of CPH vary in interpretations, assumptions and predictions (Pallier, 2007). In the strict tradition, Lenneberg (1967) suggests that a limited time window between infancy and puberty exists within which L1 can be acquired and beyond which competency declines. Lenneberg (1967) depends on indirect behavioral evidence and proposes the mechanism that past puberty the brain irreversibly loses the neural plasticity necessary for language acquisition. A variation on the mechanism is that a speaker’s L1 ‘fixes’ the functional neural connections in the cortex (Penfield, 1965; cited by Pallier, 2007).

Since CPH was put forth, many researchers have supported it. Curtiss (1977), studied severely linguistically deprived children, and argued that their inability to attain linguistic competence despite rehabilitation supports CPH. Newport and Supalla (1987), studied congenitally deaf adults, argue that increasing age of exposure to ASL as L1 in childhood and puberty predicts a decline in ultimate production and comprehension. Their study showed a gradual decline in proficiency rather than a sharp decline which supports a sensitive rather than a critical period for language acquisition.

More recent research investigated the idea of a sensitive period for second language acquisition, rather than a critical period. When it comes to age effects on L2 rather than L1 proficiency, researchers must contend with the possible effects of L2 on L1 and with the correlation between age and non-maturational factors. As reviewed by Johnson and Newport (1989), the literature suggests that in studies of immigrants age of arrival to a host country is the only predictor of L2 proficiency and that late learners have an initial and short-lived advantage over early learners which is reversed when measured by ultimate attainment.

Johnson and Newport (1989), studying Chinese and Korean immigrants to America, argue that their performance on tests of grammaticality judgments for English morphology and syntax is best predicted by their age of arrival, that is to say, their immersion in L2. [relevant criticism] Oyama (1976) argues for a sensitive period in acquiring L2 phonology. [criticism]

(past tense?)

**Research on Nonmaturational Factors Affecting Language Acquisition**

The latter, environmental possibility points to the importance of an immersive environment for L2 acquisition. There exist differences in affective and sociological learning conditions for early and late learners, especially for immigrant populations. Children in school settings are more likely to receive an immersive environment with good and constant input from native speakers, whereas late learners are more likely to be less assimilated into a social environment with good input. Late learners may be further hindered by consciousness of social stigmas associated with foreign accents, which creates a feedback loop because self-conscious or unmotivated speakers will speak less in the second language.

Terry Au (ms) ----

**Study Hypothesis and Goals**

The biological and environmental explanations for L2 proficiency can be distinguished by the effects of training learners. CPH suffers from an overabundance of undefined and contradictory predictions, but it is taken here to mean that if a sensitive period for L2 phonological acquisition exists such that non-maturational factors are negligible, training late learners in phonological perception and production should be less effective than training early learners. If the amount of good L2 input matters equally or more than biological predisposition, training late learners should be equally or more effective than training early learners. Effective training is considered to result in statistically significant improvements in perception and production of L2. In our study the improvements concern speakers’ abilities to produce the contrast between phonological minimal pair words.

In collaboration with Terry Au (ms), we hypothesize that

Cantonese and English phonology in contrast

Chan and Li (2000)

Predictions and assumptions for effect of L1 on L2

As a future goal, we want to identify and measure the acoustic cues most important in helping speakers make these distinctions.

**Methods**

**Participants**

-Terry Au

**Stimuli**

**Experimental Procedure**

**Planned Analyses**

**Acoustic Analysis**

-Acoustic analysis using Praat software

-I will be responsible for data from 11/12 year olds

-On data classified as onset, we will mark voice onset time (VOT) duration as the length of time between the release of the onset stop consonant and the onset of periodicity marking the vowel. If there is aspiration, we will measure the mean aspiration intensity. We will measure vowel duration using the .wav method to mark the start of the vowel and the F2 method to mark the end of the vowel. We will record the F2 at the end of the vowel and the pitch (F0) of the vowel if there is a level pitch contour, or the change in pitch if there is not a level pitch contour. If there is a voicing bar, we will measure voicing bar duration.

-On data classified as coda --

**Statistical Analysis**

-We will conduct a series of ANOVAs

-Comparing between pretest and posttest within age group: improvement per age

-Comparing improvements across age groups: testing the CPH

-Comparing predictive power of measured acoustic cues

-Bayesian methods, with data collected from L1 English Rutgers students as priors

**Start/End Dates**

Work on the project begins on approximately May 16 (?) and will end around August 10 (?), 2018. //Additional analysis of the data used in this study and further collection of data will continue throughout the 2018/2019 academic year.

**Student Advisor Meeting Schedule**

I will consult with my advisor(s) at least once a week for the duration of the project.

**References**

Chan, A. Y., & Li, D. C. (2000). English and Cantonese phonology in contrast: Explaining Cantonese ESL learners' English pronunciation problems. *Language Culture and Curriculum*, *13*(1), 67-85.

Curtiss, S. (1977) *Genie: A psycholinguistic study of a modern day “wild child.”* New York: Academic Press.

Johnson, J. S., & Newport, E. L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive psychology*, *21*(1), 60-99.

Lenneberg, E. (1967). *Biological foundations of language*. New York: Wiley.

Newport, E., & Supalla, T. (1987). A critical period effect in the acquisition of a primary language.

Oyama, S. (1976). A sensitive period for the acquisition of a nonnative phonological system. *Journal of Psycholinguistic Research*, 5, 261-285.

Pallier, C. (2007). Critical periods in language acquisition and language attrition. *Language attrition: Theoretical perspectives*, *33*.

Au, T. (--). Unpublished manuscript.

The praat resources

Sonya Bird, Qian Wang, Sky Onosson, Allison Benner. (2015). *Acoustic Phonetics Lab Manual*. Department of Linguistics, University of Victoria. 1-82.

Rahul Balusu and Adamantios Gafos. (2010). *Praat User’s Guide: Measuring Duration and Formants.* 1-9.

Online praat resources

Appendix A. Terry Au’s Appendix A

Appendix B. Screenshot of Praat