

# Visual Instruction and Phonological Production

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## Abstract

Research has shown that visual instruction, which illustrates point and manner of articulation, is of greater benefit to post Critical Period L2 learners than a traditional (i.e., listen and repeat) approach. By utilizing illustrations, diagrams, and animated examples, second language learners are able to conceptualize the mechanics behind sound production, thereby improving their phonological productive skills.

Past studies have proven this method of delivery to be effective in an ESL environment, and this study will investigate if the same holds true for L2 learners in a non-immersion, EFL, environment. With additional resources for autonomous learning and an understanding of the mechanics of sound production, students have a greater chance to reach native-like production abilities.

The Critical Period Hypothesis will be considered, as well as established research into the area of computer-based, visual, instruction, and show why and how it allows EFL learners to achieve more accurate phonological reproduction than a traditional behavioral approach. Another area that will be considered is student awareness of the mechanics of speech production, and their resulting phonological productive abilities.

## Introduction

How do people learn a second language (L2)? What is the best environment to do

so? At what point are they deemed to be “proficient”, “near native”, or “native” speakers of the target language? Can any of these terms be quantified or agreed upon by experts? There have been innumerable debates about the acquisition of a second language, though no one topic has created as much dispute and opposing theories as that of age and second language acquisition (SLA). Countless studies have been conducted on the subject of age and SLA, and in spite of this, linguists thus far have been unable to come to a consensus on how age affects learning a second language.

The Critical Period Hypothesis (CPH) is at the core of the debate over how much age affects one’s ability to acquire language, it was first proposed by Montreal neurologist Wilder Penfield and co-author Lamar Roberts in a 1959 paper *Speech and Brain Mechanisms*. In 1967, Eric Lenneberg brought the hypothesis into mainstream discourse when he published *Biological Foundations of Language*. According to Lenneberg’s critical period hypothesis, “automatic acquisition from mere exposure to a given language seems to disappear after puberty, and foreign languages have to be taught and learned through a conscious and labored effort.” (Lenneberg, 1967 pg. 176) Because of Lenneberg’s coherent explanation, as well as the difficulty many face in learning a second language after puberty, a good deal of people are able to associate with the CPH. It provides an acceptable explanation of how small children are able to speak target languages quite naturally, and why the majority of adults speak L2’s with foreign accents.

The critical period hypothesis has been the center of much debate since its creation, receiving support from, among others, Noam Chomsky, and argued

against by Stephen Krashen, Judith Chun, and John Schumann, to name a few. As studies have seemingly targeted the age factor in their research, many people are inclined to infer causality to a situation when there is a seemingly obvious correlation; i.e., young people generally have an easier time learning languages, older people generally have a more difficult time. The reasons behind these realities are not immediately evident. Age does not necessarily equate the ability, or lack thereof, of SLA, there are a limitless number of other factors that could be part of this imbalance. Anxiety, gender, exposure to the target language, aptitude, attitude, age, and motivation all play roles of varying degrees when one is discussing SLA.

Motivation is of great importance when learning a target language; it is what gives the learner the impetus to study hard, put into practice what they have learned, and to continually strive to build upon their knowledge base. Chomsky (1988, pg. 181) highlights the significance of the teacher being able to help learners activate their motivation: “The truth of the matter is that about 99 percent of teaching is making the students feel interested in the material. Then the other 1 percent has to do with your method.” Exactly how to get those learners to be motivated can be a difficult proposition for the L2 teacher.

Other researchers have chosen to take a more quantifiable approach in looking at what neurological processes are occurring during L1 and L2 usage, though the results seem to be varied as well.

## **Literature**

In a study by Perani et al. (2003), the effects of age of acquisition and language exposure were looked at using functional magnetic resonance imaging (fMRI). They concentrated on the cerebral correlates of lexical retrieval in high-proficient, early-acquisition bilinguals. Spanish-Catalan bilinguals were exposed to their L2 at the age of three (the L2 being the opposing language, either Spanish or Catalan), and have been using both languages on a daily basis since acquisition. In summation, Perani et al. (2003) state, "Overall, these results indicate that, during a production task, both age of acquisition and language exposure affect the pattern of brain activation in bilinguals, even if both languages are acquired early and with a comparable level of proficiency." (Perani et al. 2003, abstract) This study suggests that age and exposure play equally important roles in L2 proficiency, however the difference in ages between L1 and L2 acquisition fall well short of the commonly accepted offset of the CPH.

An earlier study by Perani et al. (1998), involving some of the same researchers as in 2003, conducted a positron emission tomography (PET) investigation on bilingualism with the purpose of evaluating the effect of early and late acquisition of L2 in highly proficient bilinguals. The group studied was made up of "Italian-English bilinguals who acquired L2 after the age of 10 years (high proficiency, late acquisition bilinguals) and a group of Spanish-Catalan bilinguals who acquired L2 before the age of 4 years (high proficiency, early acquisition bilinguals)." They found that the differing cortical responses they had noted when "low proficiency volunteers listened to stories in L1 and L2 were not found in either of the high proficiency groups in this study. Several brain areas, similar to those

observed for L1 in low proficiency bilinguals, were activated by L2.” Their conclusion was that when L1 and L2 are relatively close pairs, the level of proficiency attained in the target language was more important than the age of acquisition in regards to the cortical representation of L2. (Perani et al. 1998, abstract) With these results, it can be argued that the CPH is invalid, provided that the native language and the target language are not too far apart linguistically.

Gordon (2000) remarks that there are differences in cerebral functions between young learners and those who begin to learn a second language at an older age. He states, “If children speak a second language by hearing it in the environment in which they live, they are acquiring it as they do their mother tongue, but if they start at the age of 12 years they are learning it like any other subject they study.” (Gordon 2000, abstract) Gordon setting the cutoff point at the age of 12 supports the CPH, as it reaffirms that the offset of the CPH is at, or around, puberty.

Scovel (1969) reported that late language learners, i.e., post critical period, are unable to achieve native-like pronunciation in a second language. Research by Flege, Munro, MacKay (1995) states that native-like production in an L2 is extremely rare, and this leaves open the possibility that it is indeed possible for second language learners to reach successful L2 phonological production. However, as noted by Warsi (1988), “*with individualized practice, there is evidence that the learners’ performance is improved (Hill, 1970; Neufeld, 1977; Archibald, 1992)*”.

Building on the idea of individualized practice, Warsi conducted a study that

looked into the effectiveness of visual instruction for post critical period learners.

In his dissertation proposal, Warsi describes his research as such:

*This study proposes to test the hypothesis that adult learners practicing L2 sounds, with the ability to see on a diagram articulatory movements (point and manner of articulation) and conscious modifications of their researcher-prompted output, will approximate closer the target sounds, with the result of more native-like production and a more rapid progress. The idea behind the proposal is that it isn't just practice of sounds that improves the productive phonology, but informed practice. Teachers may give feedback to the student, but my hypothesis is that instruction that can be seen and then the output that can be modified will work better. The hypothesis is based on the assumption that the acquisition of new L2 speech sounds by adult language learners is facilitated by visual instruction.*

Through his study, Warsi found that with informed practice, participants were able to accurately produce the English liquids /l/ and /r/ and able to correctly identify perceptual speech contrasts with native-like ability. He states that by providing adult learners with visual cues and researcher feedback, a more effective method of instruction was provided.

Taking into consideration past research, 2 research questions were proposed for this study:

- How closely can post Critical Period Japanese speakers of English, in an EFL environment, produce English /l/ and /r/ in respect to native speakers of the target L2 with the aid of visual instruction?
- Is this an effective method of instruction for Japanese students in an EFL (as opposed to an ESL) environment?

## **Methodology**

The study was conducted over a 10-week period at Kanda University of International Studies during spring semester 2013. Two sophomore classes in the International Communication department were selected to participate; the control group receiving a traditional listen and repeat method of instruction via .mp3 recordings and the experimental group receiving a visual method of instruction that illustrated point and manner of articulation utilizing an animated cross section of the mouth.

Participants were given 10 unique word and sentence lists, 1 per week over the course of 10 weeks, that were composed of utterances containing either the /l/ or /r/ liquid in initial, medial, or coda position. As part of the 10-week training, participants were required to record and upload their weekly lists to a shared server in order that their progress be monitored. These lists were not rated; the task was to practice each word or sentence a minimum of 5 times before recording and uploading.

Before and after training, both the control group and the experimental group recorded their production of target sounds. The same word list was used for the pre and post-tests for all participants.

A group of 3 judges rated the participants' production of the target sounds /l/ and /r/ by listening to the recordings and ranked each utterance on a 5-point scale ( /L/ /l/ /?/ /r/ /R/ ). After judges scored the utterances as /l/ or /r/ and strong/weak/unintelligible/weak/strong, their assessments were compared with

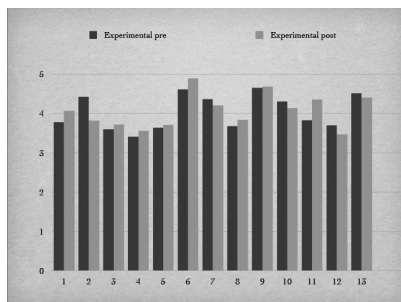
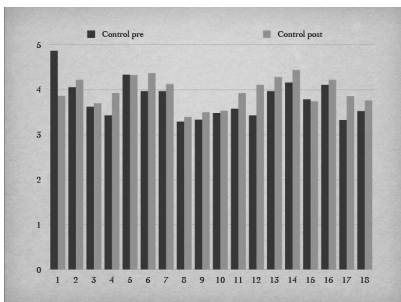
the list given as pre and post-tests. Strong production of the target sound was awarded 5 points, weak production was awarded 4 points, unintelligible production was awarded 3 points, weak production of the incorrect sound was awarded 2 points, and strong production of the incorrect sound was awarded 1 point. Participants' scores were averaged from their 50 utterances on the pre and post-test respectively, and the 3 judges' scores were averaged to get an overall rating.

## **Findings**

The 2 research questions proposed for this study, *How closely can post Critical Period Japanese speakers of English, in an EFL environment, produce English /l/ and /r/ in respect to native speakers of the target L2 with the aid of visual instruction and, Is this an effective method of instruction for Japanese students in and EFL (vs. ESL) environment* did not yield the same results as the study conducted by Warsi. While the study at Kanda University showed overall participant improvement, it did not prove that the same style of delivery equaled the same amount of improvement as the original study.

As illustrated in the graphs below, both the control (recording, listen and repeat) and experimental (visual instruction based on an animated cross section of the mouth) groups showed numerical improvement when comparing pre and post-test averages. However, while the results from the control group were statistically significant, the results from the experimental group were not.





Upon reflection, a number of variables that could have affected the outcomes of the experimental group have been identified:

- *The method of delivery was in the form of homework*

This research was a replica study of one that proved the effectiveness of visual instruction conducted in a controlled research environment. By changing the framework, perhaps a more rigid set of guidelines needs to be established.

- *Non-traditional method of instruction*

While students are accustomed to tasks that involve (independent) listening, and will play recordings multiple times in order to achieve comprehension, simply watching an animated cross section of the mouth while listening to the corresponding phoneme may have been too different of an approach for the majority of students.

- *Too much (initial) autonomy for students*

A new method of instruction, coupled with the independent nature of homework, allowed for a lax approach towards the time and quality of

practice prior to recordings.

- *Small sample size / reduced experimental size*

In each class, 18 students agreed to participate in the study. Faulty recordings and/or pre or post-tests not being uploaded contributed to a smaller sample size in the experimental group.

- *Quality of recordings*

Recording environments with background noise, extremely varied speeds of participants' production during the recording, and differing quality-levels of the recordings themselves, created uncertainty on the part of the raters as to what phoneme was being uttered.

- *Rater bias*

Participants were attempting to produce North American sounds, the raters were English speakers from non North American countries; their own linguistic backgrounds could have (unintentionally) biased their judgments.

In light of the limitations of the study, considerations for further research are:

- *Randomizing participants instead of 1 class / 1 method*
- *Improving / equalizing rater aptitude*
- *Monitoring that both the control and experimental groups commit the same amount of time / students to keep reflective journals*
- *Using low-tier freshman classes instead of higher level classes*
- *Larger sample size*

Even though anticipated results were not observed, there are still many benefits to

visual instruction and phonological production. By utilizing this method, students are able to internalize the mechanics, i.e. point and manner of articulation, providing them with a deeper, more in-depth understanding of speech production. Visual instruction addresses spatial (picture smart) & logical (reasoning) learning, providing a different manner of instruction for the learner. Finally, students can study and practice on their own and not feel pressure from teacher or peers, thereby lowering the affective filter, adding to their independent learning resources, and creating a more confident and autonomous learner.

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