Is Deep Level Processing Possible for Novel Language Sounds?

uOttawa
Psychoshorts 2017

Yu Ying (Joy) Li & Laura Sabourin
University of Ottawa

ERPLing•PÉLing Lab

Introduction

Past studies looking at second language (L2) speech perception show that one's age of acquisition and one's first language (L1) have strong influences one's acquisition and performance in the L2. These are due to one's loss of sensitivity to perceive all language sounds after 10months of age,[8] and L1 transfer effects after one's phonology has crystallized. As such, it is much easier for children to learn new languages, and why speakers of the same L1 often make similar mistakes in their L2.[3]

According to the Perceptual Assimilation Model[1] (PAM) however, perceptual learning should be possible at all stages of one's life. Although previous literature shows that it is possible for participants to perceive novel contrasts when they are presented side by side, the acquisition of novel language contrasts have not been shown to be as clear. The contrast that I am interested in investigating is the vowel length contrast, more specifically, the Japanese vowel length contrast.

Previous studies looking at naive learning of novel vowel length contrasts have shown that speakers of both different and similar L1s find it is difficult to learn the vowel length contrasts in other languages. For example, even though both Arabic and Japanese have phonemic vowel length contrasts, it is still difficult for speakers to learn each other's vowel length contrast.[5,7,9,10]

Research Questions

Q1: Can naïve learners actually perceive novel phonemic language contrasts (tested in task 1); as the contrasts are not meaningful in their L1?

Q2: Can naïve learners be trained to use this new contrast at a lexical level (tested in task 2 & 3)? I.e. Can they be trained to differentiate between words containing the new contrasts without relying on discourse context?

Hypotheses

1) All groups should perform well for the AX task as previous studies have shown that novel contrasts are distinguishable when presented side by side.

2) In terms of the Event Related Potential (ERP) task, All groups should show something in their brainwaves, even if they are unable to perform above chance for the tasks.

3) More specifically, the control group should show a N400 for the control and incongruent trials, successful learners from the experimental group should also show a N400 for the control trials and a lower N400 for the incongruent trails, and unsuccessful learners should at least show a N400 for the control trials if not the incongruent trials.

Methodology

Participants

Control group: Native Japanese speakers who are highly proficient in English. .
Experimental group: Functional Monolingual English speakers (those with exposure beyond core French are exempt).

Procedures

Task 1/Control Task: Behavioural AX Task

- The task consists of vowel pairs of long and short vowels in different configurations.
- All possible pairs are of the following configuration: **/a-a/**, **/a-a:/**, **/a:-a:/**, **/a:-a/**, **/a-different vowel/**.

Task 2: Training Task

- Participants will be taught matching pairs of pictures and their pronunciation to learn novel non-words.
- The stimuli will be comprised of 14 filler non-words and 5 pairs of target non-words (that differ only in vowel length).
- There will be mini quizzes (lexical decision task) at the end of each block containing feedback to check that the participants are learning.

Sample Stimuli: **Control/Fillers** **Short Vowels** **Long Vowels**

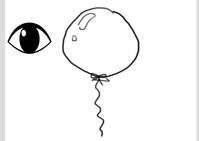
"HIBI" (cat)

"DEGI" (book)

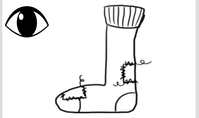
"DEEGI" (umbrella)

"GAARO" (flower)

"GEBE" (balloon)



"GEEBE" (sock)



Task 3: ERP Task

- A lexical decision task where the tokens are presented auditorially and the participants have to choose which picture is the correct match for the auditory token.
- The MMN paradigm will be used to see if participants will show a N400 response to incongruent trials.

Sample Stimuli:

"DEGI" (book)

✗ **Control/Filler "HIBI"(cat)**

✓ **Congruent "DEGI"(book)**

✗ **Incongruent "DEEGI"(umbrella)**

Analysis

"DEGI"	✗ Control/Filler	✓ Short Vowel	✗ Long Vowel
Japanese Control	Large N400 100%	X 80%	Large N400 80%
Successful Learners	Large N400 100%	X 75%	Moderate N400 75%
Unsuccessful Learners	Large N400 100%	X/? 50%	X/? 50%

Future Directions/Discussion

If the experimental group does not show a N400 in the ERP task, some reasons could be that the training method was ineffective, or that there was insufficient training time. Alternate training methods could include having the participants repeat the tokens out loud, videos of a person producing the tokens, or hand gestures to help participants learn the contrast.[4]

Another reason could be that there was not enough tokens in the experiment. According to the PAM-L2,[2] L2 learning is the rephonologization of their L1, like the "vocab explosion" for 18month children acquiring their L1. As such, if we increase the number of tokens, and thus the vocabulary, the participants should show a N400.

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Contact Information: jli238@uottawa.ca & Laura.Sabourin@uottawa.ca