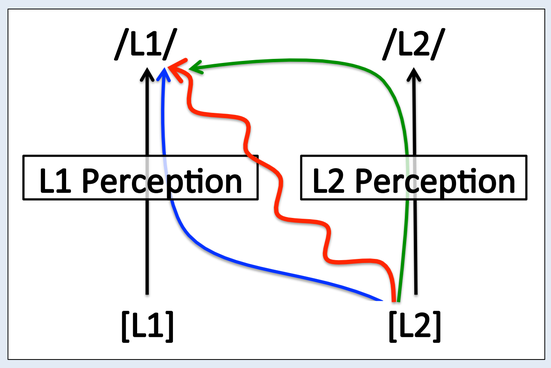
L2 categories in perceptual adaptation and implications for loanword phonology

Yoonjung Kang & Jessamyn Schertz
University of Toronto

Introduction

- **Previously**: Loanword adaptation as non-native perception of source language phonetic input (Silverman 1992; Boersma & Hamann 2011; Peperkamp, et al. 2008)
- **Challenge**: established loanwords are largely systematic in input-to-output correspondences while non-native perception by naïve monolinguals is highly variable. (Smith 2009; Kang 2010; Ito 2014; de Jong & Cho 2012)
- **Solution?**: Cross-language perception is modulated by listeners' L2 knowledge:
  - L2-to-L1 mapping by experienced L2 learners is less variable than by inexperienced learners.
  - Experienced L2 listeners attend less to the phonetic details not contrastive for L2 than inexperienced L2 listeners.
  - This suggests that L2-to-L1 mapping is mediated by perceived L2 categories. (Best & Tyler 2007; Bundgaard-Neilson, et al. 2011; Nomura & Ishikawa 2016; Kwon 2017)
- **Gap in previous work**: The proposed connection between L1 or L2 perception and Cross-language perception is ***inferred*** based on the comparison of production data, rather than directly compared.
- **This study** examines how L2-to-L1 (Cross-language) perception is related to listeners' L1 (Native language) Perception and L2 (Source language) perception by:
  - creating a controlled acoustic space across two languages along relevant acoustic dimensions and
  - comparing responses from the same listeners on L1, L2, and L2L1 perception.



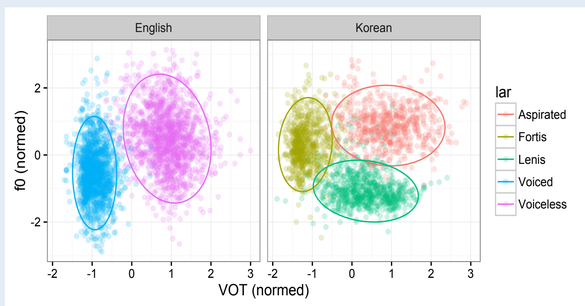
- **Hypothesis**
  - L2L1 perception is a combined function of L1 Perception and L2 perception and
  - L2 perception has a stronger influence for high L2 proficiency listeners than for low proficiency listeners.

English and Korean stops

- Loanword correspondences

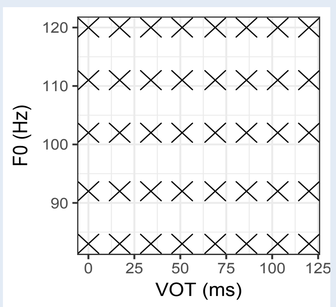
English	*Korean*	
voiceless	aspirated	*pen > pʰen*
voiced	lenis ~ fortis	*beer > piʌ, bus > p'ʌs'ɨ*

- Acoustic comparison
  - English voicing contrast is primarily signalled by VOT while Korean aspiration contrast is signalled by a combination of VOT and F0.



Methods

- **Participants**
  - 86 Seoul Korean listeners recruited in Seoul Metropolitan Area (65) and Toronto (21).
- **Stimuli**
  - Nonsense words pʰ/p/p'aru (Korean) and p/baru (English), produced by male native speakers
  - Manipulated to vary in VOT (0-120ms, 8 steps) and f0 (83-120 Hz, 5 steps).

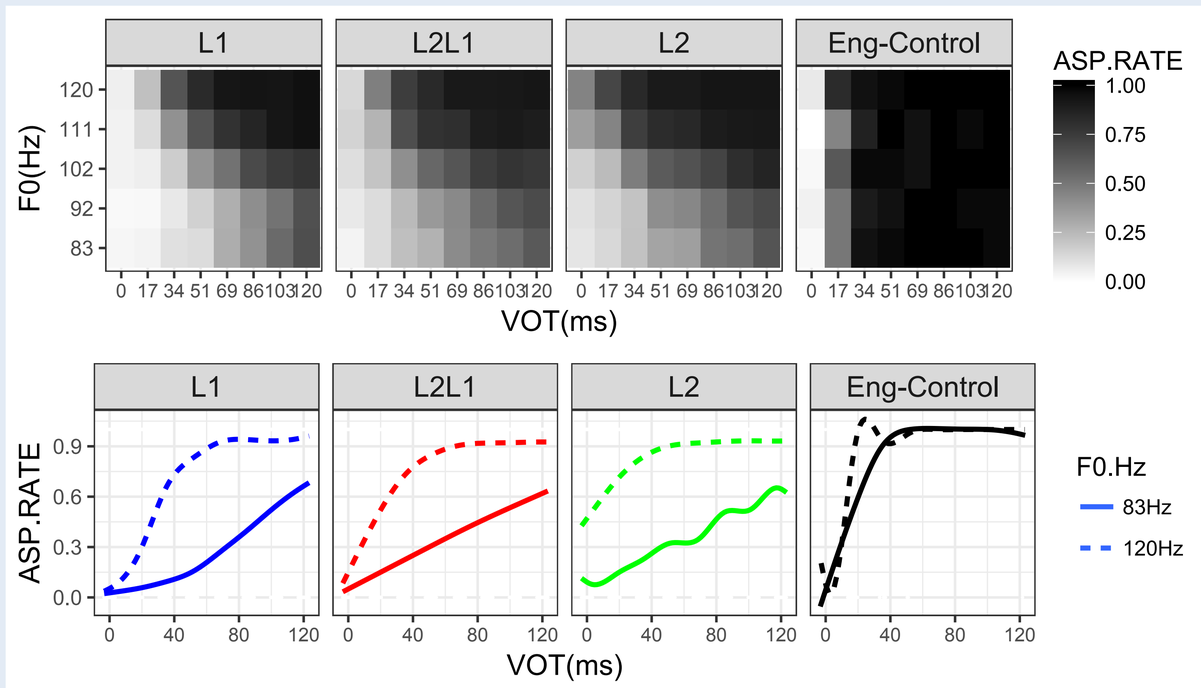


- **Procedures**
  - Listeners heard the stimuli and chose the best-fit Korean or English category as instructed.
  - L1 and L2 (counterbalanced in order) tasks followed by L2L1 task

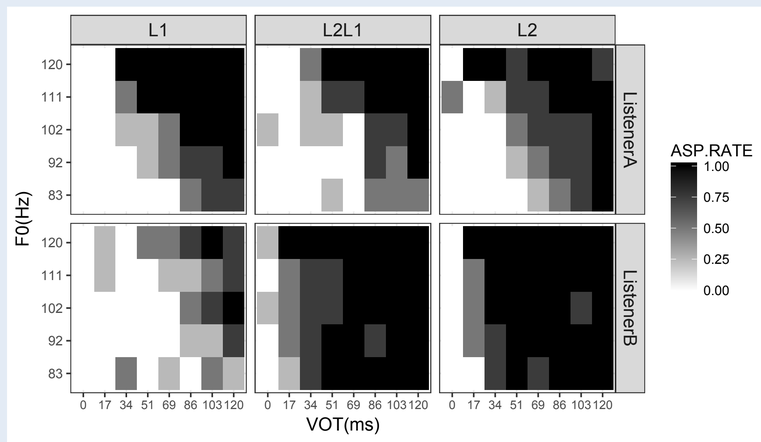
Tasks	*Stimuli*	*Responses*
L1	Korean	Korean
L2	English	English
L2L1	English	Korean

- **Controls and L2 proficiency**
  - 10 English listeners with no knowledge of Korean also completed English perception.
  - Their data serve as a target English L2 perception norm, against which Korean listeners' English perception proficiency is measured.
- **Analysis**
  - **Coding the response**: The responses are converted to a binary variable, aspirated/voiceless vs. nonaspirated/voiced, collapsing fortis and lenis responses for Korean.
  - **Comparing similarity across tasks**: Separate mixed effects logistic regression models are built for L1 and L2 perception and these models are used to predict L2L1 perception responses. Then, L1 and L2 model predictions are compared against actual L2L1 responses and **accuracy** of L1 and L2 models is calculated for each participant: glmer (asp ~ f0 * vot + (1 + f0 * vot | sub))
  - **L2 Proficiency**: Individuals' L2 responses are compared against the prediction of control speakers' L2 perception logistic regression model.
  - **Statistical test**: The effect of proficiency and the presentation order on relative accuracy of L2 vs. L1 in predicting L2L1 responses (= L2 accuracy − L1 accuracy) were tested: lm (relative.accuracy ~ proficiency * order)

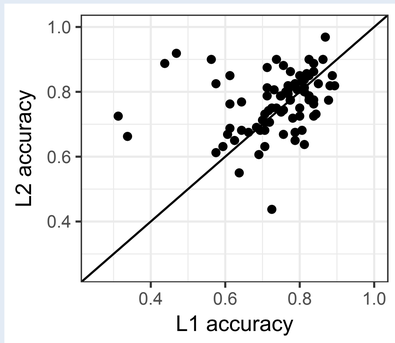
Results



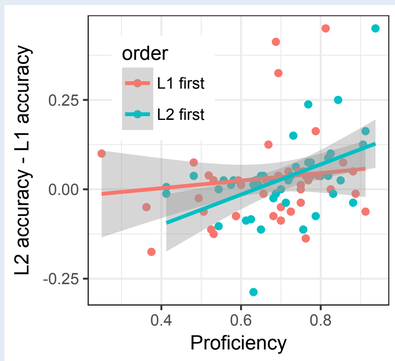
- **Korean L1 vs. English control** : The Korean contrast relies on F0 and VOT while the English contrast mostly relies on VOT.
- **L1, L2, and L2L1:** L1 perception colours both L2 and L2L1 perception. The responses are generally quite similar across the three tasks.
- **Individual variation**
  - Listener A: similar L1-like responses across all tasks
    - L1 accuracy: 85%
    - L2 accuracy: 83%
    - Proficiency: 68%
  - Listener B: L2 perception is control-like and L2L1 responses mirror L2 not L1.
    - L1 accuracy: 44%
    - L2 accuracy: 89%
    - Proficiency: 94%



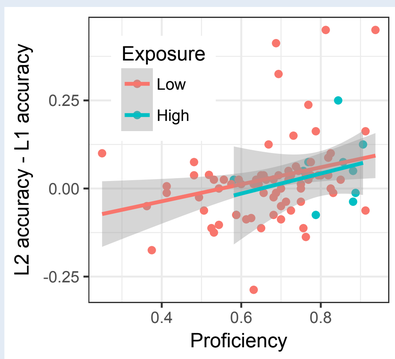
- **L1 vs. L2 accuracy in predicting L2L1**
  - Most listeners cluster around the upper-right corner. This indicates that their perception is similar across all three tasks like listener A.
  - Among those who show more dissimilar responses across tasks, more are found above the black line (L1 accuracy = L2 accuracy). This indicates that their L2L1 perception is more similar to L2 than L1, like listener B.
  - **Paired t-test:** L2 accuracy > L1 accuracy ($t = 2.2458$, $df = 85$ $p = 0.02731$)



- **L2 Proficiency, task order, and relative L2 accuracy**
  - a marginally significant interaction of task order and proficiency
  - **L1 first (L1 − L2 − L2L1)**: when L2 task was right before L2L1 task, there was no effect of proficiency on relative accuracy of L2 over L1.
  - **L2 first (L2 − L1 − L2L1)**: when L2 task was done first and L1 task intervened between L2 and L2L1 tasks, high L2-proficiency listeners relied on L2 more than less L2-proficient listeners.



- **English exposure and relative L2 accuracy**
  - Exposure: residence in English speaking countries under (LOW) vs. over (HIGH) 6 months (cf. Best and Tyler 2007)
  - No independent effect of exposure



- **Summary**
  - Many Korean listeners show L1-like perception patterns in L2 and L2L1 perception, confirming the pervasive influence of native perception on non-native perception.
  - High L2-proficiency listeners (who closely approximate L2 target perception) are more likely to show an independent and strong influence of L2 perception on L2L1 perception than low L2-proficiency listeners (whose L2 perception is dependent on L1).
  - The study provides direct evidence that L2 perceptual knowledge modulates L2L1 perception and that perceived L2 categories mediate L2L1 mapping.
  - We suspect a stronger L2 category effect on L2L1 mapping when L2 category perception is aided by lexical and syntactic information in actual adaptation situation.
  - By demonstrating that L2 phonological categories can play a role in cross-language perception, the study provides a way to reconcile the perceptual adaptation view of loanwords with the phonological regularity of established loanwords.

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