The role of perceived L2 category in cross-language perception & implications for loanword adaptation

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Mechanism of loanword adaptation

- Phonological operation (Paradis and LaCharite, 1997)
- Perceptual operation (Silverman 1992, Peperkamp & Dupoux 2003, Boersma and Hamann 1998)
- Perceptually informed phonological operation (Steriade 2001, Kenstowicz 2001, Yun 2016)

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  - Input: output of L2 phonology
  - Non-contrastive, gradient phonetic details of L2 are not relevant.

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  - Input: unstructured acoustic signal of L2
  - Phonological structure of L2 is not relevant

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- Perceptually informed phonological operation (Steriade 2001, Kenstowicz 2001, Yun 2016)
  - Perceptually relevant phonetic details of L2 matter.

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Duality of adaptation

- Adaptation is sensitive to non-contrastive **phonetic** details of L2 but also L2 **phonological** structures are adapted more regularly than predicted by L1-driven perception alone.

(cf. Peperkamp, et al. 2008, Kang 2010, deJong and Cho 2012)

Boersma & Hamann (2009)

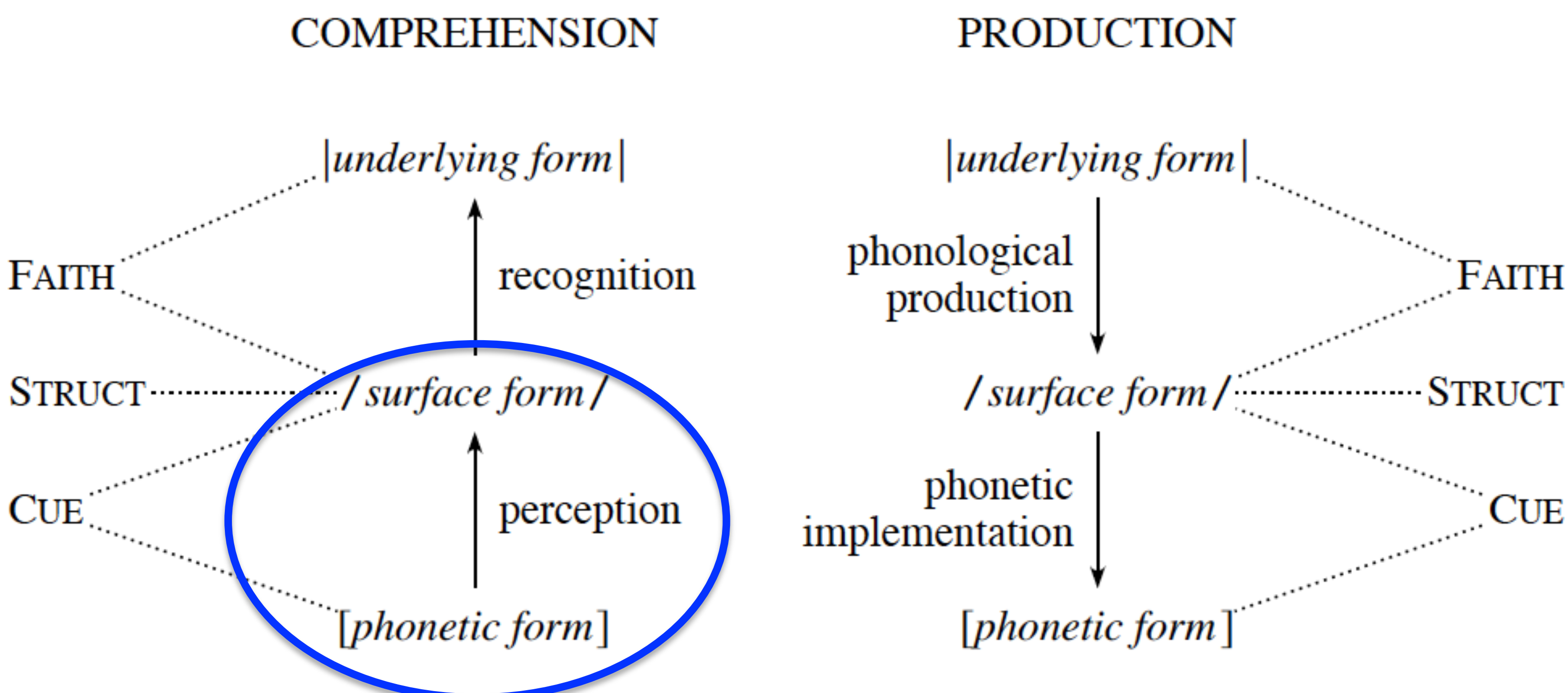
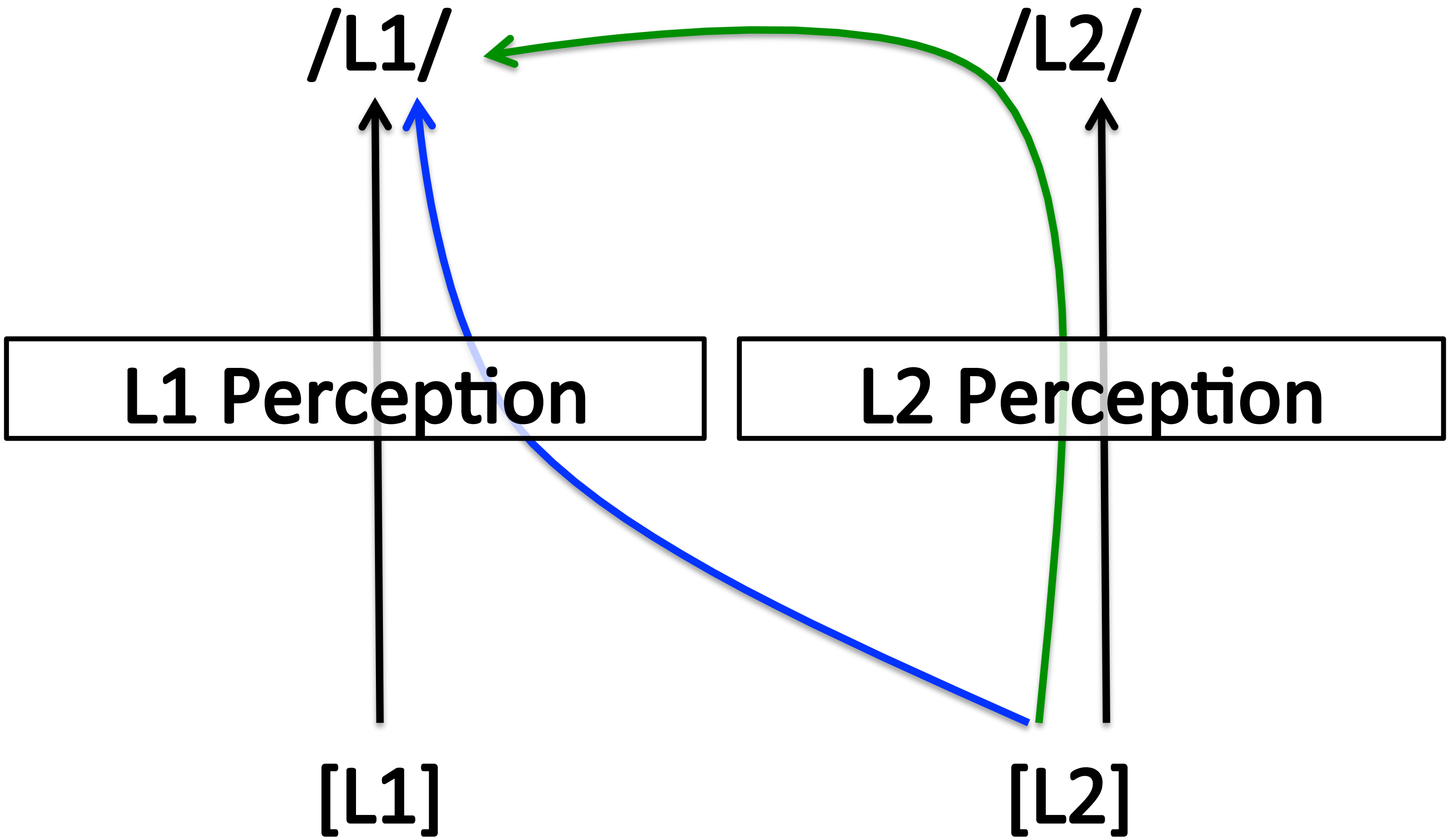


Fig. 1. A single model for L1 processing as well as loanword adaptation.


/L1/
/L2/
L1 Perception
L2 Perception
[L1]
[L2]

Goals

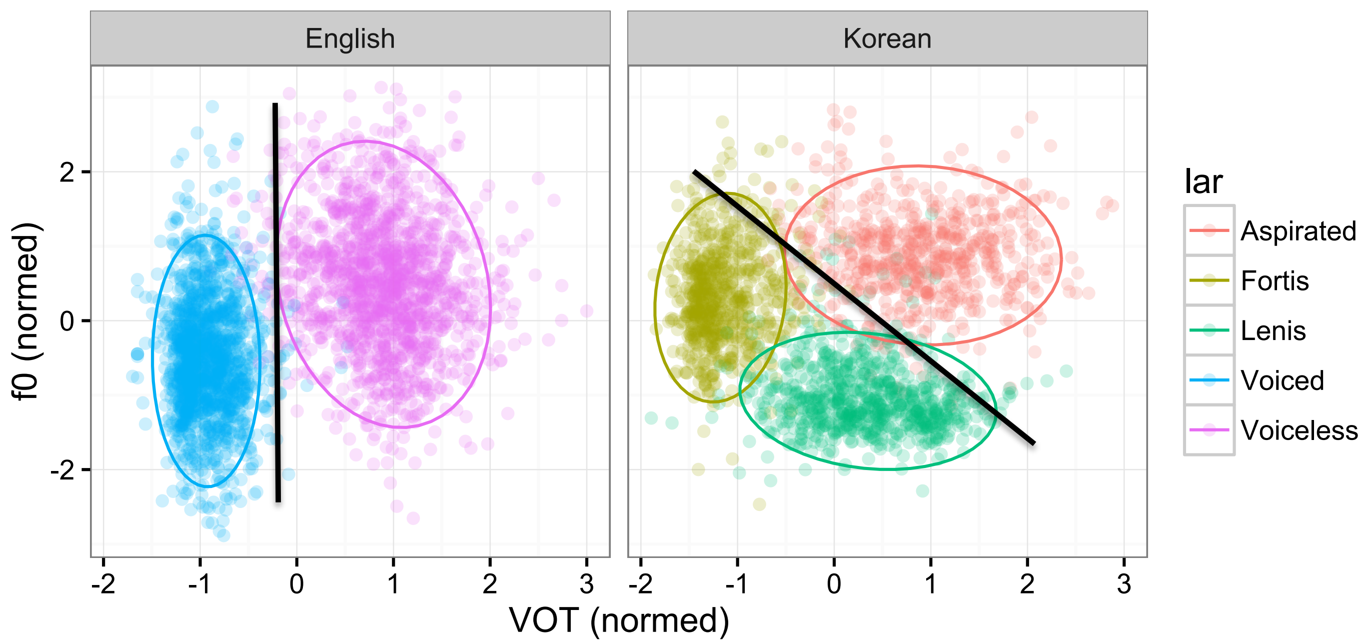
- Examine how similar L2L1 mapping is to L1 perception and if L2L1 mapping is modulated by L2 perception.
- Compare the mappings across the tasks (L1, L2, L2L1) by controlling for acoustic differences between L1 and L2, a departure from previous L2L1 mapping studies that used natural L2 stimuli.

Hypotheses

- Hypothesis 1: If listeners map foreign sounds directly onto L1 categories based on the relevant acoustic dimensions, results for the cross-language mapping task should be identical to the L1 mapping.
- Hypothesis 2: If listeners perceive foreign sounds in terms of L2 categories, results for the cross-language mapping task should diverge from the L1 mapping in the case of L1-L2 category mismatch.

English stops in Korean

English		Korean	
Voiceless /p/	→	Aspirated /pʰ/	*pʰen* ‘pen’
Voiced /b/	→	Lenis /p/	*piʌ* ‘beer’
	↘	Fortis /p’/	*p’ol* ‘ball’



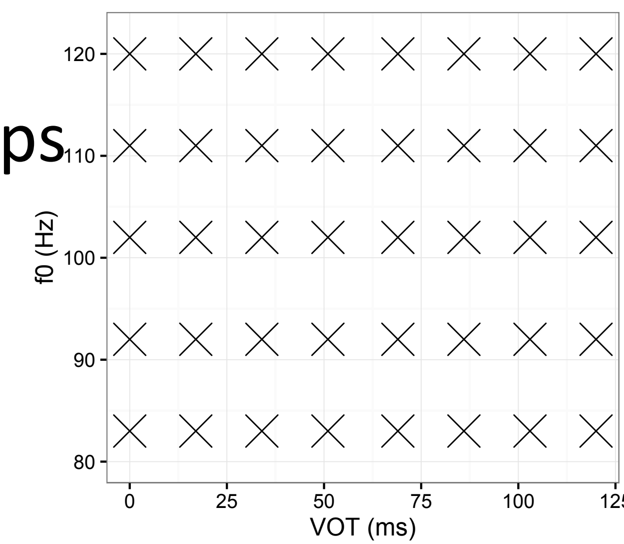
Experiments

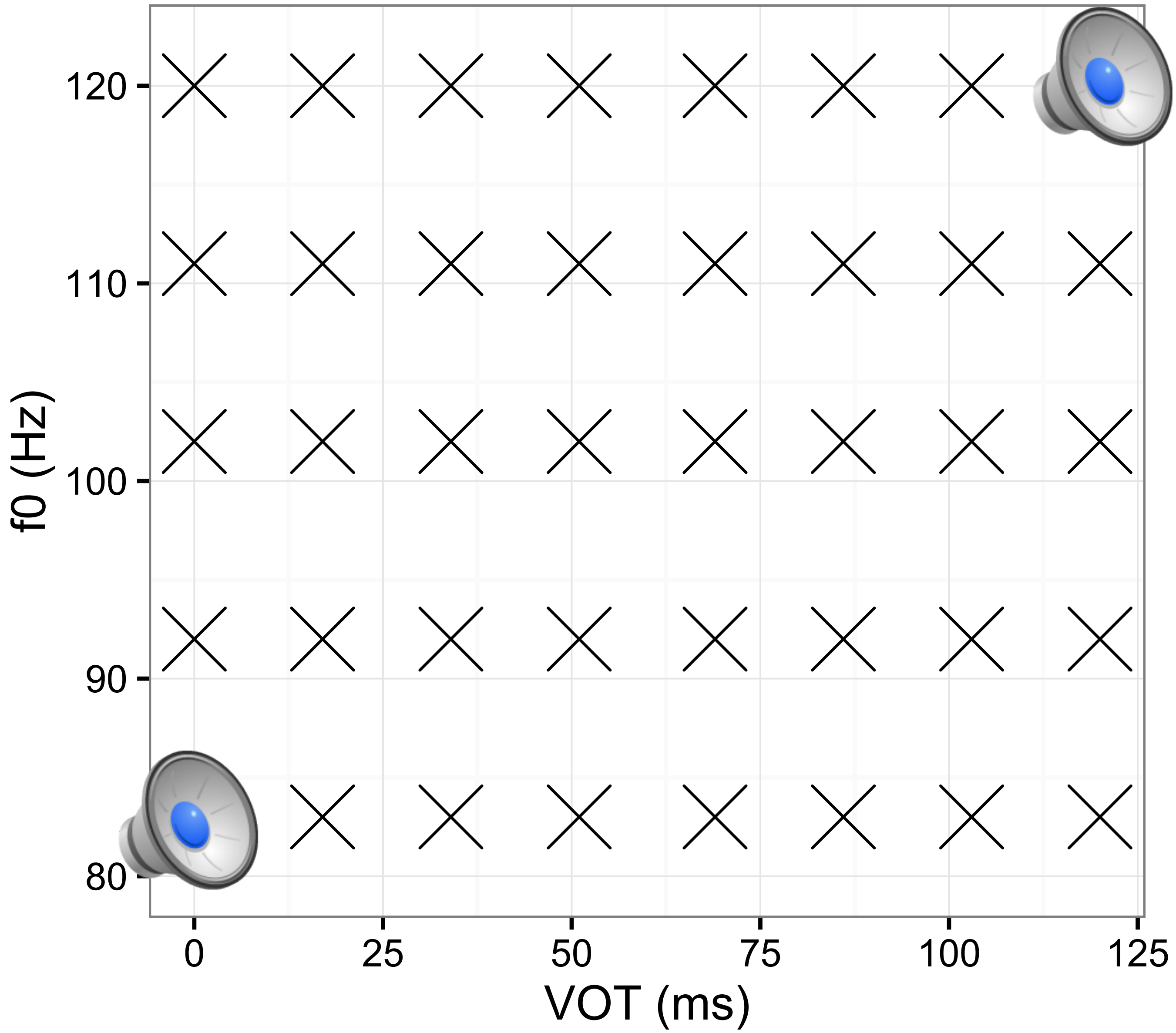
Experiment	Stimuli	Response
L1	Korean stops	Korean categories (바/빠/파)
L2	English stops	English categories (ba/pa)
L2L1	English stops	Korean categories (바/빠/파)

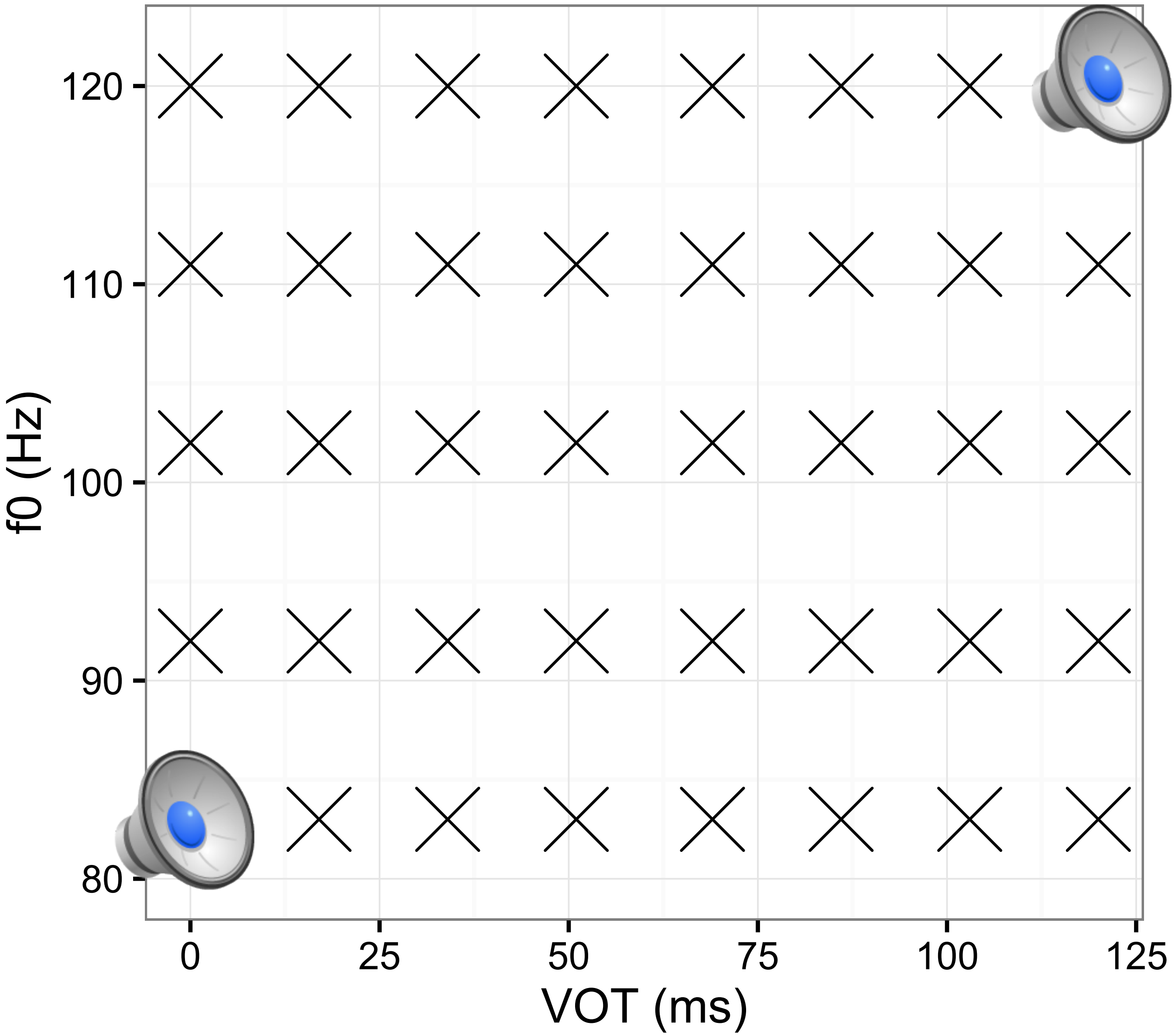
*Order of **L1** and **L2** varied across participants

Stimuli

- Nonce-word stimuli ('paru') produced by male native speakers of each language
- Manipulated to create a controlled acoustic space, identical for L1 and L2
  - VOT (0-120ms): 8 steps
  - f0 at V onset (83-120 Hz): 5 steps
  - two base vowels
  - two repetitions
  - 4 tokens per "cell" per task




120
110
100
90
80
f0 (Hz)
0
25
50
75
100
125
VOT (ms)



120
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Participants

- 87 Seoul-Kyeongki Korean listeners
  - 22 recruited in Toronto (Year of Birth: 1987~95)
  - 65 recruited in Incheon (Year of Birth: 1933~96)
- 8 English controls with no knowledge of Korean

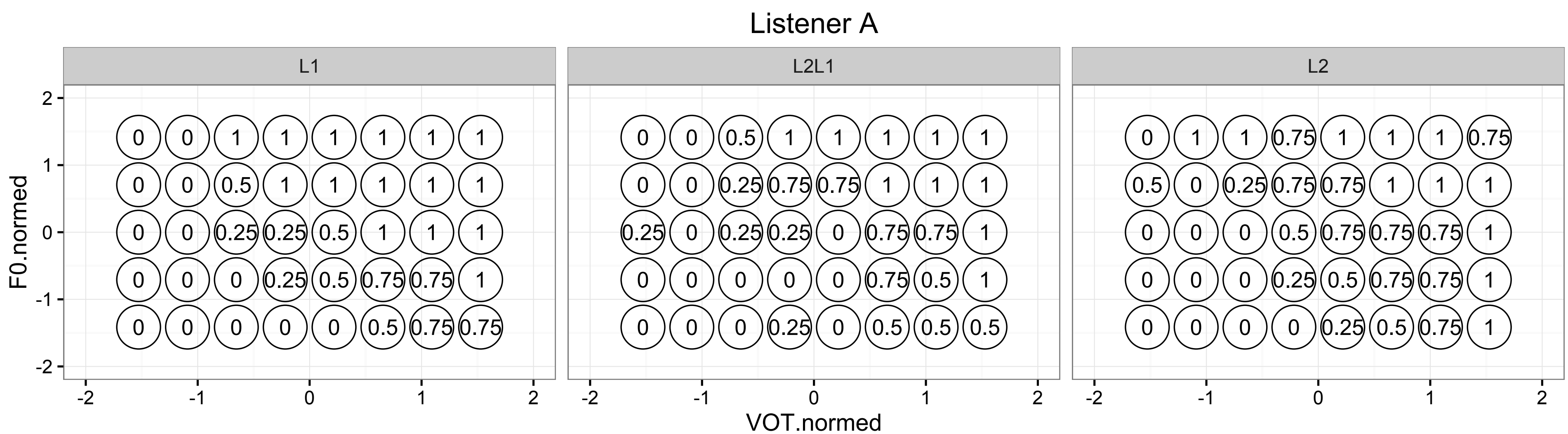
Response Coding

- Responses are coded into binary choice, mirroring the correspondences in loanwords.

English	Korean	Coding
Voiceless (p)	Aspirated (p^h)	Aspirated
Voiced (b)	Lenis (p)/Fortis (p')	Non-aspirated

Response Coding

- We then calculated the rate of "aspirated" choice (ASP.RATE) for each cell of the f0-by-VOT acoustic space for each task for each listener.



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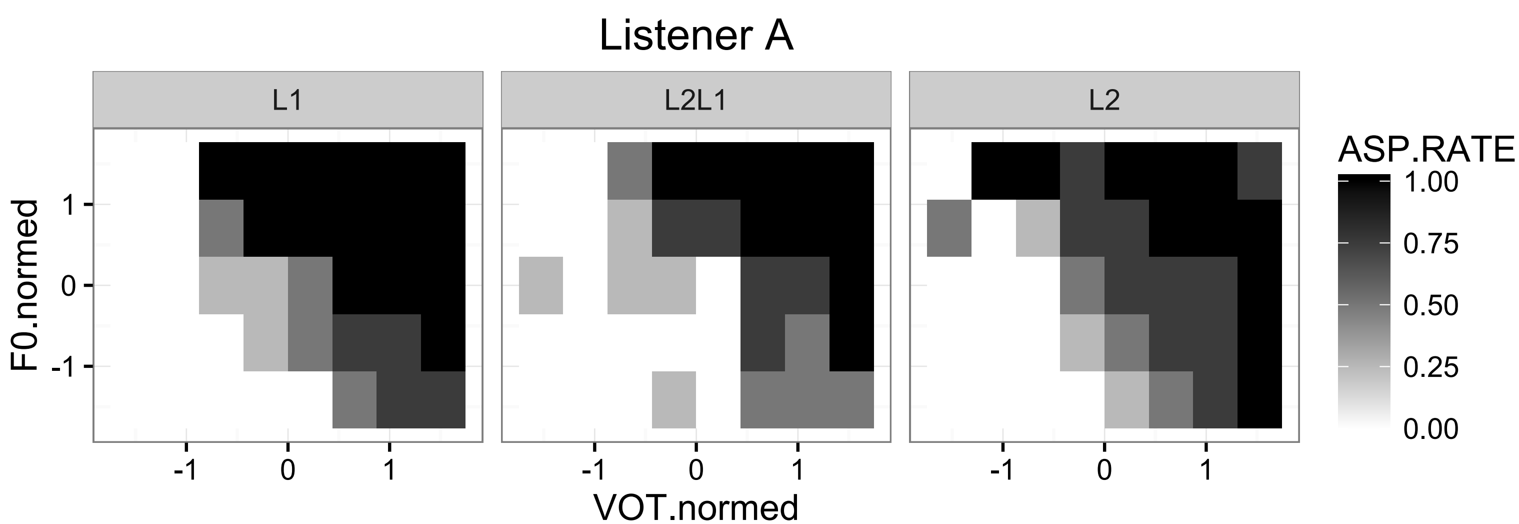
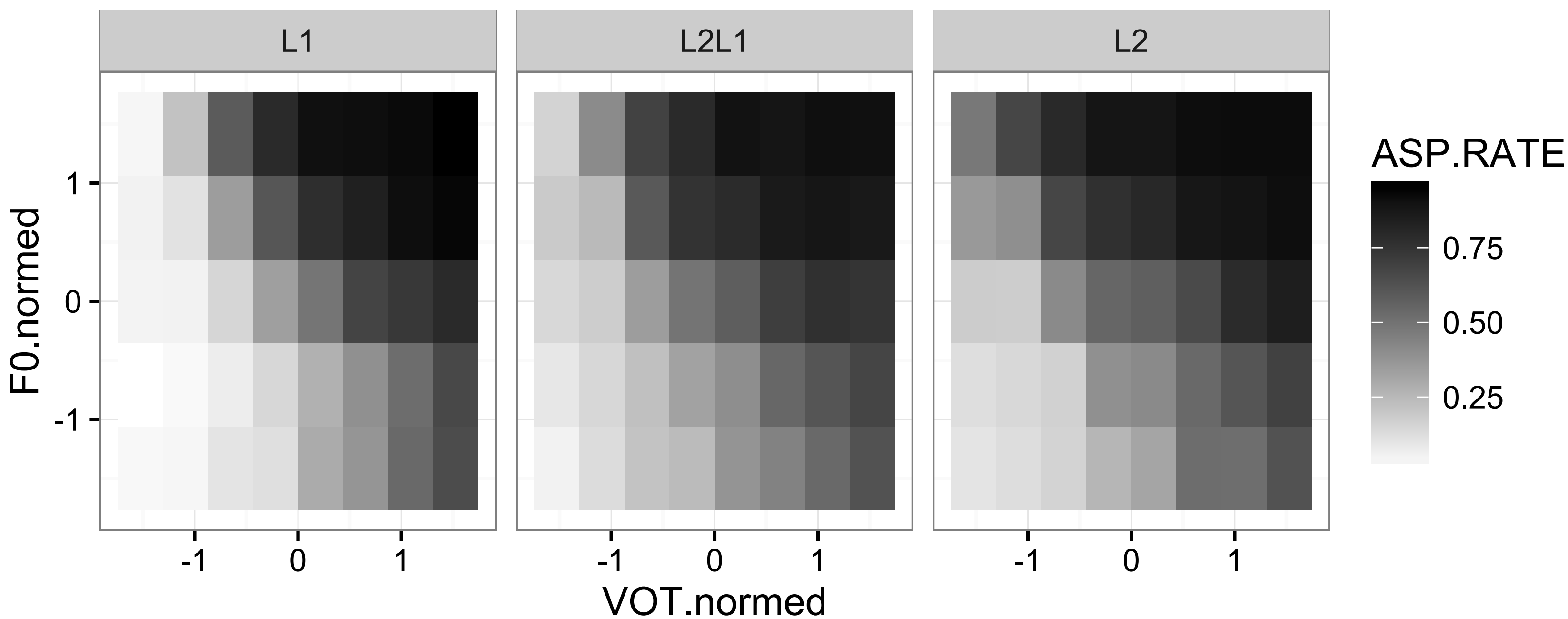
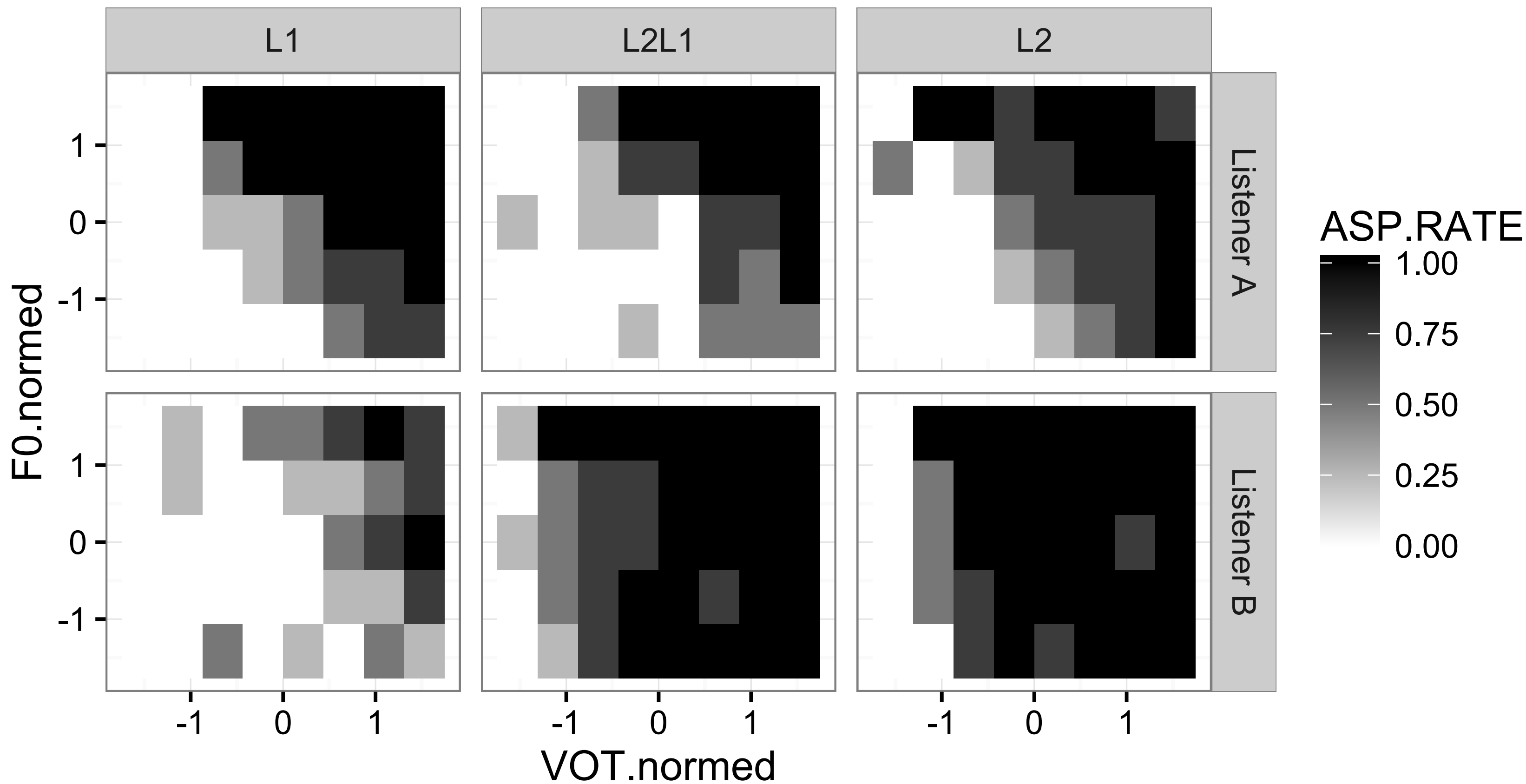


All listeners combined

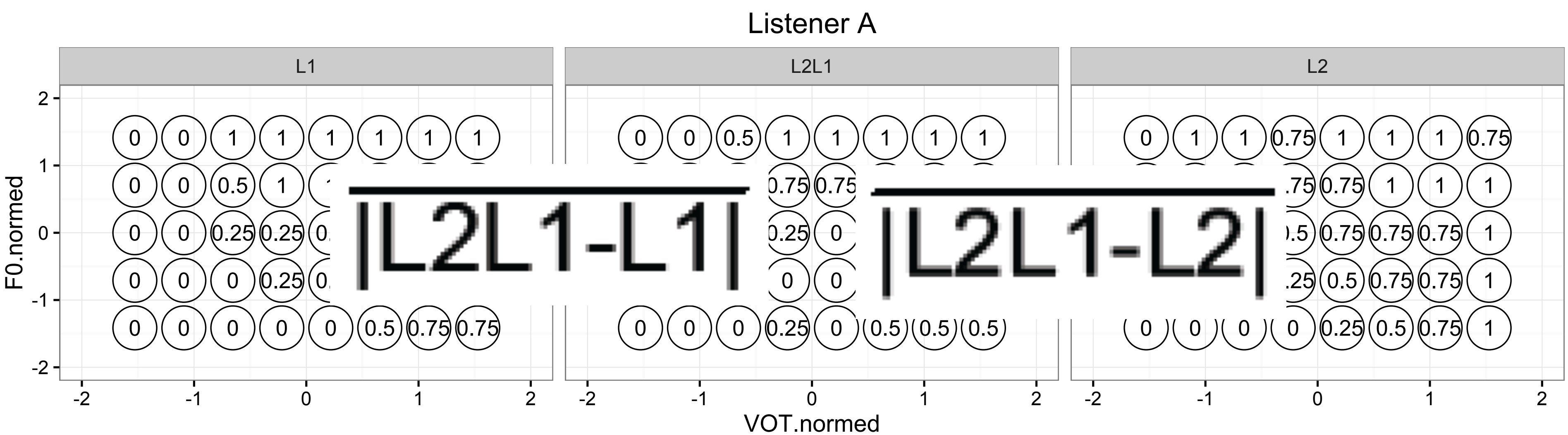


Individual variation



Comparing across experiments

- For each cell for each listener, the difference in response rate across experiments were calculated and averaged. (0: identical, 1: opposite)



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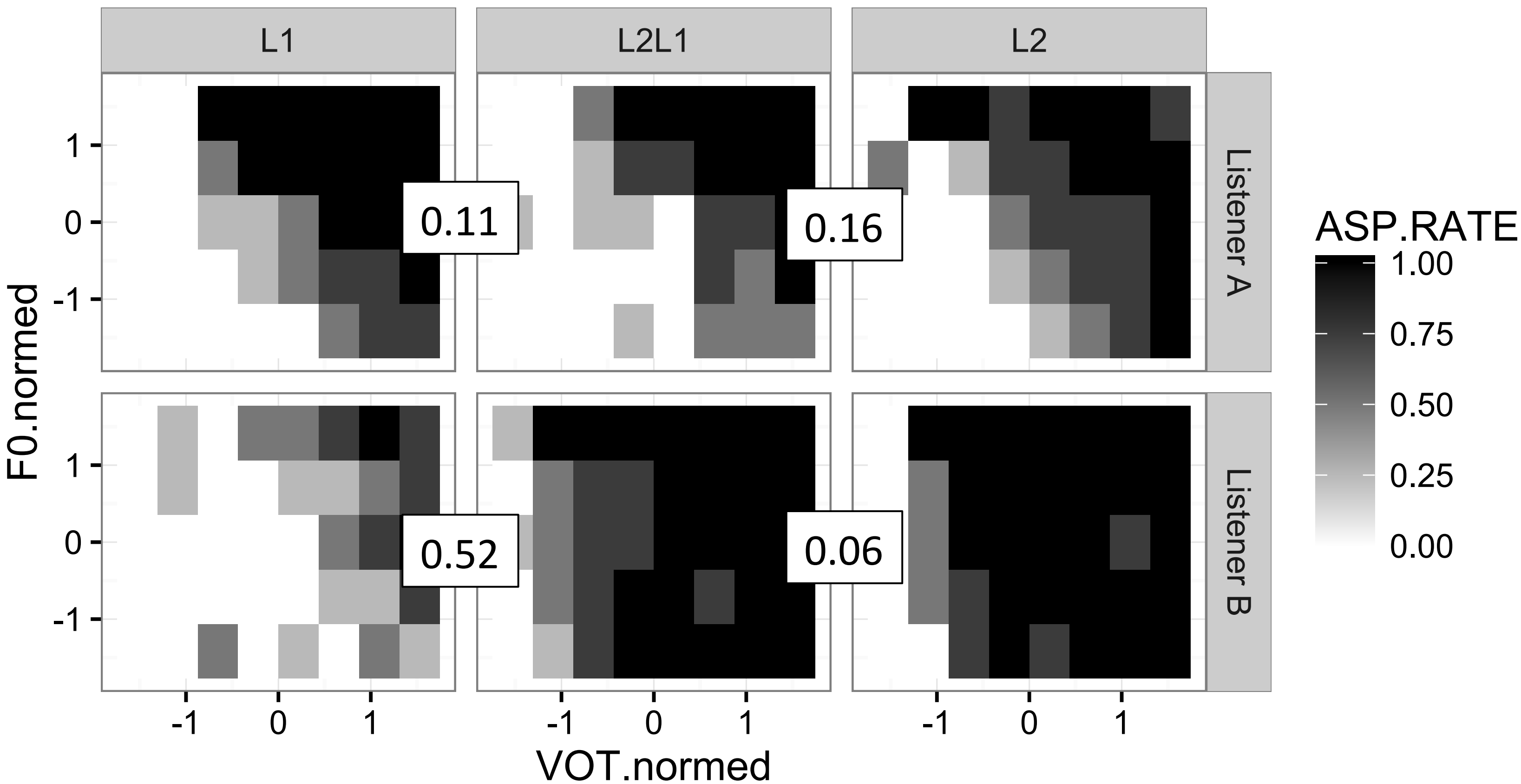
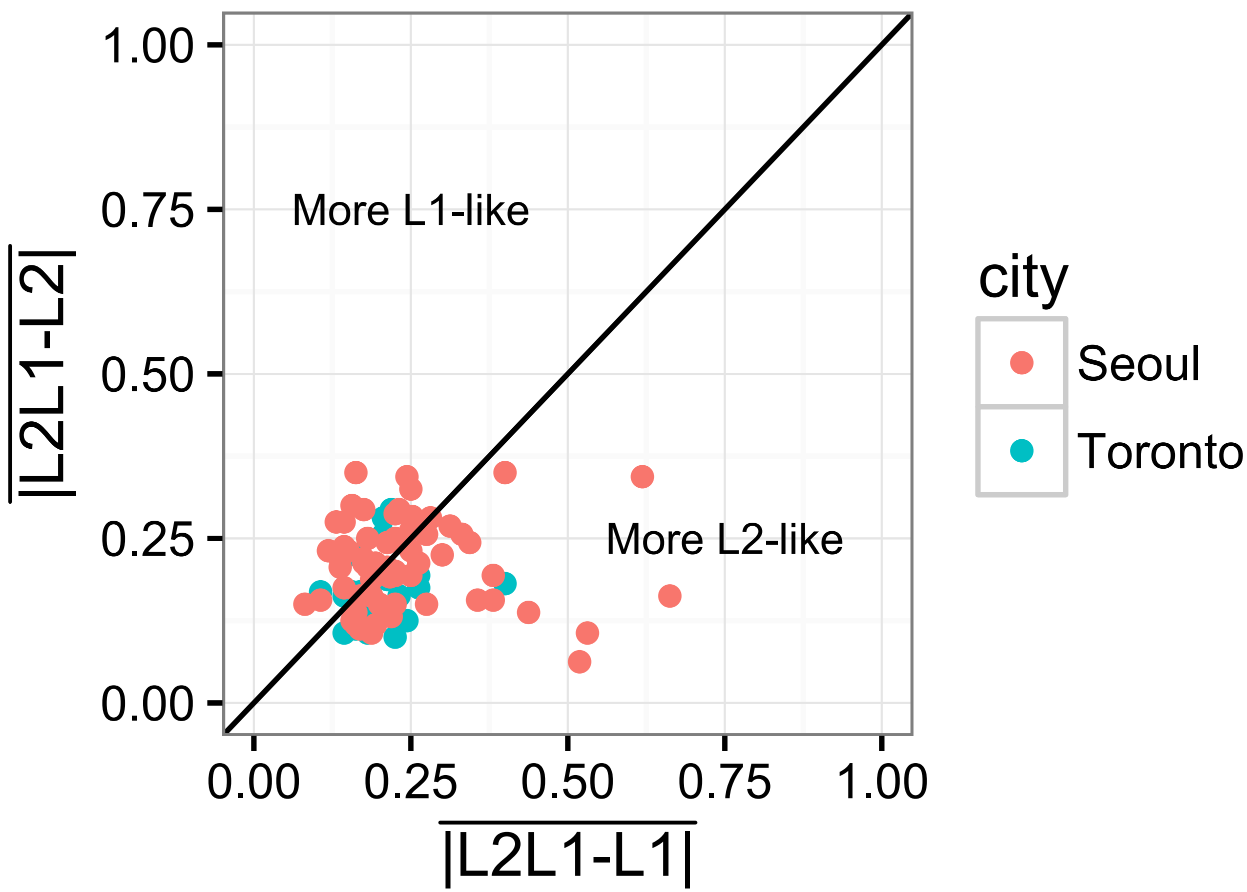


Comparing across experiments

Difference between cross-language perception and **L2** perception

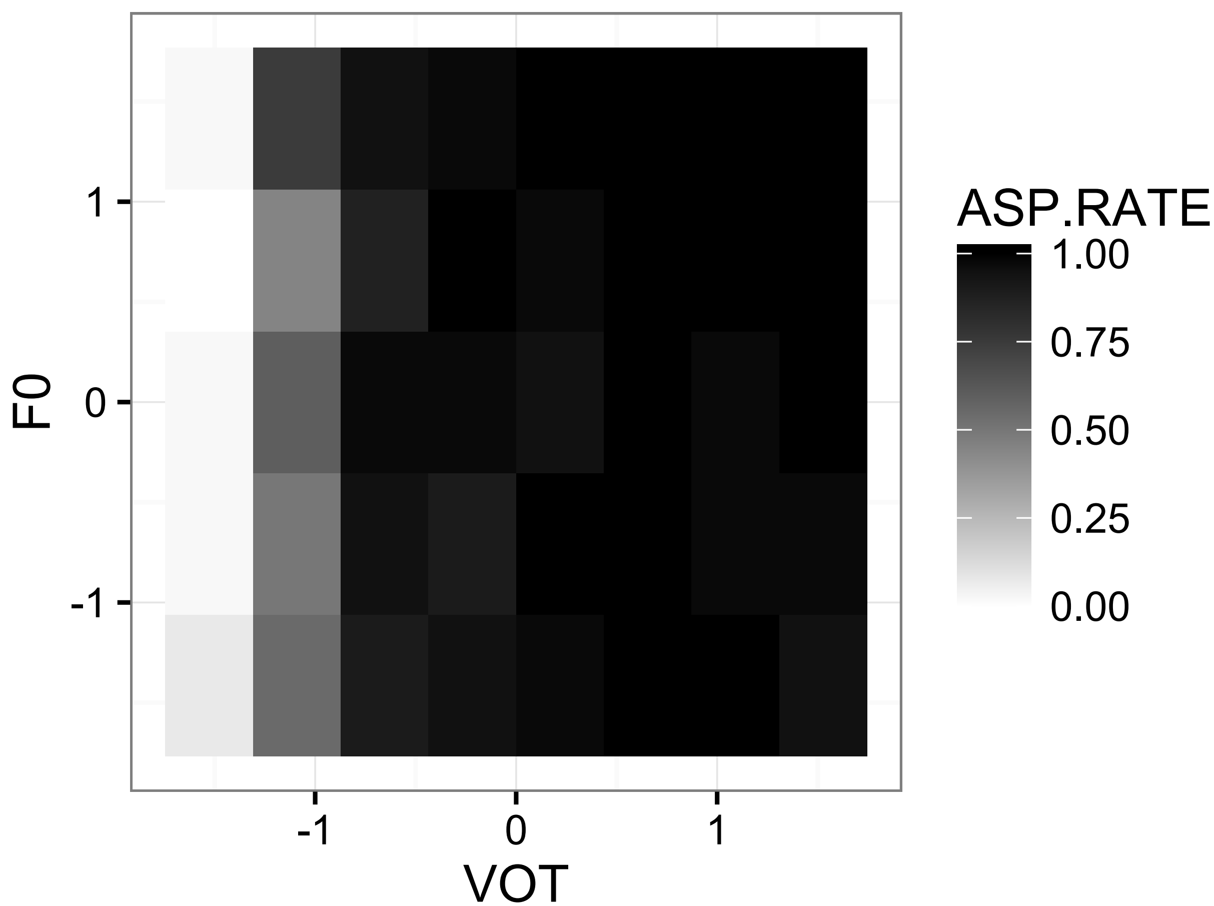


Difference between cross-language perception and **L1** perception

Summary

- For those listeners with asymmetries, responses in the cross-language mapping experiment were more similar to the L2 than the L1 experiment.
  - Paired t-test confirms $|L2L1\text{-}L1| > |L2L1\text{-}L2|$
    ($t = 2.1509$, $df = 86$, $p = 0.03429$).
- However, most listeners show very little difference across any of the experiments.
  - L2 perception (and L2L1 perception) is heavily influenced by L1 perception?

English control



L2 perception proficiency as predictor

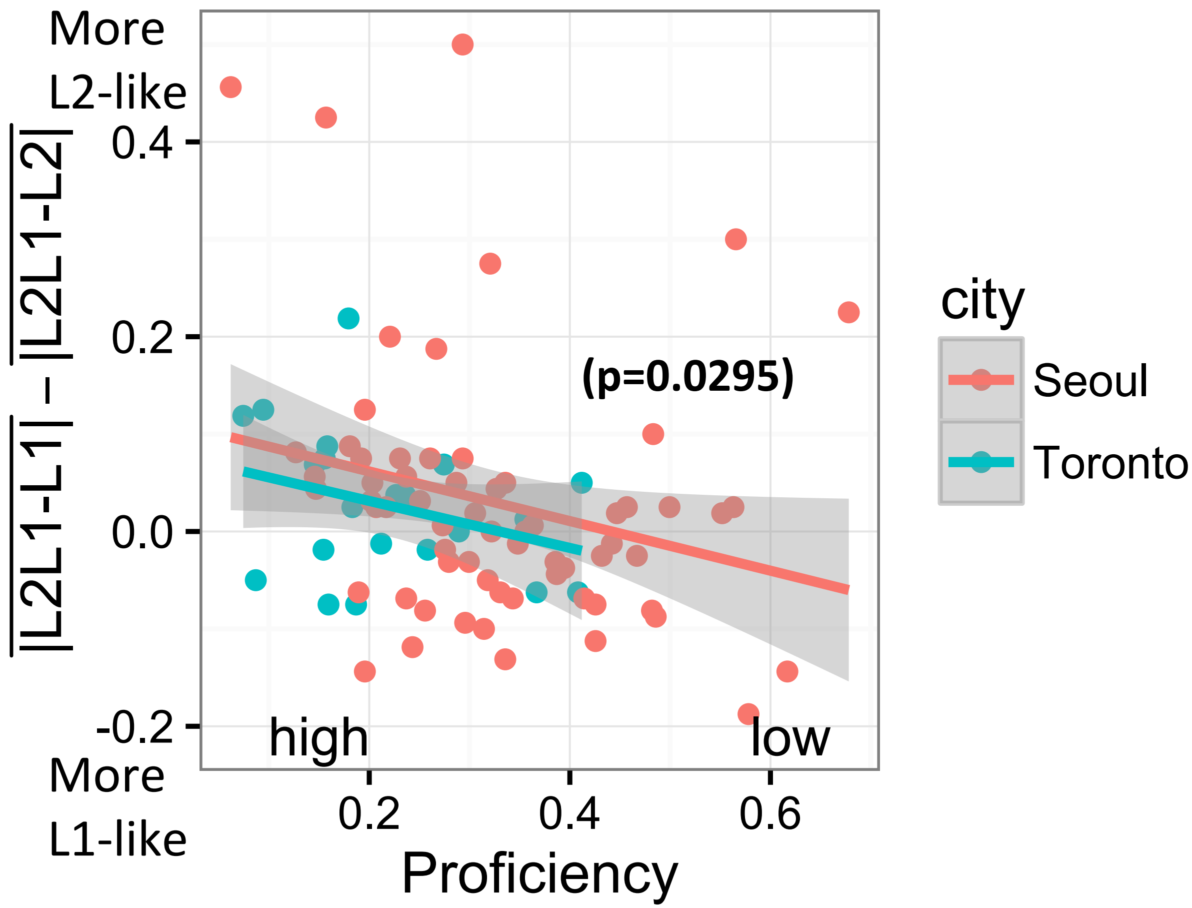
- For each listener, we also calculated the difference between ASP.RATE in the L2 experiment and the average ASP.RATE of the English control listeners. |*Control-L2*|

L2 perception proficiency as predictor

- We examined how well listeners' L2 perception proficiency predicts the degree of relative influence of L2 perception vs. L1 perception on L2L1 mapping (*|L2L1-L1| - |L2L1-L2|*)

L2 perception proficiency as predictor

Relative similarity of L2L1 to L2 vs. L1



Conclusion

- Our experiments controlled L1 and L2 stimuli for their acoustic properties to provide a stronger test of (in)congruence across mapping tasks.
- For most listeners, there is very little difference across the three perception tasks.
  - L1 perception heavily influences L2 and L2L1 perception.

Conclusion

- For those listeners for whom L1 and L2 perception diverges enough (high L2 proficiency), we can observe the L2 influence on L2L1 perception independent of L1 influence.
- This result is in line with recent studies that show that cross-language perception patterns can differ by the listeners' level of L2 exposure (Kwon in press, Nomura & Ishikawa 2016)

Conclusion

- The current study presents a potential perceptual solution to the duality problem.
  – The phonological structure of L2 can play a role even when the mechanism of loanword adaptation is perceptual.

Acknowledgements

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