Cross-language perceptual category mapping: Korean perception of English obstruents.

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[Work supported by the NIH and NSF]

Perception Acquisition

- L1 acquisition: acquirers build categories from scratch.

- L2 acquisition (e.g., Flege, 1987): Two related processes
  - Use preexisting L1 categories and modify or split them to suit L2
  - Build new categories from leftovers

Data & Problem

- Research:
  - To what extent and in what manner are L1 categories used in L2 perception?
- Relevant Data:
  - Compare a single group of acquirers' L1 and L2 responses to L2 stimuli.
- Problem
  - Many languages share orthographic response labels (e.g., English, French, Spanish, etc.), so L1 category effects could be happening at the level of orthography.

Different Orthographic Systems

- Korean vs. English
- Each phoneme can be represented as a single grapheme in each language, yet there is no visual similarity between two writing systems.

English	b	c	d	f	g	h	j	k	l	m	n	p	q	r	s	etc.

Korean	ㄱ	ㄴ	ㄷ	ㄹ	ㅁ	ㅂ	ㅅ	ㅇ	ㅈ	ㅊ	ㅋ	ㅌ	ㅍ	ㅎ

Approach

- Have Korean subjects label consonants in L2 syllable (as in de Jong, Silbert, & Park, 9 minutes ago).
- Use L1 (i.e., Korean) responses to predict errors in L2 (i.e., English) responses to L2 stimuli.

English & Korean Corpus

- Korean three-way contrast: lax, tense and aspirated.
- No non-sibilant fricatives

		KOREAN			ENGLISH		
			labial	coronal		labial	coronal
Stops		Lax	p	t	Unaspirated	b	d
		Tense	p’	t’			
		Aspirated	p^h	t^h	Aspirated	p	t
Fricatives	Non-sibilant				Voiced	v	ð
					Voiceless	f	θ
	Sibilant	Lax		s	Voiced		s
		Tense			Voiceless		z

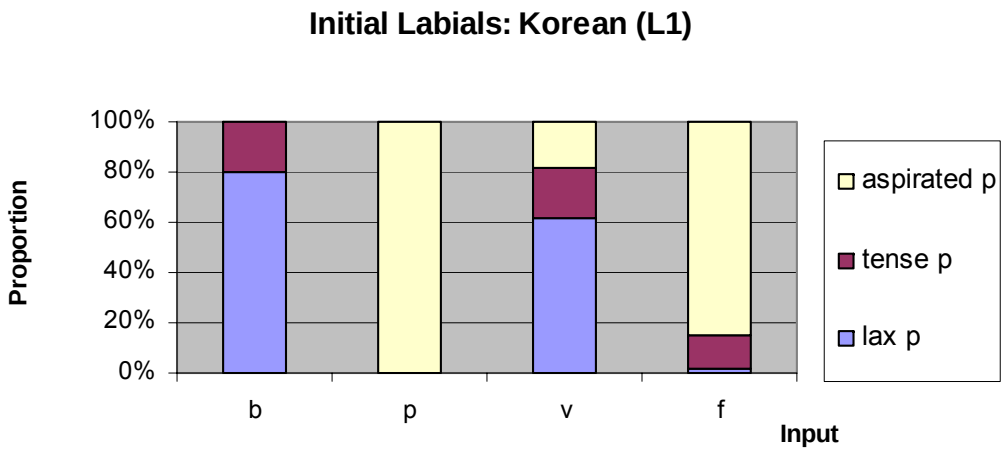
Methods: Subjects, Stimuli, Procedure

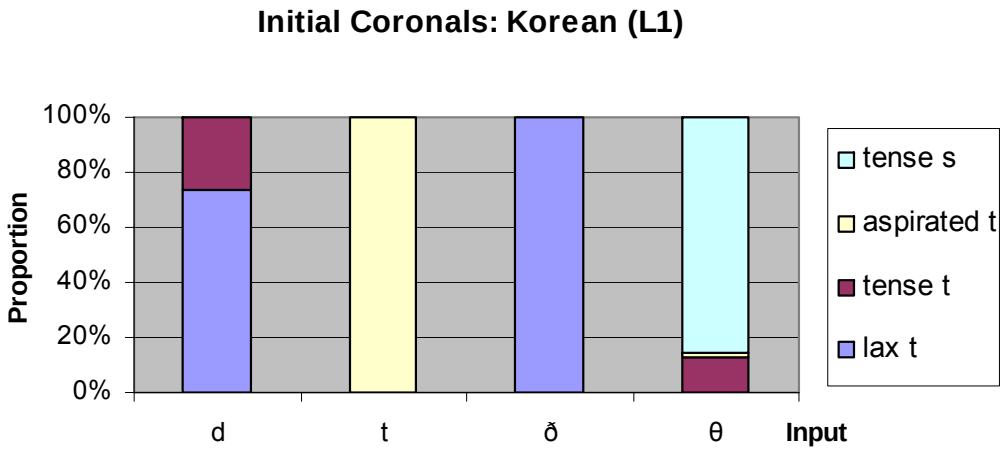
- Subjects: 20 Korean speakers (mean time in US: 5 mo)
- Stimuli:
  - 3 repetitions of voiced and voiceless labial and coronal stops and fricatives in onset and coda position in nonsense syllable (e.g., [ba], [ab], [pa], [ap], [va], …) produced by a male L1 English speaker (midwestern dialect): 2 * 3 * 2 * 2 * 2* 2 = 96.
- Procedure
  - Two different (Pseudo) closed set consonant identification tasks: one with English labels, one with Korean labels.
  - Administered after English responses in previous experiment

d t θ ð f v s z p b m h other _____

ㄷ ㅃ ㅍ ㄷ ㄸ ㅌ ㅅ ㅆ ㅈ ㅉ ㅊ ㅁ ㅎ other _____

Results (L1) & Observation (initial position)





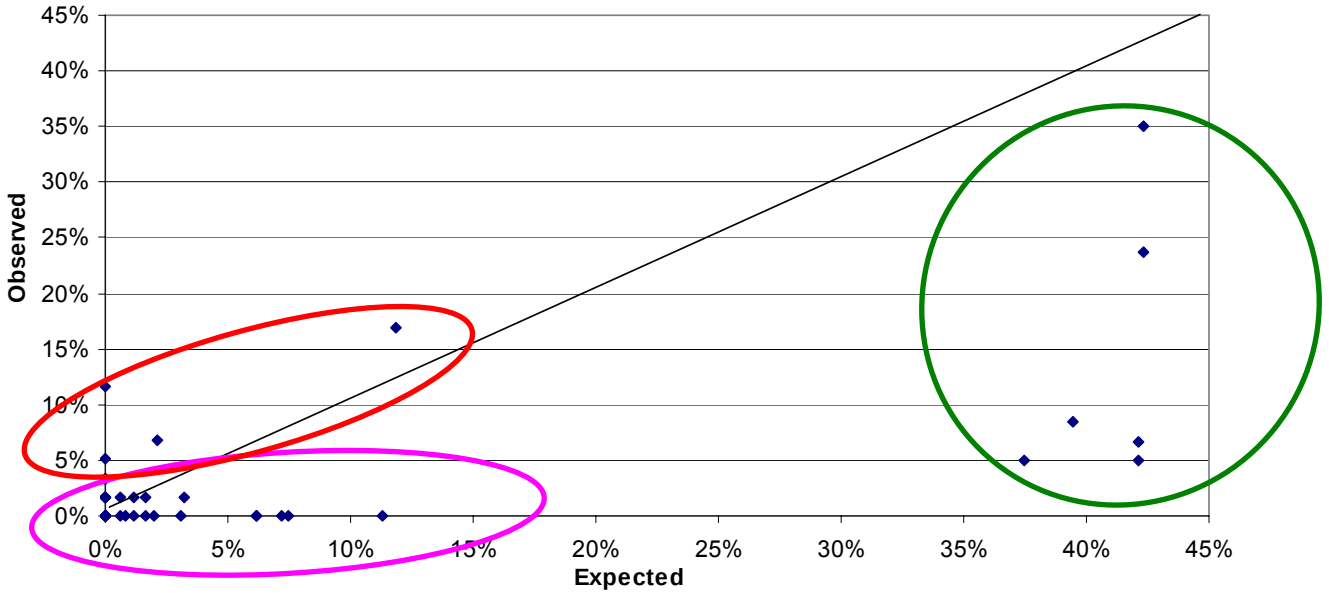
- Labials
  - /p/, /v/ & /f/ → aspirated /p/
  - /b/ & /v/ → lax /p/
  - /b/, /v/ & /f/ → tense /p/
- Coronals
  - Same as labials, except:
    - /ð/ is different from /v/. (/v/: aspirated & tense)
    - /θ/ is different from /t/. ('/t/&/θ/' vs. '/p/&/f/' pattern)
- Prediction
  - Use L1 labels to predict L2 labeling errors (e.g., /p/ & /f/ both labeled as L1 aspirated; confusions between /p/ and /f/ are predicted).

Prediction of specific errors

Probability of Error where category A → category B = $\sum$ Probability of category A → L1 category X X Probability of L1 category X being associated with category B

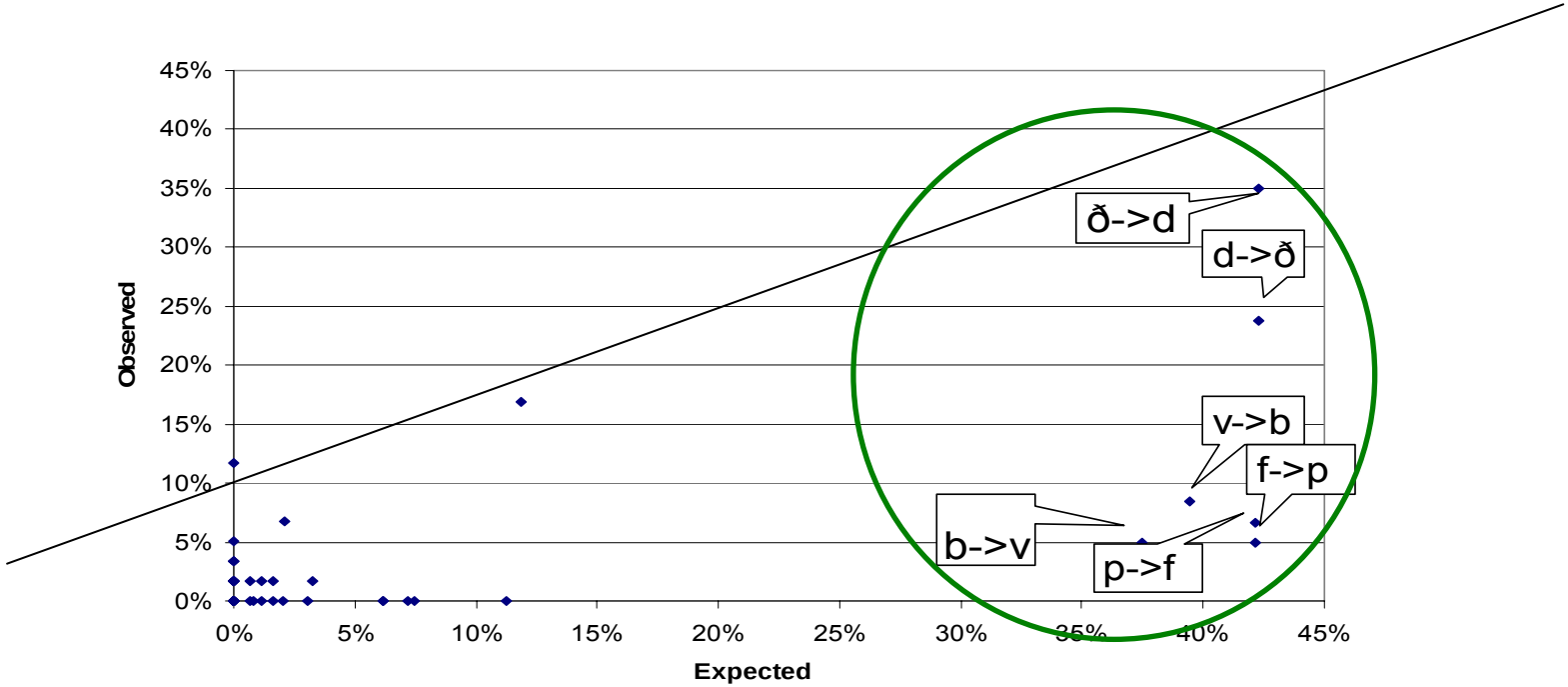
Input	L1 Labeling	Prediction for errors
L2 /t/: L1 /t/ (70%) L1 /t'/ (30%)	L1 /t/ : L2 /t/ (60%) L2 /ð/ (30%)	/t/ → /ð/: (0.7*0.3) + (0.3*0.7) = 0.42 expected error: 42%
L2 /ð/:L1 /t/ (90%) L1 /t'/ (10%)	L1 /t'/ : L2 /t/ (30%) L2 /ð/ (70%)	/ð/ → /t/: (0.9*0.6) + (0.1*0.3) = 0.57 expected error: 57%

Results: Observed Errors



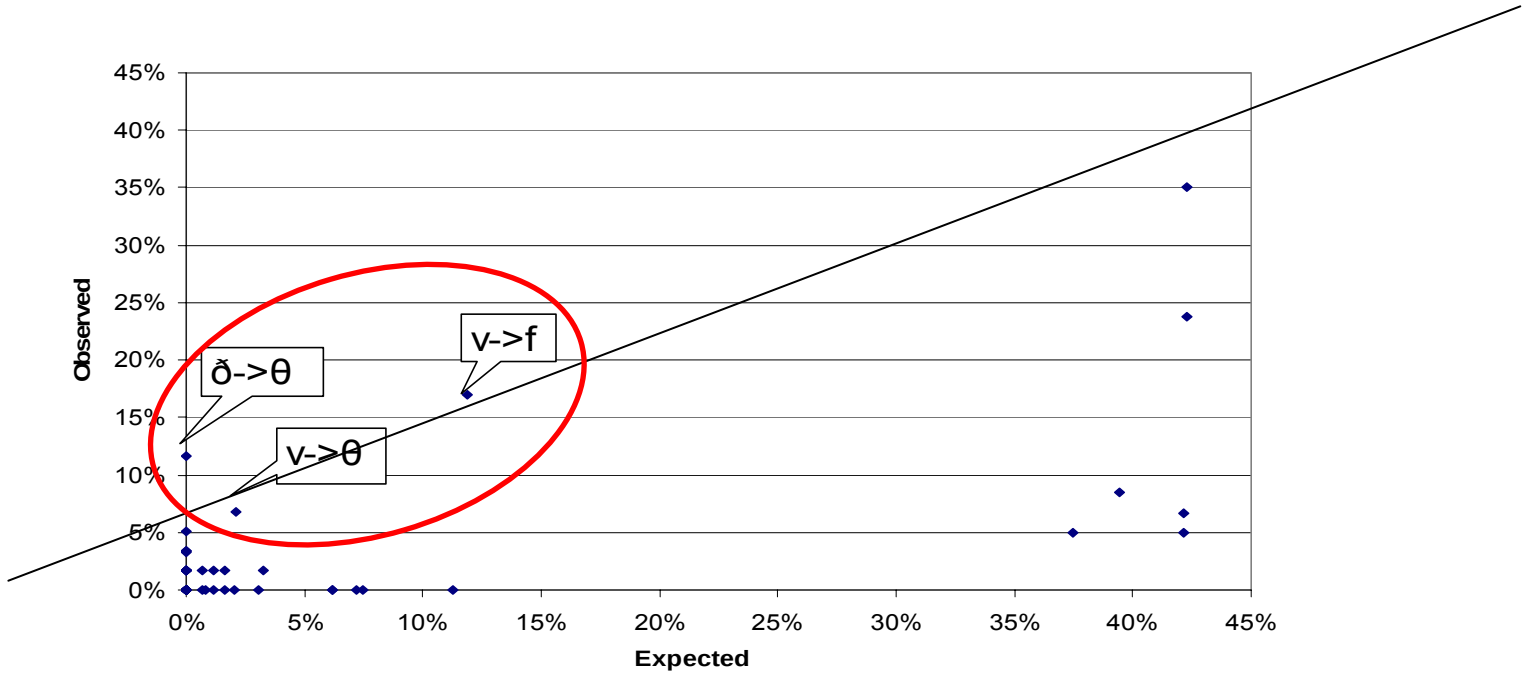
- General correlation of predicted and observed error.
- Three error clusters:
  - Cluster 1: Those with very few or no errors (purple).
  - Cluster 2: Higher error rate than expected (red).
  - Cluster 3: Lower error rate than expected, still fairly high (green).

Results: Observed Errors



- Cluster 3 (green)
  - All are manner of articulation errors (stop~fricative confusions).
  - The observed error rate was lower than the expected.
  - Subjects are building “new” categories for non-sibilant fricatives.

Results: Observed Errors



- Cluster 2 (red)
  - Some cases have higher error rates than predicted (i.e., subjects would do better if they relied on L1 categories.)
  - All cases are fricatives erroneously called voiceless.
  - Subjects' paired "new" categories are less effective than L1 categories on L2 stimuli.

Conclusions

- Most errors occur where two L2 sounds are labeled with the same L1 labels. Much of L2 category identification in these subjects relies on L1 categories.
- The cases of lower than expected error rate may indicate building of “new” categories for “new” phones.
- New categories may be less effective at categorizing L2 productions than original L1 categories. If so, this would result in a regression in performance.
- Cross-language perceptual category mapping can be simply and effectively investigated by using two different orthographic systems such as Korean and English.

References

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