



Cross-linguistic perception of Thai tones is shaped by the functional prominence of lexically-contrastive pitch in L1



Vance Schaefer and Isabelle Darcy
 Department of Second Language Studies
 Indiana University
 idarcy@indiana.edu, vkschae@indiana.edu

New Sounds 2013
 Montreal, Quebec, Canada
 Concordia University
 May 17-19, 2013

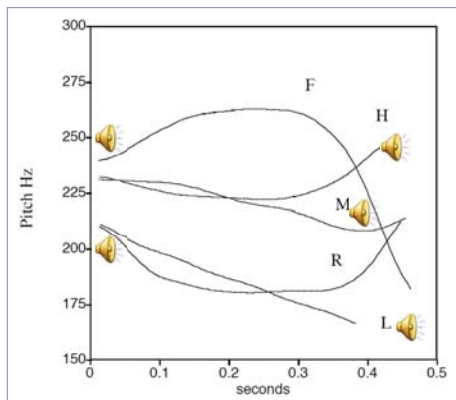
Tone

- ◆ **Tone** languages use variations of voice
 $t = \text{“pitch”}$, or “ F_0 ” to distinguish
 heighords.
- ◆ Patterns: **LEVEL** or **CONTOUR**

Thai tones

| | |
|--------------------------|-------------------|
| nâ: <i>face</i> | <i>falling</i> |
| nă: <i>thick</i> | <i>rising</i> |
| ná: <i>aunt</i> | <i>high level</i> |
| na: <i>rice field</i> | <i>mid level</i> |
| nà: <i>custard apple</i> | <i>low level</i> |

2 contour tones
3 level tones



Source: Contour shapes of Thai tones in citation form.
 Representative examples from one speaker.
 From Zsiga & Nitisaroj, 2007, p. 347

Tone perception by native speakers

- ◆ Native speakers perceive tones as linguistic
 ategories

C_v an Lancker & Fromkin, 1973; Wang, Jongman & Sereno, 2001

- ◆ Tonal information also constrains lexical

Lee, 2007

access

Tone perception by non-native speakers

- ◆ Speakers of a tonal language display high accuracy in non-native tone perception

Wang & Guion, 2004

- ◆ Speakers of non-tonal languages have less sensitivity to tonal contrasts than people with previous tonal experience

Chang & Best, 2004, for French listeners; Gandour & Harshman, 1978; Wang, Behne, Jongman & Sereno, 2004, among others

ศัพท์วิทยาของภาษาที่สอง

4 ๔

Do all non-tonal language speakers perform equally in non-native tone perception?

- ◆ There are differences AMONG non-tonal language speakers in non-native tone perception

e.g., L1 pitch accent speakers perform at comparable accuracy levels to L1 tone language speakers

- ◆ Languages differ in the extent and function to which they use F_0 variations:

some languages use pitch for intonation at the level of phrases while only some use pitch for distinctions at the word level

ศัพท์วิทยาของภาษาที่สอง

5 ๕

Lexically-contrastive pitch usage

- ◆ **Tone**
e.g., Mandarin Chinese, Thai, Vietnamese

- ◆ **Pitch accent languages**
High pitch on the accented mora, determining the pitch level (H or L) of preceding/following moras (+ more rules)
e.g., Japanese, Swedish

Lexical

- ◆ **Word stress languages**
Pitch variation as one correlate of lexically contrastive word stress
e.g., English, German, Spanish. e.g., **RE**cord vs **re**CORD

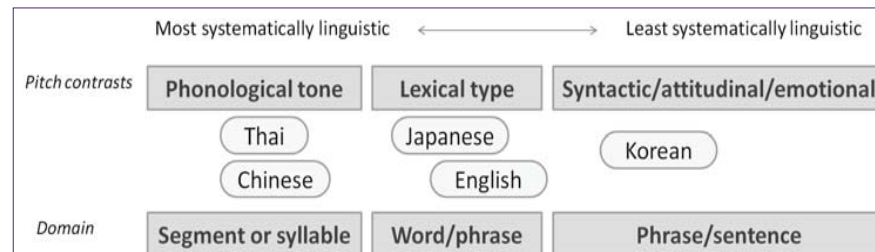
- ◆ **“Intonation - only” languages**
These languages do not use lexically-contrastive pitch, but like all languages we know of, they use intonation (phrase domain)
e.g., Korean, French

Non-lexical

ศัพท์วิทยาของภาษาที่สอง

6 ๖

Functional scale of pitch contrasts



Adapted from Van Lancker, 1980: 210

ศัพท์วิทยาของภาษาที่สอง

7 ๗

Pitch prominence typology and predictions for tone perception accuracy

| Language | Domain | Prominence |
|--------------------------|-------------------|--|
| Tone (Mandarin) | Lexical, syllable | Maximal |
| Pitch-accent (Japanese) | Lexical, word | High-intermediate (pitch is exclusive) |
| Word stress (English) | Lexical, word | Low-intermediate (pitch is non-exclusive) |
| Intonation-only (Korean) | Non lexical | Low |

ศัพท์วิทยาของภาษาที่สอง

8 ๘

Pitch prominence typology and predictions for tone perception accuracy

| Language | Domain | Predicted Sensitivity/ Accuracy in tone perception |
|--------------------------|-------------------|---|
| Tone (Mandarin) | Lexical, syllable | Maximal |
| Pitch-accent (Japanese) | Lexical, word | High-intermediate (pitch is exclusive) |
| Word stress (English) | Lexical, word | Low-intermediate (pitch is non-exclusive) |
| Intonation-only (Korean) | Non lexical | Low |

ศัพท์วิทยาของภาษาที่สอง

8 ๘

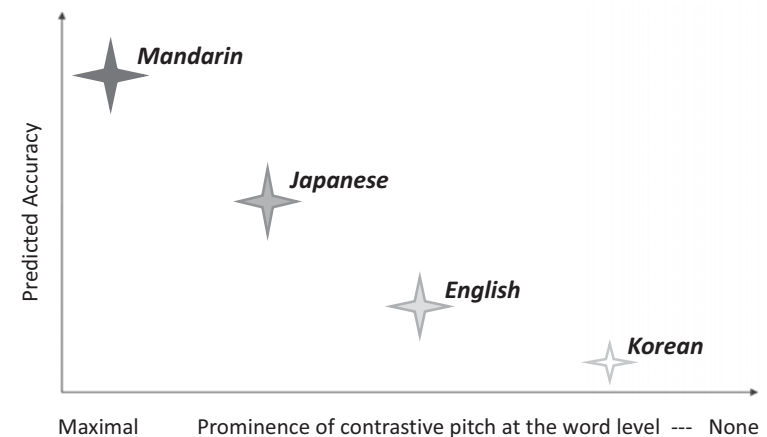
Pitch Prominence Hypothesis

- ◆ Similar predictions are found in previous studies
 - ◆ **Feature Hypothesis** McAllister, Flege, & Piske, 2002: L2 perception of Swedish vowel length contrasts by native speakers of Estonian, English, and Spanish
 - ◆ Linguistic relevance of a dimension in L1 shapes the brain response to L2 contrasts (with MMN data) Nenonen, Shestakova, Huotilainen, & Näätänen, 2003
- ◆ We predict accuracy of cross-language tone perception based on prominence of pitch in the L1

ศัพท์วิทยาของภาษาที่สอง

9 ๙

Prominence predicts accuracy



ศัพท์วิทยาของภาษาที่สอง

10 ๑๐



Participants

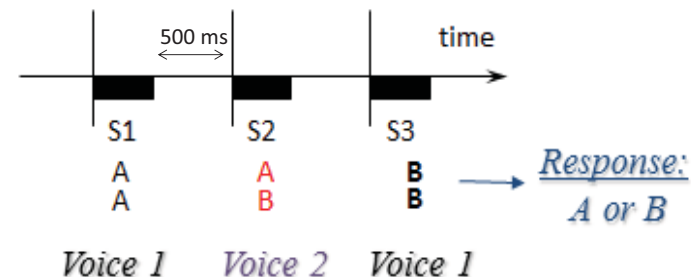
N = 2 Thai native speakers
 N = 10 Mandarin speakers
 N = 11 Japanese speakers
 N = 10 English speakers
 N = 10 Korean speakers

- Graduate students
- Generally involved in language studies/linguistics
- Students in the US

11



AXB categorization



Accuracy rates and reaction times

12



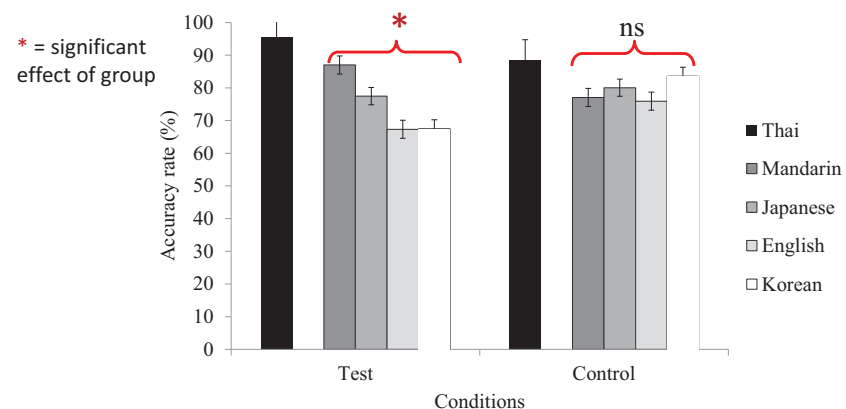
Experimental conditions

- Monosyllabic words & nonwords presented in triplets (48 „test“, 48 „control“)
- All test words were open syllables
- 3 test conditions:

| Test Conditions | | | Control Condition |
|------------------|---------------|-----------------------------|-------------------|
| Direction (n=12) | Height (n=12) | Mixed (n=24) | Control (n=48) |
| rising-falling | low-mid | low-rising low-falling | consonant |
| rising-falling | low-high | mid-rising mid-falling | |
| rising-falling | mid-high | high-rising high-falling | |

13

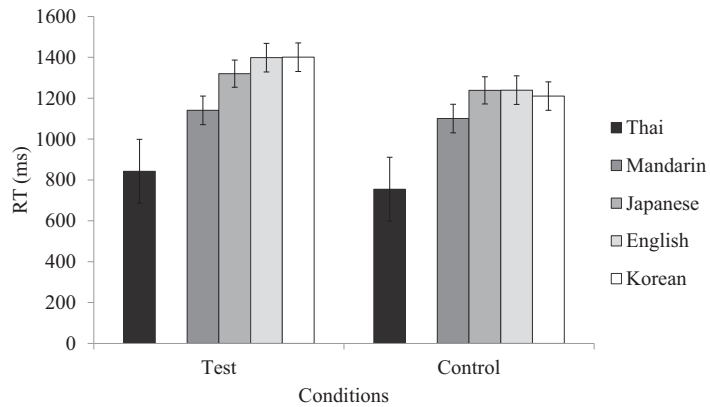
Accuracy rates in each group



- ◆ Significant interaction between “group” and “condition”: $F(3, 37) = 11.3, p < .001$
- ◆ Effect of group is significant for **test condition only**: $F(3, 67.3) = 11.3, p < .001$
- ◆ Predicted hierarchy of accuracy: Mandarin (M = 87% correct), Japanese (M = 77% correct), English and Korean (M = 67 % correct for both).

14

Reaction times in each group



◆ Interaction was not significant: $F(3, 37) = 2.4, p = .08$

15 ๑๕

Conclusions

☑ Influence of the L1 phonological system

The functional prominence of lexically-contrastive pitch in L1 shapes cross-linguistic perception of Thai tones

◆ Globally, our findings confirm previous results obtained across studies and add strength by allowing a direct comparison with the same

methodology

16 ๑๖

Discussion: Overall performance

◆ Equal accuracy between English and Korean in tone discrimination was not predicted. Why?

◆ Are English “less accurate than expected”?

- F_0 is rarely used *alone* to distinguish words in English, perhaps creating the same performance as if F_0 was not used at all to signal lexical contrast (English = Korean)
 - Stress constrains lexical access only to a limited extent in English (Cooper, Cutler & Wales, 2002)
 - In contrast, when F_0 can be used *alone* to distinguish words, as in Japanese, performance is higher

◆ Are Koreans “more accurate than expected”?

- Influence of L2 English on Koreans?
- Exposure to a pitch-accent Kyungsang dialect?

17 ๑๗

경상도언

경상도언

Individual Korean Dialectal Differences

경상도 언

Kyungsang Korean



◆ Dialectal boundaries
Lee & Ramsey, 2000

Kyungsang = Gyeongsang
Cholla = Jeolla

경상도 언

Lexical pitch in Korean

- ◆ Kyungsang listeners show categorical perception of pitch accent patterns
Kim & de Jong, 2007; Kim, 2011
- ◆ Limited advantage in the naïve perception of Japanese pitch accent
Sukegawa, Choi, Maekawa & Sato, 1995
- ◆ Emergence of lexical pitch in standard Korean among younger speakers
Silva, 2006

경상도 언

Pitch accent in Korean Kyungsang dialect

Minimal pairs of 3 lexical accent patterns

- a. **[moi]**: HL vs. LH ‘feed’, ‘conspiracy’
- b. **[more]**: HL vs. HH ‘sand’, ‘the day after tomorrow’
- c. **[yanmo]**: LH vs. HH ‘wool’, ‘adoptive mother’

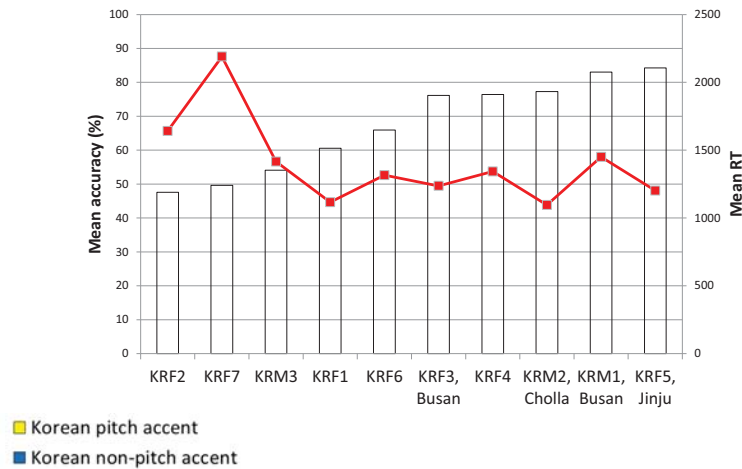
From Kim, 2011; Kim & de Jong, 2007

경상도 언

Predictions

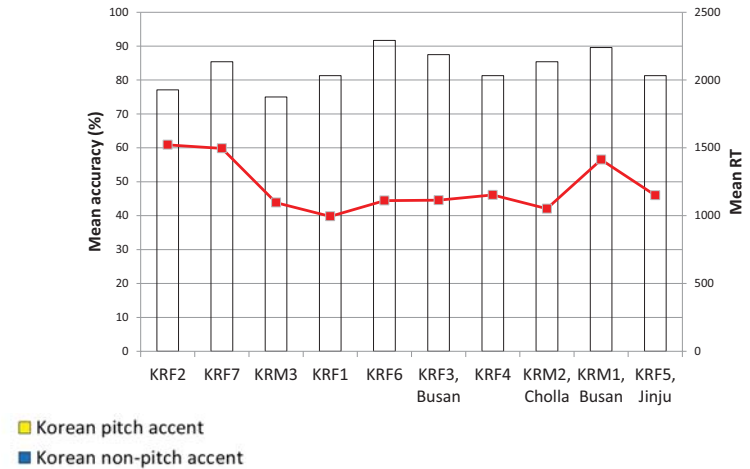
- ◆ If the L1 phonological system determines accuracy, Kyungsang Korean dialect speakers should outperform non-Kyungsang speakers
- ◆ We examine individual performance for the Korean group

Korean performance on combined test items



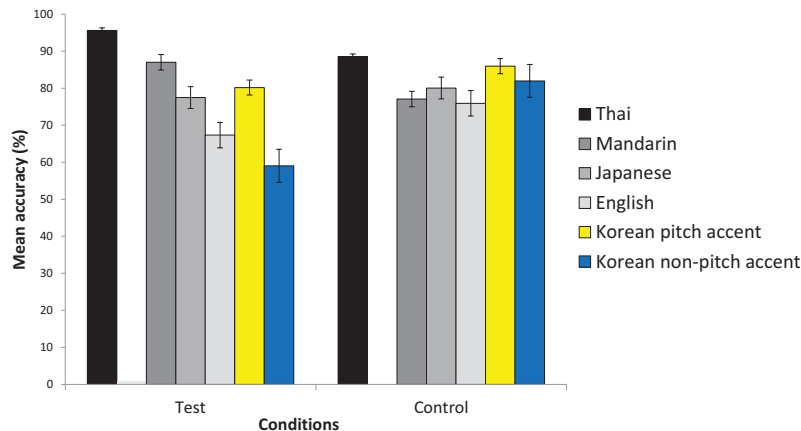
22 ๒๒

Korean performance on control items



23 ๒๓

Accuracy rates for each Korean subgroup



- We conclude that the Korean group most likely performed "More accurately than expected" because of the dialect differences within that group

24 ๒๔

Take home message

- ☑ Influence of the L1 phonological system - in a narrow sense, i.e. L1 dialect
- ◆ The functional prominence of lexically-contrastive pitch in L1 shapes cross-linguistic perception
- ◆ Further support for the Feature Hypothesis (McAllister et al., 2002): Accuracy of perception of non-native phonological dimensions is shaped by the prominence of that dimension in the L1 phonological system
- ◆ For pitch: Exclusivity and domain size matter to determine prominence

25 ๒๕

Acknowledgements

Kathleen Bardovi-Harlig
 Laurent Dekydtspotter
 Ken De Jong
 Stephanie Dickinson
 Mariko Kondo
 Keiko Kuriyama
 Philip LeSourd
 Charles Lin
 Öner Özçelik
 Rex Sprouse
 David Stringer
 Second Language Psycholinguistics
 Lab members
 SLRF audience
 LabPhon audience
 SLS seminar classmates



References

- Burnham, D., Francis, E., Webster, D., Luksaneeyanawin, S., Attapaiboon, C., Lacerda, F., & Keller, P. (1996). Perception of lexical tone across languages: Evidence for a linguistic mode of processing. In H. T. Bunnell & W. Idsardi (Eds.), *Proceedings of the Fourth International Conference on Spoken Language Processing* (Vol. 1, pp. 2514–2517). Wilmington, DE: Applied Science and Engineering Laboratories.
- Cooper, N., Cutler, A., & Wales, R. (2002). Constraints of lexical stress on lexical access in English: Evidence from native and non-native listeners. *Language and Speech, 45*(3), 207-228.
- Gandour, J., & Harshman, R. (1978). Crosslanguage differences in tone perception: a multidimensional scaling investigation. *Language and Speech, 21*, 1–33.
- Hallé, P. A., Chang, Y.-C. & Best, C.T. (2004). Identification and discrimination of Mandarin Chinese tones by Mandarin Chinese vs French listeners. *Journal of Phonetics, 32*, 395-421.
- Kim, J.-S. (2011). Perception of Lexical Pitch Accent by Kyungsang and Cholla Korean Listeners. In W.-S. Lee, & E. Zee (Eds.), *Proceedings of the 17th International Congress of Phonetic Sciences 2011 [ICPhS XVII]* (pp. 1070-1073). Hong Kong: Department of Chinese, Translation and Linguistics, City University of Hong Kong.

26

References

- Kim, J.-S., & de Jong, K.J. (2007). Perception and Production in the Pitch Accent System of Korean. In J. Trouvain and W. J. Barry (Eds.), *Proceedings of the 16th International Congress of Phonetic Sciences 2007 [ICPhS XVI]* (pp. 1273 – 1277). Dudweiler: Pirrot.
- Lee, I., & Ramsey, S. R. (2000). *The Korean Language*. Albany, New York: State University of New York Press.
- Lee, C.-Y. (2007). Does Horse Activate Mother? Processing Lexical Tone in Form Priming. *Language and Speech, 50*(1), 101-123.
- McAllister, R., Flege, J. E., & Piske, T. (2002). The influence of L1 on the acquisition of Swedish quantity by native speakers of Spanish, English and Estonian. *Journal of Phonetics, 30*, 229-258.
- Nenonen, S., Shestakova, A., Huotilainen, M., & Naatanen, R. (2003). Linguistic relevance of duration within the native language determines the accuracy of speech-sound duration processing. *Cognitive Brain Research, 16*(3), 492-495.
- Silva, D. J. (2006). Acoustic evidence for the emergence of tonal contrast in contemporary Korean. *Phonology, 23*, 287-308.
- So, C. K. (2006). Perception of non-native tonal contrasts: Effects of native phonological and phonetic influences. In P. Warren, & C. I. Watson (Eds.), *Proceedings of the 11th Australian International Conference on Speech Science & Technology*. Auckland, New Zealand: University of Auckland.

27

References

- Sukegawa, Y., Choi, H., Maekawa, K., & Sato, S. (1995). Perception of pitch accent by Korean learners of Japanese and its implications. *Denshi Joho Tsushin Gakkai gijyutsu kenkyu hokoku: shingaku giho, 95*(41)/19950518, 61-66.
- Van Lancker, D. (1980). Cerebral lateralization of pitch cues in the linguistic signal. *Papers in Linguistics: International Journal of Human Communication, 13*, 201–277.
- Van Lancker, D., & Fromkin, V. A. (1973). Hemispheric specialization for pitch and “tone”: Evidence from Thai. *Journal of Phonetics, 1*, 101–109.
- Wang, Y., Behne, D. M., Jongman, A. & Sereno, J. A. (2004). The role of linguistic experience in the hemispheric processing of lexical tone. *Applied Linguistics, 25*, 449-466.
- Wang, Y., Jongman, A., & Sereno, J. A. (2001). Dichotic perception of Mandarin tones by Chinese and American listeners. *Brain and Language, 78*, 332–348.
- Wayland, R. P., & Guion, S. G. (2004). Training English and Chinese listeners to perceive Thai tones: A preliminary report. *Language Learning, 54*, 681-712.
- Zsiga, E., & Nitisaroj, R. (2007). Tone features, tone perception, and peak alignment in Thai. *Language and Speech, 50* (3), 343-383.

28