



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



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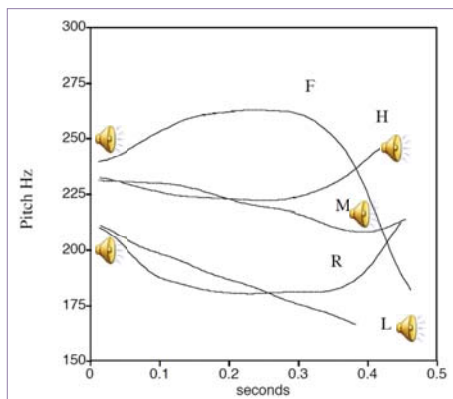
Tone

- ◆ **Tone** languages use variations of voice height = “pitch”, or “ F_0 ” to distinguish words.
- ◆ 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 categories
 Van Lancker & Fromkin, 1973; Wang, Jongman & Sereno, 2001
- ◆ Tonal information also constrains lexical access Lee, 2007

Tone perception by non-native speakers

- ◆ Speakers of a tonal language display high accuracy in non-native tone perception
Wayland & Guion, 2004
- ◆ Speakers of non-tonal languages have less sensitivity to tonal contrasts than people with previous tonal experience

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

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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
Burnham et al., 1996; So, 2006
- ◆ Languages differ in the extent and function to which they use F_0 variations:
 - All languages use pitch for intonation at the level of phrases while only some use pitch for distinctions at the word level

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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
e.g., A-me 'rain' (HL) vs a-ME 'candy' (LH)
- ◆ **Word-stress languages**
Pitch variation as one correlate of lexically-contrastive word stress
e.g., English, German, Spanish. e.g., REcord vs reCORD
- ◆ **"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

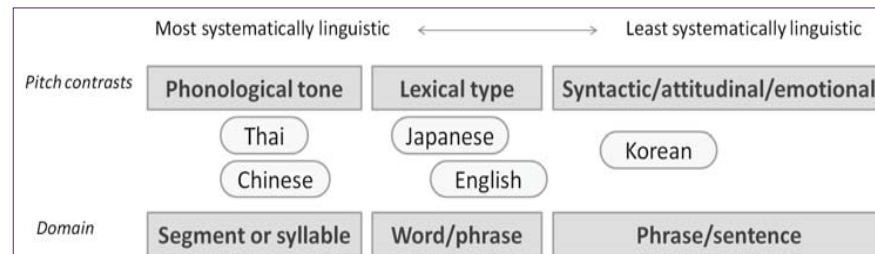
Lexical

Non-lexical

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Functional scale of pitch contrasts



Adapted from Van Lancker, 1980: 210

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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

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Pitch prominence typology and predictions for tone perception accuracy

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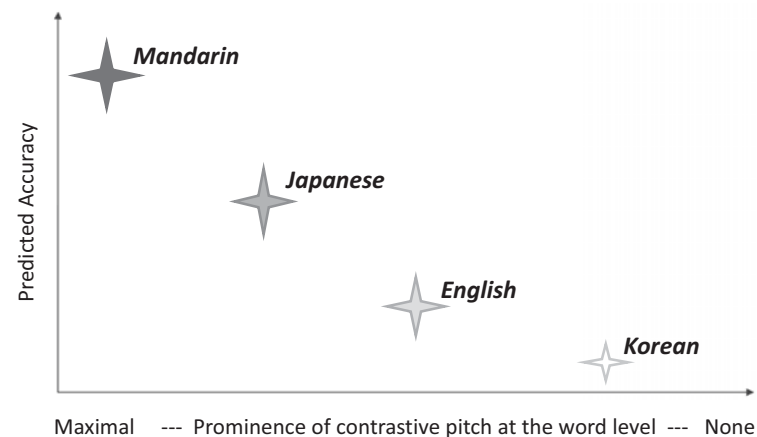
Pitch Prominence Hypothesis

- ◆ 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

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Prominence predicts accuracy



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Participants

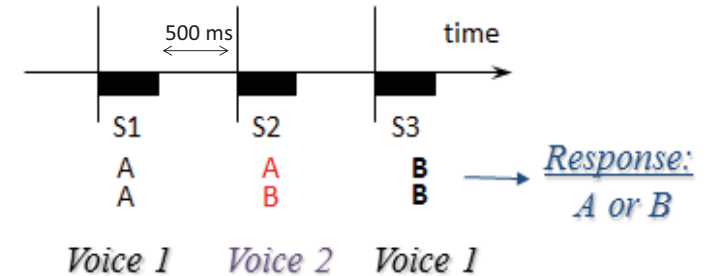
N = 2 Thai native speakers
 N = 10 Mandarin speakers
 N = 11 Japanese speakers
 N = 10 English speakers
 N = 10 Korean speakers

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

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AXB categorization



Accuracy rates and reaction times

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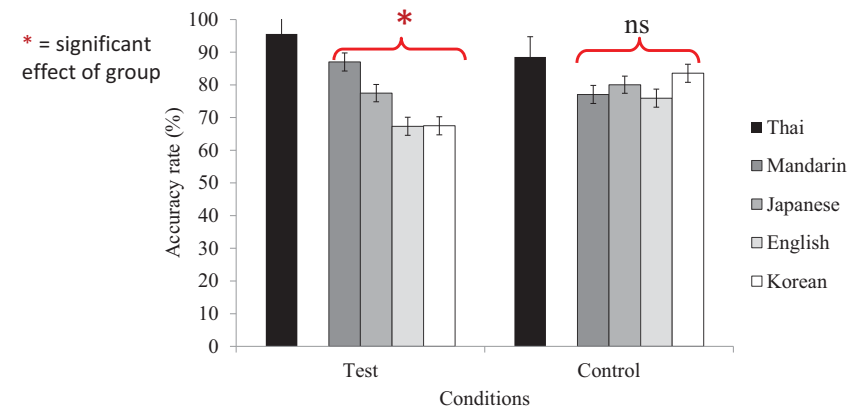
Experimental conditions

- 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	

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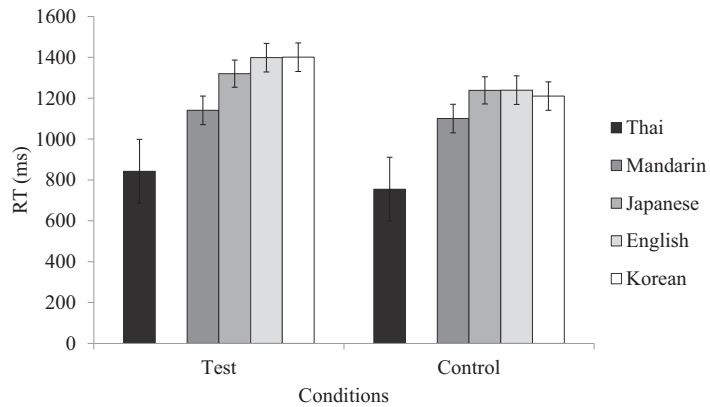
Accuracy rates in each group



- ◆ 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).

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Reaction times in each group



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

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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

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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?

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경상도 방언

경상도 방언

Individual Korean Dialectal Differences

경상도 방언

경상도 방언

Kyungsang Korean



◆ Dialectal boundaries
Lee & Ramsey, 2000

Kyungsang = Gyeongsang
Cholla = Jeolla

Lexical pitch in Korean

경상도 방언

경상도 방언

- ◆ 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

Pitch accent in Korean Kyungsang dialect

경상도 방언

경상도 방언

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

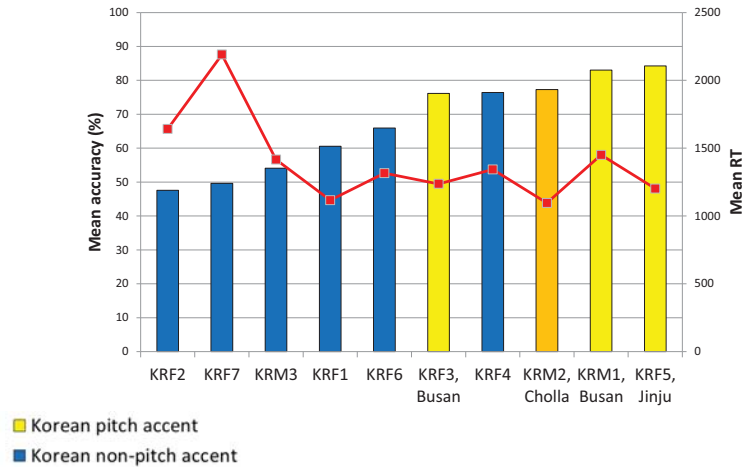
Predictions

경상도 방언

경상도 방언

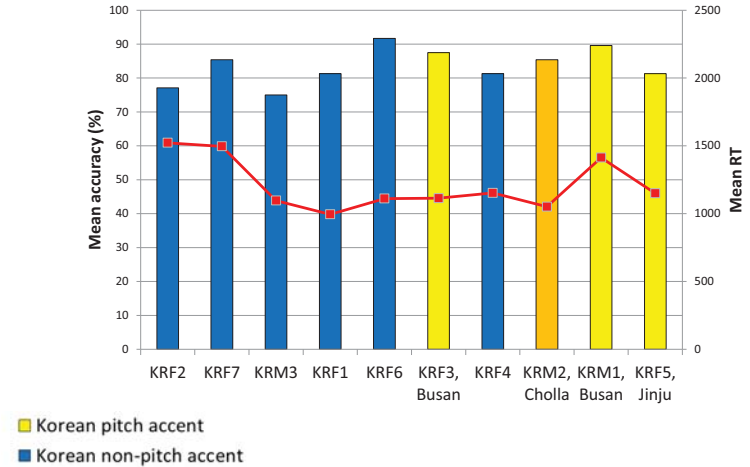
- ◆ If the L1 phonological system determines accuracy, Kyungsang Korean dialect speakers should outperform non-Kyungsang speakers
- ◆ We examine individual performance for the Korean group

Korean performance on combined test items



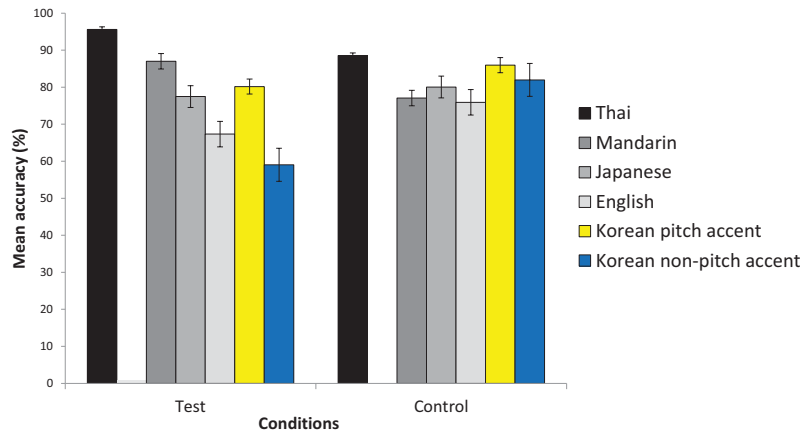
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Korean performance on control items



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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

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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

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 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.

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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.

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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.

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