Direction
Mandarin
Height
Feature
Vietnamese
Japanesethai
Prominence
Pitch accent
Stress
Second language
Korean
English
Phonology
Tone
Perception

Cross-linguistic perception of Thai tones

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Objective & Contribution of the study

Objective

- To test whether using pitch to distinguish words in your L1 will help you perceive tonal or pitch contrasts in an unknown language. In our case, we'll look at the cross-linguistic perception of Thai tones by naïve listeners (= non-learners).

Contribution

- We use one methodology on a range of languages which use pitch in a different way.

Phonological systems

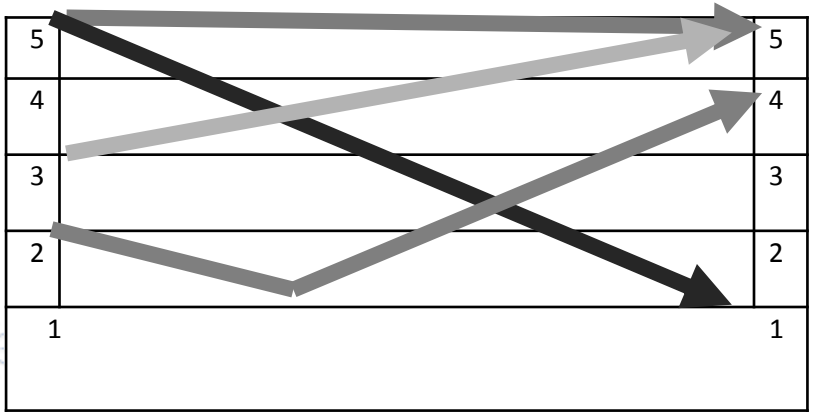
- **Segmental inventories**
  - Spanish: i, u, e, o, a
  - French: i, ɯ, e, o, a, y, ə, ɛ, œ, ø, ɔ, ɑ, ɑ̃, ɔ̃, ɛ̃, œ̃
- **Syllabic structure**
  - Japanese : V, CV, CVN
  - English: V, CV, CCV, CCVC, CVCC, CCVCC, CCCVCC
- **Phonological processes**
  - German: final devoicing
  - French: voicing assimilation in obstruent clusters
- **Suprasegmentals**
  - Chinese, Thai: Tone
  - English, German: Word Stress
  - Swedish, Japanese: Duration, Pitch accent

Definition of tone

- **Tone** languages use variations of voice height = “pitch” to distinguish words.
- Patterns : **LEVEL** or **CONTOUR**

  e.g., Mandarin Chinese

1 mā	*mother*	**high level**
2 má	*hemp*	**rising**
3 mǎ	*horse*	**low falling**
		rising/dipping
4 mà	*to scold*	**high falling**



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)

Are all non-tonal language speakers "created equal" for tone perception?

- It is possible that 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 f0 variations:
  - while all languages use pitch for intonation at the level of phrases, only some use pitch for distinctions at the word level

第二言語音韻

Not all languages use tone, but all languages use pitch patterns

Lexical

- **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**

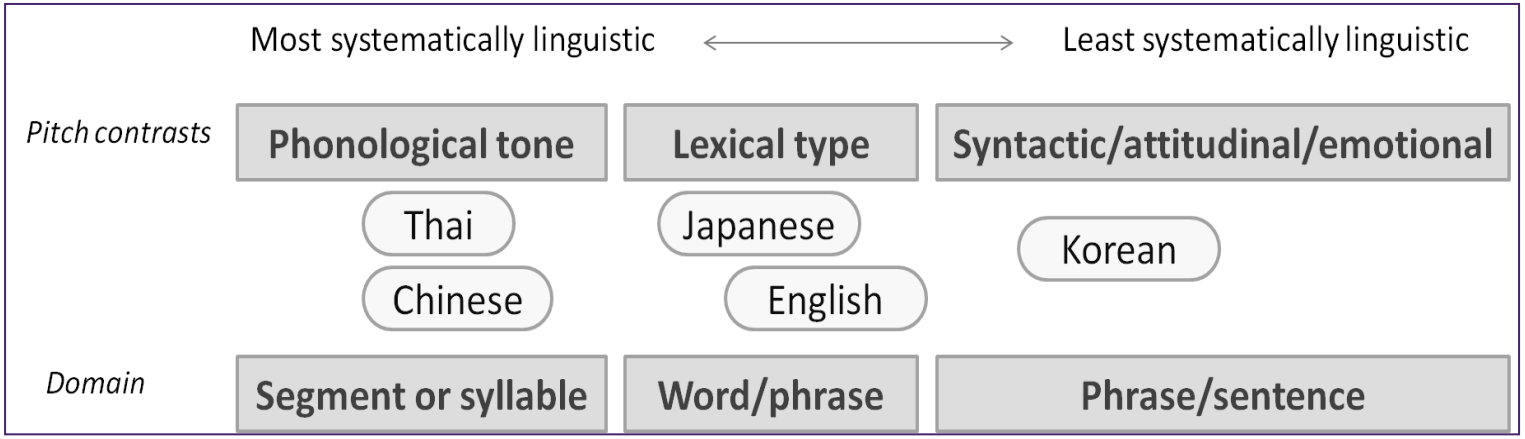
  Pitch variation as one correlate of lexically-contrastive word stress;
  - e.g., English, German, Spanish **e.g., REcord vs reCORD**

Non lexical

- **"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

Functional scale of pitch contrasts



(Adapted from Van Lancker, 1980: 210)

Question 1:

Does pitch prominence shape tone perception?

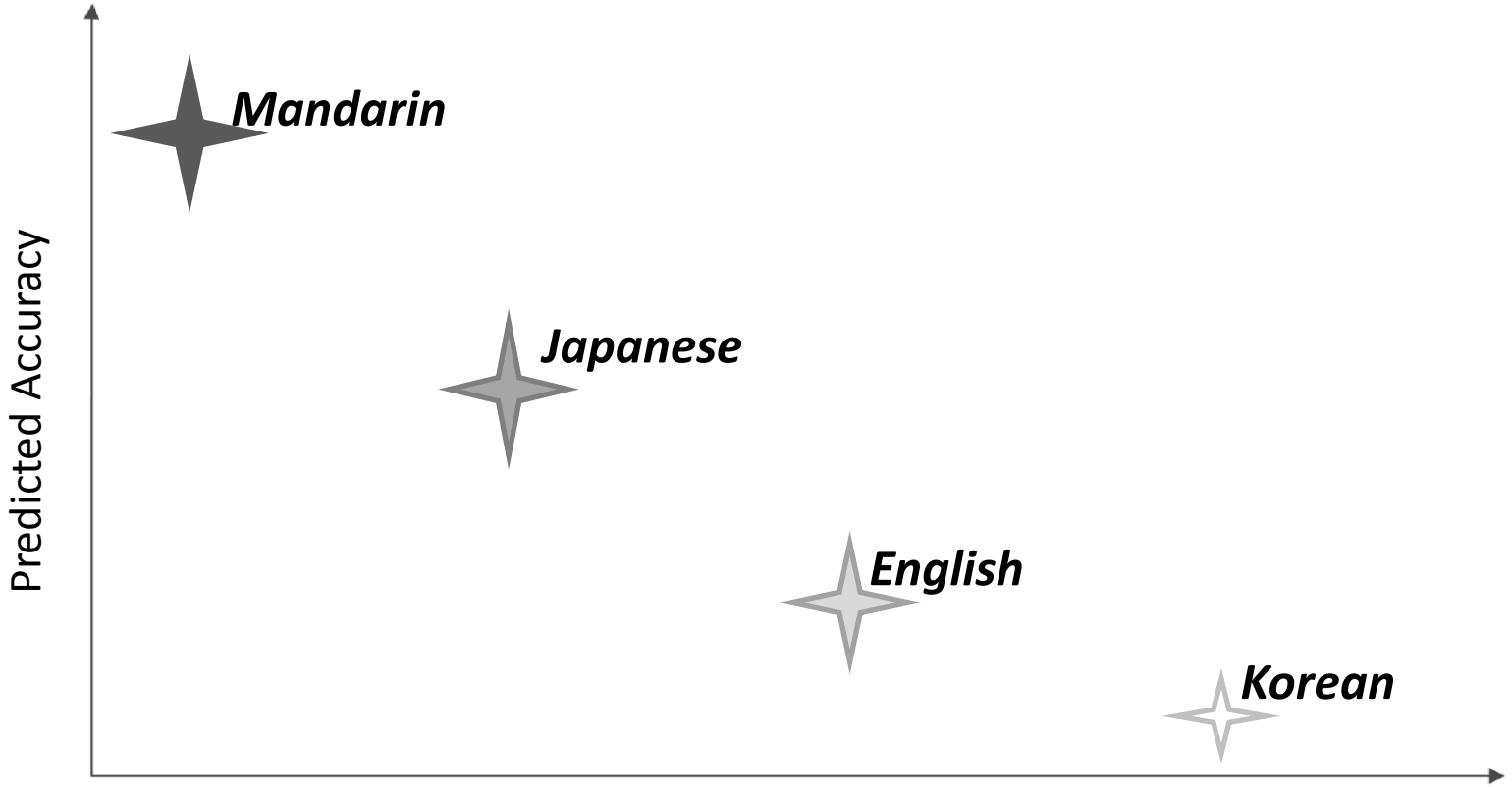
- **Prominence** based on the function of linguistic pitch to signal lexical contrast
- See *Feature Hypothesis* (McAllister, Flege, & Piske, 2002)
  - **Degree of Prominence** of vowel duration differences in L1 predicts acquisition of vowel duration in L2 Swedish. The extent to which a language uses vowel duration differences predicted acquisition.

- We predict accuracy of cross-language speech perception for tones based on prominence of pitch in the L1

Predictions: the role of prominence

Pitch pattern	Prosodic Domain	Sensitivity/Accuracy in tone perception
Tone (Mandarin)	Syllable	Maximal
Pitch Accent (Japanese)	Word	High-Intermediate (pitch is exclusive)
Word Stress (English)	Word/Foot	Low-intermediate (pitch is non-exclusive)
Intonation (Korean)	Intonational phrase, PPh	Low

Prominence predicts accuracy



Question 2:

Do specific tonal comparisons matter?

- The exact type of tonal contrasts examined can influence performance
  - English speakers process dynamic (contour) f0 variations more accurately than static f0 differences in disyllabic stimuli (Repp & Lin, 1990; Wood, 1974, Lee and Nusbaum, 1993)
  - Dutch listeners attend to f0 information when these correspond to contours having linguistic meaning in Dutch (disyllabic stimuli, question intonation) (Braun & Johnson, 2011)
- Is performance in non-native tone perception affected by specific tonal shapes?

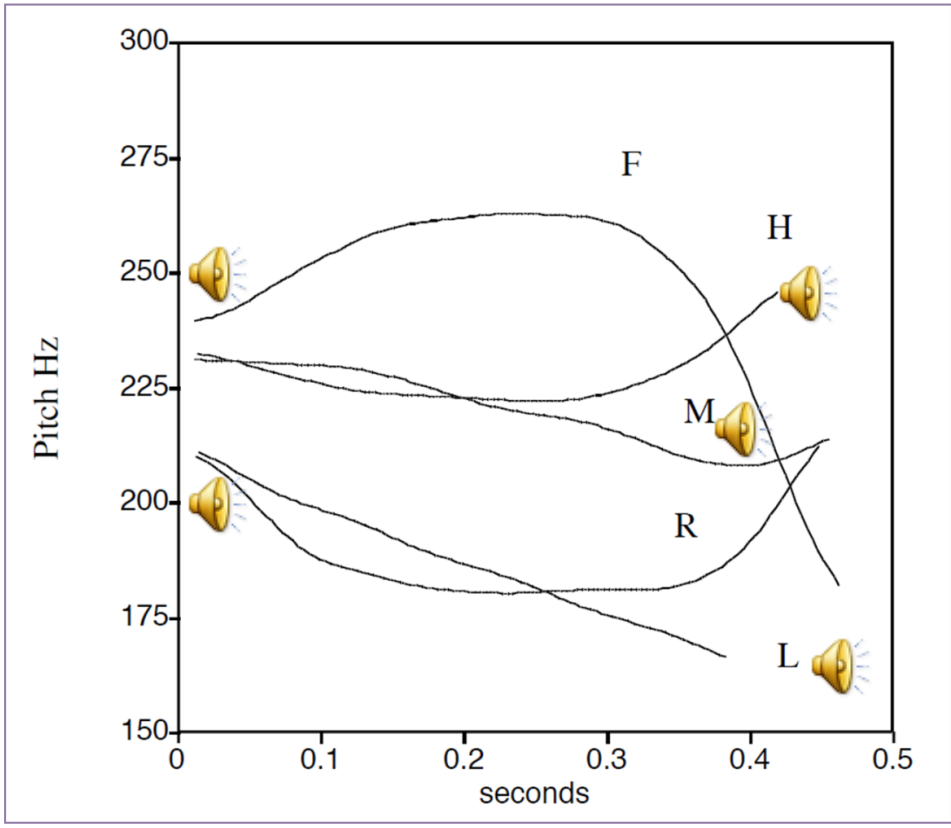
Method

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

Thai tones

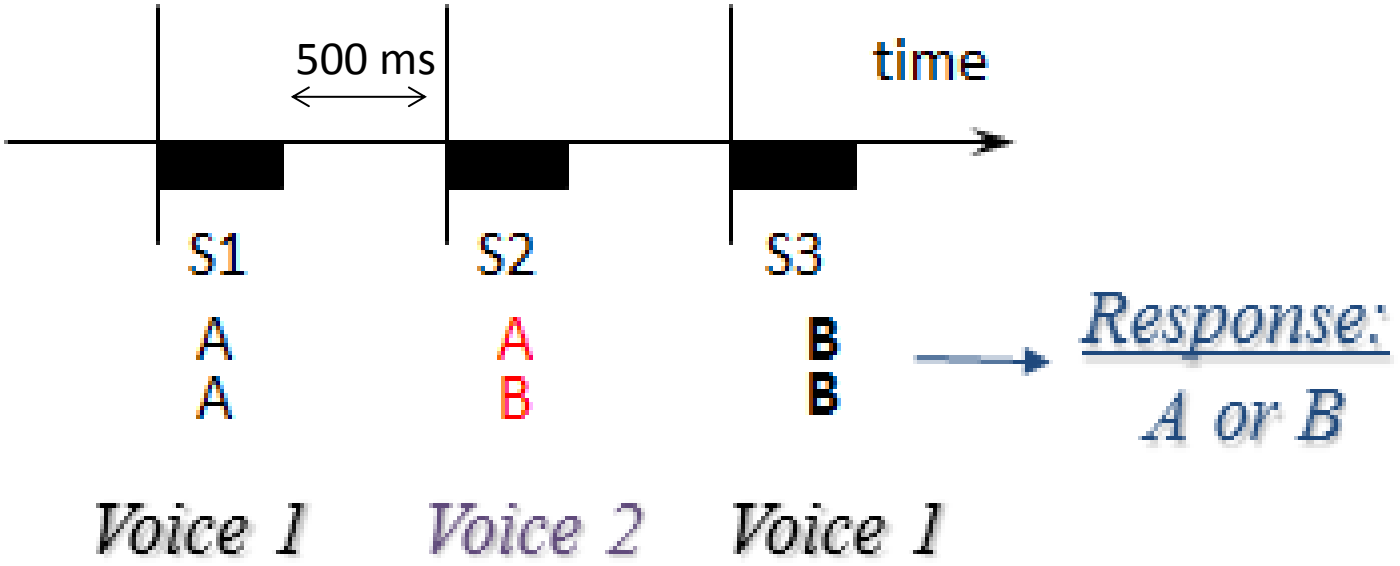
nâ:	*face*	*falling*
nǎ:	*thick*	*rising*
ná:	*aunt*	*high level*
na:	*rice field*	*mid level*
nà:	*custard apple*	*low level*

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

AXB categorization



Accuracy rates and reaction times

AXB categorization

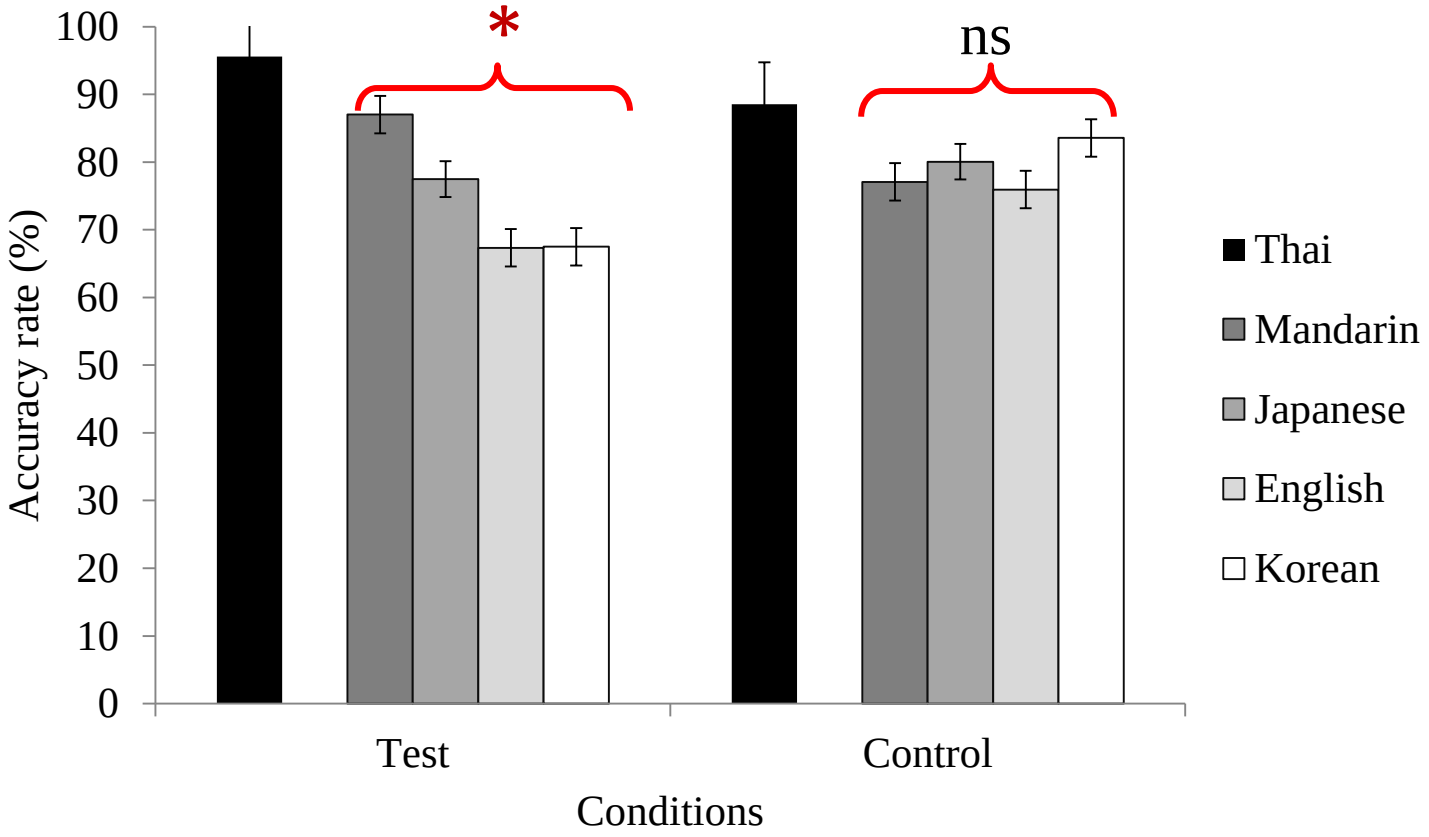
- Monosyllabic words & nonwords presented in triplets (48 „test“, 48 „control“)
- All test words were open syllables
- 3 test conditions:

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
	low-high	mid-rising mid-falling	vowel
	mid-high	high-rising high-falling	

Results

Accuracy rates in each group

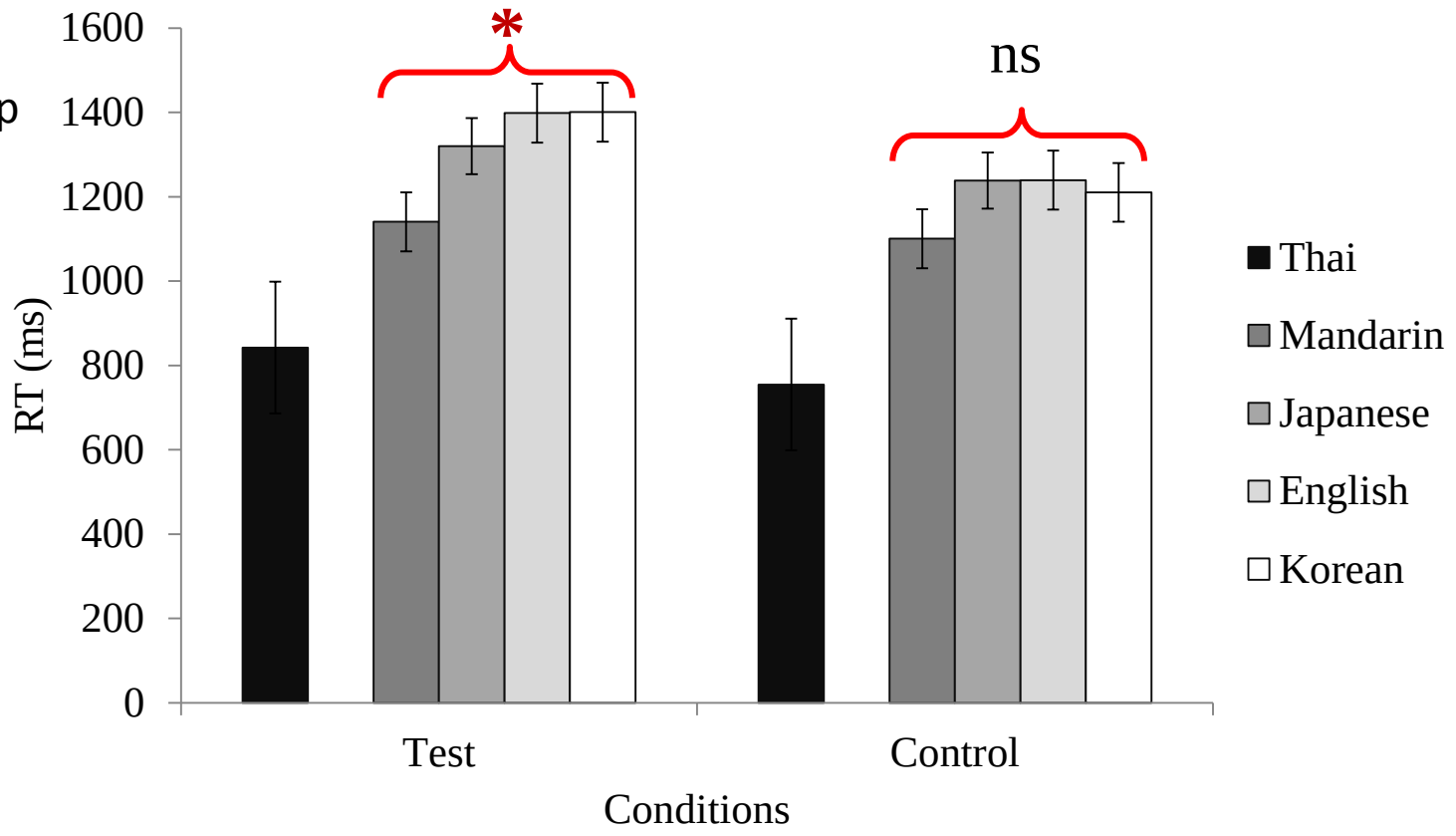
* = significant effect of group



- Significant effect of group for test conditions only
- Accuracy: $F(3, 67.3) = 11.3$, $p < 0.001$
- Predicted hierarchy of accuracy: Mandarin (M = 87% correct), Japanese (M = 77% correct), English and Korean (M = 67 % correct for both).

Reaction times in each group

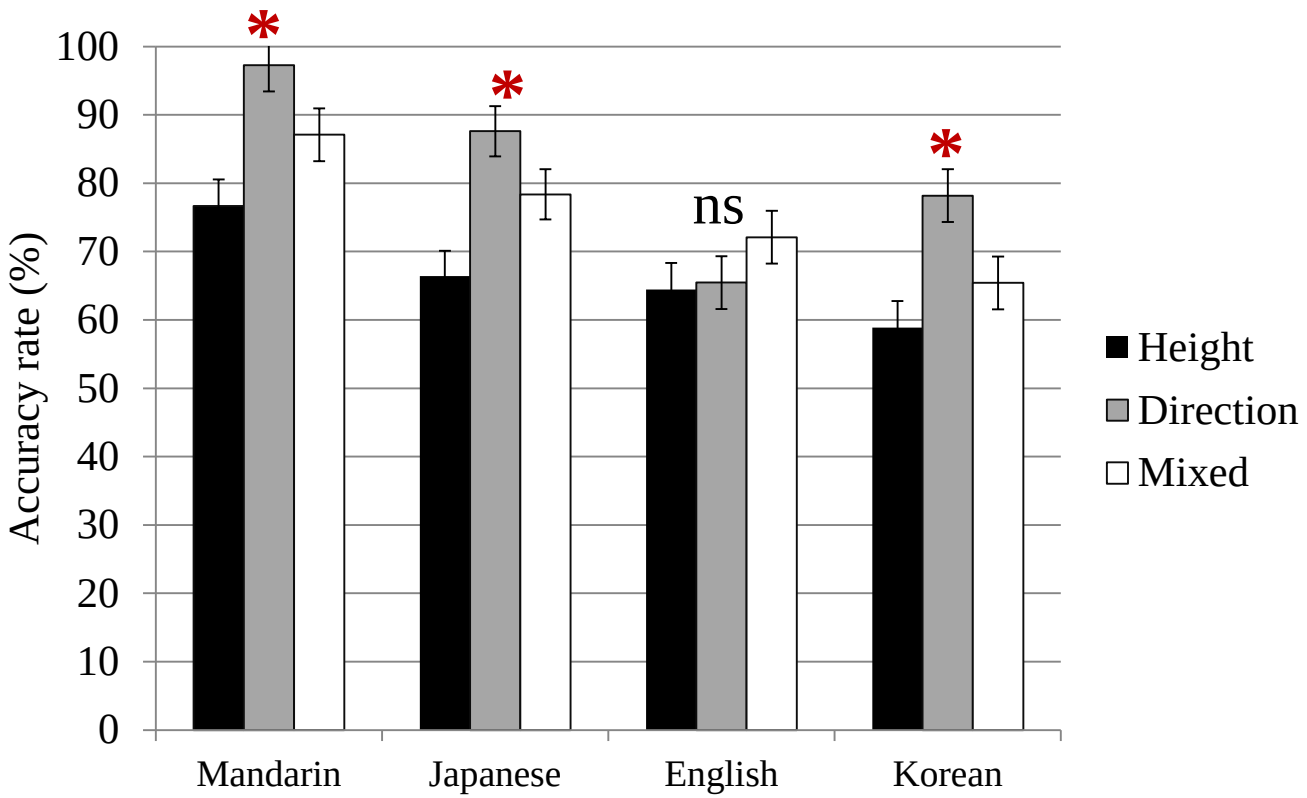
* = significant effect of group



- Significant effect of group for test conditions only
- Reaction time: $F(3, 47.3) = 2.98$, $p < 0.05$

Accuracy rates in each condition by group

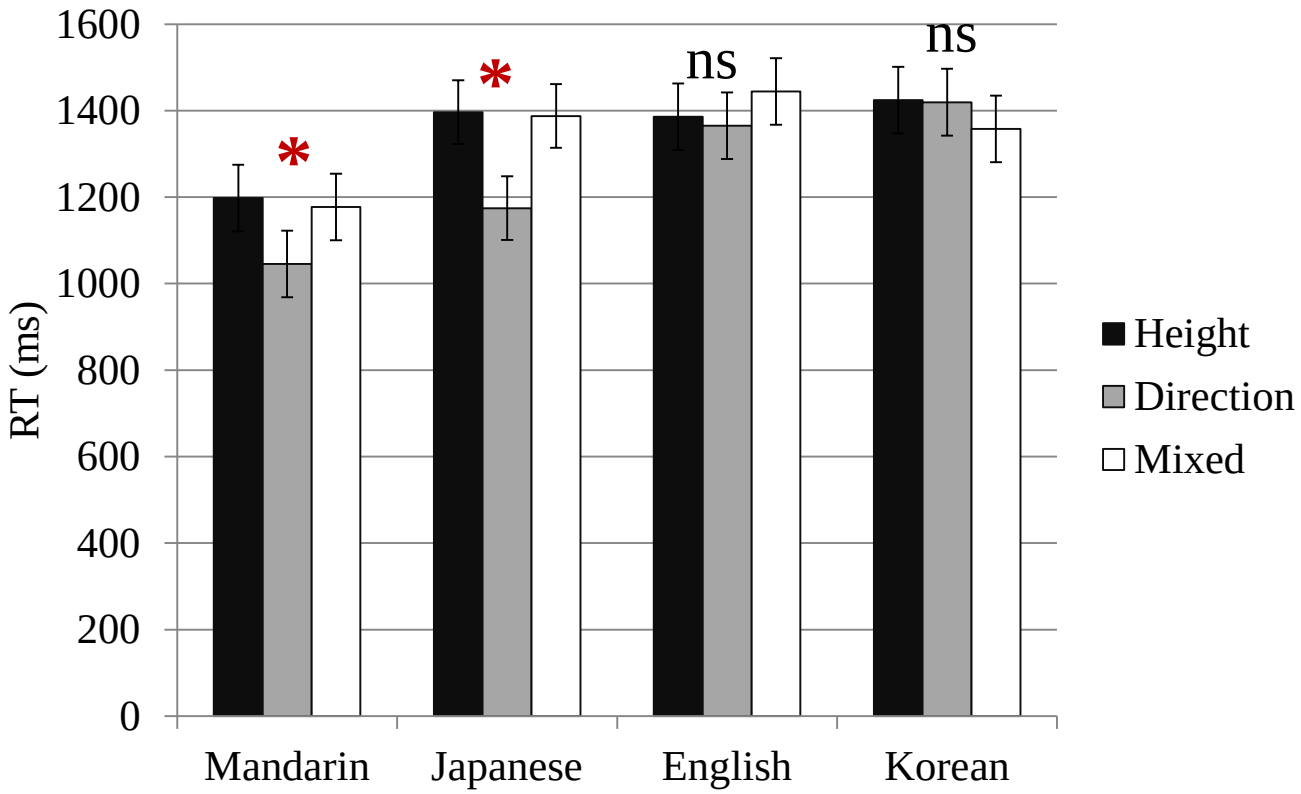
* = significant effect of condition



- The “height” condition is overall the most difficult, the “direction” condition is the most accurate
- For English, accuracy is the same in all conditions

Reaction times in each condition by group

* = significant effect of condition



- The “direction” condition yields faster RTs
- No significant differences for English and Korean

Conclusions

1. Influence of the L1 phonological system : **The functional prominence of lexically-contrastive pitch in L1 shapes cross-linguistic perception of Thai tones**

2. Specific tonal comparisons matter and interact with L1
   - Accuracy differences in the height vs. the direction conditions indicate that for Thai tones, tracking pitch direction is easier than tracking pitch height
   - This does not apply to the English group

Discussion: Overall performance

- Globally, our findings confirm previous results obtained across studies and add strength by allowing a direct comparison with the same methodology
  - The degree of prominence of pitch to signal lexical contrast, at the syllable domain, appears to determine accuracy on our tonal categorization task

Discussion: Overall performance

- However, we did not predict equal accuracy between English and Korean
  - f0 is rarely used alone to distinguish words in English; this appears to yield the same performance in tone discrimination as if f0 was not used at all to signal lexical contrast (English = Korean)
  - f0 can be used exclusively to distinguish words in Japanese; Different patterns obtained by Japanese and English listeners suggest that this fact plays an important role
  - Consistent with findings that stress constrains lexical access only to a limited extent in English (Cooper, Cutler & Wales, 2002)
  - Perhaps Koreans are more accurate because of their L2 English? Alternatively, the effect could be due to exposure to a pitch-accent dialect. Retest with control group from Seoul only.

Discussion: Specific comparisons

- Data in Gandour (1983), and in Guion and Pedersen (2007) suggest that pitch height is more salient and hence easier to track for all listener groups (compared to direction, for example)
  - Our findings do not confirm their data: In all groups except English, direction was easier than height or mixed
  - However, it is possible that these results are in part explained by the fewer number of comparisons in the direction condition (only Rising = Falling) compared to height (Low=Mid, Low=High, Mid=High) or to mixed (see Bohn, 1995)
- Yet, this did not affect the English (who were flat in all conditions). But how can we explain English flat performance across conditions?
  - Use of monosyllabic stimuli may prevent them from applying intonational contours to tonal comparisons, as they did in Braun and Johnson (2011)

ขอบคุณ
มากครับ
Thank you very much.

Questions
&
Answers

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