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

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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:  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
Tone perception by native speakers

◆ Native speakers perceive tones as linguistic categories

◆ 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
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
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
# Functional scale of pitch contrasts

<table>
<thead>
<tr>
<th>Pitch contrasts</th>
<th>Most systematically linguistic</th>
<th>Least systematically linguistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological tone</td>
<td>Thai, Chinese</td>
<td>Syntactic/attitudinal/emotional</td>
</tr>
<tr>
<td>Lexical type</td>
<td>Japanese, English</td>
<td>Korean</td>
</tr>
<tr>
<td>Domain</td>
<td>Segment or syllable</td>
<td>Word/phrase</td>
</tr>
</tbody>
</table>

Adapted from Van Lancker, 1980: 210
Pitch prominence typology and predictions for tone perception accuracy

<table>
<thead>
<tr>
<th>Language</th>
<th>Domain</th>
<th>Prominence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tone (Mandarin)</td>
<td>Lexical, syllable</td>
<td>Maximal</td>
</tr>
<tr>
<td>Pitch-accent (Japanese)</td>
<td>Lexical, word</td>
<td>High-intermediate (pitch is exclusive)</td>
</tr>
<tr>
<td>Word stress (English)</td>
<td>Lexical, word</td>
<td>Low-intermediate (pitch is non-exclusive)</td>
</tr>
<tr>
<td>Intonation-only (Korean)</td>
<td>Non lexical</td>
<td>Low</td>
</tr>
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## Pitch prominence typology and predictions for tone perception accuracy

<table>
<thead>
<tr>
<th>Language</th>
<th>Domain</th>
<th>Predicted Sensitivity/Accuracy in tone perception</th>
</tr>
</thead>
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<td>Tone (Mandarin)</td>
<td>Lexical, syllable</td>
<td>Maximal</td>
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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
Prominence predicts accuracy

- **Prominence of contrastive pitch at the word level**
- **None**

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**Predicted Accuracy**

- **Mandarin**
- **Japanese**
- **English**
- **Korean**

Maximal
Methodology
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
AXB categorization

Accuracy rates and reaction times
Experimental conditions

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

<table>
<thead>
<tr>
<th>Test Conditions</th>
<th>Control Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction (n=12)</td>
<td>Control (n=48)</td>
</tr>
<tr>
<td>Height (n=12)</td>
<td>consonant</td>
</tr>
<tr>
<td>Mixed (n=24)</td>
<td>vowel</td>
</tr>
<tr>
<td>rising-falling</td>
<td>low-mid</td>
</tr>
<tr>
<td></td>
<td>low-rising</td>
</tr>
<tr>
<td></td>
<td>low-falling</td>
</tr>
<tr>
<td>rising-falling</td>
<td>low-high</td>
</tr>
<tr>
<td></td>
<td>mid-rising</td>
</tr>
<tr>
<td></td>
<td>mid-falling</td>
</tr>
<tr>
<td>rising-falling</td>
<td>mid-high</td>
</tr>
<tr>
<td></td>
<td>high-rising</td>
</tr>
<tr>
<td></td>
<td>high-falling</td>
</tr>
</tbody>
</table>
Results
Accuracy rates in each group

* = significant effect of 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).
Reaction times in each group

![Bar chart showing reaction times in different conditions for Thai, Mandarin, Japanese, English, and Korean groups.]

- Interaction was not significant: $F(3, 37) = 2.4, p = 0.08$
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
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)
    - By 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?
Individual Korean Dialectal Differences
Dialectal boundaries
Lee & Ramsey, 2000

Kyungsang = Gyeongsang
Cholla = Jeolla
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
  Sukekawa, Choi, Maekawa & Sato, 1995

◆ Emergence of lexical pitch in standard Korean among younger speakers
  Silva, 2006
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. [yaŋmo]: LH vs. HH ‘wool’, ‘adoptive mother’

From Kim, 2011; Kim & de Jong, 2007
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

- **Mean accuracy (%)**
  - KRF2
  - KRF7
  - KRM3
  - KRF1
  - KRF6
  - KRF3, Busan
  - KRF4
  - KRM2, KRM1, Jinju

- **Mean RT**
  - KRF2
  - KRF7
  - KRM3
  - KRF1
  - KRF6
  - KRF3, Busan
  - KRF4
  - KRM2, KRM1, Jinju

Legend:
- Yellow: Korean pitch accent
- Blue: Korean non-pitch accent
Korean performance on control items

- Mean RT
- Mean accuracy (%)

Legend:
- Yellow: Korean pitch accent
- Blue: Korean non-pitch accent
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.
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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SLRF audience
LabPhon audience
SLS seminar classmates
References


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References


