Effects of linguistic and musical experience on non-native perception of Thai vowel duration

Introduction

Previous research

Many languages, such as Standard Thai, utilize phonemic vowel length to contrast different word meanings. Rate of speech has been found to have an impact on the ease of perceptibility of these distinctions, which can be a challenge for non-native listeners [1, 2]. Previous research has suggested a relationship between musical experience and L2 proficiency; reporting that musicians are more accurate at identifying and discriminating non-native segmental and suprasegmental contrasts [3, 4, 5].

The current study

We investigated the influence of linguistic and musical experience on non-native perception of speaking-rate-varied Thai phonemic vowel length distinctions using native listeners of Thai and English listeners with and without musical experience.

Hypotheses

1) Native vs. non-native:
   a) native Thai listeners expected to be more accurate at identifying and discriminating "short" and "long" vowels than the English groups, across speaking rates
   b) the native group was not expected to be as sensitive to within-category differences (as long vowels at fast and normal rates) as the non-native group; the musically-trained participants would be the most sensitive to these subtle acoustic differences.

2) Non-native musically trained vs. untrained: Given that musicians are trained to discern temporal discriminations in music, English musicians were expected to be more accurate at identifying and discriminating non-native vowel length distinctions than English non-musicians, particularly at faster rates of speech.

Methods

Participants

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Age (avg. yrs)</th>
<th>Language background</th>
<th>Musical training [Aug. yrs. (min – max)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thai</td>
<td>18</td>
<td>25</td>
<td>Standard Thai</td>
<td>2.9 (0-10)</td>
</tr>
<tr>
<td>English non-musician (ENM)</td>
<td>16</td>
<td>26</td>
<td>No experience with a language using phonemic vowel length</td>
<td>2.4 (0 - 5)</td>
</tr>
<tr>
<td>English musician (EM)</td>
<td>16</td>
<td>22</td>
<td>Same as above</td>
<td>12.0 (6 - 20), formal instructional training</td>
</tr>
</tbody>
</table>

Stimuli

- produced by 2 native Thai speakers (1 male, 1 female) at 3 different speaking rates (slow, normal, fast)
- 8 minimal pairs of monosyllabic real words with CVC structure contrasting in vowel length (e.g. so:k and sob). All in low tone and voiceless consonantal context.
- 2 pairs used in identification task.
- 3 pairs used in discrimination task. The discrimination trials (AB pairs) were created in 3 target conditions:
  Condition Description Example
  Different length Between-category difference; pair of words at same speaking rate but differ in vowel length d:3 rates: 1) slow; 2) normal; 3) fast
  Rate: slow rate khor slow rate khok
  Different rate Within-category difference; pair of words at different rates but have same vowel length
  Rate: 2 rate patterns: 1) slow = normal; 2) fast = normal
  Different length & rate Pair of words containing one word with long vowel at fast rate and one word with short vowel at slow rate
  Fast rate phi k slow rate phi k

Procedure & Analysis

Tasks

Identification
- participants listened to individually-paced stimuli and indicated whether it was a long-vowel word or a short-vowel word
- stimuli were blocked for rate (order of block presentation counterbalanced across speakers)
- given 2 seconds to make a response

Discrimination
- participants discriminated pairs of words based on vowel length and indicated whether each pair were the same word (e.g. both short) or different words (e.g. one short and one long)
- given 2 seconds to make a response

Analysis
- mean percent correct of and d’ (d') scores were tabulated for each condition. d' prime was calculated as $2(zM – zF), where z are standardized z scores and (H) and (F) are hit rate and false alarm rate, respectively

Findings

Identification

<table>
<thead>
<tr>
<th>Mean d’ scores for each group by rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
</tr>
<tr>
<td>Slow rate</td>
</tr>
<tr>
<td>Normal rate</td>
</tr>
<tr>
<td>Fast rate</td>
</tr>
</tbody>
</table>

Discrimination

<table>
<thead>
<tr>
<th>Rate</th>
<th>Thai</th>
<th>ENM</th>
<th>EM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow rate</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Normal rate</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Fast rate</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Conclusions

These findings show the influence of linguistic experience on native and non-native perception of phonemic vowel length as a function of speaking rate.

Native listeners outperformed the non-natives at identifying short and long vowel words across rates; however, language background was not influential for between-category discrimination. This difference may be due to the degree of linguistic relevance of these tasks; identification requires labeling of linguistic categories, whereas discrimination focuses more on acoustic distinctions [6, 7].

Moreover, the English listeners were more sensitive to the fine-grained acoustic distinctions of within-category and minute between-category differences (different length & rate). While the mean durational differences for these conditions were less than the between-category fast rate pairs, variant vowel-to-word ratios may have provided cues.

Musical experience primarily provided greater within-category discrimination and does not appear to influence broader linguistic category formation.

References


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