Background: Categorical perception of tones

- Categorical perception (CP) studies attempt to account for the mapping of multiple acoustic cues to discrete phonological categories.
- Classic CP research focuses on segments (Sire J. M. 1978, Fant 1960, and others).
- Acoustic landmarks cue perception: Consonants tend to be perceived categorically while vowels are not (Sire J. M. 1978).
- CP of suprasegmentals has been less clear:
  - Register tones are perceived continuously (Sire J. M. 1979, Fant 1960).
  - Contour tones are perceived (more) categorically (Fant 1960).
- Contour tones have acoustic landmarks that register tones lack, and sentence frames can provide further context, e.g., for the speaker’s F0 range.
- Past studies have shown sentence frames provide speaker-specific context for pitch and speech rate, facilitating CP of tones (Sire J. M. & M. 1987) (Kong & S. D. 2004, Sire J. M. et al., 2008).
- Sentence intonation may also cause lexical tones to become more contoured (see Thai background).
- Francis et al. (2006) tested unmodified mid-level tones in Cantonese sentence frames modified to varying degrees (semitones). Those mid-level tones were identified differently depending on the frame, suggesting the idea that extrinsic context is relevant to lexical tone processing.

Background: Thai

- Lexical tone in Thai (low, rising, and falling) and other languages (e.g., Cantonese in Fant, 1960) can change shape in different intonational contexts.
- Limited research to date on the perception of the Thai lexical tone and intonation.
- Liskuwanawararak (2008) described Thai intonation based on production data (e.g., raised, narrow pitch range for questions & final fall for statements).
- Abramson (1979a, Morén & Zsiga 2003) propose that the phonetic realization of lexical tone differs across different intonational/contexual conditions.
- Abramson (1979b) noted that either Morén & Zsiga (2003) postulate a falling tone in final position (i.e., citation form), and that tones in non-final position are compensated for.
- Alternatively, since there is agreement that the phonetic realization of tones is different sentence-medially and sentence-finally, it is generally assumed that there is a final fall in declaratives (attributed to L%). We can also assume that tones are influenced by F0 in Cantonese (Sire J. M. et al., 2008).
- Therefore, we assume that a sentence-final falling tone (L% intonational boundary tone) causes high and falling tones, respectively, to take on a lower contour with a final fall, and a greater fall (see Fig. 2).
- Additionally, these tones can potentially be described as having their canonical contours semantically.

Materials

- Two naturally produced words, /tʰ∅/ (high) and /t∅∅/ (falling), were recorded in sentence-medial and sentence-final positions.

Method

Task 1: Identification

- Four items
- One practice item
- 54 randomized trials (5 steps: 2 frames / 4 steps)
- Participants hear a tone from the continuum embedded in a frame, and select the picture corresponding to the high- or falling-tone word.

Task 2: Discrimination

- Four items
- ABX discrimination task (one internal but not A and B)
- 500 ms ISI (interval offset/offset of onset of tones)
- 3114 vs targets in Medial context
- 2152 vs targets in final context
- Participants hear A, B, X, and then select “X is identical to A” or “B is more similar”
- [8 tone pairs x 2 AB orders x 2 frames / 2 reps]

Fig. 2: Sentence frames provide acoustic context such as release pitch, which will facilitate categorical perception of tones.

P1: A final L% boundary tone will cause the categorical boundary between high and falling tones to shift; more steps will be identified as falling-tone words as compared to the medial position, indicating a strong influence of bottom-up acoustic information.

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