

The role of musical experience in Cantonese lexical-tone perception by native speakers of Thai

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Abstract

Adult non-native perception is subject to influence from a variety of factors, including native language and musical experience. The present study investigates the influence of these two factors in the perception and learning of non-native lexical tones. Native Thai-speaking musicians and non-musicians completed pre- and post-test identification tasks on five Cantonese tones, with 4 days of lexical identification training. Higher identification accuracy scores for musicians suggest that extention of experience. Learners' L1 systems can interact with the developing second language (L2) phonetic system, shaping perception and the formation of new phonetic categories (e.g. [2]). Musical background can also potentially affect how efficiently and effectively non-native contrasts are acquired, as language and music may share common processing mechanisms [3-5].

Research has indicated that listeners' native phonetic systems can strongly influence the perception of novel sounds, and that the interaction of new phonetic structures, both segmental and suprasegmental, with established ones can have substantive effects on learning [6-8]. Concerning linguistic pitch, a study examining native English listeners' perception of Mandarin lexical tones suggested that the English intonational system had a direct influence on how listeners were perceiving particular tones, namely the Mandarin falling tone [6]. The authors argue that English declarative intonation and the Mandarin falling tone share acoustic similarities, thereby facilitating the identification of this tone (in isolation) as well as when it occurred in final position of a string of syllables. Similarly, Mandarin listeners' identification accuracy was best on the three Cantonese lexical tones that have similar counterparts in Mandarin, suggesting that native category representations can have a significant influence on non-native perception [7].

Additionally, it has been reported that perceptual discrepancies in lexical tone perception can be attributed to linguistic experience and language-specific weightings of two perceptual dimensions: F0 height and direction of change [8].

Results of the perception of Thai tones indicated that 'direction of change' appeared to be the most perceptually salient dimension for Thai listeners, whereas non-tone language listeners (English) gave greater weight to the 'height' dimension. It was posited that tone language and non-tone language groups are separable based on their respective rankings of these perceptual dimensions. Additional studies to linguistically meaningful F0 changes and distinctions in one's native language can be particularly advantageous when perceiving non-native lexiprevious studies have pointed to a link between (11). Both language and music qualify as rule-based systems where fundamental units (e.g. notes and phonemes) are arranged into higher-level hierarchical structures. Thus, it is not surprising that studies have suggested that language and music may have shared cognitive faculties and that crucial language areas in the brain are recruited during the processing of music [10], which may account for why verbal memory was also found to be better in musicians than non-musicians [12-13]. This close connection between language and music has led to a growing body of research addressing the effect of musical training on language learning. Given that both music and tone languages employ significant pitch modulations, several studies have examined the influence of musical experience on the acquisition of non-native suprasegmentals [3-5]. Research on the non-native perception and production of Mandarin lexical tones reported that musically-trained participants, with non-tone language backgrounds, performed significantly more accurately on tone identification and discrimination tasks [3-5].

1.2. The current study

This study explores the role of experience in non-native lexical tone perception. Native Thai-speaking musicians and non-musicians were asked to identify five Cantonese tones before and after they underwent a multi-session training program. As some studies have suggested that having a tone language background facilitates the acquisition of non-native tones [2, 9], the present research investigates the interaction of L1 with musicianship, and whether the addition of musical experience will still be advantageous for perceptual accuracy. In other words, this study seeks to extend the previous findings regarding the influence of musical experience on non-native suprasegmental learning to include listeners with a tone language background (Thai) identifying Cantonese tones.

We hypothesize that previous research will be extensible to tone language listeners and that musicians will have higher identification accuracy scores overall than non-musicians. Moreover, we hypothesize that L1 influence will likely manifest in their patterns of tonal accuracy, such that the

Cantonese lexical tones with close analogues in the Thai tonal system, including the high and low-level tones, will see the highest identification accuracy and the most improvement after training.

2. Methods

2.1. Participants

Thirty-three native Thai-speaking participants were involved in this study. All participants considered Thai to be their first and dominant language and reported having no previous knowledge of Cantonese or any other lexical tone language. Furthermore, they possessed normal hearing and cognitive abilities. They were recruited from Chulalongkorn University and Silpakorn University in Bangkok, Thailand. The participants were divided into two groups based on their musical experience. Eighteen participants (10 male, 8 female; mean age: 22 years) were considered “non-musicians”, such that they had less than three years of musical experience (0.4 years on average) and no experience within the last five years. The “musician” group was comprised of fifteen participants (10 female, 5 male; mean age: 21 years), who had undergone at least six years of continuous Western instrumental music training (6-17 years, with a mean of 9 years) and had a current ability to play an instrument.

2.2. Stimuli

2.2.1. Pre-/post-test

Five CV monosyllables (*waj*, *low*, *si*, *pej*, *fu*) were produced with five Cantonese tones, creating a total of 25 real-word stimuli. The phonemes were common to both Thai and Cantonese in order to maintain focus on the suprasegmental information. The initial consonants selected were both voiced and voiceless to provide a variety of consonantal contexts, and five different vowels were included to ensure generalizability. The five Cantonese tones utilized in this study include the high-level, high-rising, low-falling, low-rising and low-level tones. The mid level-tone was not included, as it may be easily confused for the high and low level tones, particularly in the absence of any contextual cues [3]. Two native Cantonese speakers (1 male, 1 female) were recorded in a sound-attenuated booth. The stimuli were sampled at 44.1 kHz.

2.2.2. Training

Four novel speakers (2 male, 2 female) not used in the pre-/post-tests produced three CV monosyllables (*tsou*, *kwaaj*, *wu*) with five Cantonese tones. These 15 Cantonese words (3 syllables x 5 tones) were associated with meanings (common concrete nouns), as represented by a picture presented on the screen. Because participants would be receiving lexical identification training (learning sound-meaning pairings), these particular syllables were selected because they do not contain any semantic content in Thai, so as to reduce lexical competition with existing words in a participant’s lexicon.

2.3. Procedure

2.3.1. Pre-/post-test Identification Task

The participants first completed a familiarization task in order to acquaint themselves with the task procedures. It also familiarized listeners with the five Cantonese tones and indicated how to identify them. They heard each Cantonese tone pronounced in isolation and viewed an appropriate tone

image on the screen (a visual representation of the contour/level tone). Following these five trials, the participants were asked to respond after each stimulus, identifying the tone they heard by pressing the number on the computer keyboard corresponding to the appropriate tone image. Feedback on the accuracy of their response as well as the correct answer were provided. This task used productions of /ji/ by the female talker from the main task. Three randomized repetitions produced a total of 15 trials, lasting approximately 2 minutes.

The main task was a forced-choice identification task, where the participants identified the tone of each syllable from a selection of five options (presented as tone images on the screen), similar to the familiarization section. However, they did not receive any feedback on their identification accuracy. This task was comprised of four blocks, each containing the

demonstrate that Thai musicians were significantly more accurate at identifying non-native lexical tones than Thai non-musicians overall, which is consistent with previous findings on the influence of musical experience of non-native suprasegmental perception [3-5]. Musicians performed