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Editorial: Tonal language processing and acquisition in native and non-native speakers

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Editorial on the Research Topic
Tonal language processing and acquisition in native and non-native speakers

Over 60% of world languages use pitch patterns to distinguish individual words or the grammatical forms of words. Some tonal languages involve moving pitch patterns or contour tones, e.g., from a flat pitch to a rising pitch, in distinguishing the morphosyntactic and semantic features. Tonal language acquisition and processing present a distinct linguistic challenge (Best, 2019). In contour tonal languages like Mandarin, Vietnamese, and Yoruba, these pitch patterns vary dynamically, imposing additional complexity on both native speakers, who rely on tones from an early age, and non-native speakers who struggle with the novel tonal distinctions. The five articles in this Research Topic explore tonal language processing and acquisition from both native and non-native perspectives, examining how multimodal cues, intonation, statistical learning, and perceptual compensation impact learners' abilities to recognize and reproduce tonal patterns. Collectively, these studies highlight the nuanced nature of tonal language acquisition and contribute essential insights for language pedagogy, cognitive science, and applied linguistics.

Farran and Morett reviewed the role of multimodal cues—specifically, visual and haptic inputs—in aiding non-native speakers' acquisition of lexical tones. They underscore how hand gestures and visual aids can help learners conceptualize pitch contours in a tonal language, providing alternative pathways for tone recognition and production (Morett and Chang, 2015). This multimodal approach supports the integration of auditory and visual processing, aligning with multimedia learning theories that emphasize the benefits of using multiple sensory modalities. The authors suggest that multimodal training could enhance second-language (L2) pedagogy, particularly for learners whose first language (L1) is a non-tone language and lacks lexical tones.

Tjuka et al.s' study focuses on Northern Vietnamese speakers, investigating how intonation interacts with lexical tones within discourse. Vietnamese intonation patterns offer a rich ground for examining tonal variations, given the language's complex system of six tones. Through a study with 70 native speakers, Tjuka et al. analyzed the pitch variations across contexts, showing that Vietnamese speakers employ distinct intonation strategies to convey information structure.

Their findings underline the interplay between intonation and lexical tones, suggesting that tonal and intonational features must be taught cohesively for effective language learning. This research provides valuable insights for instructional practices that address tonal nuances in both L1 and L2 contexts.

In exploring statistical learning as a mechanism for tone acquisition among non-tone language speakers, Tang et al. conducted a study using tone-syllable combinations. Their findings support the hypothesis that statistical learning facilitates L2 tonal acquisition, even without explicit feedback. However, non-tone speakers demonstrated stronger learning with syllable patterns than with tones, underscoring the challenges they face in internalizing tonal contrasts. Tang et al.'s research reveals the potential of implicit statistical learning in developing L2 learners' tone recognition skills, especially in immersive environments. This suggests that educational programs could benefit from incorporating implicit learning activities to foster tonal language acquisition.

Vonessen and Zellou's research investigates the perception of coarticulated tones in Mandarin, where a tone's relative pitch height and its contour may be altered by the preceding and following tones. Perceptual compensation occurs when listeners mentally adjust their perception of a tone based on the surrounding sounds, effectively "correcting" for the acoustic variations caused by coarticulation, thus allowing them to accurately identify the intended tone despite its altered acoustic characteristics due to the neighboring tones. In other words, listeners "compensate" for variations due to co-articulation in order for optimal tone perception. Vonessen and Zellou examined whether and how native tone language speakers and tone-naive listeners differ in their perceptual compensation. Their results show that native listeners exhibit a high degree of perceptual compensation for tonal coarticulation, while tone-naive listeners struggle with context-dependent tonal shifts. Notably, tone-naive listeners were less consistent in perceiving coarticulated tones correctly, therefore, indicating the challenges of tonal perception in multi-syllable contexts. The authors highlight the intricate processing demands that tonal languages place on learners and suggest that L2 training should emphasize coarticulated contexts to help learners develop robust perceptual skills for tonal variations.

Finally, Wang et al. provide a tutorial on the Tone Superimposition Technique in speech sciences, a methodological approach for manipulating pitch contours on spoken syllables by "superimposing" a specific tonal pattern onto the relevant syllables. This technique is essential for experiments requiring hybrid speech tokens to test listeners who have knowledge of more than one language (e.g., Wang et al., 2020) in Speech Perception and Spoken Word Recognition. This tutorial addresses the lack of detailed methodological guidance on tone superimposition, presenting a standardized approach for future tonal bilingualism research. The technique holds promise for further studies examining the perception of pitch-contoured speech, especially in multilingual settings.

The studies in this Research Topic address critical gaps in our understanding of tonal language acquisition and processing. From multimodal training and statistical learning to the specific perceptual challenges posed by coarticulation, each study contributes a piece to the broader puzzle of how tones are represented and learned across linguistic contexts. While the studies provide foundational insights, remaining gaps warrant further exploration. Future research could investigate how multimodal cues interact with the cognitive load during tonal acquisition or how statistical learning mechanisms apply to advanced tonal structures. Additionally, studies on perceptual compensation in non-native listeners could expand to include longitudinal designs to assess how exposure impacts tonal perception over time.

In practical terms, this Research Topic underscores the need for tonal language education strategies that incorporate multisensory learning and context-based perception. For both L1 and L2 speakers, tonal training could benefit from methods that integrate auditory, visual, and haptic modalities, offering a comprehensive approach to overcoming the unique challenges of tonal languages. By bridging theoretical insights with applied strategies, these findings not only advance linguistic theory but also support educators, clinicians, and policymakers in designing effective language interventions.

Author contributions

WH: Writing – original draft, Writing – review & editing. XW: Writing – review & editing. LC: Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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