

THETA AND BETA OSCILLATIONS REVEAL LANGUAGE SPECIFIC INFLUENCES IN INFANTS' STRESS CUE-WEIGHTING

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From segmenting words to tracking hierarchical structures in natural speech, sensitivity to rhythmic patterns in speech facilitates language acquisition (see Barajas et al., 2021 for a review). While rhythm perception is modulated by listeners' prior linguistic knowledge, the extent to which it is modulated by acoustic or phonological processes, as well as the neural underpinnings of this developmental process, is not well understood.

Most studies on this topic investigated the Event-related potentials (ERPs), in particular mis-match negativity (MMN), yielding mixed findings and interpretations on the polarity and strength of the responses (Friedrich et al., 2007; Kidd et al., 2018; Kooijman et al., 2009; Ragó et al., 2021; Weber et al., 2004; Werwach et al., 2022). The limited number of studies on the neural oscillations in infants suggest that power at different frequency bands can provide indication of neural phonological sensitivity. Theta oscillations have been reported as an index for perceptual narrowing of non-native phonetic segments (Bosseler et al., 2014). Moreover, oscillatory power becomes more prominent at higher bands with development (Barajas et al., 2021). Beta synchronisation is relevant to auditory prediction in an oddball paradigm (Chang et al., 2008).

Using a multi-feature mismatch negativity paradigm, the current study investigated the event-related time-frequency responses of the weighting of pitch, intensity and duration cues signalling stress, in speech and (acoustically matched) non-speech (see stimuli and paradigm in Zeng et al., 2022) in English and Mandarin infants at 7-8 and 10-11 months. The two developmental stages were set to explore potential perceptual narrowing of lexical stress cues (Skorupa et al 2009; 2013).

Infants' time-frequency responses at theta and beta bands revealed striking cross-linguistic differences in the **speech** domain. English infants used all three cues at both ages, whereas Mandarin infants showed sensitivity to pitch and intensity (but not duration) in the younger age and diminished sensitivity to all three stress cues when older. These results are in line with the perceptual narrowing process, providing strong evidence suggesting that the infant phonological system is heavily involved in the processing of acoustic changes in stress cues, even when these cues are not strictly categorical.

When listening to the **non-speech** cues, both English and Mandarin infants showed increased sensitivity to cues with age. No obvious perceptual narrowing comparable to that in the speech domain was observed. Nonetheless, there was limited cross-linguistic difference, such that English infants and Mandarin infants showed sensitivity to differing cues at the younger age. English infants focused on intensity and duration at 7-8 months. Meanwhile, age-matched Mandarin infants tended to pitch and intensity. At 10-11 months, English infants' sensitivity to pitch cues and Mandarin infants' sensitivity to duration cues are evident, reflecting late sensitivity for these cues. These results suggest that attunement to differing cues may point to the level of familiarity with the cues employed in phonological processing, which may mildly modulate the acoustic processing in a neighbouring auditory domain.