Tonal coarticulation in Angami level tones
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Angami (Tenyidie) is a Tibeto-Burman language spoken in Nagaland, North-East of India with only level tones in its tonal inventory. In this study, the contextual effects of tones in disyllables are investigated. Angami native speakers living in the Kohima district of Nagaland provided speech data intended to capture tonal coarticulation. A total of 24 speakers consisting of 15 females and 9 males were recorded for this study. The mean speakers' age was 33.1 years (SD = 3.3) at the time of recording. For this study, we annotated the Angami tones with five-level categories as suggested in the MKS Dieda, a standard dictionary for Angami. There are 20 distinct meaningful disyllabic words with the syllable structure CVVCV and one case of VCCCV. The target disyllables were embedded in three environments: sentential, phrase and isolation, resulting in 2824 disyllabic tokens for the current study.

Cross-linguistically, numerous tonal languages exhibit the tone carryover effect and anticipatory effect. The F0 effects, however, differ depending on the language (Gandour, 1994; Xu, 1994). According to evidence from contour tonal languages such as Mandarin and Cantonese, the effects are bidirectional, with anticipatory effects dissimulating while carryover effects assimilate (Wong, 2006). Cantonese tones get higher when followed by a low onset tone showing the dissimilatory nature of anticipatory effects. In contrast, onset is higher when preceded by a high offset showing assimilatory carryover effects. Similar study is also attested in Mizo, a Tibeto-Burman language and Thai, where the effects were bidirectional, however unlike Mandarin and Cantonese, the anticipatory effect assimilates or dissimilates depending on the following tone (Sarmah, 2015; Gandour, 1994). In Mizo, anticipatory effects are more significant on contour tones where falling tones are lowered when followed by high, rising or low tones, which assimilate or dissipilate depending on the following. Mizo carryover effects are assimilatory where high or low onset (falling or high) is lowered by preceding low offset (low or falling). While there is a considerable number of studies on the tonal coarticulation or contextual tonal characteristics in contour tone languages, the contextual effects of tones in level tone languages still need to be studied. We could locate only the abstract of the study that reported contextual tones variations in Hausa, Bole and Yoruba (Yu, 2009). Hence, this study is essential as it studies tonal coarticulation in level tones.

To obtain tonal characteristics, we extracted F0 values from the vowel of the first syllable (V₁) and then continuing onto the onset consonant of the second syllable (C) and finally ending at the termination of the vowel in the second syllable (V₂). F0 values were extracted at every 2% of the total duration of the V₁CV₂, resulting in 51 points across the total duration where F0 were extracted. The extracted F0 values were used to visually represent the tonal contours and also to conduct exploratory statistical tests using Linear mixed effects (LME) modelling.

The overall F0 of the tones in Angami suggests there is an overlapping in tones T2 and T3, which are statistically insignificant. Hence, it confirms that Angami has four level tones, as opposed to the five tones proposed in the MKS dictionary. This finding is similar to the recent studies on tones in Angami. The results also showed that, in terms of anticipatory effects, only the high tone (T1) and mid-tone (T3) in the first syllable have dissimilatory effects from the second syllable (see Figure 1). However, no other tone in the first syllable showed any systematic effect of the following tones. Regarding carryover effects, the effects are both assimilatory and dissimilatory in nature. The results show that only the initial 25% of the tone contour of the second syllable is affected by the tone in the first syllable. However, both the anticipatory and carryover effects depend on the height of the tone as higher tones (T1, T2, T3) dissimilate while lower tones (T5) assimilate regardless of anticipatory or carryover effect. Statistical analyses conducted in the three middle points of the tone contours confirm the findings. The results also demonstrated that the tonal coarticulation patterns in level tone languages slightly differ from the often cited contour tone languages.
Figure 1: Normalized mean F0 in disyllables showing carryover and anticipatory effects. T1 represents the highest tone; T2, T3 & T4 are the intermediary tones while T5 is the lowest.

References