Word meaning in context contributes to non-uniformity in the realisation of Mandarin tones

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In standard accounts of Mandarin morphophonology, each monosyllabic morpheme is associated with one of four lexical tones – high level, rising, dipping, or falling – plus one neutral tone whose shape depends on the preceding tone (Chao, 1968). The pitch contours of bimorphemic words are generally understood as being shaped by the tones of the constituent morphemes. Consequently, all bimorphemic words sharing, for example, a falling tone followed by a rising tone are assumed to be realised with the same underlying pitch contour. However, there is considerable non-uniformity since tonal realisation is modulated by factors such as speech rate, co-articulation, segmental make-up, and predictability. This presentation provides evidence that the tonal realisation of Mandarin bimorphemic words is also partially determined by word meaning, independently of morphophonology.

We investigate the rise-fall tone pattern in a Taiwan corpus of spontaneous conversation (Fon, 2004). The dataset includes nouns such as 學校 xuéxiào 'school', verb forms such as 學到 xuédào 'learn+resultative', and negated verbs such as 不是 búshì 'not+be'. Using generalised additive modelling, we show that word type is a stronger predictor of a token's pitch contour than all factors combined that are standardly held responsible for the non-uniformity. Adding information about meaning in context further improves prediction accuracy, supporting our hypothesis that the word effect is semantic. We then show, using computational modelling, that it is possible to predict the meaning of a word token from its tonal contour and to predict tonal contour from meaning. In the comprehension model, token-specific pitch contours predict word meaning with 50% accuracy on held-out data. In the production model, token-specific semantic embeddings predict the shape of pitch contours with 30% accuracy. These accuracies, an order of magnitude above chance, suggest that the relation between word tokens' pitch contours and their meanings is sufficiently strong to be functional for language users.

Our findings have profound theoretical implications for the morphophonology of Mandarin.

References

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