

Tianjin Mandarin Tunes: Production and Perception data

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Alternating pitch accents and boundary tones are common methods of making a yes-no question in non-tonal languages (c.f. English, Greek, etc.); tonal languages, however, are much restricted by lexical tones, including contour shape and register. How does a tonal language speaker ask a yes-no question syntactic marking or even context? Can listeners perceive the questions well? This paper aims to answer these two research questions through investigating the production and perception of the tunes of statements and intonational yes-no questions in Tianjin Mandarin. Tianjin Mandarin is a northern Mandarin dialect which share many common syntactical, phonologically and lexical features with standard Mandarin. Tianjin Mandarin, despite having the same number of lexical tones with standard Mandarin, has a more evenly distributed lexical tone inventory (L, H, LH, HL), which conveniently serves as a good tool for prosody research.

A **production** study was conducted to investigate whether intonational contours would override lexical tone contours and how tone and tune interact. Six native speakers of Tianjin Mandarin (3 male and 3 female) were recorded. Mono syllabic materials were used – three different syllables, each with four lexical tones, were tested for declarative and interrogative tunes. A comprehensive analysis of the data suggests that (a) The register is higher in interrogative tunes than in declarative for all tones; (b) The pitch range of the intonational yes-no questions is smaller for lexical tones ending with a L tone, but bigger for lexical tones ending with a H tone. This implies that, on the one hand, the Ls in the questions do not fall as sharply as those in the statements; on the other hand, the Hs in the questions rise even higher than those in the statements. This finding is consistent with Chang's (1958, in Ladd 1996) study on Chengdu Chinese questions. (c). There is a floating H boundary tone for intonational yes-no questions in Tianjin Mandarin. The literature on standard Mandarin has mixed conclusions. For example, Lin (2004, 2006) assumes boundary tone, while Yuan et al. (2002) assumes none, as the current study does. In summary, intonational yes-no questions in Tianjin Mandarin differs from statements only in terms of **register**, and a **floating H boundary tone** but not in terms of pitch accents. The results coincide with some African languages, which make questions by utilising the register and degree of pitch rise and fall (Rialland, 2007). Tianjin Mandarin also has syntactically marked yes-no questions, in which the utterances end with a question particle. This construction may be a consequence of the fact that intonation alone in a tonal language is not robust enough to facilitate effective communication.

A **perception** experiment was also conducted to investigate whether listeners could identify YNQ from statements by merely using the subtle cues of register change and floating boundary tone. 28 native Tianjin Mandarin speakers (15 male and 13 female) took part in the experiment. They were instructed to perform a forced-choice task by pressing either the 'Q' button or 'S' button when hearing an utterance.

Results: The following table shows the accuracy rate of the identification task. The lexical tones are presented by average accuracy rate. When results from two lexical tones are not statistically significant, the relation is represented with a "=" (Table 1).

The crucial cue for perceiving statements is the L tone at the left boundary. L tone and LH tone both start with a L tone, so they both achieved the highest accuracy. When the initial tone does not help with identification, such as between HL and H tone, the ending H tone interferes with the identification. On the contrary, listeners use the right boundary height for YNQ. The general trend is that if the right boundary is a H tone, then it is easier to identify. Similar to the statement, initial L interferes with the identification too. Since H Tone is a rising H, it is easy to be considered a question. The floating H% added the advantage.

Table 1: Perception experiment results

Sentence type	Gender of stimuli voice	Lexical tones
Statement	Male	LH=L > HL > H
	Female	LH=L=HL > H
Yes-No Question	Male	H ^{H%} > LH ^{H%} =L ^{H%} =HL ^{H%}
	Female	HL ^{H%} =H ^{H%} > LH ^{H%} > L ^{H%}

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