

## Sentence Final Particles and *Wh*-indefinites in Beijing Mandarin

Yu-Yin Hsu<sup>1</sup>, Ka-Wai Chan<sup>1</sup>, Tsz-Shan Lo<sup>1</sup>, Xia Wang<sup>1</sup> & Anqi Xu<sup>2</sup>

*Hong Kong Polytechnic University<sup>1</sup>, University College London<sup>2</sup>*

yu-yin.hsu@polyu.edu.hk, ka-wai.kw.chan@connect.polyu.hk, tsz-shan.lo@connect.polyu.hk,  
xuanqi@connect.polyu.hk, summer.x.wang@polyu.edu.hk

In this study, we used a speech production experiment to study whether and how Beijing Mandarin native speakers (n=6) use prosody to disambiguate *wh*-indefinites, and to explore whether and how sentence final particles (SFPs) signal the clausal types and interact with focus marking. *Wh*-indefinites refer to *wh*-phrases that are ambiguous between interrogative and indefinite readings, which has been attested in many languages (cf. Kuroda, 1965). For example, *wh*-phrases in Mandarin like *shenme* ‘what’ can be interpreted as a *wh*-interrogative in a *wh*-question (e.g., (1a)), or as an indefinite in a *yes/no* question (e.g., (1b)). Previous syntax-semantic studies have identified contexts that license the indefinite reading of *wh*-indefinites, and the occurrence of SFPs such as *ma* for *yes/no* questions as in (1b) is one of such *wh*-indefinite-licensing contexts (Li, 1992; Cheng, 1994). While most linguistic studies have focused on sentences like (1a-b) for *wh*-indefinites, we notice that in declarative sentences like (1c) with SFP *ba* indicating weak epistemic judgment, the *wh*-phrase also obtains an indefinite reading.

- (1) a. Zhangsan mai-le shenme (ne)?  
Zhangsan buy-ASP what WH-PARTICLE  
‘What did Zhangsan buy?’  
b. Zhangsan mai-le shenme (ma)?  
Zhangsan buy-ASP what Y/N-PARTICLE  
‘Did Zhangsan buy something/anything?’  
c. Zhangsan mai-le shenme (ba).  
Zhangsan buy-ASP what S-PARTICLE  
‘Zhangsan probably bought something/anything’

Examples in (1) show that *wh*-indefinites in Mandarin not only are lexically ambiguous but are also relevant to structural ambiguity, given that SFPs often are not obligatory in Chinese.

Considering prosody as one of the disambiguation devices, some prior studies have reported that *wh*-indefinites while functioning as *wh*-interrogatives manifest more acoustic prominence (due to the focus status) than *wh*-indefinites in languages such as Korean (Jun and Mira, 1996), Japanese (Ishihara, 2003; Kitagawa, 2007), and German (Truckenbrodt, 2013). Yet, some studies reported that no acoustic differences on the *wh*-indefinites that distinguished interrogative and indefinite readings, and distinction may be found on the following units (e.g., Yon, 2018).

Different results were also reported for *wh*-indefinites in Mandarin. Hu (2002) studied *wh*-subject *shei* ‘who’ and *shenme* ‘what’ and reported that Mandarin speakers expressed *wh*-interrogatives acoustically different from *wh*-indefinites: it was reported that *wh*-phrases had higher mean F0 in *wh*-questions, and the verb phrase of a sentence showed higher mean F0 in *yes/no* questions. In this study, only descriptive statistics results were reported for mean F0, duration and amplitude (with SD), and some inter-participant differences were found. For Taiwan Mandarin, Shyu and Tung (2018) reported two different findings; first, based on eight tokens from a speech corpus, they reported that some differences were found between *wh*-interrogatives and indefinites, however the syntactic and the phonetic contexts where these eight tokens occurred were different; second, their production study showed that participants did not acoustically disambiguate the two meanings of *wh*-indefinites; since all their participants responded to the same two items for one context, it is difficult to draw a general conclusion for Taiwan Mandarin. Thus far, the findings about Mandarin *wh*-indefinites remains inconclusive.

**In this study**, we examined the prosody of *wh*-questions and *yes/no* questions like those in (1) containing *wh*-indefinites, and use declarative sentences as the baseline. Four *wh*-phrases (*shei* ‘who’, *shen.me* ‘what’, *na.li* ‘where’, and *shen.me-dong.xi* ‘what thing’) were used to constructed each type of sentences with five versions of the Tone4 verbs. In total, 60 target sentences (3 sentence types x 4 *wh*-phrases x 5 verb) and 40 filler sentences (in different sentence structure with no SFPs) were used in an experimental session. Each trial consisted of a pre-recorded leading context (25 character long) and a target sentence (like those in (1)) that participants used to respond. The leading contexts were pre-recorded by a female speaker of Beijing Mandarin. The acoustic measurements were generated by ProsodyPro 5.7.6 (Xu, 2013) for duration, fundamental frequency (F0) range and time normalized F0. Linear Mixed Effects models were conducted on duration and F0 range using the lme4 package in R (Bates et al. 2015). Example trails are shown below.

(2) *Wh*-question

A: 我等会儿要出去买饭。有没有人需要我顺路办事或者带饭的? 'I am about to go to buy my meal. Does anyone need me to run simple errands or to buy a meal on the way?'

B: 你可以帮忙带什么呢? 'What can you help me bring?'

(3) *Yes/no* question

A: (The leading context same as the one in the *wh*-question)

B: 你可以帮忙带什么呢? 'Can you help to bring something?'

**Our results** show distinction between declarative sentences and questions on the regions of *wh*-phrases and on the region of SFPs. This suggests that Mandarin speakers prosodically disambiguate *wh*-indeterminates. We also found very interesting and consistent patterns of duration and F0 range across four *wh*-phrase types. Unlike the on-focus lengthening effect reported in previous studies, in our study the last syllable of *wh*-phrases in both questions was shorter than that syllable in declarative sentences, especially when their *wh*-phrases were *what* (y/n:  $p < .001$ ) and *where* (y/n:  $p < .001$ ; wh:  $p < .001$ ). However, the SPFs (which immediately following the *wh*-phrases) in both types of questions were significantly longer than the SFP in declaratives ( $ps < .001$ ). Furthermore, the duration of SFPs was the longest in *yes/no* questions across four *wh*-phrase types rather than SFPs in *wh*-questions. The focus marking pattern in terms of F0 range was also consistent across four types of *wh*-phrases. When comparing with declaratives, the F0 range of statements tended to be wider than questions in the last syllable of *wh*-phrases, especially in *what* (y/n:  $p = .004$ ) and *where* (y/n:  $p = .008$ ; wh:  $p = .076$ ).

These patterns seem to suggest that the occurrence of SFPs specifically defines the sentence types, and this information requires the prosodic organization to comply in expressing the differences between questions from statements. In sum, these results suggest that the internal organization at different structural levels may interact with the prosody system.

## References

- [1] S.-Y. Kuroda, "Generative grammatical studies in the Japanese language," Doctoral Dissertation, MIT, Cambridge, MA, 1965.
- [2] Y.-h. A. Li, "Indefinite Wh in Mandarin Chinese," *Journal of East Asian Linguistics*, vol. 1, no. 2, pp. 125-155, 1992.
- [3] L. L.-s. Cheng, "Wh-words as polarity items," *Chinese Languages and Linguistics*, vol. II: Historical Linguistics, pp. 615-640, 1994.
- [4] S.-a. Jun and O. Mira, "A prosodic analysis of three types of wh-phrases in Korean.," *Language and Speech*, vol. 39, no. 1, pp. 37-61, 1996.
- [5] S. Ishihara, "Intonation and interface conditions," Doctoral dissertation, MIT, 2003.
- [6] Y. Kitagawa, "When we fail to question in Japanese," in *Proceedings of the 2nd workshop on prosody, syntax, and information structure (WPSI 2)*, 2007.
- [7] H. Truckenbrodt, "An analysis of prosodic F-effects in interrogatives: Prosody, syntax and semantics," *Lingua*, vol. 124, pp. 131-175, 2013.
- [8] J. Yon, "Meaning and Prosody of Wh-Indeterminates in Korean," Massachusetts Institute of Technology, Accepted.
- [9] F. Hu, "A prosodic analysis of wh-words in Standard Chinese," in *Speech Prosody*, Aix-en-Provence, France, 2002.
- [10] S.-i. Shyu and T.-l. Tung, "Taiwan Mandarin Wh-phrases and Prosody," *Studies in Prosodic Grammar*, Accepted.
- [11] Y. Xu, "A Tool for Large-scale Systematic Prosody Analysis," in *TRASP 2013*, Aix-en-Provence, France, 2013.
- [12] D. Bates, M. Mächler, B. Bolker and S. Walker, "Fitting Linear Mixed-Effects Models Using lme4," *Journal of Statistical Software*, vol. 67, no. 1, pp. 1-48, 2015.