The two sides of Wh-indeterminates in Mandarin: a prosodic and processing account
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Chapter 7  General Conclusion

This dissertation investigates the clausal typing in Mandarin and the licensing of Mandarin wh-indeterminates (wh-interrogatives and wh-existentials), by presenting diverse empirical evidence ranging from fine-grained prosodic studies to online sentence processing. In this chapter, I address the two research questions put forth in Chapter 1 by summarizing the main findings in each chapter. In section 7.1, I propose an extended clausal typing hypothesis in Mandarin. In section 7.2, I discuss the licensing environments of wh-existentials and wh-interrogatives. In the final section, I conclude this dissertation and discuss the relevance and implications of the current research for the future work.

7.1 The clausal typing mechanism

7.1.1 The main findings about clausal typing in Mandarin

As a wh-in-situ language, Mandarin has no wh-movement or reliable wh-particles to type clauses and hence we investigate whether prosody can function as a clausal typer. We scrutinize the prosodic analysis of wh-questions and wh-declaratives, which are string identical. The results of the production study (Chapter 2) demonstrate that prosody is utilized in differentiating the two clause types in Mandarin. To be specific, wh-declaratives differ from wh-questions in terms of prosodic properties already from the clause onset in duration. Wh-declaratives are prosodically longer than wh-questions in terms of word duration starting from the subject and the pattern reverses at the wh-word; wh-declaratives are lower in F0 and smaller in F0 range than wh-questions at the wh-word and there is a F0 range compression in the post-wh-word region in wh-questions. Furthermore, the results of the perception and the audio-gating study (Chapter 3) show that listeners not only make use of the prosodic cues to identify the two clause types accurately but also anticipate clause types by only listening to the clause onset (e.g. the gate only containing sentence subject). It suggests that the prosodic marking of different clause types functions like wh-particles or wh-movement, which we can count on in making an assessment and prediction about the clause types.

The findings about the effects of prosody on clausal typing are further supported by electrophysiological evidence found in the two auditory ERP studies on wh-questions and wh-declaratives and their manipulated incongruent conditions (Chapter 7). The (early) negative components found in the incongruent conditions (Declarative-Question) of both experiments confirm that the prosodic cues are 37 So far the findings that prosody can mark the clause type and thus listeners can identify and anticipate clause types are only based on the investigations of the ambiguous sentences, wh-questions and wh-declaratives respectively. One might wonder, will the same findings be extended to wh-questions and ordinary declarative containing noun phrases? Gryllia, Yang, Pablos, Doetjes & Cheng (submitted) has confirmed this by showing that prosody can differentiate wh-questions and declarative containing noun phrases and listeners can anticipate clause types based on prosody, just as in the case of wh-questions and wh-declaratives.

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utilized in online sentence processing and play an important role in clausal typing. Furthermore, it provides evidence that even at the sentence beginning (i.e. subject), listeners can already detect the clause typing incongruity by utilizing the limited prosodic cues, confirming that the findings of the audio-gating studies in Chapter 3 about the clause type anticipation have a neural correlate basis.

7.1.2 The extended clausal typing mechanism

According to Chomsky and Lasnik (1977: 445), “each clause must be identified as declarative (a declarative or relative clause) or interrogative (a direct or indirect question).” Given all the above findings on the effects of prosody on clausal typing in Mandarin, we make an extension based on the traditional Clausal Typing Hypothesis on wh-questions, repeated here “Every clause needs to be typed. In the case of typing a wh-question, either a wh-particle in C0 is used or else fronting of a wh-word to the Spec of C0 is used, thereby typing a clause through C0 by spec-head agreement.” (Cheng, 1991: 29). Our extended Clausal Typing Hypothesis is given in (1).

(1) Extended clausal typing hypothesis

Every clause needs to be typed. In the case of typing a wh-question, languages can have different ways to realize that. Languages can front a wh-word to the Spec of CP (wh-movement languages), or utilize a wh-particle (wh-in-situ languages with wh-particles), or/and utilize prosody to type the clause.

The above extended hypothesis raises another theoretical question. As prosody is often perceived as the PF level realization, how can it function as a clausal typer and be included in the early process before spell-out? We hypothesize that it is indeed in the process of narrow syntax that prosody starts to function and in this process, prosody is a relatively abstract concept that types the clause, without having all the details of the prosodic realizations as our production study shows. We term the clausal typer at this process as an “intonational Q-morpheme” following Cheng and Rooryck (2000) or simply an “intoneme” Q following Feng (2015) and Tang (2015). In the process of narrow syntax as represented in (2), we hypothesize that the intonational Q-morpheme/intoneme Q is inserted in C0, and has Spec-head agreement with the interrogative operator at Spec-CP.
But only at the interface level (syntax-prosody), the rules coming from phonology will interact with the information syntax conveys (including intonational Q-morpheme /intoneme Q), leading to the well-formed PF realization/prosodic markings. Further studies are needed for the complete theoretical analysis on the intonational Q-morpheme/intoneme Q before spell-out.

### 7.2 The licensing of wh-existentials and wh-interrogatives

Wh-words in Mandarin Chinese are “wh-indeterminates” as they can have interrogative, existential, universal, or free choice interpretations. The interpretations of wh-words are restricted to certain contexts where there is a licensor that can license the specific interpretations. In this dissertation, I mainly investigate the licensing environments and licensing evidence of two frequently used interpretations of Mandarin wh-words, wh-existentials and wh-interrogatives respectively, and the results are summarized as below.

#### 7.2.1 The licensing of wh-existentials in Mandarin

With respect to licensing of wh-indeterminates, Mandarin has no reliable particles like Japanese and Korean to license wh-indeterminates. Previous studies claim that Mandarin wh-existentials are only licensed by nonveridical contexts such as contexts containing negation or epistemic modality (Lin, 1998; Xie, 2007; Lin, Weerman & Zeijlstra, 2014; Huang, 2017). We provide evidence in Chapter 4 that wh-existentials can also be licensed in nonveridical contexts under certain conditions. To be specific, in Chapter 4 we find that if a wh-word in a sentence can be licensed as a wh-existential, the sentence normally has the following environments:

(3) i. Either the sentence contains a nonveridical operator (negation, questions, conditionals and epistemic modalities) that can license the wh-existential.

or ii. When the nonveridical contexts (i.e. containing future environments) are not able to license wh-existential or when the sentence is simply veridical, it needs a last resort licensor like diǎnr. Diǎnr provides the existential force in licensing the wh-existential in the VP when diǎnr cliticizes to the verb.
7.2.2 The licensing of wh-interrogatives in Mandarin

In Mandarin, when there is no overt licensor/operator, a sentence containing a wh-word is a wh-question with the in-situ wh-word licensed by the null interrogative operator (Q) at Spec-CP or C°, and thus obtains the interrogative force. This covert dependency between the null interrogative operator (Q) and the in-situ wh-word is investigated in Chapter 5, in which three self-paced reading studies on Mandarin wh-questions as compared with declaratives with indefinite noun phrase are reported. By comparing wh-questions containing simplex wh-phrases (‘who’) with declaratives containing indefinites (‘someone’), and by comparing wh-questions containing complex wh-phrases (‘which x’) with declaratives containing indefinites (‘an x’), we provide processing evidence of constructing a covert dependency between the in-situ wh-word and the interrogative operator (Q) at Spec-CP or C°. The higher processing cost we find in wh-questions than in declaratives support the hypothesis that a covert dependency is needed between the wh-phrase and the interrogative operator (Q) at Spec-CP or C°.

7.3 Conclusions and future work

This dissertation explores the licensing of wh-indeterminates in Mandarin, with a focus on the clausal typing of sentences containing wh-existentials and wh-interrogatives and the licensing of them, from the perspective of prosody and processing. The results of the production study and audio-perception/gating studies demonstrate that prosody can mark and type wh-questions, and listeners can anticipate clause types by utilizing prosody since the clause onset. Moreover, this dissertation uses electrophysiological measurement to investigate the fine-grained time course of clausal typing based on prosody during online sentence processing, the results of which show that prosodic information is immediately utilized in detecting clause type incongruities. On the basis of the empirical evidence, we propose an extended clausal typing hypothesis, explicitly recognizing the role of prosody in clausal typing and hence making the original clausal typing hypothesis more complete, cross-linguistically speaking.

With respect to the licensing of wh-existentials, this dissertation challenges the general assumption in previous studies that wh-existentials are licensed in nonveridical contexts only (Lin, 1998; Xie, 2007; Lin et al., 2014; Huang, 2017); we provide evidence and analysis that wh-existentials can be licensed in veridical contexts, when the preceding licensor of diǎnr (or gè) cliticizes to the verb as a clitic group. Regarding the licensing of wh-interrogatives/question words, the higher processing cost in reading wh-questions as compared with declaratives containing indefinites provides empirical evidence that a covert dependency is required between the wh-interrogative and the interrogative operator (Q) at Spec-CP (or C°), in processing a wh-in-situ question in Mandarin. Cross-linguistically speaking, a dependency is always needed in interpreting a wh-question, be it a wh-in-situ question like in Mandarin or a wh-movement question like in English.

For future studies, it is important to investigate whether prosody also plays a role in the clausal typing of wh-questions in other wh-in-situ languages (e.g. Bangla,
Vietnamese, among others). It is also important to give a detailed theoretical analysis about how intonational Q-morpheme/intoneme Q takes part in the derivation process before the spell-out of a sentence. Furthermore, although this dissertation investigates the licensing of *wh*-existentials and *wh*-interrogatives, the methodology and the research perspective (prosody and processing) can be extended to the licensing of other interpretations of *wh*-indeterminates (e.g. universal and free-choice interpretations).