Processing Filler-Gap Dependencies in Mandarin Chinese: An Effect of Language Exposure?

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PROCESSING FILLER-GAP DEPENDENCIES IN MANDARIN CHINESE:
AN EFFECT OF LANGUAGE EXPOSURE?

By

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Abstract

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Advisor: Professor Janet Dean Fodor

This study investigates how speakers of Mandarin Chinese process filler-gap dependencies in potentially ambiguous fronted wh-questions. The study recruited native speakers of Mandarin with different degrees of English proficiency. In the experiment, participants were first presented with a wh-in-situ question and then a wh-ex-situ alteration of it that has the wh-phrase fronted to the beginning of the sentence. Participants were asked to judge and rate whether the two sentences could express a similar meaning or not. The results show that the movement of the wh-phrase zai nali (‘where’) is generally accepted by Mandarin speakers, despite Mandarin being a wh-in-situ language by default, and that this movement is licensed by the focus marker shi (which can be deleted at PF). It also hints that Mandarin speakers might be in favor of an active filler strategy that has been found cross-linguistically. The findings also suggest that language exposure (English) could affect one’s acceptability judgments under the assumption that there is in fact a shared syntax available to both languages.
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1 Introduction

While wh-movement in Mandarin Chinese has been studied by various researchers in the past decades, a consensus has not been reached in terms of whether wh-movement is generally accepted or not. In line with the literature, judgments from native speakers seem to be in discrepancy as well.

A possible reason for the former is that the methodologies relied too much on the intuitions of individuals, which to some extent was less objective. As raised by Myers (2012), the study of Chinese linguistics has followed the tradition of heavily relying on the intuition of the linguist, which creates a problem when the language treated is no longer English, especially for international readers. That is, it is very difficult for non-Chinese speakers to confirm the linguists’ empirical findings. Thus, a psycholinguistic approach perhaps can provide a vantage point for resolving such differences, which is the method this study adopts.

As for the latter, with English being widely spread over the world as an integrated part of many education systems, it is intriguing to probe into whether its exposure has any effect on one’s native language. In some cases, an individual is exposed to both Mandarin and English at a very early stage of their lives; do these individuals develop differently in terms of their mental grammar than those who acquired English at a later stage? Will these two types of bilinguals (balanced and partial) display different judgments to structures that only one language has?

In short, this study aims to develop a better understanding of how parsers process wh-movement
structures in Mandarin as well as how exposure to English might affect one’s mental processes.

1.1 Research Questions

The primary inquiries of this study are as follows:

(I) How acceptable is the fronted wh- (zai nali ‘where’ adjunct) question to native speakers of Mandarin?

(II) Following (I), regardless of its acceptability, does the focus marker shi have any effect on acceptability judgments of these wh-ex-situ structures?

(III) Following (I), if they are acceptable, does the parser follow the active filler strategy that is seen cross-linguistically?

(IV) Does exposure to another language (in this case English) have an effect on one’s acceptability judgements in their native language (Mandarin), especially if the structure is not shared in the two languages?

2 Background

2.1 Wh-Movement in the Syntax of Mandarin Chinese

The study of wh-movement in Mandarin Chinese has been widely debated over the past four decades. Huang (1982) proposed that Mandarin does not have wh-movement at the surface level, but that there is
abstract movement at Logical Form (LF). This view positioned Mandarin as a wh-in-situ language, which differs from wh-ex-situ languages, such as English that move the wh-element to the beginning of a sentence.

Following Huang’s work, Tsai (1994) had a different position in terms of movement. He regarded overt movement possible, but to some extent restricted. Following WAHL’s (Weinberg, Aoun, Hornstein, & Lightfoot) assumption (p. 162), Tsai leaves the issue of whether overt wh-movement in Mandarin is possible or not an open case.

Much research that followed in which movement was accepted was analyzing fronted wh-phrases as either a focus or topic structure. Among the former, Hoh and Chiang (1990) made distinctions between base-generated topics and preclausal wh-phrases; gaps in the former construction were thought to be fillable while gaps in the latter could not be filled due to a trace effect via movement. This is demonstrated in the examples given by Hoh and Chiang in (1).

(1)
a. Zhangsan de yanchu ni zui ai kan ___
   Zhangsan POSS performance you most love watch
   ‘It is Zhangsan’s performances that you love to watch the most.’ (Hoh and Chiang 1990, (6))
b. Zhangsan de yanchu ni zui ai kan Baishezhuan
   Zhangsan POSS performance you most love watch The Legend of the White Snake
   ‘Among Zhangsan’s performances, you love to watch The Legend of the White Snake the most.’ (Hoh and Chiang 1990, (7))
c. [Shei de yanchu], ni zui ai kan ti?


who POSS performance you most love watch

‘It is whose performances that you love to watch the most?’

d. *Shei de yanchu ni zui ai kan **Baishezhuan**?

who POSS performance you most love watch **The Legend of the White Snake**

‘It is whose performances that you love to watch The Legend of the White Snake the most?’ (Hoh and Chiang 1990, (8))

The gap in the topic structure (1a) can be filled by the DP **Baishezhuan** as seen in (1b). On the other hand, due to the trace left by the wh-phrase shei de yanchu in (1c), (1d) is unacceptable, given that the DP cannot be in the same position as the trace.

Pan (2011) and others advocate the idea that fronted wh--phrases are topic structures. However, more recently, Pan (2016) supports the notion that wh-movement is indeed possible by differentiating between wh-topics and wh-foci through the “eventuality constraint” (p. 195). Direct objects of eventuality predicates cannot be extracted to become the focus of a sentence, while topics on the other hand can.

(2)
a. Shi [ni de yizhuo]i gongsi de laoban bu be\(^1\) you POSS clothing company POSS boss Neg xihuan ti like

‘It is the way you dress that the boss of the company doesn’t like.’ (Pan 2016, (5a))

b. *Shi [ni de gou]i wo zai gongyuan li

---

\(^1\) Due to the various ways researchers have glossed the marker *shi*, throughout this paper, I will provide instances of *shi* with the original gloss as labeled by the author and gloss examples of mine own as SHI for consistency.
‘It was your dog that I found in the park.’ (Pan 2016, (5b))

Examples in (2) are from Pan (2016), demonstrating that action verbs like zhaodao restrict the fronting of a focus as in (2b), while non-action verbs such as xihuan in (2a) do not. In turn, he categorizes four possible wh-ex-situ structures in terms of whether it is a topic or focus and whether the gap is through movement or if it is a gapless construction where the wh-element is base-generated. The four types along with Pan’s (2016) examples are shown in (3).

(3)

a. Type I extracted wh-topic
   Na yi bu dianying Zhangsan zui bu which one CL movie Zhangsan most Neg xihuan kan ____?
   like watch

   ‘Which is the movie that Zhangsan likes watching the least?’ (Pan 2016, (8))

b. Type II extracted wh-focus
   Shi na yi bu dianying Zhangsan zui be which one CL movie Zhangsan most bu xihuan kan ____?
   Neg like watch

   ‘Which is the movie that Zhangsan likes watching the least?’ (Pan 2016, (17))

c. Type III base-generated wh-topic
   Na ge guojia ni xihuan de da which CL country you like POSS big chengshi bu duo?
   city Neg many
‘Which is the country that you like which doesn’t have many big cities?’ (Pan 2016, (18))

d. Type IV base-generated wh-focus

<table>
<thead>
<tr>
<th>Shi</th>
<th>shei</th>
<th>de</th>
<th>biaoyan</th>
<th>dajia</th>
<th>zuotian</th>
<th>dou</th>
</tr>
</thead>
<tbody>
<tr>
<td>be</td>
<td>who</td>
<td>POSS</td>
<td>performance</td>
<td>everyone</td>
<td>yesterday</td>
<td>all</td>
</tr>
<tr>
<td>jiao</td>
<td>hao?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cry</td>
<td>good</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

‘Whose performance was it that everyone cried “Bravo!” yesterday?’ (Pan 2016, (19))

While there is no doubt of the clear distinction of the four types he proposes, the acceptability for these types are still in question, given that Mandarin is by default a wh-in-situ language. Pan claims that Type I is restricted to D-linked wh-elements, which leaves the status of non-D-linked wh-phrases unknown. In fact, in Pan (2014), he explicitly states three criteria for wh-topics (Types I and III): (1) the wh-phrase must be D-linked, (2) locality constraints are respected, and (3) the “episodic eventuality” constraint is obeyed.

Cheung (2014) resolves the focus vs topic debate to some extent by reanalyzing the structure and introducing what she labels as an Identificational Focus (IdentF), which “specifies an exhaustive set” (p. 395). To Cheung, fronted wh-questions are cases where IdentF is licensed, and therefore, are also exhaustive, which contrasts with wh-in-situ questions that do not express exhaustivity. Furthermore, these fronted constructions are not topic structures, given that they are incompatible with topic markers.

According to Cheung (2014), in fronted wh-questions, the focus marker *shi* and the wh-phrase are born within the same TP. Cheung follows Hoh and Chiang’s (1990) analysis, in which it is assumed that *shi* originates in the T head. *Shi* first raises to the Foc head to become a focus marker, which triggers the
wh-phrase to move to Spec FocP where it is licensed as an IdentF. Finally, the focus marker raises to the F head of an FP to c-command the wh-phrase. This last movement mirrors that of the need of focus particles (e.g. *zhi*, the translation equivalent of the English *only*) to c-command their focused elements as reported by Aoun and Li (1993). The structure is illustrated in Figure 1, which I have adopted in part from Cheung’s analysis.

Figure 1. Movement of *zai nali* and *shi* in a *where* adjunct question

In this study, I adopt Cheung’s analysis in terms of the structure of fronted wh-phrases.
2.2 Wh-Questions

Erbaugh (1992) describes Mandarin questions as rather “simple.” By substituting a noun with a wh-phrase, one can transform a declarative into an interrogative. This form resembles echo questions in English, where wh-phrases also stay in-situ, as shown in the comparison of (4a) and (4b).

(4)  
a. He told John what?  
b. Ta gaosu Yuehan *shenme*?  
   he told John what  
   ‘What did he tell John?’

Cole and Hermon (1994) contrast the typology of Mandarin questions with typical European languages that are wh-ex-situ and describes it as wh-in-situ, stating that the wh-phrase stays in its original position but exhibits the same functions as its European counterparts.

2.2.1 The Wh-Phrase Zai Nali

The wh-phrase *zai nali* can be considered as the translation equivalent of the English *where*. While Tsai (1994) leaves the general existence of wh-movement in Mandarin open, he does propose restrictions to certain wh-phrases. In the instance of *zai nali*, he regards it as an adjunct and that it should pattern with other adjuncts in Mandarin (when, why, and how) in terms of overt movement; that is, unlike arguments (who and what), adjuncts cannot undergo overt movement in syntax. Under this assumption, the only
possible wh-phrases that can demonstrate overt movement in Mandarin are who and what. However, we do see some of these adjuncts fronted in the reported literature (Hoh and Chiang 1990; Cheung 2014) as demonstrated in (5a-c), which renders the movement of *zài nālǐ* possible or at least debatable.

(5)

a. 
```plaintext
Shi [zai shenme shihou]i ni shuo tamen
FOC at what time you say they
Ш� jian guo mian?
meet PERF face
```
‘When was it that you said they met?’ (Hoh and Chiang 1990, (34))

b. 
```plaintext
Shi [zai nali]i Zhangsan ti kandao Mali
SHI at where Zhangsan see Mary ne?
Q
```
‘Where was it that Zhangsan saw Mary?’ (Cheung 2014, (19b))

c. 
```plaintext
Shi [weishenme]i ni ti yao zheme dui
SHI why you want thus toward wo?
me
```
‘Why is it that you want to treat me this way?’ (Cheung 2014, (19d))

2.2.2 The Focus Marker *Shi*

The *shi* marker only occurs in preverbal positions and cannot be postverbal (Huang 1988; Hoh and Chiang 1990; Cheung 2014). Examples from Cheung (2014) are provided in (6).

(6)

a. 
```plaintext
Shi ta zuotian zai xuexiao da le Lisi
```

In (6a-d), the *shi* marker occurs before the verb *da* in all instances, while in (6e), it appears after the verb, making it unacceptable.

When *shi* is at the edge of a sentence, it can focus the following phrase or the entire sentence as seen in (7a-b) from Pan (2016).

(7)

a. Shi [Focus wo] bu xiang qu kan zhe
   be I Neg want go see this
   bu dianying
   CL movie
   ‘It is I who does not want to see this movie.’ (Pan 2016, (4b))

b. Shi [Focus xia yu le] bu pian ni
   be fall rain PART Neg trick you
   ‘It is really the case that it is raining now, I am not tricking you.’
   (Lu 2000 as cited in Pan 2016, (4c))
In terms of its contributions in meaning, there are no interpretive differences with or without *shi* in wh-fronting constructions, according to native speaker judgments à la Cheung (2014). She regards the marker as surface-optional because according to her analysis, after it enters the numeration, it can be deleted at PF after the licensing of IdentF.

2.2.3 Questions with Two Potential Gaps

While Mandarin shares the same basic default word order with English (SVO), subtle discrepancies exist between them. Like English, the main clause comes before the embedded one; however, in terms of the base positions for AdvPs, Mandarin is a lot more restricted. In most cases, AdvP appears before the verb but after the verb’s subject as shown in (8) to (11).

(8) Frequency
*ta changchang hui jia kan mama*
He frequently go back home see mother
‘He frequently goes home to see his mother.’

(9) Manner
*didi xunsu de pao dao xuexiao*
younger brother quickly DE run reach school
‘My younger brother ran quickly to school.’
(10) Instrument

meimei yong beizi zhuang guozhi
younger sister use cup fill juice

‘My younger sister used a cup for juice.’

(11) Temporal

duaju mingtian hui shangba
uncle tomorrow will go to work

‘My uncle will go to work tomorrow.’

In Mandarin bi-clausal sentences, both verbs can be preceded by a locative adjunct as seen in

(12a). If either locative is substituted with the wh-phrase *nali*, it becomes an in-situ question as demonstrated in (12b-c).

(12)

a. Zhangsan zai gongsi shuo yao zai niuyue kaihui
   Zhangsan at work say want at New York hold a meeting
   ‘Zhangsan said he wanted to hold a meeting in New York.’

b. Zhangsan zai nali shuo yao zai niuyue kaihui?
   Zhangsan at where say want at New York hold a meeting
   ‘Where did Zhangsan say he wanted to hold a meeting in New York?’

c. Zhangsan zai gongsi shuo yao zai nali kaihui?
   Zhangsan at work say want at where hold a meeting
   ‘Where did Zhangsan say he wanted to hold a meeting at work?’

If we entertain the possibility that a wh-phrase can be situated in four different positions (edge of main clause, in-situ in main clause, edge of embedded clause, and in-situ in embedded clause) and that
each instance can be focused or not, there should be 8 structures possible as seen in (13a-h).

(13)

a. **Shi** zai nali Lisi shuo yao zhua hudie?
   
   ‘Where is it that Lisi said he wanted to catch butterflies?’ 
   
   (edge of main clause)

b. Zai nali Lisi shuo yao zhua hudie?
   
   ‘Where did Lisi say he wanted to catch butterflies?’

   (in-situ in main clause)

c. Lisi **shi** zai nali shuo yao zhua hudie?
   
   ‘Where is it that Lisi said he wanted to catch butterflies?’

   (edge of embedded clause)

d. Lisi zai nali shuo yao zhua hudie?
   
   ‘Where did Lisi say he wanted to catch butterflies?’

   (in-situ in embedded clause)

e. Lisi shuo **shi** zai nali yao zhua hudie?
   
   ‘Where is it that Lisi said he wanted to catch butterflies?’

f. Lisi shuo zai nali yao zhua hudie?
   
   ‘Where did Lisi say he wanted to catch butterflies?’

g. *Lisi shuo yao **shi** zai nali zhua hudie?
   
   ‘Where is it that Lisi said he wanted to catch butterflies?’

h. Lisi shuo yao zai nali zhua hudie?
   
   ‘Where did Lisi say he wanted to catch butterflies?’

Through Cheung’s (2014) analysis in Figure 1, we can explain the structures (13a) and (13b) as they are fronted wh-questions with and without the *shi* marker. (13c) can also be derived by the fact that the *shi* marker along with the wh-phrase can both stay in their original positions as seen in Figure 2.
In this case, there is no motivation for *shi* to move further up; given that this is a nonexhaustive in-situ question, there is no need to license an IdentF. (13e) and (13f) are also both possible, since the embedded clause can also have a left periphery that hosts an FP and a FocP, resembling that of the main clause as we saw in Figure 1. (13g) is strongly rejected by native speakers due to the fact that the *shi* marker cannot co-occur with an overt T head (*yao*). In other words, base-generated *shi* and overt tense markers should be in complementary distribution since they both originate in T and cannot occupy the same position. Finally, (13d) and (13h) are both acceptable given that they are both in-situ structures that only differ in terms of the position of the adverbial phrase. In this study, structures that resemble (13a-f) will be included as targets of the experiment.

Figure 2. *Zai nali* and *shi* in their original positions

```
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2.3 Filler-Gap Dependencies and the Active Filler Strategy

Frazier (1987) provided evidence from Dutch to support her claim of an active filler strategy during the parsing of sentences (Crain & Fodor, 1985; Frazier, 1987; Frazier & d’Arcais, 1989). Under this assumption, the parser is filler-driven when engaging in online processing. After the parser encounters a filler (a wh-element e.g. what), it drives the parser to look for an appropriate landing site (i.e., a gap position) that can be associated with the filler that has been held in memory.

(14) What do you think that John saw ____?

In (14) above, the filler (what) is the moved direct object of the verb, associated with the gap that follows saw.

Omaki, White, Goro, Lidz, and Philips (2014) investigated how adults process bi-clausal wh-questions with where in English and Japanese. An English example is given in (15).

(15) Where did Lizzie tell someone that she was gonna catch butterflies? (Omaki et al. 2014, (4a))

These questions are structurally ambiguous; parsers can associate the where with either the main clause VP or the embedded VP. In other words, the question could be asking either where the telling took place
or where the *catching* did. In line with the *active filler strategy*, in both English and Japanese cases, the filler (*where*) was associated with the first gap encountered, despite the fact that there may be another gap to follow. The word order of the two languages determined which clause was associated with the filler. In English sentences, the filler was associated with the main clause, which preceded the embedded clause, while in Japanese, the embedded clause was chosen, which preceded the main clause. This is demonstrated in (16) from Omaki et al.

(16)

*Doko-de* Yukiko-chan-wa *pro* choucho-o tsukamaeru-to itteta-no?
*where-at* Yukiko-Dim-Top she butterfly-Acc catch- Comp was telling-Q
‘Where was Yukiko telling someone that she will catch butterflies?’ (Omaki et al. 2014, (4b))

In general, little work has been done on filler-gap dependencies in Mandarin Chinese. Ng (2008) posits an *active gap strategy* for parsers when processing sentences with plausible and implausible decoy fillers. In her experiment, gap-first constructions like (17) were tested, where participants encountered a gap at the beginning of the sentence and anticipated a filler to follow.

(17)

ei nonghuaile jige wanju bingwei-shi xiaohaizi de baomu, gengxiaoxin
broke a-few toy not-CAU child DE nanny more-careful
‘Having broken a few toys did not make the child’s nanny more careful.’ (Ng 2008, (2a))
In this case, the parser has a strong tendency to associate the gap with the first filler encountered (xiaohaizi) without waiting for other potential candidates further down the sentence. This example is structurally the opposite of sentences that will be tested in the present study, which are filler-first, where fillers precede the potential gap positions as shown in (18) repeated from (13a).

(18)
(SHI) zai nali Lisi shuo yao zhua hudie?
SHI at where Lisi say want catch butterfly
‘Where is it that Lisi said he wanted to catch butterflies?’

To the best of my knowledge, there have been few studies that have established the existence of an active filler strategy in Mandarin for filler-first structures as illustrated in (18), other than Huang and Kaiser (2008), which looked at the dependencies of topic structures via a self-paced reading experiment. They found that the parsers actively searched for a landing site for the topic filler; that is, they were committed to the active filler strategy. However, the in-situ and ex-situ situations could not be compared, given that topics normally must move to the front of a sentence to become a topic. Furthermore, while fronted wh-phrases might be considered as topics, Huang and Kaiser’s study did not include the movements of wh-phrases.

2.4 The Present Study: Acceptability and Interpretation of Fronted Wh-Questions
This study investigates filler-gap dependency processes of bilingual adults via a sentence comprehension experiment in Mandarin Chinese. The structures of the target sentences are shown in (19).

(19)
Shi zai nali Lisi shuo yao zhua hudie
SHI at where Lisi say want catch butterflies?
‘Where is it that Lisi said he wanted to catch butterflies?’

This structure resembles the English sentences in Omaki et al. (2014) in that the fronted wh-phrase (zai nali) can be associated with two potential gaps. The first gap (gap 1) is located in the main clause before the VP (shuo) and the other one (gap 2) is before the embedded VP (zhua). If the parser associates the filler with the main verb shuo, the question would be asking about where the saying took place. On the other hand, if the filler is associated with the embedded verb zhua, then it would be asking about the location that Lisi wanted to catch butterflies in. While Mandarin Chinese is usually considered to be a wh-in-situ language, many arguments have been made for the possibility of moving wh-elements. One of the aims of this study is to seek confirmation of the existence of wh-moved structures through experimental work. The current study focuses on bi-clausal questions in Mandarin that have two potential locative adverbial phrase (AdvP) gaps.

3 Methods
3.1 Participants

This study recruited 39 native speakers of Mandarin Chinese from Manhattan and surrounding communities in New York City. Data from two participants were entirely excluded due to either having too much background knowledge about the experiment (n=1) or failing at more than 17% (6 out of 36 items) of the filler sentences (n=1). Furthermore, one of our participant’s RT data was excluded due to taking the wrong version of the experiment (simplified characters instead of traditional). Given that the study is a reading study, it was decided that this data should not be included in the final analysis.

The age range of the participants was between 23 and 36 years old with a mean of 27.1 (SD 3.37). The intent was to recruit potential native speakers who were still attending school either at the college or graduate level with various degrees of English proficiency. Table 1 provides a more detailed description of their demographics.

Table 1. Demographics of participants

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>37</td>
</tr>
<tr>
<td>Age (mean)</td>
<td>27.081 (SD 3.37)</td>
</tr>
<tr>
<td>Gender</td>
<td>15 male; 22 female</td>
</tr>
<tr>
<td>Handedness</td>
<td>35 right-handed; 2 left-handed²</td>
</tr>
<tr>
<td>Country of Origin</td>
<td>27 Taiwan; 10 China</td>
</tr>
<tr>
<td>Overall English Proficiency Rating of 1-3 (mean)</td>
<td>2.027 (SD .44)</td>
</tr>
</tbody>
</table>

² Although these two female participants reported that they consider themselves left-handed, they mentioned that they were taught to write in their right hands only.
The overall English proficiency ratings were based on the participants’ responses on their language background questionnaire with 3 being highly proficient and 1 being limited in terms of proficiency. The composite score (overall English proficiency rating of 1-3) is affected by their age of arrival in the US, length of residence in the US, main language(s) used in formal education settings, and age of acquisition of English. The reading aloud task (an excerpt from The Rainbow Passage found in Voice and Articulation Drillbook; Fairbanks, 1960) at the end of the language background questionnaire was a crucial criterion to differentiate partial bilinguals (henceforth referred to as bilinguals) and balanced bilinguals. Bilinguals that had less or no trouble with the passage were considered balanced.

3.2 Materials

3.2.1 Sentence Comprehension

The sentence comprehension task is divided into two parts: a practice session conducted by the experimenter and the main experiment administered on a laptop using the software E-Prime (version 2.0.10.356).

The practice session included five practice questions with detailed explanations after each question for participants to refer to (the practice booklet can be found in Appendix A). The experimenter asked participants to read the pair of sentences in each question and respond whether the two sentences could mean the same thing or not. That being said, the participants were told if they were to encounter
an ambiguous sentence (e.g. practice question 3), the pair should still be judged the same, provided that
the ambiguous sentence shares one of its meanings with the following sentence. After their first reply,
the experimenter explained that all pairs judged similar in meaning during the experiment should be
given a positive number (+1 to +3) and all pairs that expressed different meanings should be rated
negative (-1 to -3). The participants were also told that the numbers themselves represented how
confident they were in their judgements with 3 being the most confident and 1 being the least confident.
During the course of the practice session, if a participant had any trouble understanding why a pair was
judged with a certain rating, further explanations were given until the participant understood the
reasoning and gave verbal confirmation.

The main E-Prime experiment was conducted on an ASUS UX303L laptop. The experiment
included 54 items in total comprised of 18 target sentences and 36 fillers. The target sentences were
controlled for their syntactic structure as well as verb lengths. Verb lengths were considered due to the
fact that the verbs indicated the presence of potential gaps; that is, once a verb is encountered, the parser
is expected to associate the filler held in memory with the preverbal gap. Furthermore, complexities in
verb lengths might also be potential noise sources in terms of response time. Targets 1-16 shared the
same syntactic structure while targets 17 and 18 had a different gap position (as defined in 2.4)
associated with the wh-phrase. Table 2 compares the different types of targets.
Table 2. Summary of target stimuli

<table>
<thead>
<tr>
<th>Stimuli ID</th>
<th>Verb Length</th>
<th>Associated Gap Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>T01-T08</td>
<td>Disyllabic</td>
<td>1</td>
</tr>
<tr>
<td>T09-T16</td>
<td>Monosyllabic</td>
<td>1</td>
</tr>
<tr>
<td>T17</td>
<td>Disyllabic</td>
<td>2</td>
</tr>
<tr>
<td>T18</td>
<td>Monosyllabic</td>
<td>2</td>
</tr>
</tbody>
</table>

Target items T17 and T18 were included in the experiment to replicate the findings of a previous pilot study with the same (gap 2) syntactic structure. In that study, eight participants were asked to judge whether pairs of sentences could express the same meaning; a wh-question (with the wh-phrase in-situ in the main clause) was presented first, followed by a wh-ex-situ alteration of it that moved its wh-phrase to the edge of the main clause\(^3\). In the pilot data, 5 of these pairs were tested, and out of the 40 instances, only 2 were judged to mean the same thing. The implication was that the participants had an active filler strategy that made the wh-ex-situ sentence associate its wh-phrase to the first gap (gap 1) encountered, resulting in the two sentences expressing different things, given that the first sentence’s wh-phrase takes scope over only gap 2. The results of T17 and T18 in the present study will be presented in the discussion chapter.

Two versions of the experiment list were compiled to test the effects of the presence of the *shi* marker. In list 1, the *shi* marker was present in all of the odd numbered targets (T01, T03, etc.), while in list 2, all even numbered targets had the marker instead. In addition, to accommodate the differences in

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\(^3\) All target sentences in the pilot had the focus marker *shi* before the wh-phrase.
the writing systems between Taiwan and China, two versions of each list were designed: one in traditional characters and one in simplified ones. A full list of the experimental sentences is given in Appendix B⁴.

In E-Prime, the participant was first presented three screens of instructions, explaining what the questions would look like and how to respond, as well as reminding them what the rating numbers represent. During the experiment, before each pair of sentences, a fixation point would show up in the middle of the screen for one second. Following that, the first sentence (the wh-in-situ one⁵) would be displayed in the upper portion of the screen. Once the participant is done reading, he/she would press the SPACE bar and the second sentence (the wh-ex-situ one) would appear below the first one, along with a Likert-scale ranging from -3 to +3. After the participant has read the second sentence and has made his/her judgment, he/she should press one of the keys on the laptop that have been explicitly labeled with a rating number from -3 to +3.

3.2.2 Language Background Questionnaire

After the computer-based experiment, participants were asked to complete a questionnaire with 24 questions, mostly about their language experiences. At the end of the questionnaire, there was a passage

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⁴ The target sentences presented in Appendix B are in traditional Chinese characters, and the shi marker is present in all 18 targets.
⁵ This is only the case for the main targets 1-16. The wh-phrases in targets 17 and 18 have moved to the edge of the embedded clause, since zai nali appears before the T head yao. The reason for not keeping shi and the wh-phrase in-situ in the embedded clause was due to the fact that the shi marker was judged to be bad when appearing before a zai nali phrase (cf. 13g in 2.2.3). In order to maintain the comparison of a moved and unmoved pair, the structures in 13e-f were chosen for the experiment, where shi and the wh-phrase were at the edge of the embedded clause.
excerpted from The Rainbow Passage for them to read aloud. The entire questionnaire can be found in Appendix C.

3.3 Procedure

For each participant, according to their sequence of arrival, an ID number was assigned that would later be used for data analysis. Participants were first asked whether they were taught traditional or simplified characters and then given a practice booklet that matched their preference of character style. The experimenter would then conduct the practice session and ask if the participants had any questions. Following that, the participants were randomly assigned to one of the experimental lists (1 or 2), and then led into a sound proof room for the computer-based experiment. After finishing the main task, participants were asked to complete a language background questionnaire and share any feedback they had about the experiment. The entire session lasted around 40 minutes to an hour, and the participants were given $10 for participation and $5 for transportation at the end of the session.

4 Data Analysis and Results

4.1 Data Analysis

Analyses were performed on three dependent measures: the (-3 to +3) scale acceptability ratings, a binary version of the ratings produced by converting each negative rating value to 0 (Unacceptable) and
each positive value to 1 (Acceptable), and response times (RTs). The data consisted of responses to the 16 experimental sentences by the 37 participants, or in the case of the RTs, by 36 participants\(^6\). For the acceptability scale data and the RT data, linear mixed effects regression models were used, and for the binary acceptability data, logistic mixed effects models were used. The models were built with R (version 0.99.903) using the lme4 (Bates, Maechler, Bolker, & Walker, 2015) package. In the models, the absence or presence of the *shi* marker in the sentence was a fixed effect. The language group of the participant (monolingual, bilingual, balanced bilingual) was not used in the analyses because of the very small n’s (\(n_{\text{monolinguals}} = 3\), \(n_{\text{balanced bilinguals}} = 4\)). Participants were treated as a random effect, and a maximal random effects structure (Barr, Levy, Scheepers, & Tily, 2013) with random intercepts and slopes was used in the models. To assess the significance of the *shi* marker, a model containing the *shi* marker variable was compared to one having an identical random effects structure but without the *shi* marker variable as a fixed effect.

4.2 Results

Although language group comparisons are given in this section, it should be kept in mind that due to the limited number of participants in the monolingual and balanced bilingual groups, no group analysis was available to shed light on the differences between groups.

\(^6\) Nineteen participants were assigned to list 1 and 18 to list 2. Among list 1, 12 lists were in traditional Chinese characters and 7 in simplified. In list 2, 14 were in traditional characters and 4 in simplified (as noted above in 3.1, one participant’s RT data was excluded from the analysis).
4.2.1 Acceptability Scale Ratings

The analysis of the acceptability scale ratings showed no significant effect of the presence of the *shi* marker \((p < .05)\), though there is a numerical hint that the monolinguals have a preference for the presence of *shi*. Figure 3 shows the mean ratings with and without the *shi* marker, by language group.

![Image showing mean acceptability ratings with and without the *shi* marker by language group]

4.2.2 Binary Acceptability Ratings

In the analysis of the binary ratings, there was a significant effect \((\chi^2(1) = 4.8, p < .05)\) of the presence of the *shi* marker (see Table 3). The model’s estimate of the odds of an Acceptable rating when the *shi*
marker was absent was 14.0:1, or about 93.3% of the time. When the *shi* marker was present, the odds increased to 81.5:1, or about 98.8% of the time. In terms of the actual data, there was an overall 5% increase of the odds of an Acceptable rating when the *shi* marker was present. Figure 4 shows the proportions of Acceptable (and Unacceptable) ratings with and without the *shi* marker, by language group.

Table 3. Logistic mixed effects regression model for binary acceptability ratings

|                  | Estimate (log odds) | Std. Error | z value | Pr(>|z|) | Model Comparison χ²(1) |
|------------------|---------------------|------------|---------|---------|----------------------|
| Intercept (Without *Shi* Marker) | 2.6413              | 0.4755     | 5.555   | 2.78e-08 *** |                      |
| *With Shi* Marker                                      | 1.7593              | 0.9324     | 1.887   | 0.0592 .        | 4.80*                |

* p < .05
4.2.3 Response Times

Because the distribution of response times was found to be highly skewed (see Figure 5), the RTs were logarithmically transformed, resulting in a more normal distribution, as shown in Figure 6. The analyses used the log transformed values.
In the analysis of the log(RTs), there was a significant effect ($\chi^2(1) = 4.39, p < .05$) of the presence of the *shi* marker (see Table 4). The model’s estimate of the RT without the *shi* marker is 10,746 ms, while the estimate with the *shi* marker is 9,225 ms, representing a response time that is about 15% faster. (Note that these values differ from the means of the untransformed RTs, which are $M = 15,210$ (SD = 13556) without the *shi* marker and $M = 12,429$ (SD = 10980) with the *shi* marker, representing a response time that is about 18% faster). Figure 7 shows the mean untransformed RTs with and without the *shi* marker, by language group.
Table 4. Mixed effects regression model for log(RT)s

<table>
<thead>
<tr>
<th></th>
<th>Estimate (log(RT))</th>
<th>Std. Error</th>
<th>t value</th>
<th>Model Comparison $\chi^2$(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>9.28237</td>
<td>0.11940</td>
<td>77.74</td>
<td></td>
</tr>
<tr>
<td>(Without Shi Marker)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With Shi Marker</td>
<td>-0.15267</td>
<td>0.06764</td>
<td>-2.26</td>
<td>4.39*</td>
</tr>
</tbody>
</table>

* p < .05

Figure 7. Means of untransformed RTs with and without the shi marker by language group

5 Discussion

5.1 Wh-Movement and the Shi Marker as a Licenser

According to the results in 4.2.2, the fronted wh-constructions in this study were generally accepted by the participants. With or without the shi marker, the wh-phrase zai nali seems to be moveable to the
front of a sentence. If we look at this recurring structure in targets 1-16, out of 592 observations from 37 participants, 87.5% (518/592) of the time participants (across all language groups) accepted it. This brings empirical evidence to support the reported judgments about the movement for at least one of the Mandarin adjuncts out of its in-situ position as seen in (5a-c).

As for the *shi* marker, we see a speed boost in RTs when it is present in Figure 7. The findings here are aligned with Cheung’s (2014) analysis quite neatly. The deletion of the marker at PF would explain the slower response times when *shi* was absent. Therefore, I postulate that there is a processing cost for this deletion. Given that the *shi* marker resides high up in the left periphery of the main clause, when it is deleted, the parser may have to go back and reanalyze the structure when encountering the verb in the main clause. Analogously, just as in garden path sentences, the parser might have to go back to the beginning of the sentence and postulate that there is a *shi* marker in the F head (even though it is not overt) to confirm that the wh-phrase, which moved out of the gap, was indeed properly licensed.

During one of the debriefing sessions with a participant, it was mentioned that when the *shi* marker was present (at edge of the main clause), only the main verb reading was available. When *shi* was absent, the filler was able to be associated with both gaps. If we recall Cheung’s (2014) discussion of exhaustivity, this perhaps is explainable. When the *shi* marker was present, there was one reading, which is not surprising, given that all fronted wh-questions are exhaustive according to Cheung. But why is it that we get two readings when *shi* is deleted? I speculate that when *shi* is overtly present, it is clear to
the parser that it originates from the T head of the main clause and moves up through the Foc head and lands in the F head as seen in Figure 1\textsuperscript{7}. However, when it is deleted, there is no way for the parser to know for sure where \textit{shi} originates, given that \textit{IdentF} could be licensed by \textit{shi} in the embedded left periphery, meaning that \textit{shi} could have originated in the T head of the embedded clause instead. This would explain why our participant had two readings when \textit{shi} was deleted. This is not to say that exhaustivity is invalidated. The sentence is still exhaustive in the sense that, once the parser knows where \textit{shi} originates from, as before, one answer is expected. However, based on the surface structure of the question, there is perhaps no way for the parser to be sure of whether \textit{shi} originates in the main or embedded clause, resulting in the ambiguous nature of these two potential gap questions.

As plausible as this might seem, there is one assumption behind this explanation. Since \textit{IdentF} must be c-commanded by \textit{shi}, this means that both the marker and the wh-phrase must move from the edge of the embedded clause to the edge of the main clause through successive cyclic movement. While this is not uncommon for wh-phrases, whether focus markers can move in this fashion even at LF is unclear.

5.2 The Dual Gap Situation

For targets 1-16, the overall acceptability of the fronted structure discussed in 4.2.2 can also be carried over to shed light on the predictions of the \textit{active filler strategy} discussed in 2.3. Since 87.5\% of the time

\textsuperscript{7} Here I postulate that there is a locality constraint on \textit{shi} movement that is being respected when \textit{shi} is overtly present; that is, the parser would prefer the short distance interpretation over the long distance one, unless the short distance possibility is otherwise restricted by other cues.
participants accepted and expressed that the two structures had (or could have) similar meanings, it is logical to conclude that they were associating the filler with the first gap encountered.

The high acceptability rate of this gap 1 interpretation in the present data offers some encouragement for the hypothesis that Mandarin parsers may prefer the first gap. In that case, Mandarin parsers would be employing the same strategy found in English speakers.

On the other hand, targets 17 and 18 displayed results out of expectations and are presented in Table 5. It is worthwhile to note that due to the limited number of observations for this structure, conclusions drawn from them should be taken in this light.

Table 5. Means of ratings and RTs from targets 17 and 18

<table>
<thead>
<tr>
<th></th>
<th>Without Shi Marker</th>
<th></th>
<th>With Shi Marker</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rating</td>
<td>Acceptability</td>
<td>RT</td>
<td>Rating</td>
</tr>
<tr>
<td>T17</td>
<td>0.167</td>
<td>61%</td>
<td>17628.722</td>
<td>0.211</td>
</tr>
<tr>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td>19 (18)</td>
</tr>
<tr>
<td>T18</td>
<td>0.895</td>
<td>63%</td>
<td>13141.167</td>
<td>-0.222</td>
</tr>
<tr>
<td>n</td>
<td>19 (18)</td>
<td></td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

Recall that in the pilot study, the structure was strongly rejected, and that participants were following an active filler strategy. Here, regardless of the shi marker, the acceptability of this condition are all above or at least at chance level. This is very surprising, for it implies that perhaps more than half

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8 Here, the number represents the number of observations of a given target in different conditions. If a number is in parentheses, it denotes the number of observations of the RT data, which may differ from the rating and acceptability judgments.
the time our participants were able to inhibit the *active filler strategy* they followed in targets 1-16 and associate a filler with the second gap of a sentence.

For the sake of argument, if we take into account of the possibility that *shi* can originate in either the T head of the main clause or the T head of the embedded clause (as discussed in 5.1), then the results here are actually predicted, since the absence of an overt *shi* marker in fact grants the parser to maintain the ambiguity, given that it is unclear where *shi* originates. However, this does not explain why when *shi* was present, they did not hold on to the *active filler strategy* more faithfully, albeit we do see a higher reject rate compared to the without *shi* condition.

5.3 An Effect of Language Exposure?

Due to the small n’s in the monolingual and balanced bilingual groups, no group analysis is available. Nonetheless, while the implications here should be taken with a grain of a salt, they are still quite informative, given the patterns seen in 4.2. There is a sharp contrast between monolinguals and balanced bilinguals in terms of their acceptability ratings as demonstrated in Figure 3. Generally speaking, the more English one had, the more acceptable the structure was. Recall that Mandarin has been traditionally regarded as a wh-in-situ language that does not usually exhibit wh-ex-situ constructions; however, we do see that it is accepted in both the partial and balanced bilingual groups. Given that the participants were all recruited around the NYC area, it is reasonable to assume that even the partial
bilinguals could be leaning towards the balanced group in terms of performance. These differences are demonstrated in the binary version of the data as well. In Figure 4, we see that monolinguals are more conservative in their judgments even when the *shi* marker was present, while balanced bilinguals highly accepted the structure with or without the presence of the marker. In terms of reaction times, it took monolinguals much longer to process moved wh-phrases compared to bilinguals in general.

In Hernández, Bates, and Avila (1994), two types of processing strategies were mentioned among others for bilingual processing: *forward transfer* and *backward transfer*. The former is described as the bilingual using strategies in the L1 in their L2 while in the latter, the reverse is true; that is, strategies in L2 are applied in their L1. Liu, Bates, and Li (1992) found that bilinguals of Mandarin and English differed in processing strategies in terms of their age of exposure to English. In their study, they recruited both early and late bilinguals. The late bilinguals (LateCE or LateEC) were exposed to the second language after the age of 20 and displayed forward transfer. The early bilinguals were grouped into three sub groups based on their age of exposure to English. CEInfant included bilinguals who were exposed to English before the age of 4, the group CECChild was exposed between 6-10, and CETeens were exposed to English between the ages of 12-16. Backward transfer was found in the groups CEInfant and CETeen, while participants in CECChild were thought to perform like monolinguals in both their languages.

Among the four participants in my balanced bilingual group, one of them was exposed to English at
3 and another at 12, which would explain their backward transfer in terms of accepting the wh-fronted cases in Mandarin more readily. The other two bilinguals were exposed to English at 6 and 7, which expects them to be proficient in both languages if we take the Liu et al. (1992) position. If they have mastery of both languages, then why are they demonstrating backward transfer?

One possibility is that language dominance might have an effect in their strategies. In Fernández (2003), attachment of relative clause preferences in Spanish-English bilinguals were found to be related to language dominance; bilinguals who were more dominant in Spanish parsed more like Spanish monolinguals and vice versa. Perhaps the participants who were exposed to English at 6 and 7 were more dominant in their English, which resulted in them being more receptive of wh-movements in Mandarin.

We could also make an attempt to explain the performances of the balanced bilinguals through the concept of an integrated grammar. Through experiments in syntactic priming between languages, Hartsuiker, Pickering, and Veltkamp (2004) propose the shared-syntax account in which the grammar of a bilingual is not language specific and can be accessed by either language. In order for a structure to be shared, it has been emphasized that the word order of the two languages has to be more or less the same (Hartsuiker et al., 2004; Kantola & van Gompel, 2011).

Given that the word order of Mandarin and English is very close, except for some subtle differences as discussed in 2.2.3, it would not be surprising for the two languages to share the structure of a
wh-question. More specifically, the echo questions in English and wh-in-situ questions in Mandarin highly resemble each other in terms of word order as seen in (4) repeated here as (20).

(20)

a. He told John what?
b. Ta gaosu Yuehan \textbf{shenme}?
   he told John what
   ‘What did he tell John?’

If the two languages indeed share this structure, the only other information that needs to be stored separately would be whether wh-phrases are allowed to be fronted or not. Or in the case of the balanced bilinguals in this study, the choice with more freedom is taken (the English grammar of having both wh-ex-situ and wh-in-situ).

Based on the limited findings in this study, I suggest that the grammar of a bilingual is indeed shared or at least partially shared by both languages when the word orders generally resemble each other, resulting in the higher acceptance of fronted wh-questions in balanced bilinguals of this study.

5.4 Conclusions

From the results of the experiment, movement for the wh-phrase \textit{zai nali} seems to be generally accepted. The focus marker \textit{shi} is thought to license this movement, and if deleted, costs the parser as demonstrated in slower response times. It is hinted that Mandarin speakers might favor the \textit{active filler}
strategy when they encounter a potentially ambiguous wh-question, in which case they would associate the filler with the first gap encountered as seen cross-linguistically in English and Japanese. Finally, based on the subtle differences in judgments displayed by monolinguals and balanced bilinguals, it is possible that further research may confirm that exposure to English may have an effect on the mental grammar.

5.5 Limitations

While the design of the experiment was innovative, there are a few shortcomings that need to be addressed. For one, the data that was collected was built on an assumption. I assumed that since the first sentence was the wh-in-situ (default construction in Mandarin), participants would not or would seldom need to go back to re-read it. However, through the design that was implemented, it would be impractical to try to tease apart the time that was actually spent on comprehending the second (wh-ex-situ) in contrast with the first, based on the RTs that were collected since the first sentence was still available on screen for participants to refer to if needed. In other words, the RT collected reflects not only the time that was spent on the second sentence, but also, if any, the time that was used to go back to the first sentence as well as the time to judge whether they could express similar meanings or not.

A possible reason for seeing significance in the binary ratings and not the numeric ones is potential scale-edge avoiders; that is, for example, if the participant accepted the two sentences and wanted to
choose a positive number, he/she could avoid the scale edges +1 and +3 by picking +2, the more neutral choice in the middle. In terms of whether a pair of sentences could mean the same thing, it was a forced choice for the participants to choose a positive or negative number. In terms of how confident they were, they had the option to choose +2 or -2 if they wanted to avoid the edges of the scale. In the initial design of the study, a scale of -2 to +2 was ruled out for being too simple to reflect the fine degrees of confidence and a scale from -4 to +4 proved to be too complicated for some individuals that I consulted. However, in both of these scales, a forced choice would have been available, which might have yielded more significant results. In other words, there would be no middle ground (-2 and +2 as mentioned earlier) for participants to resort to, given the even number of choices for acceptable and unacceptable.

While verb lengths were controlled in the experiment, verb frequency was not, which might be a factor that could influence the processing of these fronted-structures.

The language background questionnaire could have been more refined to help capture subtle differences, especially in terms of the extent of language use, which is thought to be a crucial factor in acceptability judgments (Gita Martohardjono, personal communication).

5.6 Future Directions

This study only investigated one of the adjuncts (zai nali) that was debatable in terms of movement. Further investigations of the other adjuncts (e.g. when and why in Mandarin) will be needed to grasp a
more general view of the behaviors of Mandarin adjuncts as a whole. While acceptability judgments is the first step of understanding how parsers deal with syntactic structures, electrophysiological measures through ERP studies could prove to be a great addition to the behavioral data, given that it would be able to detect automatic responses to grammatical violations.
Appendix A

Practice Questions

練習題

(1)

媽媽說用紙袋裝水果嗎?

媽媽說用水果裝紙袋嗎?

●●●●●●●●●●●●●●
(-3) (-2) (-1) (+1) (+2) (+3)

不同 一致

這兩問句所問的事情是不同的。一個是用紙袋裝水果，一個是用水果裝紙袋。後者在正常的情況下是不太可能發生的。因此，應從-1 和-3 之間做選擇。

(2)

你知道今天什麼日子嗎?

今天什麼日子你知道嗎?

●●●●●●●●●●●●●●
(-3) (-2) (-1) (+1) (+2) (+3)

不同 一致

這兩問題所問的大致上一致，只是換個說法而已。故應從+1 和+3 之間做選擇。
(3)

誰看到女孩哭了？

誰看到女孩然後哭了？

●-●-●-●-●-●-●-●
(-3) (-2) (-1) (+1) (+2) (+3)

不同 一致

雖然第一個問句有兩個意思，但它依然可以表達第二句所表達的意思。也就是說，兩句都可以在問看到女孩然後哭了的人，而非看到女孩哭泣的人。所以應從+1 和+3 之間做選擇。

(4)

蘋果和生菜都是水果嗎？

生菜和蘋果都是水果嗎？

●-●-●-●-●-●-●-●
(-3) (-2) (-1) (+1) (+2) (+3)

不同 一致

這題所表達的意思是一致的，只有順序上的差別而已。故可以在+1 和+3 之間做選擇。
數字六是介於七與八之間嗎？
數字七是介於六與八之間嗎？

●--●--●--●--●--●--●
(-3) (-2) (-1) (+1) (+2) (+3)

不同 一致

此兩句所問的事情是不一樣的。第一句的答案為否，因為數字六不是介於七與八之間。而第二句的答案為是，因為七的確是介於六和八之間。因此，應從-1 和-3 之間做選擇。
## Experimental Sentences

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Language Background Questionnaire

Please complete this questionnaire to the best of your knowledge and add any information you feel might be relevant. If you have already participated in “Behavioral responses to grammatical violations” in the past, we will be unable to offer you compensation for participating in the study again.

1. Date ____________________________ 2. Learning English before age 5 ___
   after age 18 ___
3. Name ____________________________ 4. Participant number _________
   First Name          Last Name
8. Do you have normal hearing? If not, please briefly describe any difficulties

________________________________________________________________________________
9. Age of Arrival in the USA ______ 10. Length of residence in the USA (please list all periods of time if applicable. e.g. Fall 2014 - Spring 2015; March 2013 – May 2015)

________________________________________________________________________________
11. City and Country of origin__________ 12. Do you mix frequently with other speakers of Mandarin? If so, who are they (names are not needed)?

________________________________________________________________________________
13. Do you frequently travel to your country of heritage?______ When was your last visit? _______

________________________________________________________________________________
14. Do you frequently travel to any other Mandarin speaking country?____ When was your last visit? __

________________________________________________________________________________
Comments:
**Family Background**
15. Mother’s/Guardian’s primary Language/s

16. Father’s primary Language/s

17. Caretaker’s/nanny’s primary Language/s

**Your Education Background**
18. Please check all that apply and list the other languages, if applicable, on the right:
   A. Daycare       in English_____ in Mandarin_____ Other_____ not applicable_____
   B. Pre-school    in English_____ in Mandarin_____ Other_____ not applicable_____
   C. Elementary school  in English_____ in Mandarin_____ Other_____ not applicable_____
   D. Middle school: in English_____ in Mandarin_____ Other_____ not applicable_____

**Language History**
19. How old were you when you started to speak English?_____ Mandarin?_____
20. How old were you when you started to read in English?_______ Mandarin?_____
21. How old were you when you started to write in English?_______ Mandarin?_____
22. Please specify other languages learned and age of acquisition:______________
23. In what language do you feel you communicate better?______________
24. Please skim briefly and then read the following short passage out loud as naturally as possible.

   When the sunlight strikes raindrops in the air, they act as a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow. Throughout the centuries people have explained the rainbow in various ways. Some have accepted it as a miracle without physical explanation. To the Hebrews it was a token that there would be no more universal floods. The Greeks used to imagine that it was a sign from the gods to foretell war or heavy rain. The Norsemen considered the rainbow as a bridge over which the gods passed from earth to their home in the sky.
References


