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The Effect of Speaker Identity on the Interpretation of Chinese Pronoun Usage

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## ABSTRACT

Features of language that function at the syntax-discourse interface, such as null pronouns in Mandarin Chinese, pose major learning difficulties for second language (L2) speakers. The interpretation of ambiguous or otherwise ungrammatical speech, such as those that may result from learning difficulties at the syntax-discourse interface, differs depending on the identity of the attributed speaker. The present study investigates the impact of pronoun usage, in combination with speaker identity, on comprehensibility. In a self-paced reading study, native speakers (L1) of Chinese read sentences incorporating pronouns in grammatical and infelicitous conditions attributed to either L1 or L2 speakers. Significant reading time differences between L1 and L2-attributed sentences provide additional evidence of comprehension differences based on speaker identity independent of processing difficulties associated with spoken accent. We consider the implications of these findings in the larger accounts of accented speech processing. Null reading time differences between pronoun usage and context animacy otherwise suggest that infelicitous pronoun production does not impede comprehensibility, providing insight into learning objectives for advanced Chinese learners and educators.

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## Literature Review

Mastering a second language poses a variety of challenges for learners and educators. As second language (L2) speakers progress to advanced fluency, some language features prove more easily mastered than others. When L2 speakers engage in lengthy discourse and interpersonal communication, they must learn to manage and coordinate a wide variety of novel syntactic structures quickly. Facing these strenuous demands, many L2 speakers struggle to mirror subtle language features of the target language, causing their speech to differ from their first language (L1) speaking counterparts (Sorace, 2011).

According to the Interface Hypothesis, features of language that exclusively involve syntactic structure are fully acquirable among adult L2 speakers. However, features of language that require coordinating syntax and additional linguistic features, such as the lexicon or discourse, are significantly more difficult to acquire, and may never be fully acquirable. These interfaces are therefore subject to “residual” optionality from the influence of the speaker’s L1, as well as “emerging” optionality from the L2 (Sorace, 2005; Sorace & Filiaci, 2006), where optionality denotes linguistic variation that conveys a similar meaning with additional or different grammatical structures.

Discourse plays a unique role in communication, separate from syntactic structures, guiding a speaker’s organization and introduction of new information into the larger communicative context. Therefore, when L2 speakers encounter difficulty at the syntax-discourse interface, this may result in interpretive differences (Sorace, 2005). Because language features present at the syntax-discourse interface are particularly challenging to master, these

errors persist even among advanced L2 speakers, contributing to the subtle differences that result in less natural-sounding speech.

The use of null subjects as part of the larger pronominal system, which function at the discourse-syntax interface, requires a high level of competence with both the syntactic properties and discourse contexts that regulate felicitous use of the structure (Sorace, 2005; Sorace & Filiaci, 2006). Therefore, for L2 speakers of Mandarin Chinese, null pronouns may remain particularly challenging to master, even at advanced stages of proficiency.

### **Null Pronouns in Mandarin Chinese**

Pronouns are used to refer back to people or things previously discussed within a discourse context (i.e., he, she, and it). Several languages also permit null pronouns, which designate a previously named or implied entity without a lexical expression. In Mandarin Chinese, null and lexical pronouns are both acceptable in a variety of syntactic conditions. Null pronouns are grammatical in the object and subject position, as in examples 1 and 2, while overt pronouns may appear in both these positions as well as the indirect object, oblique object, and pivotal object positions.

(1) 小明昨天去看他的家人，所以 Ø 今天很累啊。 (*null pronoun in the subject position*)

Wo zuotian qu kan wo de jia ren, suoyi (wo) jintian hen lei a.

Yesterday Xiaoming went to see his family, so (he) is tired today.

(2) 小明昨天买了一本书，但今天谁都找不到 Ø 。 (*null pronoun in the object position*)



Wo zuotian mai le yi ben shu, dan jintian shei duo zhao bu dao (ta).

Yesterday Xiaoming bought a book, but today nobody can find (it).

When used in an acceptable position, null pronouns may play a special role in discourse by representing a non-specific subject or allowing the speaker to connect two phrases with the same topic in a process called topic-chaining, as in examples 3 and 4.

(3) Ø 考试之前, Ø 最好不一直学习, Ø 应该休息一下。 (*null pronouns as a non-specific subject*)

Ø kaoshi zhiqian, Ø zuihao bu yizhi xuexi, Ø yinggai xiuxi yixia.

Before (you) take a test, it is best if (you) do not continue to study, (you) should rest for a little.

(4) 小明今天非常忙, Ø 起床之后马上去上课, Ø 下午去打工。 (*null pronouns used in conjunction with topic-chaining*)

Xiaoming jintian feichang mang, Ø qichuang zhihou mashang qu shangke, Ø xiawu qu dagong.

Xiaoming was very busy today, after waking up (he) went right to school, in the afternoon (he) went to work.

Regardless of where the null pronoun appears, Chinese speakers rely on contextual and pragmatic cues to interpret null pronouns, rather than syntactic or semantic features, which are common in some European languages that also feature null pronouns (Li & Thompson, 1981).

Early research demonstrated that null pronouns most commonly appear in the subject position, rather than the object position (Li & Thompson, 1981). Additionally, this research showed that L1 speakers prefer null pronouns when referencing inanimate topics (Li & Thompson, 1981). Later, extensive research detailed patterns of null and overt pronoun usage among Chinese L1 speakers within various syntactic and discourse conditions when both pronominal forms are grammatically acceptable. In general, overt pronouns are generally avoided in discussions of inanimate topics, unless the repetition of the subject is required to disambiguate the referent (Li, 2014). Among L1 speakers, overt pronouns are favored in various contexts. Statements with human referents and singular subjects typically illicit overt pronouns, as well as conditions that switch referents and statements. Conversely, null pronouns are preferred within command and question structures, as well as structures that discuss one condition, such as topic-chained sentences (Jia & Bagley, 2002). However, the preferred conditions for null second person pronouns remain contested (Jia & Bagley, 2002; Li, Chen & Chen, 2012).

Across null pronoun languages, L2 speakers struggle to produce null pronouns in a native-like manner due to issues at the syntax-discourse interface (Sorace & Filiaci, 2006). While L2 speakers of Chinese do develop mastery of the syntactic properties of null pronouns, following the grammatical rules discussed above, less-proficient L2 speakers tend to encounter difficulty during discourse-based production tasks. In lengthy, narration-based tasks, such as when L2 speakers are asked to summarize a literary work or real-world event, L2 speakers produce null pronouns at significantly lower rates than native L1 speakers, across all L2 proficiency levels. Rather than omitting an overt reference when unneeded in discourse, similar to their L1 counterparts, L2 speakers continually over-use lexical pronouns. While L2 usage of

null pronouns increases as fluency increases, advanced L2 speakers continue to demonstrate significantly lower usage of null pronouns during narration-based tasks compared to their L1 counterparts (Polio, 1995). Therefore, unnatural over-production of lexical pronouns remains a barrier to native-like fluency for L2 Chinese speakers.

There are a number of factors that impact L2 Chinese speakers' production of null pronouns. In addition to level of proficiency, length of residence in a Chinese-speaking country is also positively related to increased native-like null pronoun production (Li, 2014). Native language background, namely native fluency in another null pronoun language, has also been shown to play a marginally significant role in null pronoun production, while the gender of the speaker may also be a factor, with women over-producing lexical pronouns more than men, on average (Li, 2014). Across these demographic and experimental factors, L2 speakers of all backgrounds demonstrate overproduction of lexical pronouns.

### **Accented Speech Processing**

Speaker interpretations of ambiguous or otherwise ungrammatical speech differs depending on if an utterance is attributed to an L1 or L2 speaker. Across experimental conditions, when the speaker is identified as an L2 speaker, participants tend to attribute production errors to the speaker's difficulty with production, rather than their own individual comprehension error. Evidence suggests that this error is subsequently "corrected" (Brehm, et al., 2019; Gibson et al., 2017; Lev-Ari, 2015).

Gibson et al., (2017) found differing comprehension trends among participants presented with implausible statements based on the accentedness of the speaker. After hearing an

anomalous utterance, where the position of the subject and object were such that the sentence was improbable, (e.g., the mother gave the daughter to the candle) participants were more likely to interpret the sentence completely literally when the speaker was identified as a native speaker of English, answering comprehension questions correctly, even if this led to an implausible interpretation of the sentence. When the speaker exhibited an accent, however, participants were more likely to interpret the sentence as containing an error, “correcting” the error before answering the comprehension question to match a plausible interpretation (e.g., the mother gave the candle to the daughter).

Similarly, Brehm, et al., (2019) found comprehension differences between L1 and L2 attributed sentences featuring grammatical errors. When presented with subject-verb agreement errors (e.g., *The sign on the taxi actually were lit up brightly*), native speakers of English in a series of experiments were more likely to select interpretations that corrected the subject lacking a plural marker when the sentence was attributed to an L1 English speaker, leading to an interpretation that involved a plural subject (i.e., more than one sign). However, when sentences were attributed to an L2 English speaker, this interpretation shifted, leading participants to select a singular interpretation of subject. Brehm et al. interpreted this finding as indicating the participants believed that the L2 speaker themselves selected the uncorrected verb. These results demonstrate that participants are more inclined to believe they made a reading error for L1-attributed speech, and that the speaker made an agreement error for L2-attributed speech. Moreover, given that participants interacted with written sentences, rather than spoken stimuli, these interpretative differences cannot be attributed to accent-related comprehension issues.

Additional research suggests that when interacting with utterances attributed to L2 speakers, participants rely more heavily on top-down information from context to anticipate

upcoming referents, rather than relying on the literal linguistic content presented in the speech itself. Lev-Ari (2015) presented participants with a lexical item selection task. Participants were prompted to select a group of items based on thematic constraints and the instructions of an L2 speaker, who read aloud a list of items to choose, all within a specific theme (e.g., Santa in a sleigh, a witch on a broomstick, man on a magic carpet), while promoting the participant to click on corresponding images on their computer screen. When selecting the fourth and final item within the theme, participants with high working memory capacity were more likely to reject the L2 speaker's instructions (e.g., ferry—which is also a mode of transport), selecting a competitor item that fit within a more immediate grouping (e.g., mermaid—which is also a mythical creature) at significantly higher rates than those who heard instructions from an L1 speaker. According to the authors, this suggests that participants may not listen closely enough to accented speech to notice errors in the first place. At the same time, lower intelligibility of L2 accented speech may have also led to the reliance on top-down information in this study.

Emerging research utilizing event-related potential (ERP) methodology also demonstrates online differences in processing ungrammatical speech based on the attributed speaker. ERP methodology measures neural response to linguistic stimulus, reflecting different facets of linguistic processing, such as when speakers encounter different types of grammatical or semantic errors. Hanulikova et al. (2012) demonstrated differing neural responses among Dutch participants who heard semantic anomalies and grammatical errors based on whether such anomalies were produced by L1 or L2 Dutch speakers. Gender agreement errors, which are common among L2 Dutch speakers, elicited a large P600 effect—a positive-going waveform that is generally thought to reflect difficulties with syntactic integration and reanalysis (Osterhout & Holcomb, 1992)—when attributed to an L1 Dutch speaker; yet, no effect was found when the

same error type was attributed to an L2 speaker. In contrast, semantic errors (i.e., I put a thick *evening* on my bed) resulted in similar N400 effects—a negative-going waveform that is generally thought to reflect difficulties with semantic integration (Kutas & Hillyard, 1980)—regardless of the speaker’s accent. The authors attribute these results to participants’ experience with Turkish L2 Dutch speakers, hypothesizing that previous knowledge of common gender agreement errors allows individuals to adjust their attempts to resolve errors, or simply fail to register these common errors at all.

In a study of English monolinguals with limited exposure to L2 speakers, Grey and van Hell (2017) replicated some results from Hanulikova et al. (2012), with participants demonstrating a neural response to both grammatical and semantic violations for L1 attributed speech, while only exhibiting a neural response to semantic violations for L2 attributed speech. However, when the ERP data of participants who correctly identified the L2 speaker’s Asian accent were compared with those who were not able to identify the origin of the accent, the authors demonstrated that the former group exhibited ERP sensitivity toward both the L2 speaker’s grammatical and semantic errors, while the latter group displayed neural sensitivity only towards the L2 speaker’s semantic errors. These results appear to directly contradict Hanulikova et al. (2012), who proposed previous experience with common errors made by a specific group of accented speakers resulted in differing neural effects. Nevertheless, these results further indicate that ability to identify a foreign accent may impact neural processing.

These conclusions are further complicated in an additional ERP study of Spanish speakers. Caffarra and Martin (2019) demonstrated that neural reactions to L2-attributed speech varies based on the commonality of the error. Gender agreement errors, which are common among L2 speakers, and number agreement errors, which are relatively uncommon, both elicited

P600 effects for L1-attributed speech. On the other hand, only the more common, gender agreement errors resulted in P600 effects for L2-attributed utterances.

While differences emerge between the specific effects observed within the studies discussed above, together these ERP results—especially when reviewed in tandem with behavioral studies on the processing of L2-accented speech—indicate that L1 and L2-attributed speech prompt different neural reactions. The goal of the current study is not to adjudicate between different hypotheses regarding the nature of these neural responses, but, rather, to better understand additional underlying differences in the online processing of L2 speech and whether there are limits to the impact that L2-attributed speech can have on L1 processing of grammatical anomalies.

### **Research Questions and Predictions**

The current research employs infelicitous null and lexical pronoun usage, in conjunction with speaker profiles, to examine how speaker identity impacts reading times. By focusing on null pronouns, which function at the discourse-syntax interface, the present study introduces a novel structure to the accented speech literature, examining a discourse-level feature that express naturalness preferences, rather than discrete, grammatical rules. At the same time, while previous research has principally employed listening-based methodologies (Gibson et al., 2017; Hanulikova et al., 2012; Grey et al., 2017; Caffarra et al., 2019; but see Brehm et al., 2019), the current research will deploy a reading-based task. This methodology will allow the present research to circumvent difficulties associated with auditory comprehension of accented speech.

To investigate the role of speaker identity on reading times, as well as how these affects vary across null pronoun usage patterns, we pose the following questions.

**Question 1:** Does speaker identity significantly impact the acceptability and comprehension of overt and null pronoun usage in Mandarin Chinese?

We predict that stimuli attributed to L2 speakers will result in faster reading times across all conditions, as previous research shows that L1 speakers are more likely to draw on previous content, or other contextual cues, to predict upcoming references and content in L2 production (Lev-Ari, 2015). Faster reading times for L2 stimuli would indicate that participants process L1 and L2 speech differently, engaging more deeply with the actual lexical content of L1 production to fully understand the stimuli, and, in contrast, depending more on top-down “good enough” methods to process L2 production at a faster rate.

**Question 2:** Does comprehension among these speaker groups vary across established preferences for different pronouns with animate versus inanimate subjects?

The present study will also employ inanimate subjects in conjunction with overt and null pronoun conditions, which are infelicitous in some contexts, to further examine the effect of speaker identity on L1 processing. In Chinese, null and overt pronouns are considered equally natural when used to refer to animate subjects. Indeed, previous research has found that L1 speakers display no difference in reading times for null and overt pronouns of animate subjects in canonical contexts with topic-chaining conditions (Yang et al., 1999). Therefore, we predict



that the use of null versus overt pronouns to refer to an animate subject would not produce a difference in reading times, regardless of the attributed speaker.

However, unlike preferences for animate subjects, null pronouns are considered significantly more natural when used to refer to an inanimate subject. In this case, overt pronouns are generally avoided unless the repetition of the subject is required to disambiguate the referent (Li, 2014). In the condition containing both an inanimate subject and overt pronoun, we anticipate slower reading times, indicating that participants have slowed to process an error produced by an infelicitous, unnatural use of an overt pronoun. This effect should be present in contexts attributed to both L1 and L2 speakers, but become increasingly pronounced in the former condition.

We predict slower reading times for L1-attributed stimuli with infelicitous features because previous research (Brehm et al., 2019; Gibson et al., 2017; Lev-Ari, 2015) shows that L1 speakers rely more heavily on top-down processing, and process L2 speech more superficially than L1 speech. Therefore, slower reading times for L1 attributed stimuli would indicate that participants are indeed less likely to notice errors in L2 attributed productions, and process this speech in a different, and less detailed way.

**Table 1 Predictions**

	<b>Overt vs. Null Pronoun and Animate Subject</b>	<b>Overt vs. Null Pronoun and Inanimate Subject</b>
<b>L1 Speaker</b>	=	>>
<b>L2 Speaker</b>	=	>

## **Methods**

### **Participants**

17 native speakers of Mandarin Chinese were recruited remotely through author contacts to serve as participants. Three participants were excluded, two due to technical data collection issues, and one due to heritage speaker status, such that the final number of subjects was 14 (10 female; 4 male). At the time of testing, 12 participants were located in the United States, with one in Canada and one in Europe. The average age of participants was 31, with a standard deviation of 9.2 years and a range of 21-50 years.

Each subject received a \$10 Amazon gift card as compensation for their participation in the 75-minute experiment.

### **Stimuli**

The experiment included 40 pairs of critical stimuli. As seen in examples (5) and (6), each pair of stimuli featured one condition with an animate subject, and one condition with an inanimate subject. While not completely structurally identical, stimuli within each pair exhibited similar grammatical features, and were approximately equivalent in length. Thus, there were 80 total critical sentences within the experiment. Each critical item discussed one topic over two clauses. Critical items also varied according to whether the second clause contained an overt or null pronoun.

(5a) 那位律师很受尊敬，她一场官司都没输过。 (*animate subject; overt pronoun*)

Nawei lüshi hen shou zunpei, ta yichang guansi dou mei shu guo.

“That lawyer is very well respected, she has never lost a case.”

(5b) 那位律师很受尊敬，一场官司都没输过。 (*animate subject; null pronoun*)

Nawei lüshi hen shou zunpei, Ø yichang guansi dou mei shu guo.

“That lawyer is very well respected, Ø has never lost a case.”

(6a) 那家律师事务所很受欢迎，它一场官司都没输过。 (*inanimate subject; overt pronoun*)

Najia lüshi shiwusuo hen shou huanying, ta yichang guansi dou mei shu guo.

That law firm is very well-respected, it has never lost a case.

(6b) 那家律师事务所很受欢迎，一场官司都没输过。 (*inanimate subject; null pronoun*)

Najia lüshi shiwusuo hen shou huanying, Ø yichang guansi dou mei shu guo.

That law firm is very well-respected, Ø has never lost a case.

All 80 pairs of critical items were used in both experimental lists; however, each item only appeared once, such that experimental items featured a null pronoun in one list, and an overt pronoun in the other. Each critical item was followed by a multiple-choice comprehension question with three response options, as in example (7).

(7) 谁一场官司都没输过?

Shei yichang guansi dou meiyou shu guo?

“Who has never lost a case?”

(A) 那位检察官

Nawei xiancha guan

“That prosecutor”

(B) 那位教授

Nawei jiaoshuo

“That professor”

(C) 那位律师

Nawei lüshi

“That lawyer”

The experiment also featured 40 distractor and 40 filler items. The distractor items included sentences with either null and overt pronouns, featuring overt pronouns in acceptable and unacceptable positions, as well as null pronouns in acceptable and unacceptable positions, as in examples (8) and (9), (based on Polio, 1995). Overt pronouns in acceptable positions appeared in the second half of each context. Each overt pronoun referred to either two previously mentioned, but ungrouped entities, or one of two previously mentioned entities, differentiating the subject by a gendered name. Conditions with overt pronouns in unacceptable positions

featured either overt pronouns in the direct object position, or the unnecessary repetition of an overt pronoun twice in the latter half of the context. Null pronouns in an acceptable position appeared in the object position of the second half of the context, whereas null pronouns in an unacceptable position appeared in indirect object position.

(8a) 老王和他的妹妹都是在北京长大的，但他们一点儿北京话都不会说。 (*overt pronoun; correct position*)

Lao Wang he ta de meimei dou shi zai Beijing zhangda de, dan tamen yidianr  
Beijinhua dou bu hui shuo.

“Lao Wang and his younger sister both grew up in Beijing, but they can’t speak  
the Beijing dialect.”

(8b) 那首歌是蒋太太最喜欢的，她整天听它\*。 (*overt pronoun; incorrect position*)

Na shou ge shi jiang taitai zui xihuan de, ta zhengtian ting ta\*.

“That’s Mrs. Jiang’s favorite song. She listens to it\* all day.”

(9a) 图书馆的材料都是免费的，学生可以随时用。 (*null pronoun; correct position*)

Tushuguan de cailiao dou shi mianfei de, xuesheng keyi suishi yong Ø.

“The materials in the library are free, students can use (them) at any time.”

(9b) 老寇找不到他的钱包，他很可能把忘在博物馆。 (*null pronoun; incorrect position*)

Lao Kou zhao bu dao ta de qianbao, ta hen keneng ba Ø\* wang zai bowuyuan.

“Lao Kou cannot find his wallet, he might have left (it)\* at the museum.”

Filler items exhibited one of three features, including a character error, the use of informal language, or the use of internet slang, as in examples (10), (11), and (12). Similar to the experimental items, each filler and distractor item was also followed by a multiple-choice comprehension question.

(11) 小明想要再自己的家开生日派对，但他的太太不同意。 (*character error*)

Xiao Ming xiang zai\* ziji de jia kai shengri paidui, dan ta de taitai bu tongyi.

“Xiao Ming wants to host a birthday party at\* his house, but his wife doesn’t agree.”

(12) 小梦考高考以前突然生病了，真是太倒霉啦! (*informal language*)

Xiao Meng kao gaokao yiqian turan shengbing le, zhen shi tai daomei **la!**

“Xiao Meng suddenly got sick right before the college entrance exam, what a pity!”

(13) 小丽不要参加相亲，她妈妈从来没有选过一个高富帅。 (*internet slang*)

Xiaoli bu yao canjia xiangqin, ta mama conglai meiyou xuan guo yi ge

**gaofushuai.**

“Xiaoli doesn’t want to go on blind dates, her mom never chooses any **ideal men.**”

Including all item types, each participant read 160 items in total. Of these 160 items, 107 were grammatically correct, while 53 were grammatically incorrect.

Following the design from Brehm et al. (2019), the experimental blocks each began with the introduction of a speaker profile. Within the experiment, there were two native and two non-

native speaker profiles. Each profile featured a picture and brief biography of the speaker, including her name, college major, and hobbies, and was accompanied by an audio recording of the speaker's biography. The passages for the two native speakers of Mandarin Chinese, “Fan Ai Ling” and “Li Jia Ying,” were recorded by two women from Mainland China with no significant regional accent. The recordings for the two non-native speakers, “Helen Jones” and “Nora Jackson,” were completed by two native English speakers who are both intermediate-advanced learners of Mandarin Chinese.

### **Materials and Procedure**

The experimental items were divided into eight blocks. Each block contained 20 total items, including 10 critical items, five fillers, and five distractor items. These items were presented in random order for each participant. The participants were permitted to take a brief rest in between each block.

All participants performed the experiment remotely on a personal computer. At the beginning of each block, the participants viewed the profile and image of one speaker, while listening to the speaker recording. Participants were instructed to read each sentence as naturally as possible. Each sentence was presented individually using the moving window technique (Just, Carpenter, & Woolley, 1982), with dashed lines representing the total length of the context. Each dashed line represented one character; additionally, no spaces appeared between words. As the participant pressed the spacebar to advance, the next word within the sentence appeared on screen, and the previous word disappeared. The participant then answered a multiple-choice comprehension question before proceeding to the next context.

At the end of the experiment, the participant completed a brief language background questionnaire on Qualtrics in which they self-reported various demographic information, such as age, gender, and educational background.



## Results

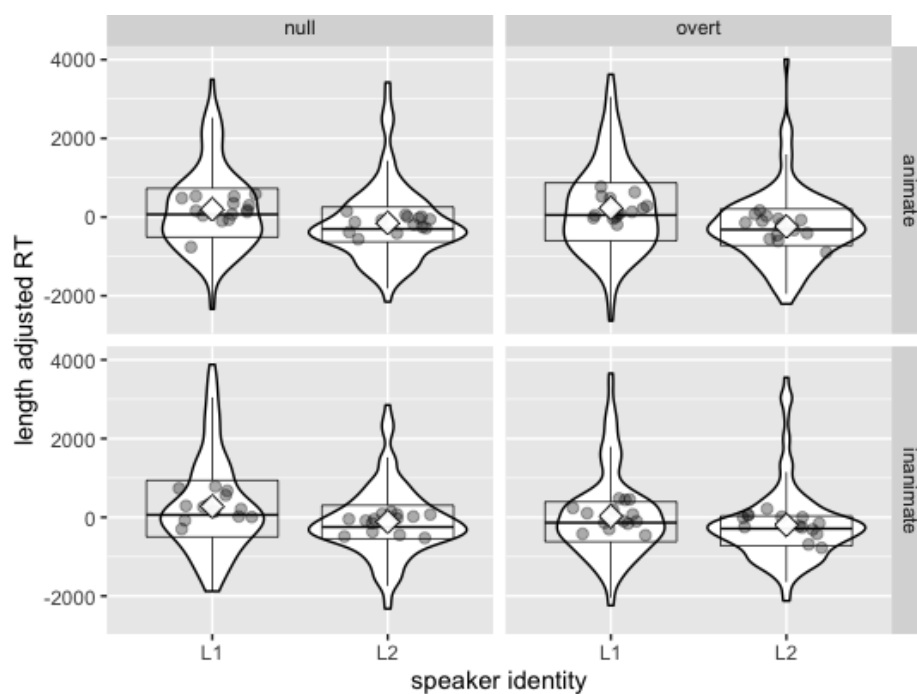
To account for length differences between critical stimuli, reading times were adjusted based on the total number of characters in each sentence prior to analysis, as in previous work (Sorace et al., 2014). For each sentence, the total reading time was computed by adding each word-by-word reading time. Then, residuals were calculated as a function of the number of characters in each sentence.

Based on initial observations of the data, summed reading times under 1,000 and over 100,000 ms were designated as extreme values and excluded from analysis, resulting in the removal of 30 observations. Additionally, for each participant, summed reading times totaling above or below three standard deviations from their personal mean reading time were excluded, removing 14 additional observations. Finally, 41 observations were excluded from analysis due to technical constraints with collecting reading time from sentences with more than 15 words.

The mean accuracy for comprehension question responses across all critical conditions was 97.23%. Reading times from 31 incorrect responses were excluded from analysis. Altogether, from 1,120 recorded reading times, 116 data points were excluded due to various reasons discussed above (10.4% of the data overall), such that the total number of analyzed trials was 1,004.

Table 2 contains the mean reading times for all participants within each condition, while Figure 1 shows the distribution of group and participant mean reading times by all three experimental conditions. The results demonstrate that trials attributed to L2 speakers were read consistently faster than trials attributed to L1 speakers, regardless of the pronoun or subject animacy. Within speaker conditions, there was no perceptible effect of pronoun usage or subject animacy.

**Figure 1** The distribution of response times within each condition



**Table 2** The mean reading times for all participants by condition

	<b>Pronoun</b>	<b>Animacy</b>	<b>Mean Reading Time (ms)</b>	<b>Standard Deviation (ms)</b>
<b>L1 Speaker</b>	Null	Animate	194	1046
		Inanimate	276	1196
	Overt	Animate	229	1135
		Inanimate	27.8	1059
<b>L2 Speaker</b>	Null	Animate	-151	955
		Inanimate	-113	874
	Overt	Animate	-241	907
		Inanimate	-193	958

The residualized values were subjected to repeated measures analysis of variance (ANOVA) with speaker identity (L1 vs L2 speaker), animacy (animate vs. inanimate), and pronoun (overt vs. null pronoun) as within-subject variables. These results revealed a significant effect of speaker identity, ( $F(1,13) = 24.37, p < .001$ ), with trials attributed to L2 speakers read significantly faster than those attributed to L1 speakers. Neither animacy ( $F(1,13) = .01, p = .942$ ) nor pronoun ( $F(1,13) = 1.77, p = .206$ ) were significant factors. Additionally, there were no significant interactions between variables (all  $ps > .11$ ).

## Discussion

The present study investigated whether differences in speaker identity (L1 vs. L2 speaker of Mandarin), in conjunction with infelicitous pronoun usage across differing animacy conditions, would result in significant differences in online processing measures among native speakers of Mandarin Chinese when they were reading Mandarin Chinese sentences. The results demonstrated a significant effect of speaker identity, with trials attributed to L2 speakers read consistently faster across all conditions. However, there were no significant effects of pronoun usage or subject animacy, with no perceptible reading time differences in those conditions.

The reading time differences between L1 and L2 speaker conditions observed in the present study are consistent with previous research, which demonstrates that L1 speakers are more likely to draw on contextual cues to anticipate the content of L2 speech, engaging more deeply with L1-attributed speech (Lev-Ari, 2015). The present results highlight the role of speaker identity in the comprehension of written text. While research employing listening-based methodologies cannot disregard potential confounding effects L2 speakers' spoken accent on processing differences (Gibson et al., 2017; Hanulikova et al., 2012; Grey et al., 2016; Caffarra et al., 2018), the current research replicates earlier findings that reveal differences in comprehension between written text attributed to L1 vs. L2 speakers (Brehm et al., 2019). This suggests that comprehension differences among L1 and L2 utterances cannot be explained by spoken accent alone. Additionally, the present study provides insight into the online processing of L2-attributed written speech, highlighting that processing differences are not only observable in comprehension task responses, as in previous research (Brehm et al., 2019), but also during reading tasks, and via online reading times, themselves. This further underscores that L1 and L2-attributed spoken and written utterances may be processed differently.

While the present study failed to identify perceptible online processing differences between conditions with null and overt pronouns, this does not fully indicate that no processing differences exist. We anticipated slower reading times for overt pronoun trials within inanimate conditions, as corpus research in Chinese reveals that overt pronouns are generally avoided with inanimate subjects unless the repetition of the subject is needed to disambiguate the referent (Li, 2014). Moreover, we predicted faster reading times in these conditions for L2 attributed speech because previous research (Brehm et al., 2019; Gibson et al., 2018; Lev-Ari, 2015) showcases L1 speakers' reliance on top-down processing in comprehending L2 speech, resulting in more superficial interactions.

In the context of Chinese null pronouns, the lack of reading time differences for animate vs. inanimate and overt vs. null pronoun conditions in the current study may be attributed to the brevity of experimental trials, which consisted of one sentence with no more than 15 words. Because the primary role of discourse is to direct the introduction of novel information into a larger communicative context, one sentence may not have been sufficient to detect interpretation differences at the discourse-syntax interface. The presentation of experimental conditions may have also negatively affected our ability to detect reading time differences. With one word (which may take the form of multiple characters in Chinese) displayed at a time, participants may have been able to resolve comprehension errors more quickly than could be detected within these parameters. To address these concerns, future research should focus on creating a more discourse-like experimental setting, while simultaneously allowing for more granular measurement of participants' reading times, by using more sensitive methodologies, such as eye-tracking or event-related potentials.

The sample size is an additional concern with the current results. The sample of 14 participants limits the statistical power of the data and precludes the detection of subtle reading time effects. Additionally, there are challenges associated with remote data collection that may have impacted results. Although the total time participants expended on the current experiment closely mirrors traditional laboratory-based experiments, ranging from 15 to 40 minutes, we acknowledge that in remote studies it is harder to control for the level of participant engagement with experimental materials.

The lack of significant comprehension differences between null and overt pronoun usage, regardless of subject animacy, provides key insight for classroom learning objectives and personal language development among advanced learners. While L2 speakers across null pronoun languages, including Chinese, continue to struggle with native-like null pronoun production into advanced learning stages (Sorace & Filiaci 2006; Polio, 1995), the current research may alleviate some concerns about the importance of null pronoun mastery in Chinese. As L1 speakers in the present study demonstrate no clear comprehension difficulties with overt pronouns in seemingly infelicitous production, L2 speakers can be confident that overt pronoun production will not impede the comprehensibility of their production. Therefore, those who have devoted class time or personal effort to mastering null pronouns can redirect their focus to other grammatical and discourse production learning objectives that may have greater impact on L2 speakers' comprehensibility.

## Conclusion

Language features present at the syntax-discourse interface, such as null pronouns in Mandarin Chinese, are particularly challenging for L2 speakers to master. The present study provides additional evidence for comprehension differences among L2-attributed written production that cannot be accounted for by spoken accent, while simultaneously suggesting that overt pronoun production in infelicitous conditions does not impede comprehensibility of L2 production. These results provide further evidence for the fundamental differences between the comprehension of L1 and L1-attributed utterances, and encourage educators as well as advanced learners to place greater emphasis on other learning objectives rather than null pronouns, which may have little influence on comprehensibility in shorter production contexts. The present research enhances current understanding of null pronoun functionality and L2 comprehensibility in Mandarin Chinese, and lays a foundation for future research to fully adjudicate the absence of comprehension differences between null and overt pronouns by pairing lengthier, more discourse-like materials, with increasingly granular online processing measures.

## Appendix A Critical Items

The experiment included 40 pairs of critical stimuli. Each pair of stimuli featured one condition with an animate subject (a), and one condition with an inanimate subject (b). Participants saw each condition with both a null and overt pronoun in separate blocks. Each item was accompanied by a comprehension question which appears in the table below.

Item Number	Animacy	Overt Pronoun Item	Null Pronoun Item	Comprehension Question
1a	Animate	犯罪发生的时候警察非常重要，他们会火速赶到现场。	犯罪发生的时候警察非常重要，会火速赶到现场。	谁会火速赶到现场？
1b	Inanimate	开车的时候安全带非常重要，它们可以防止出事故。	开车的时候安全带非常重要，可以防止出事故。	什么可以防止出事故？
2a	Animate	苹果公司的设计师懂很多东西，他们科学、艺术都有涉猎。	苹果公司的设计师懂很多东西，科学、艺术都有涉猎。	谁对科学、艺术都有涉猎？
2b	Inanimate	苹果公司的手机提供很多功能，它们无线充电、照相机都有。	苹果公司的手机提供很多功能，无线充电、照相机都有。	什么有无线充电和照相机？
3a	Animate	那位红娘还带着陈旧的观点，她现在都没有改。	那位红娘还带着陈旧的观点，到现在都没有改。	谁到现在都没有改？
3b	Inanimate	包办婚姻真是个陈旧的观点，它现在已经不合适。	包办婚姻真是个陈旧的观点，现在已经不合适。	现在什么已经不合适？



4a	Animate	老高是一九零四年在四川出生的，他二零零零年才死。	老高是一九零四年在四川出生的，二零零零年才死。	谁是二零零零年死的？
4b	Inanimate	美国的禁酒令是一九二零年颁布的，它一九三三年就废止了。	美国的禁酒令是一九二零年颁布的，一九三三年就废止了。	什么是一九三三年废止的？
5a	Animate	那位翻译者不太专业，她常常引起误会。	那位翻译者不太专业，常常引起误会。	谁常常引起误会？
5b	Inanimate	谷歌翻译不太准确，它常常引起误会。	谷歌翻译不太准确，常常引起误会。	什么常常引起误会？
6a	Animate	那个音乐家远近驰名，她在哪都很受欢迎。	那个音乐家远近驰名，在哪都很受欢迎。	谁在哪都很受欢迎？
6b	Inanimate	那首歌远近驰名，它在哪都很受欢迎。	那首歌远近驰名，在哪都很受欢迎。	什么在哪都很受欢迎？
7a	Animate	王太太不相信外星人的存在，她一直说什么证据都没有。	王太太不相信外星人的存在，一直说什么证据都没有。	谁一直说什么证据都没有？
7b	Inanimate	科学研究不支持外星人的存在，它一直说什么证据都没有。	科学研究不支持外星人的存在，一直说什么证据都没有。	什么一直说什么证据都没有？
8a	Animate	我的哥哥单身很久了，但他最近找到女朋友。	我的哥哥单身很久了，但最近找到女朋友。	谁最近找到女朋友？
8b	Inanimate	那家公司一直是私人企业，但它最近上市了。	那家公司一直是私人企业，但最近上市了。	什么最近上市了？
9a	Animate	小李现在吃得很清淡，但他变得很健康。	小李现在吃得很清淡，但变得很健康。	谁变得很健康？

9b	Inanimate	这里的交通规则最近变得很严格，但它好像很有效。	这里的交通规则最近变得很严格，但好像很有效。	什么好像很有效？
10a	Animate	那个助手一点儿用都没有，他每天都迟到。	那个助手一点儿用都没有，每天都迟到。	谁每天都迟到？
10b	Inanimate	他的车一点儿都没有用，它一直无法启动。	他的车一点儿都没有用，一直无法启动。	什么一直无法启动？
11a	Animate	他的儿子突然变得很高，他好像一夜之间就长大了。	他的儿子突然变得很高，好像一夜之间就长大了。	谁好像一夜之间就长大了？
11b	Inanimate	那棵树迅速变得很高，它好像一夜之间就长大了。	那棵树迅速变得很高，好像一夜之间就长大了。	什么好像一夜之间就长大了？
12a	Animate	那位律师很受尊敬，她一场官司都没输过。	那位律师很受尊敬，一场官司都没输过。	谁一场官司都没输过？
12b	Inanimate	那家律师事务所很受欢迎，它一场官司都没输过。	那家律师事务所很受欢迎，一场官司都没输过。	什么一场官司都没输过？
13a	Animate	圣诞老人是世界上最善良的人，他又慈祥又慷慨。	圣诞老人是世界上最善良的人，又慈祥又慷慨。	谁又慈祥又慷慨？
13b	Inanimate	圣诞节是一年之中最快乐的时候，它又和平又温馨。	圣诞节是一年之中最快乐的时候，又和平又温馨。	什么又和平又温馨？
14a	Animate	那位发言者显得很紧张，他一直说不出话。	那位发言者显得很紧张，一直说不出话。	谁一直说不出话？
14b	Inanimate	那支喇叭好像坏了，它一直吹不出声。	那支喇叭好像坏了，一直吹不出声。	什么一直吹不出声？

15a	Animate	那位越南厨师非常受欢迎，他又热情又有创意。	那位越南厨师非常受欢迎，又热情又有创意。	谁又热情又有创意？
15b	Inanimate	越南菜非常好吃，它又新鲜又辛辣。	越南菜非常好吃，又新鲜又辛辣。	什么又新鲜又辛辣？
16a	Animate	丽丽已经回家了，她明天早上才回来。	丽丽已经回家了，明天早上才回来。	谁明天早上才回来？
16b	Inanimate	那家店已经关门了，它明天早上才开门。	那家店已经关门了，明天早上才开门。	什么明天早上才开门？
17a	Animate	妹妹是服装设计专业的，她总是穿最时髦的衣服。	妹妹是服装设计专业的，总是穿最时髦的衣服。	谁总是穿最时髦的衣服？
17b	Inanimate	那个牌子以设计感著称，它总是生产最时髦的衣服。	那个牌子以设计感著称，总是生产最时髦的衣服。	什么总是生产最时髦的衣服？
18a	Animate	这对新婚夫妇看起来非常兴奋，他们到现在还在庆祝。	这对新婚夫妇看起来非常兴奋，到现在还在庆祝。	谁到现在还在庆祝？
18b	Inanimate	婚礼招待会看起来非常热闹，它到现在还没结束。	婚礼招待会看起来非常热闹，到现在还没结束。	什么到现在还没结束？
19a	Animate	新来的教授是北大毕业了，她好像很厉害。	新来的教授是北大毕业了，好像很厉害。	谁好像很厉害？
19b	Inanimate	那篇新的研究是北大发表的，它好像很厉害。	那篇新的研究是北大发表的，好像很厉害。	什么好像很厉害？
20a	Animate	昨天小明没事，但今天他好像生病了。	昨天小明没事，但今天好像生病了。	谁今天好像生病了？

20b	Inanimate	昨天我的手机没事，但今天它好像坏了。	昨天我的手机没事，但今天好像坏了。	什么今天好像坏了。
21a	Animate	他的室友很随和，而且他没有那么懒。	他的室友很随和，而且没有那么懒。	谁没有那么懒？
21b	Inanimate	那套房子很漂亮，而且它没有那么贵。	那套房子很漂亮，而且没有那么贵。	什么没有那么贵？
22a	Animate	传统中医师医非常博学，但他们太难找。	传统中医师医非常博学，但太难找。	谁太难找？
22b	Inanimate	地道四川菜非常好吃，但它太难找。	地道四川菜非常好吃，但太难找。	什么太难找？
23a	Animate	小明长得很快，他已经很高。	小明长得很快，已经很高。	谁已经很高？
23b	Inanimate	这个牌子发展得很快，它已经很成功。	这个牌子发展得很快，已经很成功。	什么已经很成功？
24a	Animate	哥哥已经在床上躺了三天，他还没起来。	哥哥已经在床上躺了三天，还没起来。	谁还没起来？
24b	Inanimate	那个咖啡杯已经放在桌子上三天了，它还没洗。	那个咖啡杯已经放在桌子上三天了，还没洗。	什么还没洗？
25a	Animate	推销员卖各种东西，但他们太热情。	推销员卖各种东西，但太热情。	谁太热情？
25b	Inanimate	台湾夜市卖各种东西，但他们太挤了。	台湾夜市卖各种东西，但太挤了。	什么太挤了？
26a	Animate	那位作者很多有意思，他最近变得很有名	那位作者很多有意思，最近变得很有名。	谁最近变得很有名？
26b	Inanimate	那本书很多有意思，它最近变得很有名。	那本书很多有意思，最近变得很有名。	什么最近变得很有名？

27a	Animate	那些商人在中国特别有名，但他们在海外还没开始生意。	那些商人在中国特别有名，但在海外还没开始生意。	谁在海外还没开始生意？
27b	Inanimate	那些商品在中国特别流行，但在海外还没打开知名度。	那些商品在中国特别流行，但在海外还没打开知名度。	什么在海外还没打开知名度？
28a	Animate	以前，猎豹很常见，但现在它们是一种濒危物种。	以前，猎豹很常见，但现在是一种濒危物种。	什么现在是一种濒危物种？
28b	Inanimate	以前，支票很普及，但现在它们并不常见。	以前，支票很普及，但现在并不常见。	什么现在并不常见？
29a	Animate	小莉的学生都充满创意，他们一定会很有影响力。	小莉的学生都充满创意，一定会很有影响力。	谁一定会很有影响力？
29b	Inanimate	那些的表演都充满创意，它们一定会影响力。	那些的表演都充满创意，一定会影响力。	什么一定会影响力？
30a	Animate	这里附近的兽医非常忙，他们一般不提供紧急服务。	这里附近的兽医非常忙，一般不提供紧急服务。	谁不提供紧急服务？
30b	Inanimate	这里附近的兽医诊所非常简陋，它们一般不提供紧急服务。	这里附近的兽医诊所非常简陋，一般不提供紧急服务。	什么不提供紧急服务？
31a	Animate	那位面包师傅很独特，他每天都卖不一样的甜点。	那位面包师傅很独特，每天都卖不一样的甜点。	谁每天都卖不一样的甜点？
31b	Inanimate	这个面包店很独特，它每天都卖不一样的甜点。	这个面包店很独特，每天都卖不一样的甜点。	什么每天都卖不一样的甜点？

32a	Animate	那对双胞胎什么时候都在一起，他们不喜欢被分开。	那对双胞胎什么时候都在一起，不喜欢被分开。	谁不喜欢被分开？
32b	Inanimate	这些女装不管什么时候都成套卖，它们不会分开出售。	这些女装不管什么时候都成套卖，不会分开出售。	什么不会分开出售？
33a	Animate	那位演员又高又帅，他总是表演动作片里的英雄人物。	那位演员又高又帅，总是表演动作片里的英雄人物。	谁总是表演动作片里的英雄人物？
33b	Inanimate	那个电影制片公司又大又活跃，它总是生产市场里最热门的动作片。	那个电影制片公司又大又活跃，总是生产市场里最热门的动作片。	什么总是生产市场里最热门的动作片？
34a	Animate	飞机技工都很努力，他们天天都需要加班儿。	飞机技工都很努力，天天都需要加班儿。	谁天天都需要加班儿？
34b	Inanimate	航空公司很谨慎，它们天天都要确保旅客安全。	航空公司很谨慎，天天都要确保旅客安全。	什么天天都要确保旅客安全？
35a	Animate	那位记者快被开除，她写作太多虚假的文章。	那位记者快被开除，因为写作太多虚假的文章。	谁写作太多虚假的文章？
35b	Inanimate	那个报纸快被禁止，因为它捏造太多虚假的文章。	那个报纸快被禁止，因为捏造太多虚假的文章。	什么捏造太多虚假的文章？
36a	Animate	这里的化学教授都很傲慢，但他们好像很受欢迎。	这里的化学教授都很傲慢，但好像很受欢迎。	谁好像很受欢迎？
36b	Inanimate	美国的知名大学的学费都很贵，但它们好像很热门。	美国的知名大学的学费都很贵，但好像很热门。	什么好像很热门？

37a	Animate	小琳在面试时大致表现得不错，但她好像还是显得一点不自在。	小琳在面试时大致表现得不错，但好像还是显得一点不自在。	谁好像还是显得一点不自在？
37b	Inanimate	工作面试大部分不错，但它好像还是显得有改善空间。	工作面试大部分不错，但好像还是显得有改善空间。	什么好像还是显得有改善空间？
38a	Animate	这里的服务员充满活力，他们一点都不偷懒。	这里的服务员充满活力，一点都不偷懒。	谁一点都不偷懒？
38b	Inanimate	这里的空气充满污染，它一点儿都不干净。	这里的空气充满污染，一点都不干净。	什么一点都不干净？
39a	Animate	这位新来的保姆非常特别，她激发孩子的想象力。	这位新来的保姆非常特别，善于激发孩子的想象力。	谁善于激发孩子的想象力？
39b	Inanimate	这些新生产的玩具非常特别，它们激发孩子的想象力。	这些新生产的玩具非常特别，可以激发孩子的想象力。	什么可以激发孩子的想象力？
40a	Animate	这个申请人太暴躁，他不适合担任这个公司的经理。	这个申请人太暴躁，不适合担任这个公司的经理。	谁不适合担任这个公司的经理？
40b	Inanimate	这个沙发太难看，它不适合放这个在客厅里。	这个沙发太难看，不适合放这个在客厅里。	什么不适合放这个在客厅里？

### Appendix B Filler and Distractor Items

The experiment featured 40 filler and 40 distractor items. Participants saw all 80 filler and distractor items. Filler items exhibited either a character error, the use of informal language, or the use of internet slang. The distractor items included sentences with either null and overt pronouns, featuring overt pronouns in acceptable and unacceptable positions, as well as null pronouns in acceptable and unacceptable positions. All filler and distractor items were accompanied by a comprehension question, listed below.

#### *Filler Items*

<b>Filler Type</b>	<b>Filler Item</b>	<b>Comprehension Question</b>
Character Typo	小明想要再自己的家开生日派对，但他的太太不同意。	谁想要开生日派对？
Character Typo	丽莲最近家了好老公，她的家人都很开心。	谁最近嫁了好老公？
Character Typo	纽约的公园都很漂亮，但这些游客都不想去逛逛。	纽约有什么漂亮的地方？
Character Typo	丽君还没人事她的新老板，但大家都说他很随和。	大家都说谁很随和？
Character Typo	那里的景色非常漂亮，所以他的朋友拍了很多照片。	谁拍了很多照片？
Character Typo	医生问凯莉她那里不舒服的时候，她就晕了过去。	谁问凯莉她那里不舒服？



Character Typo	妹妹整天在外面休息，但妈妈刚让她近来做作业。	谁让妹妹进来做作业？
Character Typo	以前，小李是音乐专业的，但他的父母让他学功成。	以前，谁是音乐专业的？
Character Typo	小王现在找新住的地方，但他的室友不喜欢附近的方子。	谁现在找新住的地方？
Character Typo	冯先生不喜欢听音乐，但是他的女儿给他送音乐会票。	谁不喜欢听音乐？
Character Typo	那位律师突然生病了，所以书记送她去看一声。	谁突然生病了？
Character Typo	老刘的家人都生他气，所以他好久没有练习他们。	老刘好久没有联系谁？
Character Typo	毕业以后，小莉的父母打算让她去医学院，但她的男朋友想跟她一起半岛外国。	谁打算让小莉去医学院？
Text Lingo	小丽不要参加相亲，她妈妈从来没有选过一个高富帅。	谁不要参加相亲？
Text Lingo	小曲不想要跟她的同学一起去看电影，他们都很重口味。	谁很重口味？

Text Lingo	她的表哥不喜欢洗澡，刷牙，大家都觉得他是个火星人。	谁不喜欢洗澡，刷牙？
Text Lingo	那个同学今天开跑车来学校，才让大家发现他是富二代。	谁今天开跑车来学校？
Text Lingo	梦太太今天特别难过，在商店碰到她丈夫的小三。	谁在商店碰到她丈夫的小三？
Text Lingo	大家都觉得老李是个骗子，他说的都是小废话。	谁觉得老李是个骗子？
Text Lingo	光棍节的时候，大哥不敢上网，因为买东西的吸引力太强了。	光棍节的时候，谁不敢上网？
Text Lingo	小明在学校有花花公子的名声，每个女孩儿都小心他。	谁有花花公子的名声？
Text Lingo	她跟她的家人很久以前就搬到加拿大，大家都想知道她到底来这里干嘛。	谁很久以前搬到加拿大？
Text Lingo	小红还没找到工作，所以她和弟弟都还靠爸妈吃饭。	谁靠父母吃饭？
Text Lingo	小莉不知道她啥时回来，老板有可能让她整天加班儿。	谁不知道她啥时回来？
Text Lingo	那个小伙常常来陪奶奶吃饭，大家都挺喜欢他。	大家都挺喜欢谁？

Text Lingo	小唐最近好像是个地地道道的宅男，他朋友说他一直留在家里，不要出去玩儿。	谁最近好像是个宅男？
Informal Language (Negation)	章老师常常让小孟不好意思，尤其是他问她考试准备好了没的时候。	谁问小孟她考试准备好了没？
Informal Language (Negation)	老板想知道他的报告看好了没，因为上次那位客户对于图形不太满意。	谁想知道报告看好了没？
Informal Language (Negation)	这个教室的条件太差了，所以老师不知道后面的同学听清楚了没她说的。	哪里的条件太差了？
Informal Language (Negation)	阿姨问小白饿了没，因为她想请大家进去吃晚饭。	谁问小白饿了没？
Informal Language (Negation)	伊宁刚刚说同学考完了没，跟她没有关系，她太累等他们。	谁说同学考完了没，跟她没有关系？
Informal Language (Exclamation)	那个饭馆儿的菜都很新鲜，旁边的面包店也特别好吃啊！	哪里的菜都很新鲜？
Informal Language (Exclamation)	这个宠物店的产品都不错，卖的狗也是特别可爱啊！	哪里的产品不错？
Informal Language (Exclamation)	这对夫妻今年庆祝了五十周年，他们的故事很浪漫哦！	什么很浪漫？

Informal Language (Exclamation)	他们家都很喜欢恶作剧，今天他的爸爸让他的朋友吓了一跳啦！	谁喜欢恶作剧？
Informal Language (Exclamation)	小梦考高考以前突然生病了，真是太倒霉啦！	什么是太倒霉了？
Informal Language (Classifier)	那个沙发非常好看，但服务员不肯打折。	谁不肯打折？
Informal Language (Classifier)	因为老白的女儿是吃素的，所以他买那个白菜。	谁要买那个白菜？
Informal Language (Classifier)	小美很喜欢这个歌，因为她的叔叔常常弹吉他给她听。	谁很喜欢这个歌？
Informal Language (Classifier)	妈妈整天在找她的老食谱，但姐姐已经把那个书拿走了。	谁整天找老食谱？

### *Distractor Items*

<b>Distractor Type</b>	<b>Distractor Item</b>	<b>Comprehension Question</b>
Null Pronouns, Acceptable Position	图书馆的材料都是免费的，学生可以随时用。	学生可以随时用什么？
Null Pronouns, Acceptable Position	老范很喜欢妈妈做的面，他都吃了。	谁喜欢妈妈做的面？
Null Pronouns, Acceptable Position	小丽的结婚请帖三个星期以前就发出去，大家都已经收到了。	大家都已经收到了什么？

Null Pronouns, Acceptable Position	周先生以前很想要买那幅油画， 但是另外一个人已经买了。	谁以前很想要买那幅油画？
Null Pronouns, Acceptable Position	那个电视节目特别好笑，年轻人 都很喜欢看。	年轻人都很喜欢看什么？
Null Pronouns, Acceptable Position	今天的数学考试非常难，只有 一个学生写完。	今天什么是非常难？
Null Pronouns, Acceptable Position	因为那个咖啡太苦了，所以明珠 不想喝。	什么是太苦了？
Null Pronouns, Acceptable Position	爷爷很喜欢他的家，所以他不想 出租。	谁很喜欢他的家？
Null Pronouns, Acceptable Position	俊俊刚买到这个帽子，所以弟弟 不可以戴。	谁刚买到这个帽子？
Null Pronouns, Acceptable Position	他已经写完哲学课的文章，但没 有人看得懂。	谁已经写完哲学课的文章？
Null Pronouns, Unacceptable Position	老刘的朋友一直说她要养动物， 所以老刘送给一只猫。	老刘送给谁一只猫？
Null Pronouns, Unacceptable Position	王太太唱歌唱得非常好，所以跟 丈夫在一起的时候她唱给听。	谁唱歌唱得非常好？

Null Pronouns, Unacceptable Position	美丽的爸爸每天早上很早就起床，所以一般是他送去学校。	爸爸一般送谁去学校？
Null Pronouns, Unacceptable Position	小梦的妈妈觉得他的房间太肮脏，所以她让整天收拾卧室。	谁觉得小梦的房间太肮脏？
Null Pronouns, Unacceptable Position	金晶上次没来上英文课，所以一个同学帮做作业。	谁上次没来上英文课？
Null Pronouns, Unacceptable Position	妹妹又偷了姐姐的衬衫，所以姐姐要她把拿过来。	谁又偷了姐姐的衬衫？
Null Pronouns, Unacceptable Position	小吴设计了一个很难看的海报，所以老师说绝不要把挂在墙上。	谁设计了一个很难看的海报？
Null Pronouns, Unacceptable Position	这张桌布很适合圣诞节的派对，所以阿姨要把铺在桌子上。	阿姨要把什么铺在桌子上？
Null Pronouns, Unacceptable Position	她的书都乱放在地面上，所以妈妈让她把摆在书架上。	什么是乱乱放在地面上？
Null Pronouns, Unacceptable Position	老寇找不到他的钱包，他很可能把忘在博物馆。	老寇有可能把什么忘在博物馆？

Overt Pronoun, Acceptable Position	小美跟她的男朋友一起去伦敦，但回来之后他们就分手了。	谁跟她的男朋友一起去伦敦？
Overt Pronoun, Acceptable Position	微微和她的弟弟都不喜欢看电影，所以他们不要去电影院。	谁不要来电影院？
Overt Pronoun, Acceptable Position	老王和他的妹妹都是在北京长大的，但他们一点儿北京话都不会说。	谁是在北京长大的？
Overt Pronoun, Acceptable Position	沈教授和她的助理教授都来开会，但她们什么都没说。	谁来看会？
Overt Pronoun, Acceptable Position	莫扎特和贝多芬都是很有名的古典音乐家，但他们都有自己的特点。	谁是很著名的古曲乐家？
Overt Pronoun, Acceptable Position	莉莉带她的弟弟来看比赛，但他觉得很无聊。	谁带她的弟弟来看比赛？
Overt Pronoun, Acceptable Position	黄太太好几次试试给赵先生打个电话，但她一直打不通。	谁试试给赵先生打个电话？

Overt Pronoun, Acceptable Position	孟医生带他的侄女到公园走一趟，所以她今天玩儿得很开心。	今天谁玩儿的很开心？
Overt Pronoun, Acceptable Position	海伦请彼得来参加她的生日派对，但他已经有约。	谁请彼得来参加她的生日派对？
Overt Pronoun, Acceptable Position	今天孟老师跟他的女儿一起去迪士尼，但他忘记带他的手机。	谁忘记带手机？
Overt Pronoun, Unacceptable Position	这个明星的样子很特别，她让观众觉得她又独特又时髦。	谁让观众觉得她又独特又时髦？
Overt Pronoun, Unacceptable Position	她和她的哥哥都是搞导游的，所以他们给人的印象是他们很健谈。	谁是搞导游的？
Overt Pronoun, Unacceptable Position	今天马克把他的手机摔坏了，所以他觉得他无法再使用。	谁今天把他的手机破坏了？
Overt Pronoun, Unacceptable Position	那个电影里的女主角很厉害，她遇到什么困难她都坚持到底。	谁是厉害？



Overt Pronoun, Unacceptable Position	电视的主持人很有趣，他什么时候都让人觉得他说的东西很好笑。	谁是很有趣的？
Overt Pronoun, Unacceptable Position	那首歌是蒋太太最喜欢的，她整天听它。	蒋太太整天听着什么？
Overt Pronoun, Unacceptable Position	他的奶奶昨天到纽约去看帝国大厦，但她迷路了没有看见它。	他的奶奶昨天到纽约去看什么？
Overt Pronoun, Unacceptable Position	这个电脑又慢又旧，所以没有人想要买它。	没有人想买什么？
Overt Pronoun, Unacceptable Position	小妹觉得这盘鱼看起来一点儿都不好吃，所以她的妈妈没有点它。	小妹觉得什么看起来一点儿都不好吃？
Overt Pronoun, Unacceptable Position	黎先生很喜欢台湾的夜市，他每天都去逛它。	黎先生很喜欢什么？

## Appendix C Speaker Profiles

Each experimental block began with the introduction of one speaker profile. There were two non-native and two native speaker profiles, each featuring a picture and brief biography of the speaker. The speaker biography was presented in Chinese to participants; an English translation is also provided below.

### 1. 诺拉杰克森 (Nora Jackson)

大家好，我叫诺拉杰克森！我今年二十二岁，我跟我的家人一起住在旧金山。我是经济专业的大学生。我有很多爱好，包含看电影和踢足球。

Hi, my name is Nora Jackson! I'm 22 years old and I live in San Francisco with my family. I'm a college student majoring in Economics. I have a lot of hobbies, like watching movies and playing soccer.



### 2. 海伦琼斯 (Helen Jones)

大家好，我叫海伦琼斯！我今年十九岁。我是在佛罗里达长大的，现在在这里上大学。我的专业是机械工程。我很喜欢运动，特别是打高尔夫和游泳。

Hi, my name is Helen Jones! I'm 19 years old. I was raised in Florida, and I'm now a college student here. My major is Mechanical Engineering. I really like sports, especially golf and swimming.



### 3. 范爱玲 (Fan Ailing)

大家好，我叫范爱玲！我今年十九岁。我从小到现在住在上海，在这里上大学。我的专业是哲学。有空的时候，我喜欢拉小提琴，读杂志。

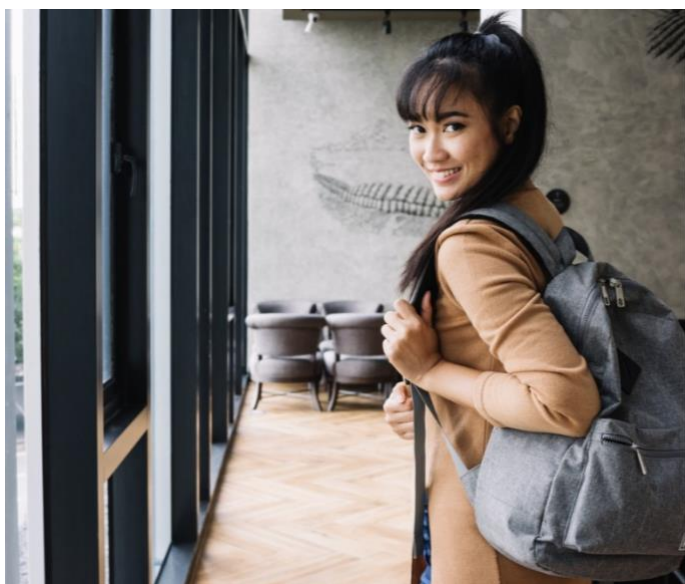
Hi, my name is Fan Ailing! I'm 19 years old. I've lived in Shanghai since I was young, and I'm a college student here. My major is Philosophy. In my free time, I like to practice violin and read magazines.



#### 4. 李家英 (Li Jiaying)

大家好，我叫李家英！我今年二十一岁。我是天津人，留在这里上大学。我的专业是化学。我不在学习的时候，很喜欢拍照片和看电视。

Hi, my name is Li Jiaying! I'm 21 years old. I'm from Tianjin, and I stayed here for college. My major is Chemistry. When I'm not studying, I like to take pictures and watch TV.



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Bachelor of Arts in Chinese Language and Culture

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- Granted full funding from the Department of Education Foreign Language Area Studies Fellowship to participate in renowned intensive language program, demonstrating advanced Chinese language proficiency.
- Completed one year of advanced Chinese language coursework in just eight weeks, with over 200 hours of direct language instruction, as well as strict adherence to a twenty-four hour language pledge.

**Cultural Exchange with Nanjing University** Nanjing, China

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- Traveled with a delegation of students for a two-week linguistic and cultural exchange, participating in intellectual dialogue with renowned international professors.
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**Research Assistant, Department of Linguistics**, University Park, PA

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- Collaborated with postdoctoral faculty to investigate the role of implicit learning in language comprehension and generalization, demonstrating understanding of quantitative research design and R statistical analysis.
- Awarded financial support and multiple grants, including the Judith Kroll Undergraduate Research Award, to fund research in dialectical variants as well as thesis experiments.
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**Research Assistant, College of Information Sciences and Technology**

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- Designed and deployed a remote adaptation of ongoing investigations into cloud user deletion models and methods.
- Interfaced with third-party vendors, review board committee members, and faculty across academic disciplines throughout the entire research process.

**Director of Content, TEDxPSU**, University Park, PA

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- Served as the primary recruiter and coach for ten keynote speakers at the annual TEDxPSU conference.
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- Guided student learning and analytical development of crime and terrorism-related course content.
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