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Cross-linguistic Influence in the Interpretation of Null and Overt Subject Pronouns by Heritage Mandarin Chinese Children

Shijia Yang and Kook-Hee Gil

1. Introduction

This paper investigates the cross-linguistic influence in the interpretation of null and overt subject pronouns by heritage Mandarin Chinese children with English as a dominant language. Previous research (i.e., production data: Serratrice et al., 2004; Müller, 2002; Müller et al., 2006; acquisition data: Argyri & Sorace, 2007; Serratrice, 2007) has focused on bilingual children acquiring a null-subject language and a non-null-subject language with the latter as the dominant language in their society. This research shows the influence of the overt subject pronouns in the non-null-subject language on the null-subject language. In other words, these bilingual children were shown to overuse the overt subject pronouns in their null-subject language in the context that requires the use of the null subject pronouns (an instance of a cross-linguistic influence). To date, few research focuses on the acquisition of null and overt subject pronouns by heritage Mandarin Chinese children with English as a dominant language. Given this, we use anaphora resolution of null and overt subject pronouns to test if there is any evidence of a cross-linguistic influence on heritage Mandarin Chinese children.

We tested anaphoric preferences for null and overt subject pronouns in the context of forward anaphora, as in example (1), where the antecedent appears before the pronoun, and in backward anaphora as in example (2), where the antecedent appears after the pronoun.

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- (1) Forward anaphora
Mama_i qin nühai_j de shihou, ta_{i>j/k} ¹/e_{i>j/k} zai ting yinyue.
mother kiss girl DE time she Prog listen music
‘When the mother_i kisses the girl_j, she_{i>j/k} /e_{i>j/k} is listening to music.’
- (2) Backward anaphora
Ta_{i>j/k} /e_{i>j/k} ting yinyue de shihou, mama_i zai qin nühai_j.
she listen music DE time mother Prog kiss girl
‘When she_{i>j/k} /e_{i>j/k} listens to music, the mother_i is kissing the girl_j.’
(The same-gender discourse referent is indicated by ‘k’.)

Previous studies on L1 Chinese anaphora resolution (Lust et al., 1996; Zhao et al., 2022) have shown that in forward anaphora, the most preferred antecedent of the null subject pronoun is the subject *mama*. This is the same for the overt subject pronoun *ta* as the most favored antecedent is also the subject *mama*. In backward anaphora, the top chosen antecedent for the null subject pronoun is still the subject *mama*; however, this is different for the overt subject pronoun *ta*, where the only preferred antecedent is the discourse referent indicated by “*k*”. This is known to be a Chinese-specific constraint (Huang, 1982, 1998; Huang & Lin, 2021).

English is a non-null-subject language and does not permit the omission of the subject pronoun in either the main clause or the subordinate temporal clause as in the equivalent Chinese constructions (1) and (2). For the interpretation of the overt subject pronoun in English, the subject antecedent is the most preferred antecedent as shown in (1) for forward anaphora and (2) for backward anaphora (Lust et al, 1996; Contemori et al., 2009).

The table below summarizes the interpretational preferences between Mandarin Chinese and English in terms of null and overt subject pronouns. It can be seen that the [Overt+Backward] condition is the only context where Mandarin Chinese and English show different antecedent preferences.

Table 1. Interpretational preferences for null and overt subject pronouns in Mandarin Chinese and English

	Null		Overt	
	Forward	Backward	Forward	Backward
Chinese	subject	subject	subject	discourse referent
English	NA	NA	subject	subject

(Note: The shaded cell indicates a different pattern from the rest conditions.)

¹ In (1), for example, we use **ta_{i>j/k}** to show the preference order for the overt subject pronoun *ta*: subject > object > discourse referent.

2. The current study

This study reports part of the data from a project on the heritage grammars of null and overt subject pronouns in Mandarin Chinese. The data reported here are from two groups of Chinese proficiency-matched monolingual and heritage Mandarin Chinese children. The proficiency levels were measured by a Chinese proficiency test - the Peabody Picture Vocabulary Test-Revised version for Mandarin Chinese (PPVT-R). The data were collected by the Picture Selection Task to discover if there is any evidence of a cross-linguistic influence from dominant English to heritage Mandarin Chinese in the interpretation of null and overt subject pronouns. The hypothesis and the prediction are as follows:

Hypothesis:

If English overt subject pronouns influence the interpretation of both null and overt subject pronouns in the interlanguage of heritage Chinese.

Prediction:

Heritage Mandarin Chinese children will overgeneralize the use of English overt pronouns to Chinese null and overt subject pronouns, and hence show consistent subject preferences across all anaphora conditions following the English pattern, even in the [Overt+Backward] condition.

2.1. Participants

Participants included 40 monolingual Mandarin Chinese children (MC) and 43 heritage Mandarin Chinese children (HC) with English as a dominant language in the UK. We also had 48 monolingual Mandarin Chinese adults (MA) as the baseline.

The monolingual children were from a kindergarten and an elementary school in Bengbu, Anhui Province, China. The monolingual adults were from universities in China. The native adults come from northern and central parts of China and speak the local dialects of the same Chinese dialect family. All monolingual participants speak Mandarin at school and local dialects at home, and had never been exposed to an English environment or been abroad before the experiments.

The heritage children were recruited from local Mandarin schools across the UK. They speak English at school and receive Mandarin Chinese input from their parents at home and a two-hour Mandarin course at weekends.

By adopting the Peabody Picture Vocabulary Test-Revised version for Mandarin Chinese, the child participants were grouped into Chinese proficiency-matched monolingual and heritage groups, as summarized in Table 2. HC1 in a lower proficiency level is compared with MC1, while HC2 in a relatively higher proficiency level is compared with MC2. It is worth noting that these child participants (MC and HC) are still of low Chinese proficiency levels.

Table 2. Basic information for Chinese proficiency-matched monolingual and heritage groups

Group (N)	PPVT-R score		Age	
	Mean (SD)	Range	Mean (SD)	Range
MC1 (19)	82 (6.45)	71-95	5;01 (0.66)	4;02-6;10
HC1 (28)	83 (9.20)	70-99	8;02 (2.09)	5;00-10;09
MC2 (21)	115 (7.07)	104-127	6;02 (1.19)	4;07-8;09
HC2 (15)	118 (9.28)	101-129	9;00 (1.67)	5;10-10;11
MA (48)	NA	NA	28;08 (4.71)	19;06-46;00

2.2. Materials

The Picture Selection Task was designed to test how participants interpret null and overt subject pronouns in forward and backward intra-sentential anaphora in Mandarin Chinese. As shown in (3) and (4), repeated from Section 1, the experimental items used in the current study are complex sentences consisting of a subordinate temporal clause marked by *de shihou* (“when”), followed by a main clause. Each experimental item contains two animate noun phrases (NP) with the same gender to serve as grammatically possible antecedents for the subject pronouns and a transitive verb (e.g., “kiss”, “praise”, “chase”).

(3) Forward anaphora

Mama_i qin **nūhai_j** de shihou, **ta_i** /*j_k* /*e_i* /*j_k* zai ting yinyue.
mother kiss girl DE time she Prog listen music
‘When the mother_i kisses the girl_j, **she_i** /*j_k* /*e_i* /*j_k* is listening to music.’

(4) Backward anaphora

Ta_i /*j_k* /*e_i* /*j_k* ting yinyue de shihou, **mama_i** zai qin **nūhai_j**.
she listen music DE time mother Prog kiss girl
‘When **she_i** /*j_k* /*e_i* /*j_k* listens to music, the mother_i is kissing the girl_j.’
(The same-gender discourse referent is indicated by ‘k’.)

There are 24 experimental items in total. By manipulating Type of Pronoun (null vs. overt) and Type of Anaphora (forward vs. backward), four experimental conditions for each item were created (see Table 3). The study adopted the 2x2 Latin Square design in which each item (e.g., one of the 24 experimental items) is rotated between participants within the 4 experimental conditions. Therefore, four experimental lists were created in which each participant answered 6 different items by each condition, making it a total of 24 experimental items for each child participant.

Table 3. The 2x2 Latin square design

Conditions	Number of tokens
a. [Null+Forward]	6
b. [Null+Backward]	6
c. [Overt+Forward]	6
d. [Overt+Backward]	6

We also included 24 control items for monolingual adults. For control sentences, a similar sentence structure without the subject pronouns was used in experiment lists for adults. The control items maintained the same predicates (e.g., “kiss/listen to music”), but changed the gender of the characters involved and added a third NP with gender-matched. An example of control items is given in example (5).

(5) Control sentence

Baba qin nanhai de shihou, yeye zai ting yinyue.
 father kiss boy DE time grandfather Prog listen music
 ‘When the father kisses the boy, the grandfather is listening to music.’

Each experimental item and control item was presented together with three pictures for participants to choose from, as shown in Figure 1. The three pictures differ in who is doing the action (e.g., “who is listening to music” in Figure 1). For instance, Picture 1 depicts that the subject antecedent - the mother - is listening to music while Picture 2 depicts the object antecedent - the girl, and Picture 3 - the external referent (discourse antecedent) not mentioned in the sentence - the grandmother.



Figure 1. Example of a picture set

2.3. Procedure

We used the PCIBex farm (Zehr & Schwarz, 2018) to run the Picture Selection Task. The experiments were conducted during the COVID-19 pandemic. While it was possible to test the MC groups one by one face to face, facilitated by their kindergarten and school, the MA and HC groups could only be tested remotely. During the experiment, the participants were instructed to choose one out of three pictures (Figure 1) (the coreferential reading with either “subject”,

“object” or discourse referent) that best matches the meaning of the sentence they were hearing.

2.4. Data analyses

Results were analyzed using the Generalized Linear Mixed-effects Model in R (version 4.2.1) with Proficiency Groups as the predictor, the target responses from the MA as the reference level and the responses from the HC and MC groups as the outcome.

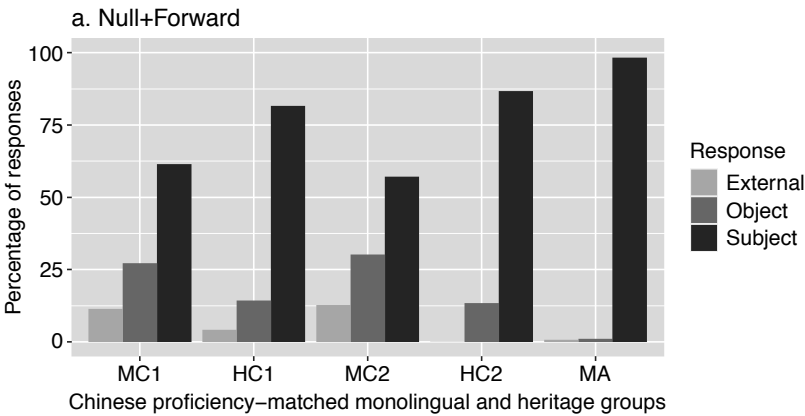
3. Results

3.1. Comparison of the three-antecedent distribution

Figure 2 presents the percentages of the three-antecedent distribution for proficiency-matched monolingual and heritage groups by experimental conditions. There are 4 graphs in Figure 2 and each graph corresponds to one experimental condition, respectively: a. [Null+Forward], b. [Null+Backward], c. [Overt+Forward] and d. [Overt+Backward].

In terms of the null subject pronouns in condition (a) and condition (b), both MC groups showed a certain extent of preference for the subject antecedent in forward anaphora (MC1: 61.40%; MC2: 57.14%), but this trend does not appear clearly in backward anaphora by MC1 (44.74%) and MC2 (40.48%). MC1 and MC2 also assigned much of their responses to the object antecedent as their second choice in both forward and backward anaphora.

The HC groups presented much stronger subject antecedent preferences in both forward anaphora in (a) (HC1: 81.55%; HC2: 86.67%) and backward anaphora in (b) (HC1: 66.67%; HC2: 76.67%), and even close to the MA baseline.



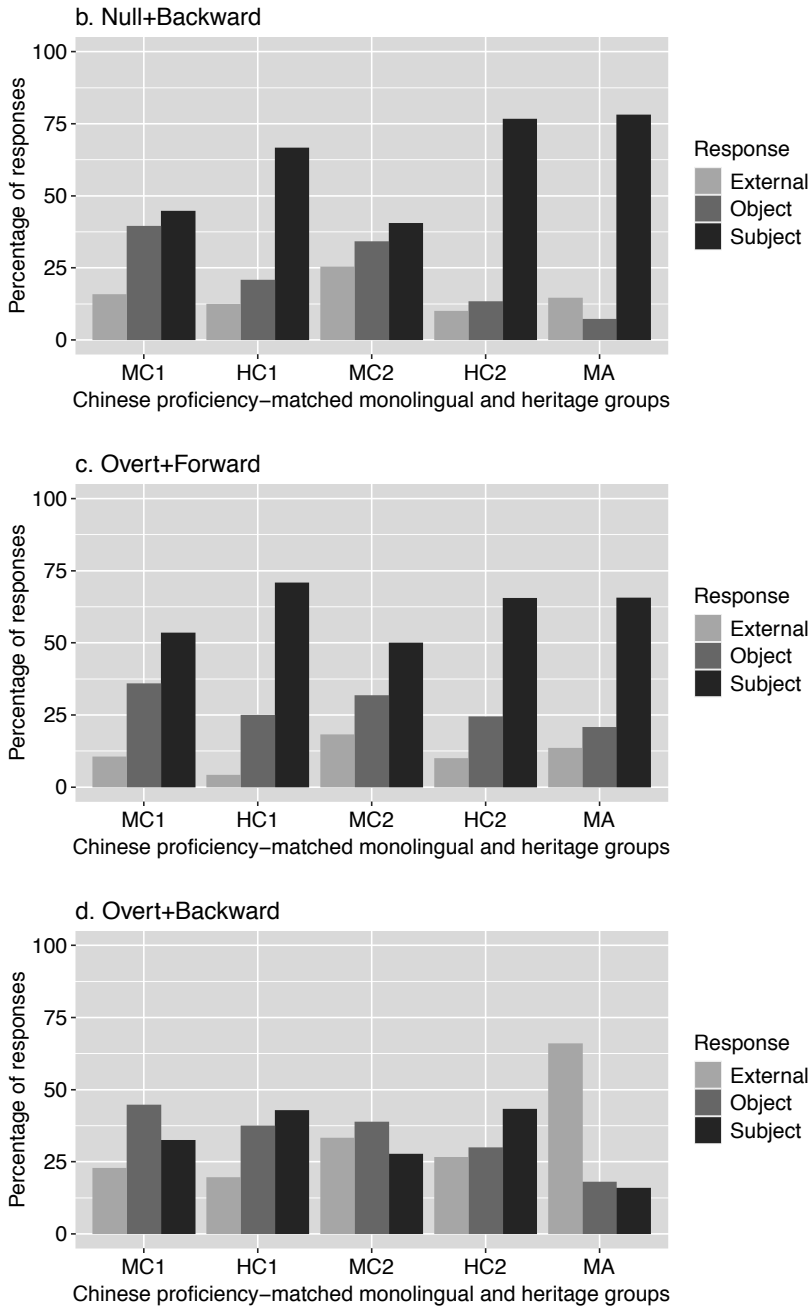


Figure 2. Percentages of the three-antecedent distribution for proficiency-matched monolingual and heritage groups by experimental conditions

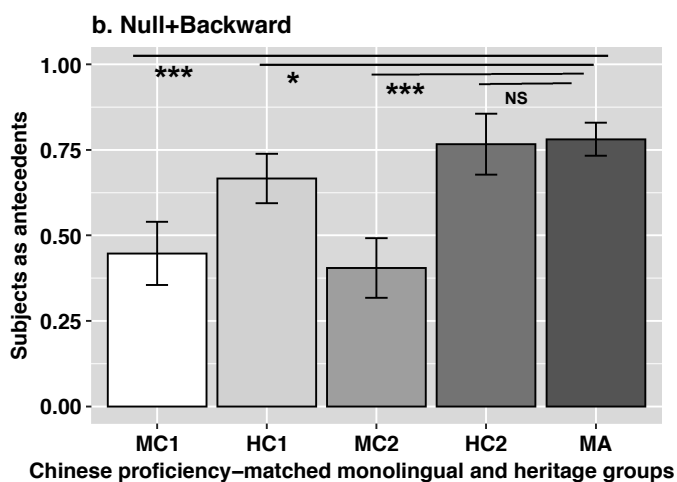
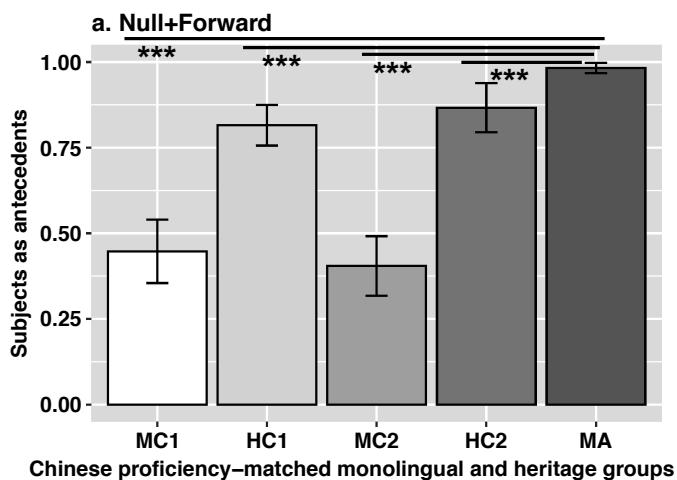
In terms of the overt subject pronouns in forward anaphora (c), MC1 and MC2 presented a gradient preference for the subject antecedent. However, in backward anaphora (d), it seemed that there were no clear patterns across the antecedents, but slightly more choices were given to the object antecedent (MC1: 32.46%; MC2: 27.78%). It is worth noting that from MC1 to MC2, there is an increase in the selection of the external referents - the discourse antecedents from 22.81% to 33.33%, and a decrease in the selection of both subject and object antecedents, showing the trend towards the target response from the baseline MA group.

A stronger subject preference can be observed in forward anaphora by HC1 (70.83%) and HC2 (65.56%), more than the MA baseline (65.63%). In backward anaphora, similar to the MC groups, the HC groups did not show a clear antecedent preference.

3.2. Target vs. non-target antecedent analyses

The Generalized linear mixed-effects model was conducted for the target antecedent analyses by conditions. Recall that the subject antecedent is the target response for 3 out of 4 conditions (a. [Null+Forward], b. [Null+Backward] and c. [Overt+Forward]), and for d. [Overt+Backward] conditions, the target response is the discourse antecedent. Given this, the responses were dichotomized into “subject” vs. “non-subject” for [Null+Forward], [Null+Backward] and [Overt+Forward] conditions, and “external” (discourse antecedent) vs. “non-external” (non-discourse antecedent) for [Overt+Backward] conditions. Different models were run by each condition, separately.

In each model, the predictor is Proficiency Groups with the MA group as the reference level (MC1 vs. MA; HC1 vs. MA; MC2 vs. MA; HC2 vs. MA), and the outcome is their responses. Participants and items were included as random slopes. Results were plotted in Figure 3 which shows the percentages of the selection of the target antecedent for proficiency-matched monolingual and heritage groups by experimental condition, and the statistical differences (denoted by asterisks ‘*’ or no significance (NS)) between each proficiency group with the MA baseline.



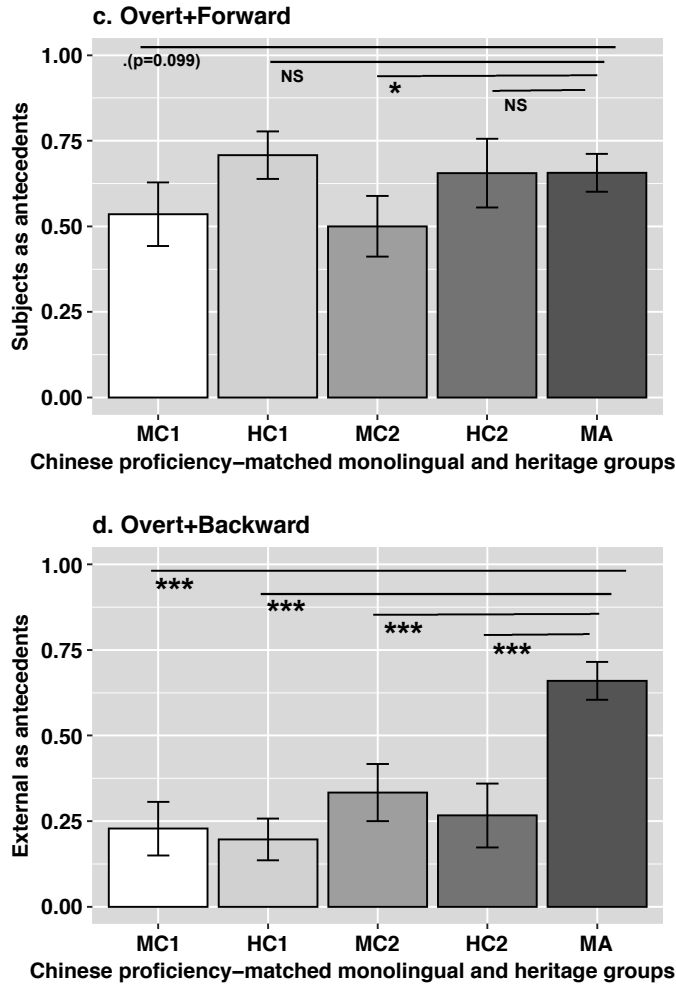


Figure 3. Percentages of the selection of the target antecedent for proficiency-matched monolingual and heritage groups by experimental conditions

In terms of the target antecedent preference, overall the HC groups showed much stronger subject preferences than their proficiency-matched MC groups in [Null+Forward], [Null+Backward] and [Overt+Forward] conditions, even close to those in the MA baseline. For the interpretation of the null subject pronouns, both MC groups performed statistically differently from the MA baseline in forward and backward anaphora; however, HC groups performed more like the MA baseline in [Null+Backward] conditions. As for the interpretation of the overt subject pronouns, both HC groups showed no statistical difference from the MA baseline in [Overt+Forward] conditions, better than their proficiency-matched

monolingual counterpart. For the [Overt+Backward] conditions, neither HC nor MC groups presented a clear discourse antecedent (target) preference.

4. Discussion and conclusion

This study investigates if there is any evidence of a cross-linguistic influence from dominant English to heritage Mandarin Chinese for the interpretation of null and overt subject pronouns. We hypothesized heritage Mandarin Chinese children would overgeneralize the use of overt subject pronouns to the null and overt subject pronouns in heritage Chinese. Hence, we predicted that heritage Mandarin Chinese children would present consistent subject antecedent preferences across all anaphora conditions following the English pattern, including the [Overt+Backward] conditions where Mandarin Chinese and English show different antecedent preferences. From the above results in Section 3, it can be observed that heritage children presented higher subject preferences in [Null+Forward], [Null+Backward] and [Overt+Forward] conditions than their proficiency-matched MC groups as predicted. In particular, in [Null+Backward] and [Overt+Forward], the percentages of the selection of the target response are closer and even beyond those in the MA baseline. However, for the [Overt+Backward] conditions, heritage children showed a much lower subject preference where the discourse antecedent is the target response as with MA. Hence, the results do not fully support our prediction as subject preferences do not show consistently across all conditions. A closer inspection of the [Overt+Backward] conditions in Figure 2 reveals that MC and HC groups pattern very differently. From MC1 to MC2, we can observe a gradual preference for the target discourse referent. However, from HC1 to HC2, there is still a linear bias towards the subject (non-target but English-like). The different patterns between the two child groups and the English-like response by the HC in [Overt+Backward] conditions suggest a cross-linguistic influence. Hence, we argue that their dominant language English influences the acquisition of heritage Mandarin Chinese and this is instanced by the influence of English overt pronouns on null and overt subject pronouns in the interlanguage of heritage Chinese.

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