STRONG Crossover AND Empty Categories IN L1 CHINESE SPEAKERS

By

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A forum paper submitted in conformity with the requirements for the degree of Master of Arts

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Abstract

The goal of this forum paper is to contribute control data as to how empty categories (ECs) in strong crossover constructions are interpreted in Chinese. Specifically, Huang (1982, 1984) and Xu (1986) differ in their opinion as to whether or not the empty object in the embedded clause can refer to the matrix clause: Huang (1982) believes that the empty category must always be a variable, while Xu (1986) rejects this and thinks that it is possible to have a non-variable reading, which means he believes the relation between the topic and the gap is not subject to the Strong Crossover Condition. The evidence from the truth-value judgment task showed that, on average, participants did in fact obey strong crossover constraints; thus suggesting that Huang (1982) is correct in his analysis. A histogram analysis, however, revealed that there may in fact be some degree of individual variation. This finding suggests that both theorists may in fact be correct in their hypotheses, and the interpretation of the empty category varies.
Acknowledgments

This project is a result of a twelve month adventure that would not have been completed – let alone started – if it were not for the help, support, and guidance of many wonderful people. I owe my deep thanks and gratitude to Eric Mathieu, my undergraduate mentor and supervisor, for providing me my first opportunity at independent research. It is doubtless that without his initial support and encouragement that I would have discovered my love of “the puzzle” and be the linguist I am today.

I also owe a heartfelt thank-you to my current supervisor and mentor, Ana-Teresa Pérez-Leroux. Every up-and-coming young researcher should be so fortunate to apprentice under this woman. I am very grateful for Ana-Teresa’s constant support, motivation, encouragement, and (above all) patience throughout this process. I also want to thank her for allowing me to make mistakes, and for always providing me with opportunities to learn more.

I offer a deep and sincere thank-you to my language consultant, Laifa Li. I am grateful for his patience in providing the translations of the stories and target utterances, and for being a constant source of knowledge about a language I knew little about when I first undertook this project.

Additionally, I would like to express my gratitude towards my MA colleagues: Andrei Anghelescu, Marisa Brook, James Byrnes, Erin Chen, Radu Craioveanu, Ross Godfrey, Isobel Marr, Christian Mutikainen, Madeline Shellgren, Michelle Stella, Brigid Thurgood, Holly Young, and Christopher Spahr. Thank you for your feedback, your participation in the early stages of the experiment, and your witty conversations.

I also owe a huge thank-you to three very wonderful and talented PhD students: LeAnn Brown, Safieh Moghaddam, and Julia Su. Thank you for always listening to my concerns,
offering to help with anything I needed, sharing funny stories, and (most of all) keeping me sane during periods of otherwise insanity.

I offer more thanks than words can ever express to: Laura, Jenna, Amy, Sarah, Miranda, Iain, Gwen, and Auntie Bonnie and Auntie Muriel. Thank you for reminding me that there is life outside the world of linguistics and for giving me opportunities to have some good-old-fashion fun. Thank you also for your constant understanding and unaltering support.

Last, but definitely not least, I wish to thank my mom. Thank you for everything. I could never have done this without you.
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1. Introduction

Within the theory of traditional pro-drop, a pronoun may be omitted from discourse if certain aspects of its reference may be obtained from other aspects of the sentence. Huang (1989) notes Chomsky (1981, 1982) in stating that the distribution of this type of pro-drop is assumed – following Taraldsen (1978) – to be determined “by the principle of recoverability” (185) or what Jaeggli (1982) terms the identification hypothesis (as cited in Huang (1989)). Therefore, in a language like Spanish – which has rich morphological agreement – the subject of a finite clause may drop because the agreement marking on the verb is rich enough to recover important aspect of the missing subject:

(1) a. Ø como una ensalada  
    *eat-1SG a salad*  
    “I eat a salad”

b. Ø jugamos al futbol  
    *play-1PL football*  
    “We play football”

In example (1a), it is the suffix –*o* on the verb (*comer*) that tells the listener that the speaker is referring to him/herself, even though the first person singular pronoun (*yo*) is missing. The same is true for example (1b): the –*amos* suffix on the verb (*jugar*) allows the comprehender to know that the speaker is referring to a group of people, which includes the speaker.

The problem for the identification hypothesis (or theory of rich agreement) comes into play when trying to account for a language like Chinese. There is no overt system of agreement marking on the finite verb; thus, recovering important aspects, or determining the reference, of the argument is not possible. Yet this language still allows for pronouns to be omitted, as illustrated below in (2):
Now that we know why a language like Chinese cannot be accounted for using the traditional method of rich agreement, a brief distinction between pro-drop, topic-drop and radical pro-drop will be made in order to give a clearer picture of what the Chinese type of pro-drop is in relation to the other two types of pronoun omission.

2. Various types of pro-drop

There are three types of referential null subjects (Sigurdsson, 2011):

1. Romance pro-drop – conditioned by agreement
2. Germanic topic-drop – conditioned by an empty Spec C
3. Chinese discourse-drop (radical pro-drop) – not clause-internally constrained

Each one will be examined separately below in order to provide a clearer picture.

2.1 Romance pro-drop

Romance pro-drop is what was discussed above with the Spanish examples. To rephrase, this theory enables a pronoun to be dropped as long as there is a way of recovering its reference from another part of the sentence. In languages like Spanish, it is the rich agreement on the finite verb that allows the listener to know which pronoun has been omitted.

(3) Ø tocas la guitarra  
\textit{touch-2SG the guitar}  
“You (singular) play the guitar”

In example (3), it is the –\textit{as} suffix on the finite verb \textit{tocar} that allows the pronoun \textit{tu} to be recovered.
2.2 Germanic topic-drop

Germanic topic-drop is different from pro-drop in that elements need to have moved to sentence initial position in order to be deleted. In other words, Germanic referential null subjects have to have access to Spec C. Following Sigurdsson and Maling (2007, 2008), Sigurdsson (2011) refers to this as the Empty Left Edge Condition. Moreover, these elements need to have been mentioned in previous discourse. If movement to sentence initial position does not happen, the pronoun cannot be deleted, even if the discourse condition is met. The examples of Dutch in (4) illustrate this. While (4a) is permissible, (4b) is not since the pronoun has not been moved to sentence initial position before deletion.

(4) a. Ø₁ ken t₁ hem niet  
   *know him not
   “pro doesn’t know him”

   b. *hem ken Ø niet  
   *him know not
   “pro doesn’t know him”

2.3 Chinese discourse-drop

Radical pro-drop, or what Sigurdsson (2011) terms Chinese discourse-drop, is different from both pro-drop and topic-drop. In radical pro-drop, a radical pronominal argument may be omitted without movement needing to take place. The examples in (5) demonstrate this point:

(5) a. Ø siken-ni otita  
   *exam-DAT failed
   “pro failed the exam”

   b. [Ø mimi-ga] nagai  
   *ear-NOM long
   “pro’s ears are long”

Radical pro-drop differs greatly from the type of pronoun omission found in the traditional theory of rich agreement and the theory of topic-drop. While traditional pro-drop
relies on the reference of the pronoun being recovered from another part of the sentence (e.g. the suffix of the finite verb in Spanish) and topic-drop requires the pronoun to be moved to sentence initial position – and be mentioned in pervious discourse – in order to be deleted, radical pro-drop allows any pronominal argument to be deleted without rich verbal agreement to recover its reference or movement to sentence initial position.

3. Hypotheses of accounting for radical pro-drop

The goal of this section is to present an overview of the different hypotheses that have been put forth to account for radical pro-drop. This section is further divided into two subsections: the first discusses hypotheses that deal with the licensing aspects of omitted pronouns, and the second covers those hypotheses that see to the interpretation of the empty category.

3.1 Licensing


Speas (1994, 2004) theorizes that it is poor agreement, rather than pro, that must be licensed. She explains that since pro lacks phi-features, it cannot be the licenser and therefore languages with poor agreement do not allow the insertion of pro. If there is no agreement, than there is nothing that needs to be licensed and pro can appear in subject position. From this Speas derives a generalized theory, which states: Null subjects occur in the context of either rich agreement (e.g. Spanish) or no agreement at all (e.g. Japanese). This generalization, however, is not general enough since radical pro-drop may apply to the subject as well as the object (Neeleman and Szendrői, 2005). Neeleman and Szendrői (2005) also note that Swedish lacks verbal agreement, but does not allow null subjects, and Afrikaans lacks agreement altogether and
still does not allow radical pro-drop. Also brought into question with Speas’ hypothesis is what constitutes rich and poor agreement, a debate that has yet to be resolved.

While Speas assumes that nothing needs to be licensed in languages with no agreement, Yuan (1997) proposes that null subjects in Chinese are licensed by the underspecification of T(ense) and Agr(eement) features (e.g. Chinese has no inflectional affixation). Unlike Speas, he believes that the absence of agreement inflections in Chinese licenses pro in the specifier of IP, rather than a trace. Following Huang (1984) he proposes that topics in Chinese, including null topics, identify null subjects (as well as null objects).

In slight contrast to the licensing ideas proposed by Speas and Yuan, Tomioka (2003) proposes that what underlies radical pro-drop is the fact that languages universally allow deletion of a noun phrase (NP). In a language that does not have determiners, this operation will give rise to phonologically unrealized arguments. NP deletion cannot create null arguments in a language with determiners, since overt material will remain after deletion. With this hypothesis, the following empirical generalization can be derived:

All languages, which allow radical pro-drop, allow bare NP arguments. Assuming deletion is conditioned by rich agreement, a full typology of null arguments can be presented:

1. Spanish style pro-drop – rich agreement, obligatory determiners
2. No pro-drop (e.g. English) – poor or no agreement, obligatory determiners
3. Radical pro-drop – (i) rich agreement and optional/no determiners or
   (ii) poor/no agreement and optional/no determiners (e.g. Chinese)
As with Speas’ arguments, Tomioka’s hypothesis poses some problems. To begin, it is unclear why only the determiner, of all the material that can adorn the NP, would block radical pro-drop. Furthermore, various radical pro-drop languages require certain functional heads to be present in extended nominal projections. In Korean and Japanese, NPs must be accompanied by a case particle (Neeleman and Szendröi, 2005). Moreover, Neeleman and Szendröi (2005) claim that Tomioka predicts that these would allow standard NP deletion, as in (6a), but this is not the case in (6b):

(6) a. *Ø-ga subete-no hon-o yon-da
   "pro read every book"

   b. Ø subete-no hon-o yon-da
   "pro read every book"

Additionally, Cheke Holo allows every argument to be omitted even if the predicate does not agree with it, and this language has determiners (Neeleman and Szendröi, 2005):

(7) a. Wasi gu Ø pohe are
   wash EMPH clothes those
   “[She] washes the clothes”

   b. Richard *(na) e tusu mei radio *(na) ka iara
   Richard ART PM hand over radio ART to me
   “Richard handed the radio to me”

Lastly, like Speas’ proposal, Tomioka’s hypothesis also encounters the problem of: What constitutes rich and poor agreement?

3.1.2 Neeleman and Szendröi (2005)

Neeleman and Szendröi propose a spell-out solution for radical pro-drop that seeks to eliminate the problems discussed with the previous proposals. They state that radical pro-drop is possible in a language like Japanese, which has agglutinating case (8) or in a language like
Chinese, which has agglutinating number morphology (9):

(8) John-ga mada [[Mary-ga Ø okutta] tegami]-o yonde-inai (Japanese)

John-NOM yet Mary-NOM sent letter-ACC read-has not

“John hasn’t yet read the letter Mary sent pro”

(9) Ta-men kanjian Ø le (Chinese)

he-PL see LE

“They saw pro”

Furthermore, they claim that radical pro-drop cannot happen in languages that have fusional (e.g. English) or invariant (e.g. Jamaican Creole) morphology of nominal features.

They hypothesize that the correlation between the morphology of pronouns and the availability of radical pro-drop derives from three independent assumptions. The first assumption is that null arguments are regular pronouns that fail to be spelled out at PF, rather than a special silent lexical item. This assumption ties to the work done by Holmberg (2005) who argues that omitted pronouns carry a full set of phi-features. This is compatible with an analysis based on spell-out, but with the claim that pro-drop results from the insertion of a special silent pronoun. If there were a silent pro, it would not have valued phi-features, as its interpretation would vary based on context. In languages like Spanish, it is often assumed that pro’s features a valued by the agreement on the verb. Holmberg points out that there would be two general types of analyses of agreement-related pro-drop:

1. Assume that pro does not exist and that information on T⁰ is interpreted as the subject. This is challenged by language that lack agreement.

2. Assume that omitted pronouns carry a full set of phi-features. One natural implication of this idea is to adopt an analysis of pro-drop as the zero spell-out of regular pronouns.

---

1 This is of course a broad generalization and based on Standard English. There are varieties of non-standard English that do allow subject omission, such as the dialect of English spoken in York, England (Benallick, 2010).
The second assumption is that the spell-out rules for pronouns target non-terminal nodes. In theories based on late spell-out, syntactic terminals do not contain phonological information; rather syntactic representations are associated with phonological material in a mapping procedure at the PF interface. Therefore they not only allow spell-out of terminal nodes, but also of larger chunks.

The final assumption is that potential competition between different spell-out rules is regulated by the *Elsewhere Principle*. There are two implications of this:

1. All else being equal, it favours the spell-out of category C over the spell-out of categories contained in C.
2. It gives preference to a phonological realization of a category C that spells out more of C’s features over phonological realizations that spell out fewer features; thus spelling out more features is good.

While Neeleman and Szendrői (2005) attempt to overcome the short comings of previous licensing hypotheses, the result still falls short of being able wholly account for radical pro-drop. As stated above, they proposed that a language may radically drop its pronouns if it has agglutinating morphology for either case (e.g. Japanese) or number (e.g. Chinese), but not if it has fusional (e.g. English) or invariant (e.g. Jamaican Creole) morphology.

(10) Ø siken-ni otita

*exam-DAT failed

“pro failed the exam”

(11) Zhangsan, [Ø baba] hen youqian

*Zhangsan father very rich

“Zhangsan, pro’s father is very rich”

(12) *Ø is writing

“He is writing”

(13) Nobadi neva sii *(im)

(Jamaican Creole)
nobody never saw him
“Nobody ever saw him”

While this rule works well for these languages (and others discussed thus far), a problem arises when looking at a language like Singapore English\(^2\). In this dialect of English there is no agglutinating morphology; however pronouns may be radically dropped from the discourse.

\[
\begin{align*}
(14) \quad & \emptyset \text{ saw } \emptyset \text{ already} \\
& \text{“(I) saw (him) already”}
\end{align*}
\]

Based on this example\(^3\), there must be something more than just agglutinating morphology that allows for a language to radically drop its pronouns (e.g. the missing pronouns *need* to be recovered from previous discourse).

Moreover, it appears as though it has been taken for granted that Chinese is a radical pro-drop language like Japanese; however, in comparing the two languages it can be seen that Chinese only has agglutinating morphology for marking the plural on pronouns, while Japanese has agglutinating morphology to mark: past tense on verbs, case on both nouns and pronouns, and plurality on pronouns.

\[
\begin{align*}
(15) \quad & a. \text{ Ta-men kanjian ta le} \\
& \text{he-PL see he LE} \\
& \text{“They saw him”} \\
& b. \text{ Ta kanjian ta le} \\
& \text{he see he LE} \\
& \text{“He saw him”} \\
& c. \text{ Ta-men kanjian } \emptyset \text{ le}
\end{align*}
\]

\(^2\) I would like to thank Daryl Chow for pointing out that Singapore English is able to radically drop its pronouns and for providing the example.

\(^3\) While I am aware that a single example from one language is not enough to completely discredit Neeleman and Szendrői’s agglutinating morphology hypothesis, for the purposes of this paper it is enough to get across the idea that there exists a language that has no agglutinating morphology, yet allows radical pro-drop. A more comprehensive and in depth analysis of this language will provide more proof to back up my claim that maybe it is more than just agglutinating morphology that allows for radical pro-drop to occur.
As we can see in examples (15a) and (15c), Chinese marks the plural of he (ta) by attaching the agglutinated morphological suffix –men. In example (16a) it can be observed that Japanese marks the genitive case with –no, the accusative case with –o and the past tense with –da.

Example (16b) illustrates that nominative case is marked by the agglutinating morphology –ga and (16c) demonstrates that the plural is formed by the addition of –ra. The question now becomes: How much agglutinating morphology is enough to allow for radical pro-drop?

Chinese allows radical pro-drop, yet only has agglutinating morphology for the overt marking of the plural on pronouns, while Japanese has this type of morphology for all of its cases, as well as the plural and past tense. Moreover, Singapore English (14) has fusional morphology, but allows radical pro-drop.

3.2 Interpretation

3.2.1 Huang (1982, 1984)

Huang (1982) hypothesizes that the empty object in the embedded clause cannot refer to the matrix clause (e.g. an empty object is never a pronominal, always a variable). An example is (17):

(17) *Zhangsan shuo ni  kanjian le PRO
Huang’s (1984) main proposal is that the distribution of a zero pronoun subject “is closely tied to the presence or absence of a potential rich enough antecedent (Agr or an actual NP)” (557). Specifically, the phenomenon of subject pro-drop can occur when there is very rich agreement or when there is no agreement at all. The former occurs in a language like Spanish where agreement is rich enough to recover the missing subject, while the latter occurs in a language like Chinese (where there is no agreement) and in which case the zero subject is identified by an NP in a superordinate clause. Moreover, he hypothesizes that pro can only appear as the subject of an embedded clause and has to be bound by an argument in the matrix clause and all other null arguments are said to be zero topics.

3.2.2 Xu (1986)

Xu disagrees with Huang’s (1982) characterization that the empty object in the embedded clause cannot refer to the matrix clause. Instead, he claims to have found a totally new class of empty categories (ECs), which are fundamentally different than from those defined in Chomsky (1982) (as cited in Huang, 1987; Xu 1986). He shows that ECs in Chinese do not behave exactly like Chomsky’s variable, NP-trace, PRO, or pro; thus he concludes that they may be identified – as all of the four types as a whole – as instances of a free empty category (FEC). He says that an FEC is an all-inclusive EC with no specified features and is “characterized by their complete freedom of referentiality.” He goes on to say that FECs are freely indexed “on condition that the binding principles are not violated.” Importantly, such ECs are not “inherently but contextually defined” (Xu, 1986: 90-91). Thus, if it is A-bound in its governing category, an
FEC is identified as an anaphor, but if it is A-free in its governing category, it may be identified as a pronominal. Below are some examples to clarify this:

(18) a. John wo piping guo e
   John I criticize AM
   “John, I criticized”

b. John bei wo piping guo e
   John by I criticize AM
   “John was criticized by me”

c. wo jueding e piping John
   I decide criticize John
   “I decided to criticize John”

d. wo shuo e yao piping John
   I say will criticize John
   “I said I would criticize John”

(Xu, 1986: 76)

If non-overt elements refer to something outside the sentence, the gap can simply be taken as the result of discourse deletion, and not as syntactically significant. In the examples in (18), each of the null proforms is c-commanded by and can be construed as co-indexed with some NP in the sentence. What Xu says is that while it is tempting to model the analysis on the pattern of ECs in English and Italian, it is not correct to do so. Indeed, Xu does not like the fact that the gap (when it occurs in object position) is regarded as an A’-bound variable in (18a), or as an A-bound NP-trace in (18b). He also rejects the analysis that occurs when the gap is in subject position with an independent theta role and is regarded as PRO in (18c) or pro in (18d).

In his argumentation that ECs are not identifiable as a variable, he states that (18a) is a typical topic sentence. If we take the similarity to the English counterpart, we would get the reading that the EC is a variable. Therefore, this example has the interpretation of “for some x, x=John, I criticized x”. Indeed, what Xu really does not like is the fact that Huang (1982) extends this analysis to include cases involving discourse topics (e.g. he disagrees with the fact
that discourse topics can be viewed as semantically empty categories). For example, in (19a) the
discourse topics are viewed as semantically empty categories, which are represented as $O_i$ and $O_j$
respectively in (19b):

(19) a. ni du guo zheben shu ma e du guo e
    you read AM this book QM read AM
    “Did you read this book? I did”

b. [s; $O_i$ $O_j$ [s, e; du guo e;]]

(Xu, 1986: 75 and 77)

Xu’s main argument for rejecting this variable analysis is that the relation between the
topic and the gap is not subject to the Strong Crossover Condition. This has been taken to be a
diagnostic for variable binding. In English, topic structures, as in (20), are limited by this
constraint:

(20) *John$_i$ he$_i$ said you would not help e$_i$

The Chinese construction in (21), on the other hand, allows an interpretation in which the topic
John, the resumptive pronoun ta and the EC all have the same referent; thus indicating that the
EC in Chinese is not interpreted as a va

(21) John ta shuo ni bu ken bangzhu e
    John he say you not will help
    “John, he said you would not help (him)”

(Xu, 1986: 77)

4. Crossover as a diagnostic tool for empty categories

Noun phrases must undergo an interpretation process by which they are assigned a
referent. Within binding theory, this process is ruled by principles that vary according to the
nature of the item in question (e.g. anaphor, pronoun or R-expression). A first generalization can
be stated as follows: anaphors must have an antecedent in the syntax (e.g. in the same sentence
where they appear). Pronouns may directly identify a referent in the world or in the previous
discourse; R-expressions are intrinsically referential (e.g. they need no antecedent). Consider the following examples:

(22) a. Miranda, loves herself
    
    b. *I love himself

In (22a) the anaphor *herself takes Miranda as an antecedent, meaning that it is bound by it. Example (22b), for morphological reasons, *I cannot work as an antecedent for *himself, so that the whole sentence is ruled out.

Consider now what happens in the case of pronouns:

(23) TJ thinks that Sarah likes him

In example (23), him can either refer to TJ or to someone else in the world, for instance to someone mentioned in the previous discourse. The conclusion up to this point can be summarized as follows: an anaphor must have an antecedent, a pronoun can have one, an R-expression cannot. Further properties, however, need to be taken into account. Consider again pronouns:

(24) *Amy, likes her

In this example, her cannot be interpreted as Amy, contrary to what happens in (23). Technically speaking, there is a condition on pronouns that makes them need to be free in their local domain.

Keeping the above binding conditions in mind, our attention now turns to what occurs when a lexical item – and in particular a pronoun – is omitted; thus leaving the category empty. Rizzi (1994) proposes to enrich the typology of empty categories by adding a new feature to the familiar [±anaphoric] and [±pronominal]. The proposed addition is [±variable], which allows a distinction between two types of A’-bound empty elements: one with the features [-a, -p, +v], and the other with the features content [-a, -p, -v]. The former is called variable and the latter is
termed null constant (NC). This division between the A’-bound elements is said to be motivated by certain crossover effects, which were brought to light by Lasnik and Stowell (1991). These types of effects are found when an operator, moving from its base position to a surface position, crosses over a pronoun. Take for instance example (25):

(25) Who does her boss dislike t?

In this example, who has moved from the object position (which is indicated by the trace t) to its surface position at the front of the sentence. In doing so, the WH-word has crossed over the pronoun her.

There are two types of crossover: strong and weak. According to Haegeman (1994), the difference between the two types is that strong crossover (SCO) follows from binding theory, but weak crossover (WCO) does not. Her generalization is based on the following examples:

(26) * Who, does he, think t, left?
(27) * Who, does he, think you saw t,?
(28) * Who, does he, see t,?
(29) * Who, does his, mother love t,?

The examples in (26)-(28) illustrate SCO since their ungrammaticality is attributed to the fact that a WH-word has moved across a co-indexed pronoun. It is proposed that these examples are ruled out because of a leftness condition violation (c.f. Koopman & Sportiche, 1982: 140):

(30) leftness condition – a WH-trace cannot be co-indexed with a pronoun to its left

The example in (29), however, is demonstrative of WCO since its ungrammaticality is not felt as strongly as examples (26)-(28). Moreover, in example (29) the trace is not A-bound so there is no Principle C violation; however, in examples (26)-(28) the WH-trace is A-bound, which means there is a Principle C violation.
Subsections 4.1 and 4.2 expand on the discussion of crossover by providing more examples of strong and weak crossover respectively. Moreover, they provide an elaboration on the interpretation of empty categories within the context of the crossover constraints.

**4.1 Strong crossover**

Lasnik and Stowell (1991) assume that a bound variable construal is represented structurally by means of co-indexing the pronoun with the WH-phrase of the quantifier phrase (QP). Moreover, they assume that every WH-phrase and QP must undergo movement to an operator position in order to bind its trace as a variable at the level of LF. They also assume that WH-phrases appear in Spec CP, while quantifiers adjoin to IP. Indeed, they hypothesize that the availability of a bound variable construal is dependent on the structural position of the pronoun in the sentence; the pronoun *his* cannot be construed as a variable bound by the QP *no man* in (31a) or the WH-phrase *who* in (31b) because the scope of the WH-phrase/QP is restricted to the embedded clause, and he pronoun occurs outside this domain:

(31) a. * His$_i$ boss regrets that no man$_i$ is lucky

        b. * His$_i$ mother wonders who$_i$ Jane saw t$_i$

Their proposal is that if the scope of the QP corresponds to its c-command domain at LF the relevant restriction can be stated as an LF binding condition:

(32) A pronoun P is construed as a variable bound by a quantifier Q only if Q binds P at LF (p. 688).

In terms of SCO, the proposition in (32) is not enough:

(34) a. * Who$_i$ did you say he$_i$ made you visit t$_i$

        b. * He$_i$ saw me visit nobody$_i$

(35) a. * [CP who$_i$ [did you say [CP he$_i$ made you visit t$_i$]]]
b. * \[IP\ nobody_i [IP he saw me visit t_i]]

The quantifiers c-command the pronouns in (35), in accordance with (32), but the bound variable interpretation is still excluded, and therefore SCO is treated as a violation of Principle C.

Following Chomsky (1981) WH-traces and QP-traces are treated as R-expressions. In the examples in (35), Principle C is violated if the pronoun is co-indexed with the WH-phrase or QP and its trace since the pronoun A-binds the variable trace; the pronoun must have a different index to satisfy Principle C.

4.2 Weak crossover

Lasnik and Stowell (1991) also discuss weak crossover (WCO). In these cases neither the pronoun nor the trace c-commands the other:

(36) a. * The fact that he owned a gun implicated everyone

b. * Who does his boss dislike

c. * Which man did you say his boss dislikes

d. * His friends should mistreat no man

The bound variable interpretation of the pronoun is excluded even though the condition in (32) and Principle C are not violated. The name WCO was originally given by Wasow (1972) because the judgments concerning the unavailability of the bound construal are less robust than in the case of SCO.

They also discuss something called weakest crossover, which are constructions involving A’-binding where WCO effects do not surface even though (37) and (38) are violated:

(37) In a configuration where a pronoun P and a trace T are both A’-bound by a category C, T must c-command P.
In a configuration where a category C A’-binds a pronoun P and a trace T, P may not be contained in an argument phrase XP that c-commands T. Collectively these are termed the \textit{Generalized WCO Hypothesis}.

Some examples of where WCO effects do not occur are \textit{tough}-movement (39a), parasitic gap (39b), and topicalization constructions (39c). These are believed to have the same configuration, but effectively lack crossover effects. Therefore, they allow a bound reading.

(39) a. Who$_i$ t$_i$ will be easy for us [to get [his$_i$ mother] to talk to e$_i$]

b. Who$_i$ did you stay with t$_i$ [before [his$_i$ wife] had spoken to e$_i$]

c. This book$_i$, I expect [its$_i$ author] to buy e$_i$

They refer to violations of the \textit{Generalized WCO Hypothesis} as instances of weakest crossover. Furthermore they suggest that the principles responsible for WCO apply only to variables that are locally bound by true quantifiers, and that weakest crossover constructions do not count as such.

\textbf{5. Summary of theoretical analysis}

Up to this point, we have examined many theoretical aspects concerning empty categories. In particular, section 1 provided an introduction to the basic theory governing traditional pro-drop (e.g. Spanish) and explained how a language like Chinese – which does not meet the criteria – is still able to omit pronouns. Section 2 extended on this and focused on the various types of pro-drop and discussed how they differ from one another.

Following up on the discussion of Chinese discourse-drop (or radical pro-drop), section 3 presented two views of accounting for the empty categories: one focused on the licensing features of the omitted pronouns, while the other focused on the interpretation of the ECs. Within the latter subsection, we saw that the two theorists – Huang (1982, 1984) and Xu (1986)
– have vastly different opinions about how ECs should be interpreted. To reiterate, these authors differ in their opinion of whether or not the empty object in the embedded clause can refer to the matrix clause: Huang (1982) believes that the empty category must always be variable, while Xu (1986) thinks that it is possible to have a non-variable reading, which means he believes the relation between the topic and the gap (in Chinese) is not subject to the Strong Crossover Condition. Concerning crossover effects, section 4 presented an overview as to how crossover – and particularly strong crossover with respect to instances in Chinese – can be used as a diagnostic tool for empty categories.

6. Introduction to experiment

With the above theoretical information in mind, the focus now shifts to what is happening empirically. As has been mentioned several times, Huang (1982) and Xu (1986) disagree on whether or not the crossover principles apply to ECs in Chinese pro-drop. This empirical controversy provides an excellent basis from which to create an experiment and gather empirical evidentiary support for one (or both) of the hypotheses.

7. Question and possible outcomes

The purpose of this study is to gather empirical data in order to answer the following question: How are empty categories in strong crossover constructions actually interpreted by first language (L1) Mandarin Chinese speakers? One possibility is that these ECs are interpreted, as Huang (1982) hypothesizes, as variable. A second possibility is that the data shows speakers interpret ECs as non-variable, as Xu (1986) hypothesizes. A final possibility is that both theorists are correct in their hypotheses, and the interpretation of the empty category varies. This last possibility would be of interest to sociolinguistics, since it would show dialectal variation in the population.
8. Participants

A total of six Mandarin speaking adults (2 males, 4 females, age range 19-35) participated in the study. The participants were recruited from the University of Toronto and Chinatown via flyers. All participants – and potential participants – were informed that they would receive monetary compensation, that the experiment would last approximately one hour, and that they would remain anonymous.

Additionally, all the participants selected were from Northern provinces in China. The objective for restricting the location the participants came from was to help ensure that any differences in the responses could be attributed to the differences of the stimuli statements, and not from dialectal differences. Moreover, since my consultant – who provided the recordings the participants listened to – is from Heilongjiang, ensuring the participants came from surrounding provinces aided in making sure they could understand the stories and target utterances.

An additional recruitment criteria was that participants had not spent more than five years in Canada, spoke only Mandarin and English, and had not lived in any other countries (besides China and Canada). In addition, all participants mentioned that they spoke Mandarin on a daily basis. All of this ensured that the participants retained full access to their native intuitions.

9. Methodology

In order to answer the question and asses which of the possible outcomes is correct, I created a truth-value judgment (TVJ) task. The reason I chose to design my experiment using this type of task is because it makes it possible to assess a subject’s understanding of complex constructions that might otherwise be hard to test. Furthermore, there is no implicit assumption that the subject understands the notion of a sentence being ‘good’/‘right’ or ‘silly’/‘wrong’ as relating to intuitions about grammaticality (Gordon, 1996).
What is more, this type of elicitation task has been used previously when examining children’s knowledge of strong crossover. McDaniel and McKee (1992) created a reward/punishment truth-value judgment task in order to test children’s knowledge of SCO in two-clause sentences. Since the experimenters were working with children, subjects had to determine whether a puppet’s answers were appropriate to questions posed by the experimenter. One experimenter staged a story using toys and then asked the puppet (controlled by another experimenter) a question about the story. After the puppet answered the question, the subject had to feed the puppet a cookie if the answer was appropriate and a rag if it was inappropriate. What is more, the puppet’s answers were always true and grammatical, but did not necessarily fit the question.

Their study also presented scenarios in which another puppet was involved (controlled by the same experimenter as the first). This second puppet (Derek) sometimes participated in the stories and before each story the puppet was to participate in, the story-teller asked him if he was ready. After Derek said ‘yes’ the story-teller said to the subject: ‘He’s ready.’ Doing this provided a salient referent for he as a simple pronoun.

Unlike McDaniel and McKee, I elected to create a yes/no truth-value judgment task. The reason I opted for this type task, over a reward/punishment type, is because I was working with adults instead of children. Moreover, I chose to design the experiment using PowerPoint. The rationale behind making the TVJ task available on PowerPoint, was so the participants could work through at their own pace; thus creating a more comfortable testing environment. The subjects were asked to judge whether or not a target utterance was ‘true’ or ‘false’ based on a short story they listened to and a picture they saw, and indicate their responses on an answer
sheet provided. The following subsections provide the details of how the scenarios, pictures, and target utterances were created.

9.1 Scenarios

The participants heard 32 stories about a girl or boy and her or his friends. At the beginning of each story one of the friends was singled out in order to provide a salient referent for the pronoun. In order to keep things consistent, all stories involving girls had the same friend singled out as the salient referent for the pronoun, and the same was done for the stories involving boys. Without clarifying the referent of the pronoun a question using this pronoun would be inappropriate with a simple pronoun interpretation and subjects might then be forced into the bound variable interpretation (McDaniel & McKee, 1992). Moreover, all stories had the same format so that any difference in the responses could be attributed to the differences of the stimuli statements. See Appendix A for the scenarios.

9.2 Pictures

Next, participants saw a picture about an event related to the scenario they had just heard. While the narratives/scripts were identical, they were accompanied by pictures describing three different types of circumstances. The pictures varied between depicting bound variable, one-to-many, and many-to-one situations. In the bound variable pictures, a set of four characters were depicted performing an action on him/herself. In the one-to-many pictures, one character was portrayed carrying out an action on three others. For consistency sake, the character singled out in the scenarios was always the one performing the action in this picture type. Lastly, the many-to-one pictures illustrated three characters acting out an action on one other. Again for the sake of consistency, the character being acted upon was the one singled out in the short stories. See Appendix B for a sample of the pictures used.
9.3 Target utterances

Finally the participants were asked to judge whether a read statement was ‘true’ or ‘false’ based on what they had heard and seen. Because the statements involved null pronouns, it was important they were heard orally by the participants instead of being presented visually. Similarly to the scenarios, the statements of each kind (SCO, reflexive, pronoun) had the same syntactic structure. Again this allowed any difference in the responses to be attributed to the differences of the stimuli statements.

Table 1: Experimental sentence types and picture types

<table>
<thead>
<tr>
<th>Sentence Type</th>
<th>Picture Type</th>
<th>Bound variable</th>
<th>One-to-many</th>
<th>Many-to-one</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCO –</td>
<td></td>
<td>X → X</td>
<td>W → X</td>
<td>X → W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y → Y</td>
<td>W → Y</td>
<td>Y → W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z → Z</td>
<td>W → Z</td>
<td>Z → W</td>
</tr>
<tr>
<td>Reflexive –</td>
<td></td>
<td>False (Huang)</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td></td>
<td></td>
<td>True</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>Pronoun –</td>
<td></td>
<td>False</td>
<td>False</td>
<td>True</td>
</tr>
</tbody>
</table>

I compared the bound variable picture with a SCO statement to the bound variable picture with a reflexive statement; the one-to-many picture with a SCO statement to the one-to-many picture with a pronoun statement; and the many-to-one picture with a SCO statement to the many-to-one picture with a pronoun statement in order to have the SCO statements juxtaposed with statements using reflexive pronouns or a simple pronoun. This allowed each picture to have the chance to elicit a ‘true’ response and the participants had less of a chance of figuring out what exactly is being looked at – since the reflexive pronoun and simple pronoun statements act as controls –
and also help to keep them from getting bored. Each picture-sentence combination had four target utterances.

What is more, participants heard statements that did not involve the use of a quantifier. Four of the 32 statements were straightforward binding sentences and four others involved numerals. These eight additional control statements added further assurance that the participants were actually paying attention to the task and not randomly answering ‘true’ or ‘false’. Four of the eight control sentences had a target response of ‘true’ and four had the target response of ‘false’. See Appendix C for all utterances.

10. Results

In order to analyze the data I began by assigning ‘true’ responses a value of 1 and ‘false’ responses a value of 0 for all 32 target utterances. Next, I calculated the proportion of ‘true’ responses each participant gave for each sentence-picture grouping and the control sentences. Doing this allowed me to then calculate the average proportion of ‘true’ responses. Due the small quantity of data, and therefore high degree of individual variation, statistical tests were not run.

10.1 Picture-sentence combinations

10.1.1 Analysis by averages

The average proportion of ‘true’ responses for each picture-sentence combination are provided in Table 2. If there is crossover in the grammar, speakers were expected to reject the strong crossover sentences when they were presented in combination with a bound variable and many-to-one picture. Moreover, they were expected to accept the strong crossover sentences when they were heard in combination with a one-to-many picture. According to Xu, however, it
is possible that speakers would accept the SCO sentences when presented in conjunction with a bound variable picture.

Table 2: Average proportion of ‘true’ responses for each picture-sentence combination

<table>
<thead>
<tr>
<th>Sentence Type</th>
<th>Bound variable</th>
<th>One-to-many</th>
<th>Many-to-one</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCO – 看见了 每一个人 saw LE everyone “(She/He) saw everyone”</td>
<td>0.20833</td>
<td>0.45833</td>
<td>0.08333</td>
</tr>
<tr>
<td>Reflexive – 每一个人 都 看见了 everyone all see LE “Everyone saw (herself/himself)”</td>
<td>0.83333</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pronoun – 每一个人 都 看见了 everyone all see LE “Everyone saw (her/him)”</td>
<td></td>
<td>0.375</td>
<td>0.375</td>
</tr>
</tbody>
</table>

By examining the data presented in Table 2 by sentence type, we can see that for the strong crossover type sentences (e.g. when a null subject was followed by a quantified direct object), speakers seldom accepted the utterance with bound variable situations (0.20833), but were happy to accept it for one-to-many conditions (0.45833). Additionally, participants consistently rejected this type of target utterance when heard in combination with a many-to-one picture (0.08333). In fact, the average proportion of ‘true’ responses for this sentence type with bound variable pictures is closely related to that found with many-to-one pictures. This comparison highlights the fact that participants followed the rules of binding theory and obeyed strong crossover constraints.

For the reflexive type sentences, participants consistently accepted the target utterances with bound variable pictures (0.83333). For this experiment, this was the only combination the reflexive sentences were made part of.
A final comparison by sentence type is between the pronoun type sentences with one-to-many pictures and many-to-one illustrations. What is interesting when we look at this data is that the average proportion of ‘true’ responses is the same (0.375); thus suggesting that pronouns are ambiguous. A possible rationalization for this result is that there was an error in the actual design of the experiment. It is possible that the scenarios did not contain the appropriate amount of information or exact conditions for the participants to be able to correctly interpret/recover the missing pronoun in the target utterance.

While it is important to examine the data by sentence type, it is equally important to examine it by picture type. One comparison I made was between the bound variable picture with a SCO statement (BV-SCO) and the bound variable picture with a reflexive statement (BV-REFL). The reason for making this comparison is because allowed the picture a chance to elicit a ‘true’ response. By examining the averages in Table 2, we can see that BV-SCO has an average proportion of 0.20833 and BV-REFL has an average proportion of 0.83333. Therefore, on average, there were much fewer proportion of ‘true’ responses provided for BV-SCO than BV-REFL. This indicates that speakers were happy to accept when a quantifier subject was accompanied by a null reflexive direct object, but not when a null subject was accompanied by a quantified direct object.

The second comparison I made was between the one-to-many picture with a SCO statement (OM-SCO) and the one-to-many picture with a pronoun statement (OM-PRO). As with the above comparison, this one was made because allowed the picture a chance to elicit a ‘true’ response. The average proportion of ‘true’ responses for OM-SCO was 0.45833, while the average of ‘true’ responses for OM-PRO was 0.375. One possible explanation for such a result is the high degree of individual variation. However, another possible justification is that
there was an error in the actual design of the experiment. Chiefly, it is possible that the scenarios did not contain the appropriate amount of information or exact conditions for the participants to be able to correctly interpret/recover the missing pronoun.

The third comparison I made was between the many-to-one picture with a SCO statement (MO-SCO) and the many-to-one picture with a pronoun statement (MO-PRO). Again examining Table 2, we can see that the average of ‘true’ responses for MO-SCO was 0.08333 and the average for MO-PRO was 0.375. These results seem to suggest that, on average, participants were able to correctly accept and reject the target utterances.

10.1.2 Analysis by individuals

While examining the data using the average proportion of ‘true’ responses is a good first step in order to see overall trends, it is important to see how these trends apply to individuals, since the quantity of data was quite small. The histograms used in this subsection illustrate the number of speakers providing a certain number of acceptance responses. This type of analysis organizes the data by individual speakers rather than aggregating speakers into averages.

To begin, the low average proportion of ‘true’ responses of strong crossover type sentences with bound variable situations appears to suggest that the participants obeyed the SCO condition, thus indicating that Huang (1982) is correct. However, one of the possible outcomes was that there is dialectal variation in the population, and looking at the average does not provide insight into this possibility. Figure 1 illustrates the number of speakers providing a certain number of acceptance responses for strong crossover sentences in bound variable situations. For this data analysis, I made the decision that anyone who rejected all target utterances, or only accepted one, was behaving as Huang (1982) predicts.
Figure 1 shows that three of the participants rejected all four of the SCO target utterances when they were paired with a bound variable picture. Moreover, two participants accepted only one of the target utterances. Finally, one participant accepted three of the target utterances. What this seems to suggest (albeit somewhat preliminarily), is that there is some variation within the dialect: five participants behaved as Huang – and our knowledge of binding theory and crossover – predicts, while one behaved as Xu predicts.

A histogram analysis can also be used flesh out any differences between seemingly similar averages. For example, the average proportion of ‘true’ responses for the SCO sentence type with bound variable pictures is closely related to that found with many-to-one pictures, which indicates that in general rules of binding theory and obeyed strong crossover constraints. Of course this is a generalization based on averages and there are differences between these picture-sentence types when we compare the histograms of each. Figure 2 demonstrates the number of speakers providing a certain number of acceptance responses for strong crossover
sentences in many-to-one situations. As with Figure 1, anyone who rejected all target utterances, or only accepted one, was behaving as Huang (1982) predicts.

*Figure 2: Number of speakers classified according to how many SCO sentences they accepted in many-to-one scenarios.*

Figure 2 shows that four participants rejected all of the target utterances, and two subjects accepted only one. When these findings are compared to those in Figure 1, we can see that while one participant behaved in a Xu-like manner in the strong crossover with bound variable condition (Fig. 1), none of the participants behaved in such a way in the strong crossover with many-to-one condition; thus all participants obeyed strong crossover conditions and behaved in a Huang-like fashion.

Additionally, this type of individual analysis can be used to help explain the more peculiar findings from the analyses by average. For example, while in general speakers were happy to accept the strong crossover target utterances when combined with the one-to-many conditions, the average proportion of ‘true’ responses is not as high as it could have been. Figure 3 shows the number of speakers providing a certain number of acceptance responses for this combination.
Figure 3: Number of speakers classified according to how many SCO sentences they accepted in one-to-many scenarios

Figure 3 shows that the low average proportion of ‘true’ responses can be attributed to the fact that none of the participants accepted all of the utterances. In fact, only two speakers accepted three of the sentences and one accepted two of the four. What is interesting is that half of the participants only accepted one of the four target utterances. A possible explanation for these findings is that the short stories did not provide the appropriate information from which to recover and interpret the missing pronouns.

Furthermore, the possibility that the small difference in averages between the one-to-many picture with a SCO statement and the one-to-many picture with a pronoun statement can be attributed to the high degree of individual variation may be illustrated using histograms. While the data for the former is provided above in Figure 3, the data for the latter is demonstrated in Figure 4.
Figure 4 illustrates that there was no consensus in responses for this picture-sentence combination. Only one participant correctly rejected all of the target utterances. Two speakers accepted one of the four target utterances, while two others accepted half of the sentences. Finally, one speaker accepted three of the four utterances. The comparison of these findings to those in Figure 3 highlight the fact that participants were most likely unable to correctly recover and interpret the missing pronoun; thus the pronouns appear to have been ambiguous. A possible explanation for this finding is that the short stories did not provide the appropriate information from which to recover and interpret the missing pronouns.

10.2 Control sentences

As discussed in the methodology section, eight of the 32 target utterances were control sentences added to provide further assurance that the participants were actually paying attention to the task and not randomly answering ‘true’ or ‘false’. Four of these control sentences were straightforward binding sentences and four others involved numerals. Moreover, four of the eight control sentences had a target response of ‘true’ and four had the target response of ‘false’. 
It should be noted here that one of the control sentences was omitted from analysis. All participants answered #26 as ‘true’ when the target response was ‘false’. The picture showed “Zhao” looking at a picture of himself, which should have made the statement “He saw him” (with both pronouns overtly stated) ‘false’. It is possible that since “Zhao’s” face was not completely visible, the participants assumed that the person looking at the picture and the person in the picture were different.

The average of ‘true’ responses for the control sentences are provided below:

<table>
<thead>
<tr>
<th>Control Sentences – False</th>
<th>Control Sentences – True</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.11</td>
<td>0.83333</td>
</tr>
</tbody>
</table>

Examining the data in Table 3 reveals that the participants provided more ‘true’ responses for the control sentences with a target response of ‘true’ – an average of three times more – compared to the control sentences with a target response of ‘false’. This indicates that the participants were able to accurately accept and reject the sentences.

This finding is further strengthened when we look at how individuals performed. Below is a histogram illustrating how many accurate responses participants gave for the control sentences as a whole:
Figure 5: Histogram of correct responses for all control sentences

Figure 3 shows that all participants were able to provide an accurate response a minimum of 71.43% of the time. In fact, more than half of the participants were able to provide a proper response 85.71% of the time, with one participant reaching 100%. This analysis confirms the idea that the participants were not merely randomly selecting ‘true’ or ‘false’, but were indeed paying close attention to the task they at hand.

11. Discussion

The empirical data collected from the truth-value judgment task sheds light on to how native speakers of Mandarin interpret empty categories in strong crossover constructions. Based on an analysis of the average proportion of ‘true’ responses, speakers’ performance is best described in terms of Huang’s (1982) proposal as opposed to Xu’s (1986) proposal. Participants seemed to disprefer sentences with a null subject and quantified direct object when presented in conjunction with a bound variable scenario. Moreover, their obedience to strong crossover constraints – and adherence to the principles of binding theory – was illustrated in their rejection of the same sentence type with many-to-one situations and their acceptance of this sentence type with one-to-many circumstances. Importantly, the results of the control sentences revealed that
the participants were not unsystematically making judgments; thus they were using their native speaker intuitions appropriately and were actively paying attention to the task.

While an examination of the data using average proportions showed that there was an overall trend to obey strong crossover constraints (and the principles of binding theory more generally), a histogram analysis of the strong crossover sentence type with a bound variable picture revealed that there may in fact be some degree of variation occurring. This finding is reasonably preliminary, since I found that only one participant behaved in a Xu-like manner. This participant, however, comes from one of the most northeastern provinces (Liaoning) and was the only one of my participants to come from this province. Additional research would be able to reveal whether this participant’s behaviour is characteristic of the dialect from this province (e.g. there is dialectal variation) or if he is an anomaly (e.g. there is just speaker variation).

11.1 Limitations of the study

One of the biggest limitations of this study was having no evidence as to what exactly needs to be in the previous discourse in order for a pronoun to be dropped – a more importantly recovered and interpreted correctly – in the target utterance. In fact, to my knowledge no sociolinguistic data has been examined in order to determine the conditions need to be in place in order to omit pronouns in L1 Mandarin. Without the appropriate criteria present in the short stories, it is possible that the participants found the missing pronouns to be ambiguous when trying to interpret them in the target utterances. This assumption is confirmed in particular by the comparison between the pronoun type sentences with one-to-many pictures and many-to-one illustrations. Participants provided the same average proportion of ‘true’ responses for both,
when they should have ideally provided more for the target utterance with the many-to-one situations.

A second limitation of this study is the size of the speaker population. Since there were only six participants involved in this study, it was very difficult to concretely determine how empty categories are interpreted. The high degree of individual variation caused by this small sample size may have in fact skewed the results, especially when analyzing the results by the average proportion of ‘true’ responses.
References

Benallick, E. J. (2010). Ø Never thought this could happen in English!: Exploring pro-drop in English. Course paper for LIN 1156.


Appendix A: Scenarios

1. Julia (the world famous figure skater) and her friends are camping in the forest. There are lots of mosquitos around and look what happened…
茱莉亚（著名的花样滑冰选手）和她的朋友们正在森林里宿营。周围飞着很多蚊子。请看发生了什么事。

2. Julia (the world famous figure skater) and her friends are going to the library. The girls have to return lots of books and look what happened…
茱莉亚（著名的花样滑冰选手）和她的朋友们正走在去图书馆的路上。姑娘们要还好多本书。请看发生了什么事。

3. Julia (the world famous figure skater) and her friends are studying for a math final exam (together). There is a lot of information to know and looked what happened…
茱莉亚（著名的花样滑冰选手）和她的朋友们正一同复习数学准备期末考试。有许多要了解的知识。请看发生了什么事。

4. Julia (the world famous figure skater) and her friends are looking through old photo albums. The girls are having lots of fun and look what happened…
茱莉亚（著名的花样滑冰选手）和她的朋友们正在翻看旧影集。姑娘们看得正高兴。请看发生了什么事。

5. Zhao (the world famous baseball player) and his friends are camping in the forest. The boys forgot bug repellent and look what happened…
赵刚（著名的棒球选手）和他的朋友们正在森林里宿营。小伙子们忘记了带驱虫霜。请看发生了什么事。

6. Zhao (the world famous baseball player) and his friends are going to the library. The boys have to return lots of books and look what happened…
赵刚（著名的棒球选手）和他的朋友们正走在去图书馆的路上。小伙子们要还好多书。请看发生了什么事。

7. Zhao (the world famous baseball player) and his friends are studying for a chemistry final exam (together). There is a lot of information to know and looked what happened…
赵刚（著名的棒球选手）和他的朋友们正一同复习化学准备期末考试。有许多要了解的知识。请看发生了什么事。

8. Zhao (the world famous baseball player) and his friends are looking through old photo albums. The boys are having lots of fun and look what happened…
赵刚（著名的棒球选手）和他的朋友们正在翻看旧影集。小伙子们看得正高兴。请看发生了什么事。
Appendix B: Pictures

Figure 1: Example of a many-to-one picture

Figure 2: Example of a one-to-many picture

Figure 3: Example of a bound variable picture
### Appendix C: Target Utterances

<table>
<thead>
<tr>
<th>SCO</th>
<th>Reflexive</th>
<th>Pronoun</th>
<th>Control – binding</th>
<th>Control – numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>(He/She) slapped everyone 扇了每一个人</td>
<td>Everyone slapped (himself/herself) 每一个人都扇了</td>
<td>Everyone slapped (him/her) 每一个人都扇了</td>
<td>She saw herself 她看见了自己</td>
<td>One girl taught three girls 一个女孩教了三个女孩</td>
</tr>
<tr>
<td>(He/she) saw everyone 看见了每一个人</td>
<td>Everyone saw (himself/herself) 每一个人都看见了</td>
<td>Everyone saw (him/her) 每一个人都看见了</td>
<td>He slapped himself 他扇了自己</td>
<td>One boy helped three boys 一个男孩帮了三个男孩</td>
</tr>
<tr>
<td>(He/She) helped everyone 帮助了每一个人</td>
<td>Everyone helped (himself/herself) 每一个人都帮助了</td>
<td>Everyone helped (him/her) 每一个人都帮助了</td>
<td>She slapped her 她扇了她</td>
<td>Three girls helped one girl 三个女孩帮助了一个女孩</td>
</tr>
<tr>
<td>(He/She) taught everyone 教了每一个人</td>
<td>Everyone taught (himself/herself) 每一个人都教了</td>
<td>Everyone taught (him/her) 每一个人都教了</td>
<td>He saw him 他看见了他</td>
<td>Three boys taught one boy 三个男孩教了一个男孩</td>
</tr>
</tbody>
</table>