

The role of the Subset Principle in L2 acquisition: A case study of Japanese and Mandarin Chinese

Monou, Tomoko & Kawahara, Shigeto

Abstract

This paper reports on an experiment which tests the role of the Subset Principle in second language acquisition, using, as its test-ground, different interpretations of elided nominal subjects in Japanese and Mandarin Chinese. Mandarin Chinese allows only the subset of interpretation with respect to what Japanese allows. The Subset Principle predicts that introductory Japanese L2 learners of Mandarin Chinese start with the subset reading, whereas the Transfer theory predicts that the superset reading is also available when interpreting L2 Mandarin Chinese sentences, because their L1 Japanese allows the superset reading. The current experiment shows that most of the participants behaved in a way that is consistent with the Subset Principle, although a small number of speakers showed behavior that is consistent with the Transfer theory. We raise the possibility that L2 acquisition can be characterized as a conflict between universal principles, such as the Subset Principle, and L1 transfer. While the current paper reports one case study and hence its impact may be limited, it does offer a new informative set of data bearing on the general issue of L2 acquisition.

日本語主語省略構文では、省略された主語には二つの解釈（不定（indefinite）解釈、定（definite）解釈）が付与される。一方中国語では、一つの解釈（定解釈）しか付与されない。つまり、主語省略構文の解釈における日本語と中国語の間には、全体集合（日本語）、部分集合（中国語）の関係が成立する。従って、日本語を母語とする初級中国語学習者が主語省略構文を解釈する際、部分集合の原理が機能している場合と、母語の転移が起こっている場合とで、相反する振る舞いを予測する。つまり、学習の初期段階において部分集合の原理が機能する場合は定解釈のみ容認し、不定解釈は容認しないが、学習の初期段階で転移が起こる場合は定解釈と不定解釈の両方の解

積を容認することが予測される。本論文では日本語を母語とする、中国語学習期間が平均11か月の初級中国語学習者を被験者とし、実験を行った。その結果、学習者の大部分が定解釈のみを容認したことから、部分集合の原理が第二言語学習の初期段階から機能することがわかった。

1. Introduction

1.1. The subset problem: the logical problem of language acquisition

Whenever learners acquire a language, they face a general challenge, which is known as the subset problem (Angluin 1980; Baker 1979; Berwick 1985; Wexler 1993). Suppose that Language A allows structure $\{X\}$, and Language B allows a set of structures $\{X, Y\}$ —be these structures syntactic, semantic, phonetic, or phonological; that is, Language A allows only a subset of linguistic structures with respect to Language B. Language learners of A will never see evidence for the lack of $\{Y\}$, because in the inputs of language learning for Language A, they see only $\{X\}$, but no evidence for the lack of $\{Y\}$. This problem is sometimes referred to as the “lack of negative evidence”. Given the lack of negative evidence, how can a language learner reach the conclusion that Language A has only $\{X\}$, and not $\{Y\}$? This general problem is known as the subset problem, because it arises when learning a subset language.

One solution to this subset problem is to posit learning bias at the initial state of language learning and, possibly, throughout the language learning process. If the learners start with the assumption that $\{X, Y\}$ may both exist in their target language, they can never learn the lack of $\{Y\}$ for Language A. However, if the learner starts with the initial assumption that the only structure that is allowed is the element in the subset, $\{X\}$, then learners of Language A will see positive evidence for $\{X\}$ and confirm that $\{X\}$ is possible; learners of Language B will see positive evidence for both $\{X\}$ and $\{Y\}$ and will learn both. Alternatively, the initial assumption can be that no structures are allowed, which will also result in successful learning; learners start with the null set $\{\emptyset\}$, and they learn only what they see in their language input.¹ These

theories in short posit that the initial assumption that learners make is a restrictive one: a structure that is allowed only in the superset language—{Y}—is not allowed in the initial stage of language learning. Following the previous literature, we call this the Subset Principle of language learning (Berwick 1985; Wexler 1993). As an example, quoted below is a formulation by Berwick (1985):

Subset Principle (Berwick 1985: 91)

If possible target languages can be proper subsets of one another, then guess the narrowest possible language constraint with positive evidence seen so far, such that no other possible target language is a subset of the current guess.

1.2. Empirical evidence for the Subset Principle: previous studies

Although the Subset Principle of language learning is motivated based on the logical, or conceptual, consideration described above, there is an accumulating body of empirical evidence for this principle at work from actual L1 acquisition data. The Subset Principle in L1 syntax acquisition has been argued to be motivated in terms of binding principles (Manzini and Wexler 1987), null subject parameter (Rizzi 1982), quantifier interactions (Musolino 1998) and others (see Angluin 1980; Berwick 1985; Clark 1992; Fodor 1992, 1994; Goro 2007; Roeper and de Villiers 1992; Wexler 1993 among others). The Subset Principle seems to be at work in the acquisition of L1 phonological knowledge as well. For example, learners of languages that possess both voiced and voiceless obstruents (e.g. English) may show an acquisition stage in which only voiceless obstruents are allowed (in coda position) (Broselow 2004; Eckman 2004; Grijzenhout 2000; Menn 1971; see also footnote 1 for other relevant references).

1 This “nihilistic” view of learning bias is what is often embraced in Optimality Theory (Prince and Smolensky 1993/2004), in which in the initial stage of language learning, all markedness constraints, which prohibit (certain) linguistic structures, dominate all faithfulness constraints, which prohibit changes from underlying representations to surface representations (Smolensky 1996). This bias reduces all input structures to { \emptyset } at the initial state, and guarantees a restrictive learning to overcome the subset problem (Hayes 2004; Tesar 2002).

Less well investigated is whether the Subset Principle holds in L2 acquisition (though see Altenberg and Vago 1983; Broselow and Finer 1991; Broselow et al. 1998; Eckman 1981 for relevant studies), and this is the topic that the current paper takes up on.² We hasten to add that it is not the case that this topic has been unexplored in the past: in particular, Ayoun (1996) investigated the applicability of the Subset Principle to the L2 acquisition of the Oblique-Case Parameter (Kayne 1981, 1984) by learners of French. The results of a grammaticality judgment task and a correction task provide (at least) partial support for the Subset Principle. This paper reports another case study to address the role of the Subset Principle in L2 acquisition. We explicitly acknowledge here that the current study is merely one case study, so that the impact of the results would necessarily be limited. However, we believe that only through case studies of this kind, can we address the general question of how L2 acquisition works, and thus this study offers a substantial step toward understanding the mechanism of L2 acquisition.

Building on Ayoun (1996) as well as the general spirit of the Subset Principle, this paper proposes that when two languages stand in a superset-subset relationship in their available interpretations, L2 learners, regardless of their L1, start out with the one available in the subset language. This proposal is best tested by examining a case in which L2 learners' L1 is the superset language, and the L2 target language is the subset language. To this end, this paper offers a new case study of such a scenario. One novelty of this study is that it shows that the Subset Principle may hold in the

2 Some studies have suggested that the Subset Principle may not hold in L2 acquisition, in the case of the Governing Category Parameter (Finer 1991; Hirakawa 1990; Thomas 1995; White 2003). As Berent (1994) argues, however, in all cases where L2 learners do not seem to be guided by the Subset Principle, the parameters investigated may not meet the subset condition (i.e., they are not in a subset-superset relation). Another point to be noted is that most studies used advanced-level learners, at least compared to those used in the current study, because they used embedded sentences as test sentences which would have been too difficult for introductory-level learners to understand. It may as well be the case then that these learners may have overcome the Subset Principle by the time of testing. As explained later, the current study used introductory learners to eschew this potential concern.

initial stage of L2 acquisition, specifically in the domain of interpretations.

Another notable aspect of the current investigation is that this situation allows us to directly tease apart the prediction of the Subset Principle and that of Transfer View. In the Transfer theory of second language acquisition (see Bley-Vroman 1990, 2009; Schachter 1990; Schwartz and Sprouse 1994, 1996, 2000 for various incarnations of this view; see White 2003 for an overview), learners would transfer the interpretations available in their L1 when they interpret L2 sentences. If, as is the case with the current study, L1 learners allow the superset elements, {X} and {Y}, then the transfer theory predicts that these interpretations are transferred when they interpret L2 sentences. This prediction differs from that of the Subset Principle, allowing us to tease apart the two theories of L2 acquisition.

1.3. The current study

As an empirical case study, this paper reports an experiment on the interpretation of elided bare subject noun phrases in Japanese and Mandarin Chinese. These two languages stand in a subset-superset relationship in terms of the interpretation of elided subject noun phrases. Japanese is a superset language, and Mandarin Chinese is a subset language. The results show that most Japanese introductory-level learners of Mandarin Chinese assign only a subset reading—{X}—to elided bare noun phrases in Mandarin Chinese sentences, despite the fact that their L1 allows both {X} and {Y}. This result indicates that when Japanese learners start learning Mandarin Chinese, they start with the assumption that only the subset reading is possible, supporting the Subset Principle in L2 acquisition.³

The rest of the paper proceeds as follows. Section 2 illustrates the interpretation of elided subject bare noun phrases in Japanese and Mandarin Chinese. Section 3 reports the method of the current experiment, and section 4 discusses the results. Section 5 discusses some general issues that arise from the experiment.

3 A small number of participants showed the behavior that is consistent with the Transfer View, and this issue will be taken up in full detail in sections 4 and 5.

2. Background

2.1. Interpretation of elided bare noun phrases in Japanese and Mandarin Chinese

As shown in (1) and (2), both Japanese and Mandarin Chinese allow elided subject constructions, in which subject DPs are phonetically null.⁴ An example from Japanese is shown in (1), and a Mandarin Chinese example is shown in (2).

(1) Sentence with a null subject in Japanese:

a. Keesatu-ga sato san-no ie-ni kita.
police officer-NOM Ms.Sato-GEN house-DAT came
‘The/A police officer came to Ms. Sato’s house.’

b. *e* Yamada san-no ie-ni-mo kita.
Ms.Yamada-GEN house-DAT-also came
‘**The/A police officer** also came to Ms. Yamada’s house.’

(^{OK}definite interpretation / ^{OK}indefinite interpretation)

4 Some theories consider these null subjects to be an empty pronoun, *pro* (Kuroda 1965; Hoji 1985; Saito 1985; Sato 2014), whereas others argue that these null subjects arise from argument ellipsis (Oku 1998; Otani and Whitman 1991; Saito 2007; Şener and Takahashi 2010; Takahashi 2008a, 2008b)—see Tomioka (2014) for a recent overview and comparison of these two views. For the sake of discussion, this paper assumes that this null subject construction involves argument ellipsis (see Oku 1998; Otani and Whitman 1991; Saito 2007; Şener and Takahashi 2010; Takahashi 2008a, 2008b for Japanese, and Cheng 2011 for Mandarin Chinese; though see also Hoji 1998) rather than empty pronoun (Kuroda 1965) for the following reason. Null subjects in Japanese and Chinese can have the sloppy reading in addition to the strict reading, and null subjects should thus be treated as something different from empty pronouns. However, the conclusion drawn in this paper does not hinge on which one of these theories is the correct interpretation of the null subjects in these languages. What is crucial is that Japanese and Mandarin Chinese stand in a subset-superset relationship, in terms of this construction at issue. Also, while null arguments in Japanese and Mandarin Chinese can be derived by ellipsis, we do not assume that every elided argument attested in natural languages must be analyzed this way.

(2) Sentence with a null subject in Mandarin Chinese:

a. Jīngchá lái-le Zuǒtóng jiā,
police officer come-ASP Ms. Sato's house
'The police officer came to Ms. Sato's house.'

b. *e* yě lái-le Shāntián jiā.
also come-ASP Ms. Yamada's house
'**He/She** also came to Ms. Yamada's house.'

(⁰Kdefinite interpretation/*indefinite interpretation)

The sentences involving null subjects, as shown in (1b) and (2b), consist of similar syntactic elements, but (1b) and (2b) nevertheless differ in their available interpretations. Each interpretation is illustrated in Figure 1 and Figure 2. Null subjects in (1b) are ambiguous between a definite interpretation (Figure 1: the police officer who went to Ms. Sato's house must be the same police officer as the one who went to Ms. Yamada's house) and an indefinite interpretation⁵ (Figure 2: the police officer who went to Ms. Sato's house can be different from the one who went to Ms. Yamada's house).⁶

5 These readings have alternatively been referred to as “strict reading” and “sloppy reading”, respectively. The terminological differences do not matter much in the following discussion.

6 Not every speaker of Japanese may accept both of the two readings for this type of sentences. However, in order to eschew this potential concern, we only tested those Japanese speakers who accept both readings of these sentences, so that the version of Japanese tested in this paper is indeed the superset language, allowing both readings. The detail of this screening procedure is reported in the method section.

Figure 1. Definite interpretation

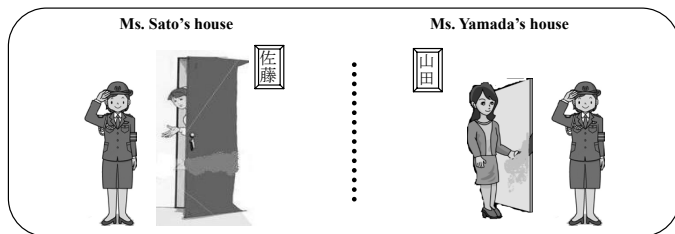
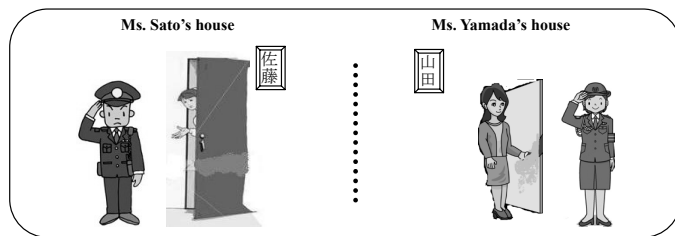


Figure 2. Indefinite interpretation

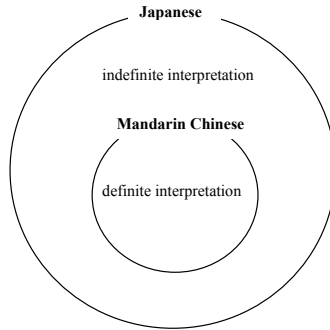


On the other hand, elided bare noun constructions in Mandarin Chinese, like (2b), have only a definite interpretation, illustrated in Figure 1 (Cheng and Sybesma 1999).

This difference between Japanese and Mandarin Chinese in terms of their interpretations can be represented as a subset-superset relationship, as in (3).⁷

7 The difference between Japanese and Mandarin Chinese could derive, for example, from the structural differences between the two languages, in particular in terms of at which structural positions the silent noun phrases are copied at LF (Cheng and Sybesma 1999; Kakegawa 2000; Tateishi 1988, see also Watanabe 2006). Again, similar to the issue discussed in footnote 4, for the current purpose, the source of the differences between the two languages is less important than the very fact that these two languages stand in a subset-superset relationship.

(3) Subset-superset relation among Japanese and Mandarin Chinese:



Japanese allows both the definite interpretation and the indefinite interpretation, while Mandarin Chinese allows only the definite interpretation; therefore, Mandarin Chinese is the subset language and Japanese is the superset language.^{8,9}

Before moving on to the main discussion, some clarification is in order. As shown in (4), when the subjects are left adjacent to the verb (where elements get a nonspecific interpretation in general), elided null subjects in Mandarin Chinese can

8 If one hesitates to treat “an interpretation” as an element in Set Theory—because it is not immediately clear if we can “count” an interpretation—then interpretations can be defined as LF representations, based on the standard assumption that each distinct meaning corresponds to a different distinct LF representation (May 1977 *et seq.*). Then we can treat two interpretations as two structural elements, and then there is nothing that would prevent us from using Set Theoretic notions to handle interpretations, because LF representations are clearly countable. However, we need to make this assumption if and only if one objects to the idea that interpretations can be treated as elements in the Set Theoretic sense. We do not find treating interpretations as elements particularly problematic, because they should have distinct semantic representations anyway, be they LF representations or not.

9 Both Japanese and Mandarin Chinese allow object nouns to be elided as well. The reason why the current experiment did not use the elided object construction is because the elided objects in these languages allow, unlike elided subject constructions, both the definite and indefinite interpretations (Cheng and Sybesma 1999). Therefore comparing Japanese and Mandarin Chinese in terms of sentence with elided objects would be less informative, because they do not stand in a superset-subset relationship.

refer to a different police officer as well; i.e. the indefinite reading is possible (Li Fei and Na Ta, *p.c.*). In other words, it is not the case that the indefinite reading is utterly impossible in general for Mandarin Chinese elided subjects.

- (4) a. Zuóféng jiā lái-le sān-ge jǐngchá,
Mr. Sato's house come-ASP three-CL police officer
'The three police officers came to Mr. Sato's house.'

- b. *e* Shāntián jiā yě lái-le.
Mr. Yamada's house also come-ASP
'**They** also came to Mr. Yamada's house.'

(^{OK}pro interpretation/ ^{OK}quantificational interpretation)

However, what is crucial here is the fact that the test sentences used in this experiment allow only the definite interpretation. Most of the Mandarin Chinese informants reported that they allow only a definite interpretation for the sentence shown in (2)—see the experimental results below in section 4.

2.2. Predictions of the two theories

The difference between the two hypotheses under discussion—the Subset Principle and the Transfer View—as applied to the specific case in (3), is as follows. If L2 learners obey the Subset Principle, introductory-level Japanese learners of Mandarin Chinese should start out with the subset interpretation in (3), i.e., the definite interpretation only. On the other hand, if L1 transfer governs L2 development paths, introductory-level Japanese learners of Mandarin Chinese should apply their L1 grammar to L2 grammar; as a consequence, they should assign both the definite interpretation and the indefinite interpretation. The following experiment was set out to test these predictions.

3. Method

In order to compare the two predictions, the current experiment examined the interpretation of elided bare subject noun phrases with introductory-level Japanese learners of Mandarin Chinese. In order to tap the initial stage of L2 acquisition, the target participants were introductory learners of Mandarin Chinese; a preliminary set of results from advanced learners are reported in section 5.3.

3.1. Participants

As a pre-test screening, the Japanese learners of Mandarin Chinese were first tested on (i) whether they knew all the words and (ii) whether they can understand sequences of two separate sentences used in the stimulus sentences. The data from those who failed these screening were excluded from the experiment.

The remaining participants were 22 introductory-level Japanese learners of Mandarin Chinese. In addition, ten native speakers of Mandarin Chinese served as a control group to check the quality of the stimuli—to make sure that Mandarin Chinese is the subset language in the relevant aspect. As a further screening procedure, all the Japanese participants were asked if both the definite interpretation and the indefinite interpretation are possible in elided bare noun constructions *in* Japanese, using the same paradigm that was deployed in the main part of this study (see below). Those who answered negatively to this question were going to be excluded from the following analysis, but none of them did. Therefore, for Japanese sentences, the Japanese participants accepted both the definite and indefinite readings nearly all the time.

In the questionnaires, they all reported that they had never been explicitly taught the Mandarin Chinese and Japanese elided bare noun constructions, excluding the possibility that their responses would be affected by explicit instructions on how to interpret null subjects in Mandarin Chinese. The characteristics of the participants and control participants are described in further detail below.

The 22 introductory-level Japanese learners of Mandarin Chinese were

undergraduate students at Keio University. Their age at the time of testing ranged from 20;6 to 22;1 (average: 21;5), the age of first exposure to Mandarin Chinese, from 18;7 to 19;5 (average: 18;11), and the duration of exposure of formal instruction in Japan from 0;10 to 1;10. (average: 0;11). As long as the duration of exposure of formal instruction in Japan ranged from 0;1 to 2;00, the participants were treated as introductory-level learners.¹⁰

Ten native Mandarin Chinese-speakers, all from Beijing, also participated in this experiment as a control group. All of them were undergraduate or graduate students at Keio University or the University of Tokyo. This group of native speakers was included (i) to ensure that the current experimental stimuli would elicit the expected response patterns—i.e., only the definite interpretation—from L1 grammar, and (ii) to compare L2 learners’ data with native speakers’ data.

3.2. Stimuli

There were five sets of test sentences with the null subject, which should allow only a definite interpretation; an example test sentence is shown in (5). These different sentences were characterized by having different subject nouns: *jǐngchá* ‘*police officer*’, *xiǎotōur* ‘*thief*’, *xiǎoshòuyuán* ‘*salesman*’, *yóudiyuán* ‘*postofficer*’, and *bào zhǐ jì zhě* ‘*newspaper reporter*’. Two kinds of verbs were used in the stimulus sentences: *lái-le* ‘*come-ASP*’ and *jìn rù-le* ‘*break.into-ASP*’.¹¹ See the Appendix 1 for all the stimulus sentences.

10 In L2-related studies, it is always difficult to define the levels learners (e.g. introductory vs. intermediate vs. advanced). Our choice is at least an objective one, if not the best possible measure, although we believe that this issue is extremely complicated, and it is beyond the scope of our paper to justify our choice in full detail. In section 5.3, we will observe that advanced learners show similar behaviors to introductory learners, and therefore this distinction between “introductory” vs. “advanced” may not be moot for the case at hand.

11 The reason why we chose these two verbs is as follows. In a companion study, we tested how Mandarin speakers acquire Japanese. In that companion study, we selected those verbs that are taught at introductory levels, based on the standards provided by Japan-Language

(5) An example test sentence:

a. Jǐngchá lái-le Zuǒténg jiā,
police officer come-ASP Ms. Sato's house

‘The police officer came to Ms. Sato’s house.’

b. e yě lái-le Shāntián jiā.
also come-ASP Ms. Yamada's house

‘**He/She** also came to Ms. Yamada’s house.’

(^{OK}definite interpretation/*indefinite interpretation)

Five sets of control sentences were also included to check whether participants can interpret the sequences of two sentences (the antecedent sentence and the test/control sentence) in Mandarin Chinese. An example is shown in (6), in which (6b) has an overt pronoun in subject position, and allows only a definite interpretation.

(6) An example control sentence:

a. Jǐngchá lái-le Zuǒténg jiā,
police officer come-ASP Ms. Sato's house

‘The policeman came to Ms. Sato’s house.’

b. **Tā** yě lái-le Shāntián jiā.
he also come-ASP Ms. Yamada's house

‘**He/She** also came to Ms. Yamada’s house.’

(^{OK}definite interpretation/*indefinite interpretation)

All of the test and the control sentences were written in simplified Chinese characters

Proficiency Test, the Japan Foundation and Japan Educational Exchanges and Services. These two verbs are appropriate intransitive verbs for introductory learners.

and presented to the participants. Again see the Appendix 2 for a list of all the control sentences included in this experiment.

3.3. Task

The experiment was designed to examine whether the participants assign particular interpretations to bare noun phrases in ellipsis constructions in the stimulus sentences. The task was, for each stimulus sentence, to judge whether a particular interpretation—definite interpretation or indefinite interpretation—was available or not. All of the test and the control sentences were printed on a sheet of paper. A picture describing a particular interpretation, as in Figure 1 or Figure 2, was shown alongside each stimulus sentence. The two questions, i.e., the definite interpretation and the indefinite interpretation for the same sentence, were presented separately. The participants were asked to indicate whether each sentence correctly described the picture. For each sentence, the picture which indicates an indefinite interpretation was presented before the picture which indicates a definite interpretation, since it was expected to be easier for native Mandarin Chinese speakers and Japanese learners to assign a definite interpretation than an indefinite interpretation and thus a definite interpretation may possibly block an indefinite interpretation. There were no time limits to answer each question, and the learners finished the whole task in thirty to forty minutes.

It has been asked if it would have been better to provide a context to define the definite and indefinite readings. While we fully acknowledge this concern is valid, the difference between the definite and indefinite reading was clearly conveyed in the pictures presented during the experiment: in the definite reading, the subject of the two panels was identical (see again Figures 1 and 2).¹²

12 By this paragraph, we are by no means asserting that it is not interesting or necessary to provide explicit contexts to distinguish between the definite and indefinite readings, especially given the role of contexts in eliciting different interpretations given ambiguous sentences (see

4. Results

4.1. Japanese L2 learners of Mandarin Chinese

The results of the Japanese L2 learners are shown in Table 1,¹³ which shows “# of acceptance,” which indicates the number of participants who accepted the interpretation more than 80% of the time (i.e., four out of five items), and “% of acceptance,” which is an overall acceptance rate pooling over all the participants and all the test sentences.

Table 1. Results of Japanese learners of Mandarin Chinese

	definite interpretation		indefinite interpretation	
	# of acceptance	% of acceptance	# of acceptance	% of acceptance
Test sentence	17/20	91.0 (91/100)	5/20	31.0(31/100)
Control sentence	19/20	96.0 (96/100)	0/20	3.0 (3/100)

For the definite interpretation of the test sentences, the Japanese learners of Mandarin Chinese accepted this interpretation 91.0% of the time. Seventeen learners assigned the definite interpretation to four or five test sentences. This result does not tease apart the two theories under discussion (the Subset Principle vs. the Transfer theory), because both of the theories are compatible with this result.

On the other hand, for the indefinite interpretation of the test sentences, the Japanese learners of Mandarin Chinese accepted this interpretation only 31.0% of the time. Only five out of 20 learners assigned the indefinite interpretation to four or five test sentences. In other words, 15 out of 20 learners rejected the indefinite interpretation.

To statistically assess the difference between the definite interpretation and the indefinite interpretation, first % of acceptance was compared between the two

Gualmini 2003 and Musolino 1999, although these studies concern scopal ambiguities). Therefore, this task would be an obvious interesting and important follow-up experiment in future research.

13 The raw data for each individual participant is available in xls format from the authors upon request.

conditions using a non-parametric Wilcoxon test.¹⁴ The difference was significant ($p<.001$). # of acceptance was also compared between the two interpretations using Fisher’s Exact Test, and the difference was again significant ($p<.001$).

This statistically significant difference between the definite interpretation and the indefinite interpretation teases apart the Subset Principle and the Transfer View. Only the Subset Principle predicts that Japanese speakers reject the indefinite interpretation at an early stage of their L2 learning. The Transfer Theory predicts that Japanese speakers should accept both readings, because their L1 allows both readings: recall that those Japanese speakers accepted both the definite and indefinite readings for Japanese sentences in the screening procedure. See section 5, for reasons why the % of acceptance for indefinite interpretation is 31.0%, not 0%.

The results for the control sentences indicate that introductory-level Japanese learners of Mandarin Chinese can interpret the sequences of two sentences (the antecedent sentence and the test/control sentence) in Mandarin Chinese without problems.

4.2. Control participants: native Mandarin speakers

The results of native Mandarin Chinese speakers are shown in Table 2.

Table 2. Results of native Mandarin Chinese speakers

	definite interpretation		indefinite interpretation	
	# of acceptance	% of acceptance	# of acceptance	% of acceptance
Test sentence	8/10	92.0 (46/50)	1/10	14.0 (7/50)
Control sentence	9/10	96.0 (48/50)	0/10	4.0 (2/50)

For the definite interpretation of test sentences, the native Mandarin Chinese speakers accepted this interpretation 92.0% of the time. 8 out of 10 speakers assigned

¹⁴ A Wilcoxon test is a non-parametric version of a more standard t-test. A non-parametric test was used because the dependent variable was on a 5-point non-continuous Lickert scale.

the definite interpretation to four or five test sentences.

For the indefinite interpretation of the test sentences, the control participants allowed the indefinite interpretation only 14.0% of the time; only one out of 10 speakers assigned the indefinite interpretation to four or five test sentences.

In summary, most of the native Mandarin Chinese speakers did not assign indefinite interpretations to the test sentences. This result ensures that Mandarin Chinese constitutes the subset language in (3) in that it allows only the definite interpretation, and that the current stimuli indeed elicit only definite interpretations from native speakers.

5. Discussion

5.1. Summary and the discussion of the results

The Subset Principle predicts that introductory-level L2 learners start out with the subset language, in the current case a language that allows only the definite interpretation. The Transfer View on the other hand predicts that Japanese introductory-level learners of Mandarin Chinese start with both the definite interpretation and the indefinite interpretation, because Japanese allows both of these interpretations.

The results showed that introductory-level Japanese learners of Mandarin Chinese generally started with allowing only the definite interpretation. Moreover, the Mandarin Chinese participants also allowed only the definite interpretation. Taken together, the results confirm that Mandarin Chinese is the subset language with respect to Japanese, and also show that L2 Japanese learners of Mandarin Chinese start with the subset language. The results thus support the prediction of the Subset Principle.

Recall that all the Japanese participants report that they received no explicit instructions as to how to interpret null subjects in Mandarin Chinese. Therefore, the current experimental results cannot be attributed to the explicit teaching instructions.

Finally, a concern has been raised to the effect that the presence of *ye* ‘also’ in the stimuli helped elicit the definite reading—this sure seems to have been the case, given the results of the native Mandarin speakers. Even granted that this was the case,

it is still interesting that most of the Japanese speakers rejected the *indefinite* reading, despite the fact that the corresponding Japanese sentences allow the indefinite reading. Recall that the participants judged the availability of the indefinite and definite readings in separate questions, so the question remains why the participants rejected the indefinite reading. We suspect that it is the Subset Principle that is responsible for rejecting this reading.

5.2. Remaining Questions

Although it seems to be the case that the current results support the role of the Subset Principle in L2 acquisition, several issues and questions arise from the current experiment. This section is intended to lay out and discuss these issues and questions, although most of the time we are unable to resolve them in full detail. Optimistically speaking, however, we take it that these remaining issues open up interesting possibilities for future research.

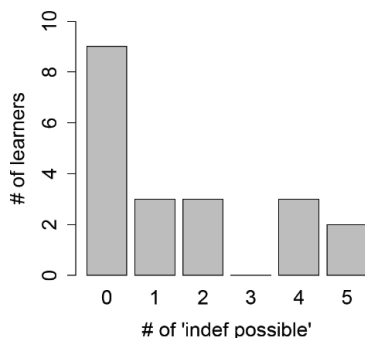
5.2.1. The subset principle vs. transfer

One remaining question that arises from the current results is that despite the fact that introductory-level learners generally allowed the indefinite interpretation significantly less frequently than the definite interpretation; they nevertheless allowed that reading 31.0% of the time. Moreover, five participants accepted the indefinite interpretation more than 80% of the time.

There are two possible explanations for this exceptional behavior: (i) the Subset Principle is a stochastic, violable principle within each speaker or (ii) L1 transfer does have some tangible influence on some groups of speakers. Put differently, the issue is whether the current results involve a within-subject variation or a between-subject variation.

To test these hypotheses, Figure 3 presents a histogram illustrating the number of participants for each number of acceptance for the indefinite interpretation.

Figure 3: The distribution of the numbers of learners in terms of for how many sentences they regard an indefinite interpretation to be possible.



One immediate observation that we can make is that there is no participant who accepts the indefinite interpretation for 3 out of 5 items. In other words, all the L2 participants belonged to either of the two groups, “Subset Principle group” and “transfer group”. Those that are distributed to the left edge of the histogram must have been following the Subset Principle, as they rejected the indefinite interpretation. Those that are distributed on the right, on the other hand, must have been following the transfer (i.e. their L1 Japanese knowledge).

This dichotomous distribution denies the possibility that the Subset Principle operated stochastically in the current experiment; rather it seems as if there are participants who follow the Subset Principle, and there are those that followed the transfer pattern from the native language.

The five participants who accepted the indefinite interpretation may have been influenced by the transfer, because they all accepted this interpretation in their native language, i.e., Japanese.¹⁵ For the remaining 15 participants, the acceptance rate of the

¹⁶ Four out of these five participants also showed behavior consistent with the Transfer View in a similar experiment reported in Monou and Kawahara (2013); i.e. there was a cross-experimental consistency. Therefore, there is a certain sense in which these speakers are resorting to the transfer strategy when they are interpreting L2 sentences.

indefinite interpretation within this group is as low as 9.0%. This low acceptance rate suggests that the Subset Principle is strongly at work, at least for these 15 L2 learners. In short, all the L2 participants in this experiment divide into either one of the two groups, “Subset Principle group” and “Transfer group”.

A deeper issue that arises now is where this grouping comes from. It may be possible to postulate that all speakers follow one principle at their initial stage (e.g., the transfer from L1) and the learning allows them to change the principle that they follow (e.g., the Subset Principle) (cf. The Full Transfer/The Full Access hypothesis of L2 acquisition: Schwartz and Sprouse 1994, 1996, 2000). In a sense, it could be that when their L2 skills are so primitive, learners may resort to the L1 knowledge. The observed differences, under this hypothesis, may then come from different length of exposure to L2. This is unlikely, however, because the length of exposure is comparable across these participants. Therefore, this issue needs to be explored in future studies. We believe that addressing this issue in full can only be accomplished after accumulation of case studies of this sort.

5.2.2. L1 vs. L2

The overall results of the experiment show that the Subset Principle can conflict with learners’ L1 grammar and its transfer in some situations. Whether this sort of conflict occurs or not may distinguish L1 acquisition and L2 acquisition, because in L1 acquisition, there is nothing that is inherently in conflict with the Subset Principle. This possibility would open up an interesting line of research on the comparison between L1 acquisition and L2 acquisition.

In this regard, the current experiment makes an interesting prediction, which can and should be tested in future research. That is, to the extent that L1 acquisition is also governed by the Subset Principle, our assertion predicts that Japanese-speaking children would also show a stage in which they accept only the definite reading for the kinds of constructions discussed throughout this paper. This issue is particularly interesting, because some studies have shown that children accept ambiguities in

scopally ambiguous sentences (Goro 2007; Zhou and Crain 2010) but that this sort of behavior is construction-specific. If the L1 acquisition is solely dictated by the Subset Principle, the prediction would be that Japanese-speaking children would show behaviors that are comparable to the current participants. On the other hand, if they are, in a sense, “permissive” about possible interpretations, then it may as well be the case that L1 acquisition and L2 acquisition may show different patterns.

To the best of our knowledge, this particular issue has not been tested, and it is unfortunately beyond the scope of this paper to conduct a new experiment on L1 acquisition. In short, this paper opens up an explicit agenda for future research, which allows us to address the general question of to what extent L1 and L2 are governed by the same principle.

5.2.3. Other constructions, other languages

Our study focused on a very specific environment: the interpretation of elided subjects in Japanese and Mandarin Chinese. It is not the case that our choice is random: we chose this particular construction for reasons that are stated in sections 1 and 2. However, we also fully acknowledge that the generalizability of our conclusion is limited, because our case study is focused on a very specific construction in two specific languages. We therefore do not intend to generalize our findings to all cases of L2 acquisition. In particular, in order to more confidently argue for the role of the Subset Principle in L2 acquisition, it is certainly necessary to look at other constructions in other languages. We do hope, however, that we have offered a substantial case study, and it is only through accumulations of these case studies can we investigate the general nature of L2 acquisition.

5.3. Beyond the introductory-level: a preliminary report

Although the main focus of this paper is on whether the Subset Principle holds at early or initial stages of L2 acquisition using introductory-level learners, a small-scale follow-up experiment with advanced-level learners was also conducted. This follow-

up experiment was intended to address the question of whether—and how long—the Subset Principle persists at later stages of L2 learning. Participants were eight advanced-level Japanese learners of Mandarin Chinese, who were students at Keiai University, Chiba, Japan and Japanese teachers of Mandarin Chinese. Their age at the time of testing ranged from 30;3 to 65;9 (average: 56;3), the age of first exposure to Mandarin Chinese, from 18;6 to 62;3 (average: 43;7), and the duration of exposure of formal instruction in Japan from 3;5 to 5;4. (average: 4;5). All of these learners were classified as advanced, as they had at least 3 years of explicit learning of Mandarin Chinese.

The results for advanced-level learners of Mandarin Chinese are shown in Table 3.

Table 3. Results of advanced-level learners of Mandarin Chinese

	definite interpretation		indefinite interpretation	
	# of acceptance	% of acceptance	# of acceptance	% of acceptance
Test sentence	8/8	97.5 (39/40)	4/8	45.0 (18/40)
Control sentence	8/8	97.5 (39/40)	0/8	5.0 (2/40)

For the definite interpretation of the test sentences, the advanced-level learners of Mandarin Chinese accepted this interpretation 98.3% of the time. All of the learners assigned the definite interpretation more than 80% of the time.

For the indefinite interpretation of the test sentences, they allowed this interpretation only 45.0% of the time. Four out of eight learners rejected the indefinite interpretation. The difference between the definite interpretation and the indefinite interpretation is significant in terms of ‘% of acceptance’ by a Wilcoxon test ($p < .05$). The difference is not significant in terms of ‘# of acceptance’; however, recall that the Ns are small, 8 vs. 4.

These results indicate that the advanced learners can correctly assign only the definite interpretation for the elided bare noun phrases in Mandarin Chinese, and that at least half of the L2 learners stick to the subset interpretation even after 3 years of

exposure to L2. The size of this experiment is small, which does not allow us to make conclusive statements, although the follow-up experiment may show that the Subset Principle is not only relevant at the initial stage, but keeps its influence until the later stage of L2 learning.

6. Conclusion

The current experiment tested the role of the Subset Principle using different interpretations of elided nominal subjects that are available in Japanese and Mandarin Chinese. Mandarin Chinese allows the subset of interpretation with respect to what Japanese allows. The Subset Principle predicts that introductory Japanese L2 learners of Mandarin Chinese start with only the subset reading, whereas the Transfer theory predicts that both readings are available in interpretation of L2 sentences. The experiment shows that most of the participants behaved in a way that is consistent with the Subset Principle, while a small number of participants showed a behavior that is consistent with language transfer. The division between these two groups of participants was clear-cut, indicating that participants can either follow the Subset Principle or the Transfer, but not both.

Appendix 1: All the test sentences

(7) a. Jǐngchá lái-le Gāoqiáo jiā,
policeofficer come-ASP Ms. Takahashi's house
'The police officer came to Ms. Sato's house.'

b. *e* yě lái-le Língmù jiā.
also come-ASP Ms. Suzuki's house
'He also came to Ms. Suzuki's house.'

(8) a. Xiǎoshòuyuán lái-le Zuǒténg jiā,
salesman come-ASP Ms. Sato's house

‘The salesman came to Ms. Sato’s house.’

b. *e* yě lái-le Shāntián jiā.
also come-ASP Ms. Yamada’s house

‘He also came to Ms. Yamada’s house.’

(9) a. Bào zhì jì zhě lái-le Líng mù jiā,
newspaper reporter come-ASP Ms. Suzuki’s house

‘The newspaper reporter came to Ms. Suzuki’s house.’

b. *e* yě lái-le Zhōng cūn jiā.
also come-ASP Ms. Nakamura’s house

‘He also came to Ms. Nakamura’s house.’

(10) a. Xiǎo tōu rù-le Xiǎo lín jiā,
thief break.into-ASP Ms. Kobayashi’s house

‘The thief broke into Ms. Kobayashi’s house.’

b. *e* yě jìn rù-le Tián zhōng jiā.
also break.into-ASP Ms. Tanaka’s house

‘He also broke into Ms. Tanaka’s house.’

(11) a. Yóu dì yuán lái-le Yī téng jiā,
postofficer come-ASP Ms. Ito’s house

‘The postofficer came to Ms. Ito’s house.’

b. *e* yě lái-le Líng mù jiā.
also come-ASP Ms. Suzuki’s house

‘He also came to Ms. Suzuki’s house.’

Appendix 2: All the control sentences

(12) a. Jǐngchá lái-le Gāoqiáo jiā,
Police officer come-ASP Ms. Takahashi's house
'The police officer came to Ms. Sato's house.'

b. Tā yě lái-le Língmù jiā.
he/she also come-ASP Ms. Suzuki's house
'He/She also came to Ms. Suzuki's house.'

(13) a. Xiǎoshòuyuán lái-le Zuǒténg jiā,
salesman come-ASP Ms. Sato's house
'The salesman came to Ms. Sato's house.'

b. Tā yě lái-le Shāntián jiā.
he/she also come-ASP Ms. Yamada's house
'He/She also came to Ms. Yamada's house.'

(14) a. Bào zhǐ jì zhě lái-le Língmù jiā,
newspaper reporter come-ASP Ms. Suzuki's house
'The newspaper reporter came to Ms. Suzuki's house.'

b. Tā yě lái-le Zhōngcūn jiā.
he/she also come-ASP Ms. Nakamura's house
'He/She also came to Ms. Nakamura's house.'

(15) a. Xiǎo tōu jìn rù-le Xiǎo lín jiā,
thief break.into-ASP Ms. Kobayashi's house
'The thief broke into Ms. Kobayashi's house.'

b. Tā yě jìnrù-le Tiánzhōng jiā.
he/she also break.into-ASP Ms. Tanaka's house
 ‘He/She also broke into Ms. Tanaka’s house.’

(16) a. Yóudiyuán lái-le Yīténg jiā,
postofficer come-ASP Ms. Ito's house
 ‘The postofficer came to Ms. Ito’s house.’

b. Tā yě lái-le Língmù jiā.
he/she also come-ASP Ms. Suzuki's house
 ‘He/She also came to Ms. Suzuki’s house.’

References

- Altenberg, E. P. & Robert M. V. (1983). Theoretical Implications of an Error Analysis of Second Language Phonology Production. *Language and Learning* 33, 427-447.
- Angluin, D. (1980). Inductive Inference of Formal Languages from Positive Data, *Information and Control* 45, 117-135.
- Ayoun, D. (1996). The Subset Principle in Second Language Acquisition. *Applied Psycholinguistics* 17 (2), 185-213.
- Baker, C. L. (1979). Syntactic Theory and the Projection Problem. *Linguistic Inquiry* 10: 533-581.
- Berent, G. (1994). The Subset Principle in First and Second Language Acquisition. In A. Cohen, S. Gass, & E. Tarone (Eds.), *Research Methodology in Second-Language Acquisition*, 17-39. Hillsdale, NJ: Erlbaum.
- Berwick, R. (1985). *The Acquisition of Syntactic Knowledge*. Cambridge: MIT Press.
- Bley-Vroman, R. (1990). The Logical Problem of Foreign Language Learning. *Linguistic Analysis* 20, 3-49.
- Bley-Vroman, R. (2009). The Evolving Context of the Fundamental Difference Hypothesis. *Studies in Second Language Acquisition* 31, 175-198.
- Broselow, E. & D. Finer. (1991). Parameter Setting in Second Language Phonology and Syntax. *Second Language Research* 7, 35-59.

- Broselow, E., S.-I. Chen, & C. Wang. (1998). The Emergence of the Unmarked in Second Language Phonology. *Studies in Second Language Acquisition* 20, 261-280.
- Broselow, E. (2004). Unmarked Structures and Emergent Rankings in Second Language Phonology. *International Journal of Bilingualism*, 8 (1), 51-65.
- Cheng, L. L.-S. & R. Sybesma. (1999). Bare and Not-so-bare Nouns and Structure of NP. *Linguistic Inquiry* 30, 509-542.
- Clark, R. (1992). The Selection of Syntactic Knowledge. *Language Acquisition* 2, 83-149.
- Eckman, F. (1981). On the Naturalness of Interlanguage Phonological Rules. *Language Learning* 31: 195–216.
- Eckman, F. (2004). From Phonemic Differences to Constraint Ranking. *Studies in Second Language Acquisition* 26, 513-549.
- Finer, D. (1991). Binding Parameters in Second Language Acquisition. In L. Eubank (Ed.), *Point Counterpoint: Universal Grammar in the Second Language*, 351-374. Amsterdam: John Benjamins.
- Fodor, J. D. (1992). Learnability of Phrase Structure Grammars. In Levine, R. (Ed.), *Formal Grammar: Theory and Implementation* (Vancouver Studies in Cognitive Science 2), 3-68. Oxford: Oxford University Press.
- Fodor, J. D. (1994). How to Obey the Subset Principle: Binding and Locality. In B. Lust, G. Hermon, G. and J. Kornfilt (Eds.), *Syntactic Theory and First Language Acquisition: Cross-linguistic Perspectives (vol. 2): Binding, Dependencies, and Learnability*, 429-451. Hillsdale: Lawrence Erlbaum.
- Goro, T. (2007). *Language-Specific Constraints on Scope Interpretation in First Language Acquisition*. Doctoral dissertation, University of Maryland.
- Grijzenhout, J. (2000). Voicing and Devoicing in English, German, and Dutch; evidence for domain-specific identity constraints. *Theorie des Lexikons*, 116 (*Arbeiten des Sonderforschungsbereich*, 282), Heinrich-Heine-Universität, Düsseldorf.
- Gualmini, A. (2003). Some Knowledge Children Don't Lack. In B. Beachley et al. (Eds.), *BUCLD 27 Proceedings*, 276-287. Somerville, MA: Cascadia Press
- Hayes, B. (2004). Phonological Acquisition in Optimality Theory: the Early Stages. In Kager, Rene, Pater, Joe, and Zonneveld, Wim, (Eds.), *Fixing Priorities: Constraints in Phonological Acquisition*. Cambridge University Press.
- Hirakawa, M. (1990). A Study of the L2 Acquisition of English Reflexives. *Second Language Research* 6, 60-85.
- Hoji, H. (1985). *Logical Form Constructions and Configurational structures in Japanese*. Doctoral Dissertation, University of Washington.
- Kakegawa, T. (2000). Definiteness and the Structure of NP in Japanese. *MIT Working Papers in Linguistics* 38, 127-141.
- Kapur, S., B. Lust, W. Harbert, & G. Martohardjono. (1993). Universal Grammar and Learnability

- Theory: the Case of Binding Domains and the “Subset Principle”. In E. Reuland and W. Abraham (Eds.), *Knowledge and Language (Vol. 1), From Orwell’s Problem to Plato’s Problem*, 185-216. Netherlands: Kluwer Academic Publishers.
- Kayne, R. (1981). On Certain Differences between French and English. *Linguistic Inquiry* 12, 349-371.
- Kuroda, S-Y. (1965). *Generative Grammatical Studies in the Japanese Language*. Doctoral dissertation, MIT.
- Manzini, R. & K. Wexler. (1987). Parameters, Binding Theory, and Learnability. *Linguistic Inquiry* 18, 413-444.
- McNamara, T. F. (1996). *Measuring Second Language Performance*. London: Longman.
- May, R. (1977). *The Grammar of Quantification*. Doctoral dissertation, MIT. Reproduced by Garland (1991).
- Menn, L. (1971). Phonotactic Rules in Beginning Speech. *Lingua* 26, 225-251.
- Monou, T and S. Kawaharfa (2013). The emergence of the unmarked in L2 acquisition: interpreting null subjects, Proceedings of TCP 14, 181-200.
- Musolino, J. (1998). *Universal Grammar and the Acquisition of Semantic Knowledge: An Experimental investigation into the Acquisition of Quantifier-negation Interaction in English*. Doctoral dissertation, University of Maryland.
- Oku, S. (1998). *A Theory on Selection and Restriction in the Minimalist Perspective*. Doctoral dissertation, University of Connecticut.
- Otani, K. & J. Whitman. (1991). V-Raising and VP-Ellipsis. *Linguistic Inquiry* 22, 345-358.
- Rizzi, L. (1982). *Issues in Italian syntax*. Dordrecht: Foris.
- Roeper, T. & D. V. Jill. (1992). Ordered Decisions in the Acquisition of Wh-questions. In *Theoretical Issues in Language Acquisition: Continuity and Change in Development*, Weissenborn et al. (Eds.), 191-236. Hillsdale, NJ: Lawrence Erlbaum.
- Prince, A. & P. Smolensky (1993/2004) *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden and Oxford [originally circulated in 1993 as ms. University of Colorado and Rutgers University]: Blackwell.
- Saito, M. (1985). *Some Asymmetries in Japanese and Their Theoretical Implications*. Doctoral Dissertation, MIT.
- Saito, M. (2007). Notes on East Asian Argument Ellipsis. *Language Research* 43, 203-227.
- Sato, Y. (2014). ϕ -Agreement and Definiteness as Two Variations on the Same Theme: New Evidence from East Asian Argument Ellipsis. ms. National University of Singapore.
- Schachter, J. (1990). On the Issue of Completeness in Second Language Acquisition. *Second Language Research* 6, 93-124.
- Schwartz, B. D. & R. Sprouse. (1994). Word Order and Nominative Case in Nonnative Language Acquisition: a Longitudinal Study of (L1 Turkish) German Interlanguage. In *Language*

- Acquisition Studies in Generative Grammar*, T. Hoekstra and B. D. Schwartz (eds.), 317-368. Amsterdam: John Benjamins.
- Schwartz, B. D. & R. Sprouse. (1996). L2 Cognitive States and the Full Transfer/Full Access Model. *Second Language Research* 12, 40-72.
- Schwartz, B. D. & R. Sprouse. 2000. When Syntactic Theories Evolve: Consequences for L2 Acquisition Research. In *Second Language Acquisition and Linguistic Theory*, J. Archibald (Ed.), 156-186. Oxford: Blackwell.
- Şener, S. & D. Takahashi. (2010). Ellipsis of Arguments in Japanese and Turkish. *Nanzan Linguistics* 6, 79-99
- Smolensky, P. (1996) The Initial State and 'Richness of the Base' in Optimality Theory. ms. Johns Hopkins University.
- Takahashi, D. (2008a). Quantificational Null Objects and Argument Ellipsis. *Linguistics Inquiry* 39, 307-326.
- Takahashi, D. (2008b). Noun Phrase Ellipsis. In S. Miyagawa and M. Saito (Eds.), *The Oxford Handbook of Japanese Linguistics*, 394-422. Oxford: Oxford University Press.
- Tateishi, K. (1988). Subject, SPEC, and DP in Japanese. *Proceedings of NELS 19*, 405-418.
- Tesar, B. (2002). Enforcing Grammatical Restrictiveness Can Help Resolve Structural Ambiguity. *Proceedings of the Twenty-First West Coast Conference on Formal Linguistics*. 443-456.
- Thomas, M. (1995). Acquisition of the Japanese Reflexive Zibun and Movement of Anaphors in Logical Form. *Second Language Research* 41, 177-204.
- Tomioka, S. (2014). Argument Ellipsis and Related Matters. Paper presented at FAJIL 2014, ICU.
- Watanabe, A. (2006). Functional Projections of Nominals in Japanese: Syntax of Classifiers. *Natural Language & Linguistic Theory* 24, 241-306.
- White, L. (2003). *Second Language Acquisition and Universal Grammar*. Cambridge: Cambridge University Press.
- Zhou, P & S. Crain. (2010). Focus Identification in Child Mandarin. *Journal of Child Language*, 37, 5, 965-1005, Cambridge University Press.