

Native-like Biases in Generation of Wh-Questions by Non-native Speakers of Japanese

Moti Lieberman¹, Sachiko Aoshima², Colin Phillips¹

¹Department of Linguistics, Cognitive Neuroscience of Language Laboratory,
University of Maryland, College Park

²Department of Language and Foreign Studies,
American University, Washington DC

Abstract

A number of studies of L2 sentence processing have investigated whether ambiguity resolution biases in the L1 transfer to superficially similar cognate structures in the L2. When transfer effects are found in such cases it is difficult to determine whether they reflect surface parallels between the languages or the operation of more abstract processing mechanisms. *Wh*-questions in English and Japanese present a valuable test case for investigating the relation between L1 and L2 sentence processing. Native speakers of English and Japanese both show strong locality biases in processing *wh*-questions, but these locality biases are realized in rather different ways in the two languages, due to differences in word order and scope marking. Results from a sentence generation study with native speakers of Japanese and advanced English-speaking L2 learners of Japanese show that the L2 learners show a strongly native-like locality bias in the resolution of scope ambiguities for in-situ *wh*-phrases, despite the fact that the closest analog of such an interpretation is impossible in English. This indicates that L2 learners are guided by abstract processing mechanisms, and not just by superficial transfer from the L1.

INTRODUCTION

Native-like sentence processing, whether in speaking or in understanding, requires the ability to *generate* the same range of candidate structures as a native speaker,¹ and in cases where there is more than one candidate, the ability to *select* among candidates in the same manner as a native speaker. A large body of research on L2 grammatical competence has focused on the generation question, by asking whether L2 learners are able to generate all and only the structures that native speakers accept (e.g., Bley-Vroman, 1990; Clahsen & Muysken, 1986; Cook & Newson, 1996; Epstein, Flynn & Martohardjono, 1996; Kanno, 1997; Pérez-Leroux & Glass, 1999; Schachter, 1998; Schwartz & Sprouse, 1994, 1996; White, 1989, 1996, 2000). An emerging literature on L2 sentence processing has focused on the selection issue, by asking whether L2 learners resolve ambiguity in the same way as native speakers (e.g. Dussias, 2003; Felser, Roberts & Marinis, 2003; Fernandez, 1999; Frenck-Mestre, 1997; Juffs, 1998; Juffs & Harrington, 1995, 1996; Papadopoulou & Clahsen, 2003). In this article we are concerned with the interaction of the two issues, using an example from in-situ *wh*-questions in English-speaking learners of Japanese, where the structure that is preferred by native speakers of Japanese is superficially similar to a structure that is ungrammatical in English. To the extent that L2 learners show native-like biases in their processing of these structures, these biases would suggest that the learners are relying on the same underlying mechanisms that govern processing in native speakers, and that they are not simply relying on surface parallels with their L1. Our

aim here is to test whether advanced learners of Japanese generate the same range of candidate structures as native speakers of Japanese, and whether they select among those candidates in the same manner as native speakers. The comparison of L1 and L2 processing of Japanese *wh*-questions is made possible by a series of recent studies that have provided detailed information on how native speakers of Japanese process *wh*-questions in their native language. It has been found that the well-known locality bias in processing *wh*-fronting structures in English (e.g., Crain & Fodor, 1985; Stowe, 1986) also applies in the processing of *wh*-in-situ and *wh*-scrambling structures in Japanese, despite substantial differences in how the locality bias is instantiated in the two languages, due to cross-language differences in word order and scope marking (Aoshima, Phillips, & Weinberg, 2004; Miyamoto & Takahashi, 2003).

Relations between L1 and L2 Structures

The focus of much previous research on L2 sentence processing has been on effects of transfer from the speaker's native language (L1) to the non-native language in ambiguity resolution. Specifically, these studies have investigated whether the range of structures allowed by the L1 grammar affects the range of alternatives that L2 speakers consider during processing, and whether or not L1 ambiguity resolution preferences carry over into the L2.

A number of studies have tested cases where an ambiguous L2 sentence has a close cognate in the L1, and have investigated whether L2 processing is affected by the status of the L1 cognate. For example, several studies have investigated the parsing of ambiguous sentences with complex NPs of the type N1-of-N2 followed by a relative clause, as in *Jan read the review of the book that was written by her politics professor*, predominantly in cases where the same relative clause attachment ambiguity exists in both the L1 and the L2 (Dussias, 2003; Fernández, 1999; Frenck-Mestre 1997; Papadopoulou & Clahsen, 2003). Some of these studies have reported evidence of transfer of L1 parsing preferences (Frenck-Mestre, 1997, Fernández, 1999), while the results of others suggest that knowing a second language at an advanced level affects parsing in both the native and second language (Papadopoulou & Clahsen, 2003; Dussias, 2003; Felser et al., 2003). Another study investigated the parsing of ambiguous reduced relative clauses, such as *The leader defeated in the election resigned one day later*, in the English of native speakers of Chinese, Japanese, Korean, and a number of Romance languages (Juffs, 1998), and found an effect of transfer from L1 on sentence processing in the L2. In all of these cases the preferred resolution of the ambiguity in the L2 corresponds to a structure that is acceptable in the L1, and in some cases matches the preferred resolution of a similar ambiguity in the L1.

A study by Hoover and Dwivedi (1998) examined how fluent L2 French speakers processed ambiguities involving clitics and causative constructions that had no close cognate in English, the speakers' L1. They found that the L2 speakers resolved these ambiguities in a similar fashion to native speakers of French. In this case, the lack of a clear L1 cognate made it unsurprising that no transfer effects were observed.

These previous studies are all consistent with the generalization that when speakers encounter ambiguous L2 sentences, their processing is affected by the existence of close L1 cognates, sometimes even leading to apparent transfer of ambiguity resolution biases. When the L1 provides no close cognates, L2 processing is less affected by the L1. These studies show that L2 sentence processing is affected by the L1, but leave open questions about precisely how it is that knowledge of the L1 affects processing in the L2. On the one hand, L1 knowledge may affect L2 processing at a superficial level, by favoring structures in the L2 that closely resemble

structures that are highly favored in the L1. Under this view, L2 processing makes direct reference to specific structures in the L1. On the other hand, L2 processing may resemble L1 processing at a more abstract level, through the application of the same generation and selection processes used in processing in the L1, regardless of whether or not they are applied to superficially similar structures in the L2. Under this view, L2 processing resembles L1 processing by virtue of employing parallel mechanisms, rather than by virtue of manipulating closely related structures. In order to begin to address this distinction, we consider here a case of ambiguity in Japanese *wh*-questions where the native speaker preference has been argued to reflect the same general selection mechanism that applies in English, but where the closest surface cognate in English corresponds to the dispreferred resolution of the ambiguity for Japanese native speakers.

Before describing our experiment, we first lay out key features of the structure and processing of *wh*-questions in Japanese and English.

Wh-Questions in Japanese

Japanese is a strongly verb-final language. All arguments, including clausal complements, precede the verb in Japanese. Therefore, the embedded clause verb appears before the main clause verb in multi-clausal sentences.

- (1) John-wa Mary-ga sono repooto-wo yonda-to omotta.
 John-top Mary-nom that report-acc read-comp thought
 “John thought Mary read that report.”

Japanese marks the scope of *wh*-questions via affixation of a question marking particle (QM) to the verb, such as *-ka* (for embedded or main verbs) or *-no* (for main verbs only). These question particles contrast with the declarative complementizer *-to*. Direct questions are created by affixing a QM to the main verb (2a), whereas indirect questions are created by affixing a QM to the embedded verb (2b). This method of scope marking contrasts with English, where the scope of a *wh*-question is indicated by the surface placement of the *wh*-word within the sentence. The *wh*-word appears at the front of the main clause in direct questions (3a) and at the front of the embedded clause in indirect questions (3b).

- (2) a. John-wa [Mary-ga dare-ni atta-to] itta-no?
 John-top Mary-nom who-dat met-comp said-QM
 “Who did John say that Mary met?”
 b. John-wa [Mary-ga dare-ni atta-ka] itta.
 John-top Mary-nom who-dat met-QM said
 “John said who Mary met.”
- (3) a. Who did John say that Mary met?
 b. John said who Mary met.

Japanese *wh*-questions typically adopt a *wh*-in-situ structure in which the *wh*-phrase occupies its canonical, thematic position (4a). *Wh*-phrases may also undergo fronting, also known as ‘*wh*-scrambling’ (4b), but in contrast to English the placement of the *wh*-phrase has no

effect on the scope of the question. In both examples in (4) the sentence is interpreted as an indirect question, since the QM is affixed to the embedded verb.

- (4) a. John-wa [Mary-ga dare-ni atta-ka] itta.
John-top Mary-nom who-dat met-QM said
 “John said who Mary met.”
- b. Dare-ni John-wa [Mary-ga atta-ka] itta.
Who-dat John-top Mary-nom met-QM said
 “John said who Mary met.”

A general requirement on *wh*-questions in Japanese is that the QM must be at least as high in the sentence structure as the thematic position of the *wh*-phrase (Miyamoto & Takahashi, 2003; Nishigauchi, 1990). For example, the sentence in (5a) is unacceptable because the nominative *wh*-phrase in the main clause receives its thematic interpretation in a higher clause than the QM affixed to the embedded clause verb. On the other hand (5b) is acceptable, since the *wh*-phrase can be associated with the main clause QM while the embedded clause QM indicates an indirect yes-no question.

- (5) a. *Dare-ga John-ga sono repooto-wo yonda-ka sitteiru.
Who-nom John-nom that report-acc read-QM knows
 “* Who knows whether John lost that book.”
- b. Dare-ga John-ga sono repooto-wo yonda-ka sitteiru-no?
Who-nom John-nom that report-acc read-QM knows-QM
 “Who knows whether John lost that book?”

The ability to leave *wh*-phrases in-situ contrasts with the *wh*-fronting found in the overwhelming majority of *wh*-questions in English. However, there are two cases in English where *wh*-in-situ does occur. The first is in echo questions, in which a previous statement is repeated with one constituent replaced in an attempt for clarification (6). Importantly for the current study, echo questions are always direct questions. It is impossible for an echo question like (6B) to be interpreted as an indirect question.²

- (6) A: “I just remembered that John bought a new Ferrari today.”
 B: “You just remembered that John bought *what* today?”

The second case of *wh*-in-situ in English occurs in multiple *wh*-questions, where fronting of one *wh*-phrase may force an additional *wh*-phrase with the same scope to remain in its canonical thematic position. Thus, the in-situ *wh*-phrases in (7a) and (7b) are unambiguously interpreted as direct and indirect interrogatives respectively, matching the scope of the fronted *wh*-phrase in each case. It is only in the case of a question with three *wh*-phrases (7c) that an in-situ *wh*-phrase in English may exhibit a scope ambiguity (Baker, 1970).

- (7) a. Who knew that John bought what?
 b. John knew who bought what.
 c. Who knew who bought what?

Therefore, whereas in-situ *wh*-phrases in Japanese are scopally free, provided that they are associated with an appropriate higher QM, in-situ *wh*-phrases in English are almost always scopally fixed, and in sentences with a single in-situ *wh*-phrase (i.e., echo questions) they always take main clause scope.

Processing Wh-Questions in English and Japanese

Recent research on native-speaker processing of Japanese has shown that Japanese speakers show a locality bias in processing *wh*-questions, paralleling a long-established finding about language comprehension in English. Interestingly, however, the locality bias manifests itself in somewhat different ways in the two languages.

In English, the surface position of a fronted *wh*-phrase marks the scope of the question, and the processing of a *wh*-phrase initiates a search for the canonical position in which the *wh*-phrase receives its thematic role. In the sentence processing literature, the fronted phrase is generally known as a *filler* and its canonical position is known as a *gap*, and the dependencies established between these positions are known as *filler-gap dependencies* (Fodor, 1978). Although the parser could, in principle, wait for direct evidence of an empty argument position before positing a gap, much evidence now indicates that the parser pursues a more active approach. It posits a gap site as soon as a potential gap site is identified, and does not wait for confirmation that the gap site is not already filled. A classic piece of evidence for this active gap creation mechanism comes from the ‘Filled Gap Effect’ elicited by examples like (8). An active search for a gap following the *wh*-phrase *who* in (8a) would identify a potential direct object gap site as soon as the transitive verb *bring* is encountered, although this would need to be rescinded at the next word, when it becomes apparent that the potential gap site is filled by the overt pronoun *us*. Slower reading times at the pronoun *us* in (8a) relative to the control sentence in (8b) supports this account (Crain & Fodor, 1985; Stowe, 1986).

- (8) a. My brother wanted to know who Ruth will bring us home to ___ at Christmas.
 b. My brother wanted to know if Ruth will bring us home to Mom at Christmas.

Further evidence for completion of filler-gap dependencies at the first potential verb position in English comes from a variety of different sources, including implausibility detection studies using eye-movements (Traxler & Pickering, 1996), ERP measures (Garnsey, Tanenhaus, & Chapman, 1989; Kaan, Harris, Gibson, & Holcomb, 2000; Phillips, Kazanina, & Abada, *in press*), complexity-based arguments (Pickering & Barry, 1991), antecedent reactivation effects (Nicol & Swinney, 1989; Nicol, Fodor, & Swinney, 1994; but cf. McKoon, Ratcliff, & Ward, 1994), and patterns of anticipatory eye-movements (Sussman & Sedivy, 2003). Some additional evidence suggests that the parser may also include potential subject positions in its search for the first potential gap position (Lee, 2004). In sum, there is a good deal of evidence for a locality bias in processing English *wh*-questions. Related evidence for rapid construction of filler-gap dependencies has also been found in many languages, including Dutch (Frazier, 1987; Frazier & Flores d’Arcais, 1989; Kaan, 1997), Russian (Sekerina, 2003), Hungarian (Radó, 1999), Italian (De Vincenzi, 1991), and German (Schlesewsky, Fanselow, Kliegl, & Krems, 2000). Note that although the standard terminology in the sentence processing literature explicitly refers to gap positions, most evidence is equally compatible with theories in which fronted phrases are directly

associated with the verb (Sag & Fodor, 1994; Pickering & Barry, 1991). Nothing in this article depends on the choice between these two representational alternatives.

The finding of locality biases in the processing of filler-gap dependencies in many languages suggests the effects of a basic property of parsing, independent of particular languages. However, findings from English-type languages have generally left open the question of how broadly locality biases apply, in terms of the range of structural dependencies that are affected. A highly relevant finding in this regard is due to Miyamoto and Takahashi (2003), who report a different kind of locality bias in processing *wh*-questions in Japanese. In *wh*-in-situ constructions in Japanese, the surface position of the *wh*-phrase indicates its thematic role but does not indicate the scope of the *wh*-question. Miyamoto and Takahashi presented evidence for an active search mechanism in Japanese that leads comprehenders to expect a QM to appear as soon as possible after an in-situ *wh*-phrase. This is shown by slower reading times for verbs marked with the declarative complementizer *-to* (9a) than for verbs marked with the question marker *-ka* (9b) in sentences containing a *wh*-phrase, reversing the pattern of relative difficulty observed in non-*wh* sentences. This slowdown is termed the ‘Typing Mismatch Effect’ (TME).

- (9) a. Senmu-ga donna-pasokon-wo tukatteiru-to kakaricyoo-ga itta-no?
director-nom what-kind-computer-acc using-is-Comp supervisor-nom said-QM
 ‘What kind of computer did the supervisor say the director is using?’
 b. Senmu-ga donna-pasokon-wo tukatteiru-ka kakaricyoo-ga itta.
director-nom what-kind-computer-acc using-is-QM supervisor-nom said
 ‘The supervisor said what kind of computer the director is using.’

Miyamoto and Takahashi argued that the TME reflects the same active search processes that generate the filled-gap effect in English, except that the Japanese parser searches for a scope marker, whereas the English parser searches for a thematic position. The preference for a local scope marker in Japanese has been confirmed by Aoshima and colleagues (Aoshima et al., 2004), using both a replication of Miyamoto and Takahashi’s TME and a sentence completion study in which speakers provided completions for sentence fragments containing *wh*-phrases. Fragments like (10) that consisted of a sequence of NPs from the beginning of a two clause sentence and included a *wh*-phrase required completions that included at least two verbs and one QM. Although an embedded clause *wh*-phrase could, in principle, be followed by either an embedded clause QM (indirect question) or a main clause QM (direct question), speakers showed an overwhelming bias to generate completions in which the QM is in the embedded clause, i.e., as indirect questions.

- (10) tannin-wa sisyo-ga tosyositu-de dono sinnyusei-ni ...
 class-teacher-TOP librarian-NOM library-at which new student-DAT ...

This finding about sentence generation provides perhaps the most robust evidence for the locality bias in processing Japanese *wh*-questions and forms the basis for the study of L2 learners reported here.

Taken together, the findings about the structure and processing of *wh*-questions in English and Japanese create an interesting scenario for investigating L2 processing. Native speakers of English and Japanese both show a reliable locality bias in processing *wh*-questions. This bias may be attributed to the same underlying mechanism in English and Japanese, despite

differences in how it is realized in the two languages. Therefore, if English-speaking learners of Japanese process scopally ambiguous *wh*-questions in Japanese using the same underlying mechanism as in English, we may expect them to perform similarly to native speakers of Japanese in a sentence fragment completion task like the one used by Aoshima et al. (2004, Experiment 3). For a bi-clausal sentence fragment with an in-situ *wh*-phrase such as (10) this would lead to an expectation for an embedded clause question particle. However, if L2 learners of Japanese are guided more by surface similarities between the L1 and the L2 then we predict a different outcome. English sentences with a single in-situ *wh*-phrase can only be interpreted as direct questions, as seen in (6). This may lead L2 learners to resolve fragments like (10) as direct questions, in contrast to the native speaker pattern.

Note that although the sentence fragment completion task is unable to provide detailed information about the time-course of dependency construction in second language acquisition, its use here serves as a worthwhile first step, and may even have certain advantages over more ‘on-line’ methods. In studies with native speakers of Japanese, a locality bias was observed using both on-line (self-paced reading) and off-line methods, but the results were clearest with the off-line fragment completion task, making this a more reliable benchmark measure (Aoshima et al., 2004; Miyamoto & Takahashi, 2003). Furthermore, time-sensitive measures of sentence processing, whether behavioral (e.g., self-paced reading, eye-tracking) or electrophysiological (ERP, MEG), are useful to the extent that the cognitive processes under investigation are time-locked to the eliciting event, and show consistent timing across participants. It is more difficult to satisfy these prerequisites in a group of second language learners, particularly when dealing with a low-density population such as advanced learners of Japanese, and when using a task that requires proficient reading of an unfamiliar orthographic script. For these reasons, an off-line measure of processing preferences may be a more informative first step.

THE PRESENT STUDY

The aim of this experiment was to investigate whether advanced English-speaking learners of Japanese resolve scopally ambiguous question fragments in a manner similar to native speakers, as predicted based upon sharing of underlying processing mechanisms, or in a manner different from native speakers, as predicted based upon dependence on surface cognates in English.

Participants

There were 42 participants (age 19-33, mean 23.7), consisting of a group of 18 native speakers of English who described themselves as advanced L2 speakers of Japanese (L2 Japanese group), and a comparison group of 24 native speakers of Japanese (native Japanese group). All participants in the L2 Japanese group had studied Japanese for at least 2.5 years prior to completing the task (range 2.5-15 years, mean 5.7 years) and had spent some time in Japan (minimum 2 weeks, mean duration 1.5 years). Participants were recruited from universities in the Washington, DC area and through Japanese speaking internet communities. All subjects gave informed consent and were paid \$15 for their participation, which lasted around 90 minutes. The participants in the native Japanese group were all undergraduate students at Shizuoka University or Shizuoka Sangyo University, Japan. They were paid \$5 for their participation, which lasted only around 30 minutes since they did not need to complete the diagnostic test and were able to complete the sentence generation task more quickly than the L2 Japanese group.

All of the L2 participants self-identified as native English speakers who were also advanced L2 speakers of Japanese. Due to the scarcity of available individuals who meet both criteria, we did not require any specific formal qualifications in Japanese as prerequisites for participation in the study, such as the Japanese Language Proficiency Test (JLPT) given by the Japan Foundation or the Oral Proficiency Interview administered by the American Council for the Teaching of Foreign Languages. A number of participants reported that they had passed either Level 1 (highest) or Level 2 of the JLPT, however there were other participants who had never taken these tests who performed very well in our studies. Therefore, in order to determine whether participants were fluent enough to complete the main sentence generation task, participants in the L2 Japanese group completed a diagnostic test prior to the sentence generation task. The diagnostic test was designed specifically for this study, and focused on aspects of Japanese vocabulary and grammar that were considered necessary to satisfy the premises of the sentence generation task. This was considered preferable to the use of scores from standardized tests of advanced proficiency in Japanese that would have required more testing time and provided less detailed information relevant to the structures tested in this study.

Diagnostic Test

The diagnostic test comprised three parts. The first was a 20 item multiple choice grammar test that probed proficiency in four areas: basic formation of *wh*-questions using question particles such as *-ka*; basic formation of *wh*-phrases such as *dare-ni* ‘wh-dat’ and *dare-ga* ‘who-nom’; comprehension of bi-clausal sentences, in particular direct and indirect questions; knowledge of argument structure and appropriate case particle marking for ditransitive structures. The second part was a vocabulary translation task in which participants were asked to match Japanese words to their English translations. All words presented in this task later appeared in target or filler items of the main sentence generation task, and thus also served to refresh participants’ familiarity with these lexical items. The third part was a 5 item sentence fragment completion task similar to the task used for the main study. Participants read the first four elements of a sentence, and were instructed to write a completion for the sentence in a grammatical manner with whatever words they deemed appropriate. This task included no fragments that were similar to those used in the main study, but was administered to ensure that participants were able to complete a task of this nature within a reasonable amount of time.

Results from the diagnostic test confirmed that the participants were able to comprehend the type of materials used in the main sentence generation task. Combined scores for the grammar test and the vocabulary test averaged 84.4%, and all participants were able to complete the practice sentence generation task in less than 10 minutes.

Materials

The main sentence generation task included 3 experimental conditions. Test items were sentence fragments consisting of a sequence of 4 phrases. Materials were similar to those used by Aoshima et al. (2004, Experiment 3), except that they were simplified in order to be more suitable for L2 speakers. All 3 conditions included two subject NPs, indicating that the sentence was bi-clausal, one dative-marked NP, and one adverbial phrase. In all 3 conditions one of the NPs was an in-situ *wh*-phrase. In two of the conditions the *wh*-phrase was a dative-marked NP. The conditions with dative *wh*-phrases were identical except that the main clause subject bore a

nominative marker in one condition and a topic marker in the other. This contrast was included because both possibilities are available for marking main clause subjects in Japanese. Topic-marked subjects are often perceived as more natural, but nominative-marked subjects are more unambiguous. However, both forms turned out to be equally effective indicators of the main clause subject position in our study. In the third condition the *wh*-phrase was the main clause subject. This condition was included in order to distinguish a native-like pattern of QM placement from a grammar-independent version of the locality bias.

In all conditions the presence of a *wh*-phrase in the fragment indicated that the sentence contained an interrogative clause, but it was left to the participants to decide whether to generate a direct question completion with a main clause QM or an indirect completion with an embedded clause QM. If the L2 participants resolve the scope ambiguity in a native-like fashion, then they should generate embedded clause QMs in the conditions with embedded clause dative *wh*-phrases, but should generate main clause QMs in the conditions with main clause subject *wh*-phrases, since Japanese grammar requires that main clause *wh*-phrases be associated with main clause QMs (Miyara, 1983; Nemoto, 1999; Saito, 1985; Takezawa, 1989). On the other hand, a grammar-independent linear version of the locality bias would lead the L2 participants to generate embedded clause QMs in all conditions, since the embedded verb is the first verb in the sentence. Alternatively, if the learners of Japanese treat the in-situ *wh*-phrases analogously to in-situ *wh*-phrases in English, then they would generate main clause QMs in all conditions, given that in-situ *wh*-phrases in English are reliably associated with direct questions.

Target items consisted of 15 sets of the 3 conditions, which were distributed among 3 lists in a Latin Square design, such that each list contained only one item from each set. The 3 lists were each combined with 30 filler items in pseudorandom order in order to create 3 versions of the sentence generation test. Filler items matched the targets in length and complexity, and included a mix of fragments requiring monoclausal and biclausal completions. Filler items were also configured such that there should be no statistical bias in the study for sentences requiring declarative or interrogative completions. The questionnaires were presented in a 12-point MS Gothic Japanese font, with *furigana* syllabic readings placed over each kanji compound in order to ensure that kanji reading presented no difficulties for the L2 Japanese participants. A sample set of target sentences can be found in Table 1. A list of all target items is included in the Appendix.

Dative I	Sensei-wa <i>teacher-top</i>	seito-ga <i>student-nom</i>	tosyositu-de <i>library-loc</i>	dare-ni... <i>who-dat...</i>
Dative II	Sensei-ga <i>teacher-nom</i>	seito-ga <i>student-nom</i>	tosyositu-de <i>library-loc</i>	dare-ni... <i>who-dat...</i>
Nominative	Dare-ga <i>who-nom</i>	sensei-ni <i>teacher-dat</i>	seito-ga <i>student-nom</i>	tosyositu-de... <i>library-loc...</i>

Table 1: Sample set of experimental conditions.

Procedure

The experiment was completed using pen and paper. Participants were instructed to first read the fragments, then complete the sentence with the first grammatically acceptable completion that came to mind. They were further instructed that they were free to write kanji or in hiragana and katakana for their answers. The sentence generation task took 45 minutes to an hour.

RESULTS

Clause Number

Since only biclausal completions are grammatical and relevant for testing the experimental hypotheses, responses were first analyzed for the number of clauses in the completions. Completions were counted as multi-clausal if two or more verbs were supplied, and other types of completion were excluded from all subsequent analyses. Native Japanese speakers generated no monoclausal sentences. L2 Japanese participants incorrectly provided monoclausal sentences in 40 of the 258 codable sentence completions (15.5%). However, 38/40 of these were provided by 3 participants. Since these 3 participants also performed poorly on the diagnostic test, scoring on average 72.2% correct and providing 3 of the 4 worst scores, their data was not included in further analyses. The remaining 15 participants produced only 2/213 monoclausal sentences (0.9%), indicating that they recognized that only biclausal completions were grammatical. Fisher Exact tests showed no statistical difference between any of the three conditions on this score, and no difference between the native Japanese group and the L2 Japanese group on this measure.

Question Markers

In the next step of the analysis we checked that the completions contained at least one question marker that could be associated with the *wh*-phrase in the fragment. Native Japanese speakers provided a QM on at least one of the verbs in 96.6% (347/359) of relevant trials. Across conditions, this consisted of 97.5% QMs in the two dative conditions, and 95% QMs in the nominative condition. L2 Japanese speakers omitted the QM more frequently, providing a QM in 73.2% (156/213) of trials. Across conditions, this consisted of 64% in the Dative I condition, 70.4% in the Dative II condition, and 82.3% in the nominative condition.³ On this measure the L2 participants did differ reliably from the native Japanese participants ($\chi^2 = 69.1, p < .001$). The omission of QMs by L2 speakers likely reflects the difficulty of the sentence generation task for these participants. An alternative possibility is that the L2 speakers made greater use of the possibility of omission of QMs in direct questions in informal colloquial Japanese. However, we consider this to be an unlikely source of the QM omissions, since the main clause verb included the polite *-masu* suffix in most completions, and since this account would incorrectly predict a higher proportion of QM omissions in the nominative condition, because that condition only allows direct question interpretations.

The fragments that were completed with QMs were then analyzed as a function of the position of the QM. Participants in the native Japanese group showed a clear contrast between the dative conditions and the nominative conditions, replicating the finding of Aoshima et al. (2004). In the dative conditions an embedded QM was provided in 100% (233/233) of trials, including 1 trial in which a QM was provided in both clauses. In the nominative conditions a

main clause QM was provided in 93.8% (107/114) of trials, including 8 trials in which a QM was provided in both clauses. The 6.1% of trials with a QM in only the embedded clause were not grammatical completions. Unsurprisingly, a Fisher Exact test showed that the results for each of the dative conditions were reliably different from the nominative condition ($p < .0001$). Results for the native Japanese group are summarized in Table 2.

Conditions	Question-type					
	<i>Embedded</i>		<i>Main</i>		<i>Both</i>	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
<i>NP-top NP-nom WH-dat</i>	116	100	0	0	0	0
<i>NP-nom NP-nom WH-dat</i>	116	99.1	0	0	1	0.9
<i>WH-nom NP-dat NP-nom</i>	7	6.1	99	86.8	8	7
<i>Total</i>	239		99		9	

Table 2: Counts and percentages of positions of question markers in completions of sentence fragments, native speakers.

Results for the L2 Japanese group were strikingly similar to those for the native Japanese group. For the two dative conditions an embedded QM was provided in 96.9% (92/98) of trials, including 3 trials with QMs in both clauses. A Fisher Exact test showed no difference between the two dative conditions ($p > .6$, 2-tailed). In the nominative condition, however, which required a QM in the main clause, main clause QMs were provided in 84.4% (49/58) of trials, including 4 trials with QMs in both clauses. Fisher Exact tests confirmed that the results for each of the dative conditions were reliably different from the nominative condition ($p < .0001$, 2-tailed). Results for the L2 Japanese group are summarized in Table 3.

Conditions	Question-type					
	<i>Embedded</i>		<i>Main</i>		<i>Both</i>	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
<i>NP-top NP-nom WH-dat</i>	44	91.6	2	4.2	2	4.2
<i>NP-nom NP-nom WH-dat</i>	48	96	1	4	1	2
<i>WH-nom NP-dat NP-nom</i>	9	15.5	45	77.5	4	6.9
<i>Total</i>	101		48		7	

Table 3: Counts and percentages of positions of question markers in completions of sentence fragments, L2 speakers.

Finally, we compared the distribution of QMs across conditions in the two groups using Fisher Exact tests for each condition. Although these tests indicated that the difference between the two participant groups was not significant in any condition, there was a marginally significant effect in two of the three conditions (Dative I: $p < .08$; Dative II, $p < .3$; Nominative, $p < .06$), reflecting the fact that there were more exceptions to the general tendency for QM placement in the L2 Japanese group. However, the overall pattern of QM placement was highly similar in the native Japanese and L2 Japanese groups.

DISCUSSION

The sentence generation study yielded rather clear results. L2 Japanese speakers with an English L1 resolved scope ambiguities in *wh*-questions in a very similar manner to native Japanese speakers, by consistently generating a question marker in the first complementizer position above the in-situ *wh*-phrase. In the case of embedded clause dative *wh*-phrases this led to a clear majority of embedded clause question markers, i.e., indirect questions. In the case of main clause nominative *wh*-phrases this led to a clear majority of main clause question markers, i.e., direct questions. The findings for native Japanese speakers confirm earlier reports of locality biases in resolving *wh*-question scope ambiguities in Japanese (Aoshima et al., 2004; Miyamoto & Takahashi, 2003). On the other hand, the native-like performance of the L2 Japanese speakers is a new finding. In what follows, we consider possible sources for this high performance, including the question of whether the similar performance between the two groups reflects similar underlying processing mechanisms.

The contrast between the nominative and dative conditions is important for the interpretation of the results of the L2 speakers. A simple grammar-blind local licensing strategy would incorrectly predict that QMs would be consistently generated on the embedded verb in all conditions, since it is the first verb of the sentence. On the other hand, a strategy that assimilated the Japanese sentences to English sentences with a single in-situ *wh*-phrase would incorrectly predict that QMs would be consistently generated on the main verb in all conditions. This is because English echo-questions are always direct questions. Thus, the L2 Japanese speakers cannot have been simply relying upon the closest English surface cognate to the Japanese sentences in order to resolve the scope ambiguities. As a result, these findings go beyond previous studies of ambiguity resolution in L2 research in which the preferred resolution of the ambiguity in the L2 involves a surface structure that has a close counterpart in the L1 (e.g., Dussias, 2003; Fernández, 1999; Frenck-Mestre 1997; Juffs, 1998; Papadopoulou & Clahsen, 2003).

The contrast between the nominative and dative conditions also casts doubt upon the possibility that the results may reflect the results of formal teaching in Japanese. A survey of widely used college textbooks for Japanese (Jordan, 1987, 1988; Jordan, & Noda, 1990; Tohsaku, 1995; International Christian University, 1996; Makino, Hasata, & Hasata, 1998; Banno, Ohno, Sakane, Shinagawa & Tokashiki, 1999) and grammar books for Japanese (Makino & Tsutui, 1986, 1995) showed that indirect questions with embedded clause *wh*-phrases are typically introduced in intermediate-level texts, and that bi-clausal direct questions are not explicitly taught. Therefore, we consider it unlikely that our results from L2 Japanese speakers could have been straightforwardly caused by biases in classroom materials. Even if the classroom materials were somehow responsible for a bias to treat bi-clausal interrogatives as indirect questions, this would fail to capture the contrast between our conditions, since the dative conditions showed a strong bias for indirect questions and the nominative condition showed a strong bias for direct questions. Moreover, we should emphasize that since most of our L2 group had extensive experience in using Japanese outside of classroom settings, it is unlikely that they were greatly influenced by any potential sampling biases from classroom materials.

We next considered whether the L2 speaker results might reflect the surface frequencies of the relevant question types in their naturalistic Japanese input. For example, the bias for

embedded clause QMs in the dative conditions might conceivably reflect a frequency bias for embedded in-situ dative *wh*-phrases to appear in indirect questions rather than direct questions.

To examine this possibility, we compared our experimental data with a small corpus of naturalistic Japanese sentences derived from an internet search using Google Japan. We searched for listings in which a *wh*-argument phrase such as ‘*nani-ga/wo/ni*’ (*what-nom/acc/dat*) and *dare-ga/wo/ni*’ (*who-nom/acc/dat*) co-occurred with a main clause report verb such as ‘*iu*’ (say) and ‘*osieru*’ (tell). We focused on report verbs in our search because these are high-frequency verbs that allow either declarative or interrogative clausal complements, and thus are compatible with both direct and indirect questions, as in the contrast between (2a) and (2b). Both of these verbs appeared in the completions generated by the native Japanese and L2 Japanese participants in our experiment. We excluded from our corpus any examples where the embedded clause was a direct quotation, since that would lead to a confounding of direct and indirect questions. In our experimental data from native Japanese speakers, 71 completions contained an in-situ dative *wh*-phrase and a main clause report verb, and 99% of these (70/71) examples was an indirect question with an embedded clause QM. Among our L2 Japanese participants, the corresponding figure was 100% (11/11). Thus, both groups of experimental participants showed an overwhelming bias for embedded QMs in trials with in-situ dative *wh*-phrases and a main clause report verb. On the other hand, the first 200 listings on Google Japan that contained both a *wh*-phrase and a main clause report verb, either ‘*itta*’ (said) or ‘*osieta*’ (told), yielded 162 occurrences of monoclausal *wh*-questions, 25 biclausal direct *wh*-questions, and 13 biclausal indirect *wh*-questions. Thus, among the bi-clausal *wh*-questions there was a bias for direct questions ($p < .05$, sign test), which was the reverse of the bias found in our sentence generation study. In sum, the preliminary corpus investigation found no evidence of the overwhelming bias for indirect *wh*-questions observed in our experimental data, and thus it is unlikely that the native-like performance of our L2 Japanese speakers reflected superficial distributional properties of their Japanese input.

An account of the results that accurately captures the observed patterns is one in which the L2 Japanese speakers draw upon the same general dependency-formation mechanisms in processing their L2 that they rely upon in processing their native language. Processing of the left-hand member of a syntactic dependency initiates an active search for the right-hand member of the dependency. In English, this gives rise to processes that actively search for a thematic position (‘gap’) in the first grammatically appropriate position following a fronted *wh*-phrase (Frazier & Clifton, 1989; Stowe, 1986). In Japanese, this gives rise to processes that actively search for a scope-marking question particle in the first grammatically appropriate position following an in-situ *wh*-phrase (Aoshima et al., 2004; Miyamoto & Takahashi, 2003). For embedded clause dative *wh*-phrases this correctly predicts a QM on the embedded clause verb. For main clause nominative *wh*-phrases this correctly predicts a QM on the main clause verb, since the grammar requires that the QM be at least as high in the structure as the *wh*-phrase. If it is the case that the L2 Japanese speakers’ performance reflects an underlying mechanism that is already operative in their native language, then this removes the need to explain how the L2 learners might have derived the observed biases from the Japanese input that they had received.

If the observed locality bias in our L2 participants does not reflect teaching or surface frequency biases in naturalistic input, then we should expect no correlation between individuals’ performance in the fragment completion task and their length of experience in studying Japanese or living in Japan. In order to test this prediction, we conducted two correlation analyses that tested for a relation between the percentage of indirect questions generated in the completion

task (Dative conditions only) and time spent learning Japanese or living in Japan. Neither the correlation with time spent learning Japanese ($r = .352$, n.s.) nor the correlation with time spent living in Japan ($r = .377$, n.s.) was significant. This suggests that the participants who had been exposed to the Japanese language for a shorter amount of time behaved similarly to those who had substantially greater exposure.

The overwhelming strength of the locality bias in our study, particularly in the case of native speakers of Japanese, may raise doubts about the acceptability of embedded clause *wh*-phrases in direct questions in Japanese. However, we should emphasize that direct questions with embedded clause *wh*-phrases are uncontroversially acceptable, and can also be found in naturally occurring texts, as in the example in (11), taken from our *Google Japan* search. The fact that locality biases in long-distance dependency formation are more robust than certain other types of ambiguity resolution biases may reflect the fact that they involve anticipatory commitments rather than decisions about how to attach ambiguous material to previously parsed structures.

- (11) [sensou sekinin-wa dare-ni aru-to] omou-ka
war responsibility-top who-dat exist-that think-QM
 ‘Who do you think bears responsibility for the war?’

The main implication of our findings is that the grammars of second language learners need to encode information in a form that is sufficiently abstract to capture the parallel between the two types of dependencies involving *wh*-phrases, such that it is possible to give a common account of local dependency formation effects found in *wh*-gap dependencies in English and in *wh*-question-particle dependencies in Japanese. This contrasts with the alternative that similarities between L1 and L2 processing are primarily driven by similarities at the level of specific surface structures. We view this issue of surface vs. more abstract parallels as orthogonal to a number of other theoretical controversies in second language acquisition. For example, a number of studies in the framework of the Competition Model (MacWhinney, 1987; MacWhinney, 2005) have explored second language acquisition as a process of adjusting of cue weights from the L1 to the L2 environment, as a result of gradually accrued experience in the second language (e.g., Liu, Bates, & Li, 1992; McDonald & Heilenman, 1991). A version of this model that treats *wh*-phrases as strong cues for direct questions in Japanese – a reasonable generalization from the statistics of Japanese and English alike – will run into the same difficulties as the general statistical approach discussed above, since our learners of Japanese clearly do not treat embedded *wh*-phrases as cues for direct questions. On the other hand, it may be possible to propose a sufficiently abstract encoding of *wh*-dependencies that would make it feasible to capture our findings using Competition Model dynamics.

A possible objection to our findings is that it is unsurprising to find native-like performance in a group of learners who are highly advanced. This objection would be appropriate in tests of L2 phenomena that have been explicitly taught or that are well represented in naturalistic input to learners. However, for properties of the L2 that are not well represented in the learners’ input, it is less obvious that advanced learners should have mastered these properties. The scope interpretation bias that our L2 learners exhibit does not reflect a frequency bias in the input, nor does it seem to reflect a property that even native speakers of Japanese are consciously aware of. The interpretation bias reflects a temporary ambiguity that is almost always resolved by the end of a sentence in Japanese. Thus, we do not consider it obvious that

advanced learners should have mastered this property of Japanese, simply by virtue of their length of exposure to Japanese.

Another possible concern is that it is inappropriate to draw conclusions about locality biases in language processing from a sentence fragment completion task, which may be primarily a language production measure. However, the fragment completion task has a number of features that make it very similar to other measures of sentence comprehension. As in standard comprehension tasks, the fragment completion task requires the participant to generate an interpretation based upon a pre-specified form. This contrasts with production tasks that require the participant to generate a form based on a pre-specified message. The fragment completion task in Japanese probes the syntactic and semantic expectations that are generated as a consequence of reading pre-verbal material, paralleling studies that use reading time measures to probe similar expectations (e.g., Miyamoto & Takahashi, 2003). The fact that the completion task can be carried out at all suggests a relatively tight coupling between comprehension and production systems. Finally, fragment completion tasks are widely used in language comprehension studies as ways of norming experimental materials, and it is standard to find correlations between reading times and the results of completion tasks. For these reasons, we consider it entirely appropriate to compare the current results with results generated using other experimental measures.

It is important to note two issues that our current results do not resolve. First, if the performance of the L2 speakers reflects an underlying locality bias in syntactic dependency formation, we cannot distinguish between an account in which this is explicitly transferred from English and an account in which this is a basic design feature of the language processor that is present for all languages. Resolution of this issue would require studies of mechanisms that are not candidates for universal properties of language processing. Second, we cannot draw any firm conclusions about the time-course of operations in the sentence generation task used here, since the task only provided information about the final answers, with no information about the process of generating a completion. Resolution of this issue will require further studies using more time-sensitive measures.

CONCLUSION

This article showed that English-speaking L2 learners of Japanese exhibit a strongly native-like processing bias in the resolution of scope ambiguities with in-situ *wh*-questions, despite the fact that the closest superficial cognate in English of the analysis that the L2 learners prefer is unacceptable in English. We interpret these results as showing that the relevant point of comparison with English *wh*-questions is not the superficial similarity of echo *wh*-questions, but the more abstract bias to resolve syntactic dependencies as soon as possible. Just as psycholinguistic studies of native speakers of English and Japanese have revealed that the same underlying locality bias yields contrasting effects in the two languages, the current study shows that L2 Japanese speakers may draw upon the same mechanisms they use to process English, albeit with superficially different outcomes.

REFERENCES

- Aoshima, S., Phillips, C., & Weinberg, A. (2004). Processing filler-gap dependencies in a head-final language. *Journal of Memory and Language*, *51*, 23-54.
- Baker, C. L. (1970). Notes on the description of English questions: the role of an abstract question morpheme. *Foundations of Language*, *6*, 197-219.
- Banno, E., Ohno, Y., Sakane, Y., Shinagawa, C., & Tokashiki, K. (1999). *Genki I and II: An integrated course in elementary Japanese*. Tokyo: The Japan Times.
- Bley-Vroman, R. (1990). The logical problem of foreign language learning. *Linguistic Analysis*, *20*, 3-49.
- Boland, J. & Cutler, A. (1996). Interaction with autonomy: Multiple Output models and the inadequacy of the Great Divide. *Cognition*, *58*, 309-320.
- Clahsen, H. & Muysken, P. (1989). The UG paradox in L2 acquisition. *Second Language Research*, *5*, 1-29.
- Cook, V. & Newson, M. (1996). *Chomsky's universal grammar: an introduction*. Oxford: Blackwell.
- Crain, S., & Fodor, J. D. (1985). How can grammars help parsers? In D. Dowty, D. Karttunen & A. M. Zwicky (Eds.), *Natural language parsing: psycholinguistic, computational, and theoretical perspectives* (pp. 94-128). Cambridge, UK: Cambridge University Press.
- de Vincenzi, M. (1991). *Syntactic parsing strategies in Italian*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Dussias, P. (2003) Syntactic ambiguity resolution in L2 learners. *Studies in Second Language Acquisition*, *25*, 529-557..
- Epstein, S., Flynn, S., & Martohardjono, G. (1996). Second language acquisition: theoretical and experimental issues in contemporary research. *Behavioral and Brain Sciences*, *19*, 677-758.
- Felser, C., Roberts, L., & Marinis, T. (2003). The processing of ambiguous sentences by first and second language learners of English. *Applied Psycholinguistics*, *24*, 453-489.
- Fernández, E. (1999). Processing strategies in second language acquisition. In E. Klein & G. Martohardjono (eds.) *The development of second language grammars: a generative approach* (pp. 217-239). Amsterdam: John Benjamins.
- Fodor, J. D. (1978). Parsing strategies and constraints on transformations. *Linguistic Inquiry*, *9*, 427-473.
- Frazier, L. (1987). Syntactic processing: Evidence from Dutch. *Natural Language and Linguistic Theory*, *5*, 519-560.
- Frazier, L., & Clifton, C. Jr. (1989). Successive cyclicity in the grammar and the parser. *Language and Cognitive Processes*, *4*, 93-126.
- Frazier, L., & Flores d'Arcais, G. B. (1989). Filler-driven parsing: a study of gap filling in Dutch. *Journal of Memory and Language*, *28*, 331-344.
- Frenck-Mestre, C. (1997). Examining second language reading: an on-line look. In A. Sorace, C. Heycock, & R. Shillcock (eds.) *Language acquisition: knowledge representation and processing: GALA 1997* (pp. 444-448). Edinburgh: Human Communications Research Center.
- Garnsey, S. M., Tanenhaus, M. K., & Chapman, R. M. (1989). Evoked potentials and the study of sentence comprehension. *Journal of Psycholinguistic Research*, *18*, 51-60.
- Hoover, M. L. & Dwivedi, V. D. (1998). Syntactic processing by skilled bilinguals. *Language Learning*, *48*, 1-29.

- International Christian University. (1996). *Japanese for College Students I, II & III*. Tokyo: Kodansha International.
- Jorden, E. H. (1987). *Japanese: The Spoken Language Part I*. New Haven, CT: Yale University Press.
- Jorden, E. H. (1988). *Japanese: The Spoken Language Part II*. New Haven, CT: Yale University Press.
- Jorden, E. H. & Noda, M. (1990). *Japanese: The Spoken Language Part III*. New Haven, CT: Yale University Press.
- Juffs, A. (1998). Main verb versus reduced relative clause ambiguity resolution in L2 sentence processing. *Language Learning*, 48, 107-147.
- Juffs, A. & Harrington, M. (1995). Parsing effects in second language sentence processing: subject and object asymmetries in wh-extraction. *Studies in Second Language Acquisition*, 17, 483-516.
- Juffs, A. & Harrington, M. (1996). Garden path sentences and error data in second language sentence processing. *Language Learning*, 46, 283-326.
- Kaan, E. (1997). Processing subject-object ambiguities in Dutch. Doctoral dissertation, University of Groningen.
- Kaan, E., Harris, A., Gibson, E., & Holcomb, P. (2000). The P600 as an index of syntactic integration difficulty. *Language and Cognitive Processes*, 15, 159-201.
- Kanno, K. (1997). The acquisition of null and overt pronominals in Japanese by English speakers. *Second Language Research*, 13, 265-287.
- Lee, M-W. (2004). Another look at the role of empty categories in sentence processing (and grammar). *Journal of Psycholinguistic Research*, 33, 51-73.
- Liu, H., Bates, E., & Li, P. (1992). Sentence interpretation in bilingual speakers of English and Chinese. *Applied Psycholinguistics*, 13, 451-484.
- MacWhinney, B. (1987). The Competition Model. In B. MacWhinney (ed.), *Mechanisms of language acquisition* (pp. 249-308). Hillsdale, NJ: Lawrence Erlbaum.
- MacWhinney, B. (2005). A unified model of language acquisition. In J. Kroll & A. de Groot (eds.), *Handbook of Bilingualism: Psycholinguistic Approaches*. Oxford University Press.
- Makino, S. & Tsutui, M. (1986). *A Dictionary of Basic Japanese Grammar*. Tokyo: The Japan Times.
- Makino, S. & Tsutui, M. (1995). *A Dictionary of Intermediate Japanese Grammar*. Tokyo: The Japan Times.
- Makino, S., Hasata, Y. A., & Hasata, K. (1998). *Nakama I & II*. New York: Houghton Mifflin Company.
- McDonald, J. L., & Heilenman, K. (1991). Determinants of cue strength in adult first and second language speakers of French. *Applied Psycholinguistics*, 12, 313-348.
- McKoon, G., Ratcliff, R., & Ward, G. (1994). Testing theories of language processing: an empirical investigation of the on-line lexical decision task. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 20, 1219-1228.
- Miyamoto, E. T., & Takahashi, S. (2003). Typing mismatch effects in the processing of wh-phrases in Japanese. *Manuscript submitted for publication*.
- Miyara, S. (1982). Reordering in Japanese. *Linguistic Analysis*, 9, 307-340.
- Nemoto, N. (1999). Scrambling. In N. Tsujimura. (Ed.), *Handbook of Japanese linguistics* (pp. 121- 153). Malden, MA: Blackwell.

- Nicol, J., Fodor, J. D., & Swinney, D. (1994). Using Cross-Modal lexical decision tasks to investigate sentence processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 20, 1229-1238.
- Nicol, J. L., & Swinney, D. (1989). The role of structure in coreference assignment during sentence comprehension. *Journal of Psycholinguistic Research*, 18, 5-20.
- Nishigauchi, T. (1990). *Quantification in the theory of grammar*. Dordrecht: Kluwer Academic Publishers.
- Papadopoulou, D. & Clahsen, H. (2003). Parsing strategies in L1 and L2 sentence processing: a study of relative clause attachment in Greek. *Studies in Second Language Acquisition*, 25, 501-528.
- Pérez-Leroux, A. T. & Glass, W. (1999). Null anaphora in Spanish SLA. *Second Language Research* 15, 220-249.
- Phillips, C., Kazanina, N., & Abada, S. (in press). ERP Effects of the processing of syntactic long-distance dependencies. *Cognitive Brain Research*.
- Pickering, M. J., & Barry, G. D. (1991). Sentence processing without empty categories. *Language and Cognitive Processes*, 6, 229-259.
- Radó, J. (1999). Some effects of discourse salience on gap-filling. Poster presented at *The 12th Annual CUNY Conference on Human Sentence Processing*.
- Sag, I. A., & Fodor, J. D. (1994). Extraction without traces. In R. Aranovich, W. Byrne, S. Preuss, & M. Senturia (Eds.), *Proceedings of the 13th Annual Meeting of the West Coast Conference on Formal Linguistics* (pp. 365-384). Stanford, CA: CSLI.
- Saito, M. (1985). *Some asymmetries in Japanese and their theoretical implications*. Doctoral dissertation, MIT.
- Schachter, J. (1988). Second language acquisition and its relationship to Universal Grammar. *Applied Linguistics*, 9, 219-235.
- Schlesewsky, M., Fanselow, G., Kliegl, R., & Krems, J. (2000). The subject preference in the processing of locally ambiguous *wh*-questions in German. In B. Hemforth, & L. Konieczny (Eds.) *German sentence processing* (pp. 65-93). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Schwartz, B. D. & Sprouse, R. (1994). L2 cognitive states and the full transfer/full access model. *Second Language Research*, 12, 40-72.
- Schwartz, B. D. & Sprouse, R. (1996). Word order and nominative case in nonnative language acquisition: a longitudinal study of (L1 Turkish) German interlanguage. In T. Hoekstra & B. D. Schwartz (eds.) *Language acquisition studies in generative grammar* (pp. 317-368). Amsterdam: John Benjamins.
- Sekerina, I. A. (2003). Scrambling and processing: dependencies, complexity, and constraints. In S. Karimi (Ed.), *Word order and scrambling* (pp. 301-324). Malden, MA: Blackwell Publishing.
- Stowe, L. A. (1986). Parsing *WH*-constructions: evidence for on-line gap location. *Language and Cognitive Processes*, 1, 227-245.
- Sussman, R. S., & Sedivy, J. C. (2004). The time-course of processing syntactic dependencies: evidence from eye-movements during spoken *wh*-questions. *Language and Cognitive Processes*, 18, 143-163.
- Swinney, D. & Osterhout, L. (1990). Inference generation during auditory language comprehension. In: Graesser, A. C. and Bower, G. H. (Eds.) *Inference and Text*

- Comprehension: The Psychology of Learning and Motivation*, 25, Academic Press, San Diego.
- Takezawa, K. (1989). *A configurational approach to case-marking in Japanese*. Doctoral dissertation, University of Washington.
- Tohsaku, Y. (1995). *Yookoso! Continuing with Contemporary Japanese 1 and 2*. New York: McGraw-Hill.
- Traxler, M., & Pickering, M. (1996). Plausibility and the processing of unbounded dependencies: an eye-tracking study. *Journal of Memory and Language*, 35, 454-475.
- White, L. (1989). *Universal grammar and second language acquisition*. Amsterdam: John Benjamins.
- White, L. (1996). Universal grammar and second language acquisition: current trends and new directions. In W. Ritchie & T. Bhatia (eds.) *Handbook of language acquisition* (pp. 85-120). New York: Academic Press.
- White, L. (2000). Second language acquisition: from initial to final state. In J. Archibald (ed.) *Second language acquisition and linguistic theory* (pp. 130-155). Malden, MA: Blackwell Publishers.

APPENDIX

Each of the items in this list represents one full set of stimuli from the experiment. In conditions (a) and (b) (Dative I and II), the alternation of the case markers is indicated by square brackets, separated by a slash (/).

1. a/b. スチュワーデス[は/が]機長が機内でだれに...
 sucyuwaadesu-wa/ga kicyoo-ga kinai-de dare-ni ...
flight attendant-top/nom chief pilot-nom inside-airplane-in who-dat ...
 c. だれがスチュワーデスに機長が機内で...
 dare-ga sucyuwaadesu-ni kicyoo-ga kinai-de ...
who-nom flight attendant-dat chief pilot-nom inside-airplane-in...
2. a/b. 先生[は/が]生徒が図書室でだれに...
 sensei-wa/ga seito-ga tosyositu-de dare-ni
teacher-top/nom student-nom library-at who-dat ...
 c. だれが先生に生徒が図書室で...
 dare-ga sensei-ni seito-ga tosyositu-de...
who-nom teacher-dat student-nom library-at...
3. a/b. コーチ[は/が]選手がロッカールームでだれに...
 kooti-wa/ga sensyu-ga rokkaaruumu-de dare-ni ...
coach-top/nom player-nom locker room-at who-dat ...
 c. だれがコーチに選手がロッカールームで...
 dare-ga kooti-ni sensyu-ga rokkaaruumu-de...
who-nom coach-dat player-nom locker room-at...
4. a/b. 部長[は/が]社長が会議でだれに...
 bucyoo-wa/ga syacyoo-ga kaigi-de dare-ni...
manager-top/nom president-nom meeting-at who-dat...
 c. だれが部長に社長が会議で...
 dare-ga bucyoo-ni syacyoo-ga kaigi-de...
who-dat manager-dat president-nom meeting-at...
5. a/b. アシスタント[は/が]作家が廊下でだれに...
 asisutanto-wa/ga sakka-ga rooka-de dare-ni...
assistant-top/nom writer-nom hallway-at who-dat...
 c. だれがアシスタントに作家が廊下で...
 dare-ga asisutanto-ni sakka-ga rooka-de...
who-nom assistant-dat writer-nom hallway-at...
6. a/b. 教授[は/が]助手が実験室でだれに...
 kyooju-wa/ga josyu-ga jikkennsitu-de dare-ni...
professor-top/nom assistant-nom lab-at who-dat...
 c. だれが教授に助手が実験室で...
 dare-ga kyooju-ni josyu-ga jikkennsitu-de...

- who-nom professor-dat assistant-nom lab-at...*
7. a/b. 母親^{ははおや}[は/が]お手伝い^{てつだ}さんが台所^{だいどころ}でだれに...
 hahaoya-wa/ga otetudaisan-ga daidokoro-de dare-ni...
mother-top/nom housekeeper-nom kitchen-at who-dat...
- c. だれが母親^{ははおや}にお手伝い^{てつだ}さんが台所^{だいどころ}で...
 dare-ga hahaoya-ni otetudaisan-ga daidokoro-de...
who-nom mother-dat housekeeper-nom kitchen-at...
8. a/b. 祖母^{そぼ}[は/が]祖父^{そふ}がすし屋^やでだれに...
 sobo-wa/ga sofu-ga susiya-de dare-ni...
grandmother-top/nom grandfather-nom sushi restaurant-at who-dat...
- c. だれが祖母^{そぼ}に祖父^{そふ}がすし屋^やで...
 dare-ga sobo-ni sofu-ga susiya-de...
who-nom grandmother-dat grandfather-nom sushi restaurant-at...
9. a/b. 先生^{せんせい}[は/が]留学生^{りゅうがくせい}が教室^{きょうしつ}でだれに...
 sensei-wa/ga ryuugakusei-ga kyoositu-de dare-ni...
teacher-top/nom foreign student-nom classroom-at who-dat...
- c. だれが先生^{せんせい}に留学生^{りゅうがくせい}が教室^{きょうしつ}で...
 dare-ga sensei-ni ryuugakusei-ga kyoositu-de...
who-nom teacher-dat foreign student-nom classroom-at
10. a/b. 歌手^{かしゅ}[は/が]ピアニスト^{かしゅ}がコンサートホール^{かしゅ}でだれに...
 kasyu-wa/ga pianisuto-ga konsaatohoolu-de dare-ni...
singer-top/nom pianist-nom concert hall-at who-dat...
- c. だれが歌手^{かしゅ}にピアニスト^{かしゅ}がコンサートホール^{かしゅ}で...
 dare-ga kasyu-ni pianisuto-ga konsaatohoolu-de ...
who-nom singer-dat pianist-nom concert hall-at...
11. a/b. 医者^{いしや}[は/が]看護婦^{かんごふ}が病院^{びょういん}でだれに...
 isya-wa/ga kangofu-ga byooiin-de dare-ni...
doctor-top/nom nurse-nom hospital-at who-dat...
- c. だれが医者^{いしや}に看護婦^{かんごふ}が病院^{びょういん}で...
 dare-ga isya-ni kangofu-ga byooiin-de...
who-nom doctor-dat nurse-nom hospital-at...
12. a/b. 妻^{つま}[は/が]夫^{おと}が電話^{でんわ}でだれに...
 tuma-wa/ga otto-ga denwa-de dare-ni...
wife-top/nom husband-nom telephone-on who-dat...
- c. だれが妻^{つま}に夫^{おと}が電話^{でんわ}で...
 dare-ga tuma-ni otto-ga denwa-de...
who-nom wife-dat husband-nom telephone-on...
13. a/b. 秘書^{ひしよ}[は/が]市長^{しちやう}が文書^{ぶんしよ}でだれに...
 hisyo-wa/ga sicyoo-ga bunsyo-de dare-ni...
secretary-top/nom mayor-nom document-with who-dat...

- c. だれが^{ひしよ}秘書に^{しちやう}市長が^{ぶんしよ}文書で...
 dare-ga hisyo-ni sicyoo-ga bunsyo-de...
who-nom secretary-dat mayor-nom document-with...
14. a/b. 刑事^{けいじ}[は/が]犯人^{はんじん}が公園^{こうえん}でだれに...
 keiji-wa/ga hannin-ga kooen-de dare-ni...
detective-top/nom criminal-nom park-at who-dat...
- c. だれが^{けいじ}刑事に^{はんじん}犯人が公園^{こうえん}で...
 dare-ga keiji-ni hannin-ga kooen-de...
who-nom detective-dat criminal-nom park-at...
15. a/b. アナウンサー^{あなうんさー}[は/が]ミュージシャン^{みゅーじしゃん}がスタジオ^{すたじお}でだれに...
 anaunsaa-wa/ga muujisyan-ga sutajio-de dare-ni...
announcer-top/nom musician-nom studio-at who-dat...
- c. だれがアナウンサー^{あなうんさー}にミュージシャン^{みゅーじしゃん}がスタジオ^{すたじお}で...
 dare-ga anaunsaa-ni muujisyan-ga sutajio-de...
who-nom announcer-dat musician-nom studio-at...

AUTHOR NOTE

This research was supported in part by grants to CP from the National Science Foundation (BCS-0196004) and the Human Frontier Science Program (RGY-0134). We are also grateful to Ellen Lau, Kaori Ozawa, Rozz Thornton and Masaya Yoshida for valuable discussions of the study, to Deborah Eastman, Gretchen Jones, Eiko Miura, Yoshiko Mori and Lindsay Yotsukura for assistance with recruiting the Japanese learners, and to John Matthews for assistance with the testing of the native Japanese speaker group.

END NOTES

1. The notion of ‘generation’ used here refers to the ability to construct a mental representation of a sentence structure, and is intended to be neutral between comprehension and production mechanisms. See Boland & Cutler (1996) for a useful discussion of the terms ‘generation’ and ‘selection’ in psycholinguistics.
2. Forms similar to echo questions also occur in ‘quiz show’ contexts in English, e.g., ‘The Maple Leafs are the hockey team for which Canadian city?’. As with echo questions, these forms are always direct questions.
3. In a very small number of trials participants placed the quantificational morpheme *-mo* after the *wh*-phrase *dare-ni* to create the quantificational expression *dare-ni-mo*, a quantifier that does not need to be associated with a QM. This occurred in 0.6% (2/359) of trials for the native Japanese group, and 1.9% (4/213) of trials for the L2 Japanese group.