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

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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 wh-scope ambiguities, 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, and in cases where there is more than one candidate, the ability to select among candidates in the same manner as a native speaker. The 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

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the same way as native speakers (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 wh-questions in English-speaking learners of Japanese, where the structure that is preferred by native speakers of Japanese is the superficial cognate of 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 suggest that the learners are relying on the same underlying mechanisms that govern processing in native speakers, and 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 cognates from the L1 grammar affect 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 parallels 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)  
\[
\text{John-wa Mary-ga sono repooto-wo yonda-to omotta.} \\
\text{John-top Mary-nom that report-acc read-comp thought} \\
\text{“John thought Mary read that report.”}
\]

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?”

    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.

    John-top Mary-nom who-dat met-QM said
    “John said who Mary met.”

    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 and 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.

    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.
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).

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 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).
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. 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.

In Japanese, Miyamoto and Takahashi (2003) report a different kind of locality bias in processing wh-questions. 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 did 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 generation 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 \textit{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 \textit{wh}-questions and forms the basis for the study of L2 learners reported here.

Taken together, the findings about the structure and processing of \textit{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 \textit{wh}-questions. This bias may be attributed to the same underlying mechanism in the two languages, despite differences in how it is realized in English and Japanese. Therefore, if English-speaking learners of Japanese process scopally ambiguous \textit{wh}-questions in Japanese using the same underlying mechanism as in English, we may expect them to perform similarly to native speakers of Japanese. For a bi-clausal sentence fragment with an in-situ \textit{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 \textit{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.

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.

Method

\textit{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.

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 included 6 items involving Japanese *wh*-question 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), 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. These conditions 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. 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 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. 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.

### Table 1

Sample set of experimental conditions

<table>
<thead>
<tr>
<th>Dative I</th>
<th>Sensei-wa</th>
<th>seito-ga</th>
<th>tosyositu-de</th>
<th>dare-ni…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>teacher-top</td>
<td>student-nom</td>
<td>library-loc</td>
<td>who-dat…</td>
</tr>
<tr>
<td>Dative II</td>
<td>Sensei-ga</td>
<td>seito-ga</td>
<td>tosyositu-de</td>
<td>dare-ni…</td>
</tr>
<tr>
<td></td>
<td>teacher-nom</td>
<td>student-nom</td>
<td>library-loc</td>
<td>who-dat…</td>
</tr>
<tr>
<td>Nominative</td>
<td>Dare-ga</td>
<td>sensei-ni</td>
<td>seito-ga</td>
<td>tosyositu-de…</td>
</tr>
<tr>
<td></td>
<td>who-nom</td>
<td>teacher-dat</td>
<td>student-nom</td>
<td>library-loc…</td>
</tr>
</tbody>
</table>

**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. 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.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Embedded</th>
<th>Main</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP-top NP-nom NP-loc WH-dat</td>
<td>116</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>NP-nom NP-nom NP-loc WH-dat</td>
<td>116</td>
<td>99.1</td>
<td>0</td>
</tr>
<tr>
<td>WH-nom NP-dat NP-nom NP-loc</td>
<td>7</td>
<td>6.1</td>
<td>99</td>
</tr>
</tbody>
</table>

1 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.
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.

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

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Question Marker</th>
<th>Embedded</th>
<th>N</th>
<th>%</th>
<th>Main</th>
<th>N</th>
<th>%</th>
<th>Both</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP-top NP-nom NP-loc WH-dat</td>
<td></td>
<td>44</td>
<td>91.6</td>
<td>2</td>
<td>4.2</td>
<td>2</td>
<td>4.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NP-nom NP-nom NP-loc WH-dat</td>
<td></td>
<td>48</td>
<td>96</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WH-nom NP-dat NP-nom NP-loc</td>
<td></td>
<td>9</td>
<td>15.5</td>
<td>45</td>
<td>77.5</td>
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<td>6.9</td>
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</tbody>
</table>

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.

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 (Jorden, 1987, 1988; Jorden, & 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.

Note also a couple of related 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. 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 *wh*-scope ambiguities, despite the fact that the closest superficial cognate in English is impossible. We interpret these results as showing that the relevant point of comparison with English *wh*-questions is not the superficial similarity of echo questions, but the more abstract preference 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 results 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


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...
   kyoooju-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 kyoooju-ni josyu-ga jikkennsitu-de...
who-nom professor-dat assistant-nom lab-at...

7. a/b. 母親[はが]お手伝いさんが台所でだれに...
   hahahaoya-wa ga otetudaisan-ga daidokoro-de dare-ni...
   mother-top/nom housekeeper-nom kitchen-at who-dat...

c. だれが母親にお手伝いさんが台所で...
   dare-ga hahahaoya-ni otetudaisan-ga daidokoro-de...
   who-nom mother-dat housekeeper-nom kitchen-at...

8. a/b. 祖母[はが]祖父がすし屋でだれに...
   sobo-wa ga sofu-ga susiya-de dare-ni...
   grandmother-top/nom grandfather-nom sushi restaurant-at who-dat...

c. だれが祖母に祖父がすし屋で...
   dare-ga sobo-ni sofu-ga susiya-de...
   who-nom grandmother-dat grandfather-nom sushi restaurant-at...

9. a/b. 先生[はが]留学生が教室でだれに...
   sensei-wa ga ryuuugakusei-ga kyoositu-de dare-ni...
   teacher-top/nom foreign student-nom classroom-at who-dat...

c. だれが先生に留学生が教室で...
   dare-ga sensei-ni ryuuugakusei-ga kyoositu-de...
   who-nom teacher-dat foreign student-nom classroom-at

10. a/b. 歌手[はが]ピアニストがコンサートホールでだれに...
    kasyu-wa ga pianisuto-ga konsaatohoolu-de dare-ni...
    singer-top/nom pianist-nom concert hall-at who-dat...

c. だれが歌手にピアニストがコンサートホールで...
    dare-ga kasyu-ni pianisuto-ga konsaatohoolu-de ...
    who-nom singer-dat pianist-nom concert hall-at...

11. a/b. 医者[はが]看護婦が病院でだれに...
   isya-wa ga kangofu-ga byooin-de dare-ni...
   doctor-top/nom nurse-nom hospital-at who-dat...

c. だれが医者に看護婦が病院で...
   dare-ga isya-ni kangofu-ga byooin-de...
   who-nom doctor-dat nurse-nom hospital-at...

12. a/b. 妻[はが]夫が電話でだれに...
   tuma-wa ga otto-ga denwa-de dare-ni...
   wife-top/nom husband-nom telephone-on who-dat...

c. だれが妻に夫が電話で...
   dare-ga tuma-ni otto-ga denwa-de...
   who-nom wife-dat husband-nom telephone-on...

13. a/b. 秘書[はが]市長が文書でだれに...
   hisyo-wa ga sicyoo-ga bunsyo-de dare-ni...
   secretary-top/nom mayor-nom document-with who-dat...
c. だれが秘書に市長が文書で...
   dare-ga hisyo-ni sicyoo-ga bunsyo-de...
   who-nom secretary-dat mayor-nom document-with...

14. a/b. 刑事[は/が]犯人が公園でだれに...
   keiji-wa/ga hannin-ga kooen-de dare-ni...
   detective-top/nom criminal-nom park-at who-dat...

c. だれが刑事に犯人が公園で...
   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[は/が]ミュージシャンがスタジオでだれに...
   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にミュージシャンがスタジオで...
   dare-ga anaunsaa-ni muujisyan-ga sutajio-de...
   who-nom announcer-dat musician-nom studio-at...