Acquisition of Overt and Null Pronoun Interpretation in L2 Japanese

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1. Abstract

This study investigates the interpretation of Japanese overt 3rd person pronouns by advanced L1-English/L2-Japanese speakers. Results of this experiment, like those of previous experiments testing the Interface Hypothesis (IH) in Italian (Sorace & Filiaci, 2006; Belletti, Bennati & Sorace 2007), show that even highly-proficient L2 speakers diverge from L1 controls on overt pronoun interpretation, with the L2 group choosing a non-subject referent (topic-shift) for an overt pronoun less often than the L1 group. However, fundamental differences in the nature of overt pronouns in Japanese and Italian led to an even greater divergence between L1 and L2 groups in this study compared to previous IH studies, with the two groups showing qualitatively (not just quantitatively) different interpretation trends. Some *individual* L2ers, however, patterned identically with L1ers; eye-tracking data further reveals that when L2 participants did choose an L1-like topic-shift interpretation, they were processing like L1ers. Results suggest that L2 interpretation patterns fluctuate based on amount of current exposure to the L1 (English).

2. L2 Acquisition of Overt Pronoun Interpretation in Null Subject Languages

2.1 The Interface Hypothesis (IH)

Previous studies have found that various bilingual populations (childhood bilinguals, L1 attriters, near-native L2 speakers) diverge from monolinguals on interpretation of overt pronouns in null-subject languages such as Italian (see Sorace, 2011 for overview). This divergence is quantitative, not qualitative: both L1ers and L2ers tend to choose a non-matrix-subject referent for overt pronouns, but the latter do so less often than the former. For example, in response to sentence (1), L1-Italian participants were more likely than L1-English/L2-Italian participants to choose a scene in which someone other than the mother (either the daughter or a third, external referent) is wearing a coat when the overt pronoun is present in the subordinate clause (Sorace & Filiaci, 2006, p. 352; p. 354):

(1) *La mamma$_i$ dà un bacio alla figlia$_k$ [mentre lei$_{k/l}$*/pro$_i$ *si mette il cappotto]*.
the mother gives a kiss to.the daughter while she/*pro* puts on the coat
"The mother$_i$ kisses her daughter$_k$ [while **she**$_{k/l}$/*pro$_i$* is wearing her coat].

Table 1. Results for Forward Anaphora[2] *condition from Sorace & Filiaci, 2006.*

	L1			**L2**		
	Subject	*Complement*	*Other*	*Subject*	*Complement*	*Other*
Overt	**8%**	82%	11%	**27%**	60%	13%
Null	51%	44%	5%	46%	43%	11%

On the other hand, there were no significant differences among L1 and L2 participants when the pronoun was null. Sorace & Filiaci (2006) concluded that L2 participants had both a native-like null-subject grammar (as they performed similarly to L1ers in the null condition) and native-like processing strategies (as they showed the same qualitative trend for overt pronoun interpretation as L1ers), but that they did not use these processing strategies consistently, perhaps due to increased processing pressure that made it easier to fall back on a subject interpretation, a less costly computation than switching reference from the subject to some other entity.

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[2] Note Sorace & Filiaci (2006) also tested backward anaphora, in which the clause with the pronoun appears in initial position (*Mentre lei…*). The Japanese items in this experiment use forward anaphora, so I present only the forward anaphora results here. The L2-Italian participants in Sorace & Filiaci (2006) showed greater divergence in the backward anaphora condition (choosing subject and non-subject roughly at chance), which the authors attribute to increased processing difficulty. Even in the backward anaphora condition, the L2-Italian speakers did not differ as greatly from L1ers as the L2-Japanese speakers did in this study.

These results were largely replicated in near-native L2-Italian by Belletti, Bennati & Sorace (2007), which included a storytelling task in which L2 speakers produced more overt pronouns than L1 controls, and a similar task as in the experiment described above. These two studies (as well as others on childhood bilinguals and L1 attriters; see Sorace & Serratrice, 2009 and Tsimpli, Sorace, Heycock & Filiaci, 2004, among others) test the Interface Hypothesis (IH), which claims that it is the complex interface between syntax and pragmatics/discourse that leads to this divergence between monolingual and bilingual speakers.

2.2 The Interface Hypothesis & Japanese

Japanese, like Italian, allows null subjects, but is typologically different in many ways, with researchers traditionally making a distinction between Italian-like *pro*–drop and Japanese-like[3] "zero-topic" languages (Huang, 1984). The existence of the null/overt subject alternation suggests that advanced L2-Japanese speakers may show similar results to the L2-Italian speakers in previous studies, with the other typological differences between Japanese and Italian providing further insights into L2 pronoun interpretation.

However, it is difficult to tell how Japanese L2ers fit in with previous IH studies, since Japanese native speakers (unlike Italian counterparts) do not show a consistent antecedent preference for overt pronouns. In particular, native Japanese speakers tend to interpret overt pronouns as referring to a subject or non-subject referent *at chance* (Okuma 2011; Ueno & Kehler 2010). For example, a study by Okuma (2012) replicated the IH paradigm with native Japanese (N = 14) and L1-English/L2-Japanese (N = 11) participants. Items included sentences with subordinate and matrix clauses similar to those in (1) above (Okuma, 2012, p. 7):

(2) *Okaasan$_i$-wa musume$_k$-ni* ***kanojo$_{k/l}$-ga/***pro$_i$ *kooto-o kiru toki-ni kisu-o sita.*
mother-TOP daughter-DAT she-NOM/*pro* coat-ACC put.on when kiss-ACC did
"The mother$_i$ kissed the daughter$_k$ when **she**$_{k/l}$/*pro*$_i$ put on the coat."

Results showed native Japanese speakers chose the subject referent 40% of the time in the overt condition (with no significant statistical differences between subject and non-subject interpretation), as opposed to the L1-Italian participants cited above, who chose the subject only 8% of the time. In other words, native Japanese participants were at chance between subject and non-subject interpretation for the overt pronoun. L2-Japanese participants in Okuma (2012) did not differ significantly from L1ers in the overt condition; that is, L2ers were also at chance.

Table 2. Results from Okuma (2012, p. 8)[4]

	Native Japanese Speakers		
Pronoun	*Subject*	*Complement*	*Other*
Overt	**40%**	45%	15%
Null	73%	21%	6%

Other studies have found similar results. A study of L2 Japanese speakers by Kanno (1997), primarily interested in the Overt Pronoun Constraint, included control items in which overt pronouns were given as the subjects of embedded clauses under a referential NP matrix subject. Kanno (1997) found native Japanese controls were evenly split between interpretations that allowed the matrix subject as NP and those that did not.

Additionally, a native-Japanese production study by Ueno & Kehler (2010) also showed no preference for topic-shift (i.e., switching to a non-subject referent) when Japanese native speakers were given an overt pronoun prompt. Items included a contextual sentence followed by a null subject prompt, a 3rd person pronoun prompt, or a "free" prompt in which participants were directed to choose their own subject (Ueno & Kehler 2010, p. 2058):

[3] The concept of zero-topic languages as found in Huang (1984) was originally based on Mandarin, but Japanese is usually put into this category as well, despite differences between the two languages.

[4] Okuma (2012)'s test items included four different syntactic conditions in order to investigate the effects of word order and topic-marking. I report on the condition that most closely matches the previously-cited IH studies; participants were at chance interpretation for overt subject pronouns in all four conditions.

(3) Context: *Taro-wa Jiro-ni hon-o watashita tokoro datta.*
Taro-TOP Jiro-to book-ACC handed scene was
"Taro handed Jiro a book."

Prompt: ø/*Kare-wa* (He-TOP)/*Free*_____.

In their sentence continuations, participants were at chance as to whether or not they switched from the subject to another referent (i.e., topic-shift) in the overt pronoun condition, leading the authors to conclude that overt pronouns do not display a non-subject bias in Japanese. An alternation between topic-marking and subject-marking on the first NP in the Context Sentence (*Taro* in (3) above) had no effect on interpretation, but aspect marking on the verb and, in a later study, verb lexical semantics (Ueno & Kehler, 2011), did. These studies suggest that Japanese, unlike Italian, has no "default" interpretation tendency for overt pronouns, with Ueno & Kehler (2010; 2011) further suggesting that semantic factors involving the individual verbs used in the Context Sentence affect interpretation.

2.3 Differences Between Italian and Japanese: A Pragmatic Analysis

As mentioned in the previous section, while Japanese and Italian both allow null subjects, they also differ typologically in several ways, such as a lack of verbal agreement morphology in the former. Additionally, Japanese allows both null subjects *and* null objects, and the rate of null argument use is much higher. Furthermore, the alternative to using a null form is not necessarily a pronoun, as speakers are more likely to use a demonstrative or lexical NP, especially for the 3rd person. These two factors together make the appearance of an overt personal pronoun (especially 3rd person pronouns, which are particularly rare) a marked choice.

The marked nature of overt 3rd person pronouns in Japanese invites a Gricean-style conversational implicature approach, in which the use of an overt pronoun where a null is expected violates the Maximum of Quantity and causes the hearer to search for a reason why the speaker chose the unusual form (Grice, 1975). Indeed, analyses of the switch-reference/topic-shift tendency in languages like Italian, such as those incorporating anaphora hierarchies, make use of this sort of mechanism (Givon, 1983; Huang, 1994, among others). These hierarchies rank different anaphors (usually according to criteria such as phonological and/or semantic weight) with respect to the saliency of antecedent that they are likely to retrieve (according to criteria such as linear distance, topic-hood, subject-hood, etc.). A weightier anaphor (such as an overt pronoun) is more likely to retrieve a less-salient antecedent (such as a non-subject) than a lighter anaphor (such as a null form).[5] This sort of analysis predicts a "default" implicature in which, all else being equal, an overt pronoun will tend to recall a non-subject referent, in contrast with the null form, which is expected when reference with the subject is maintained. This is exactly what is found in the data on L1 Italian (and to a lesser-extent, L2 Italian) reported above. Indeed, a study of pronoun use in native Italian by Carminati (2002), found that the default topic-shift interpretation for overt pronouns manifested itself most strongly in ambiguous contexts, i.e., when there are no contextual factors to cancel the default implicature.[6]

However, this default implicature analysis does not work for Japanese, since native-speakers have been found to interpret overt 3rd person pronouns at chance, rather than with a tendency towards non-subjects (or towards subjects for that matter). I claim that the type of implicature generated by overt 3rd person pronouns in Japanese is classic one-off (particularized) conversational implicature, generated anew with each utterance. That is, there is no fixed "default"; instead, interpretation is completely derived from context (whether linguistic and/or situational). In the absence of context biasing one reading or another, it is not surprising that NS interpret overt pronouns at chance.[7]

This particularized conversational implicature analysis conforms with previous empirical findings. The three Japanese studies cited in the previous section all found overt pronoun interpretation to be at chance between subject and non-subject referents, using contexts that did not bias a particular interpretation. Furthermore, Ueno & Kehler (2010; 2011) found that structural factors such as topic-hood of antecedent did not affect overt pronoun

[5] The Form-Specific Multiple Constraints (FSMC) approach (Kaiser & Trueswell, 2008) suggests that the constraints on antecedent saliency may vary from language to language and anaphor to anaphor. However, I claim here that Japanese overt 3rd-person pronouns are not constrained by anaphora hierarchies at all (or, they are so form-specific that antecedent saliency is constrained by utterance context alone).

[6] This type of "default" implicature is called a Generalized Conversational Implicature (see Huang, 1994 for an analysis of GCIs in null-subject languages).

[7] Note that in Italian-like languages, utterance context can *cancel* the default implicature, but does not *create* the implicature in the first place. The difference would be most profound in cases where there is no context: we would see a tendency for non-subject interpretation in Italian-like languages but chance interpretation in Japanese. This is exactly what we find in the studies cited above for both Italian and Japanese.

interpretation (as would be predicted by an anaphora hierarchy), but semantic factors specific to the individual verb in the context sentence, such as aspect or lexical semantics, did.

Furthermore, there is theoretical evidence that Japanese 3rd person pronouns do not fit well on the type of anaphora hierarchy described above. First, Japanese 3rd person pronouns display mixed lexical properties: the morphosyntactic properties of nouns (Kuroda, 1965; Noguchi, 1997), semantic properties of personal pronouns (person and gender features), and etymological roots in demonstratives, which some scholars suggest still influence their interpretation and binding properties (Hoji, 1991). Since these three categories (nouns, pronouns, and demonstratives) usually occupy different rankings in anaphora hierarchies, it is difficult to fit 3rd person pronouns onto such a scale. Coupled with their rarity and diachronic youth, the mixed lexical properties of Japanese 3rd person pronouns provide further evidence that they do not fit with a default implicature approach.

Although I focus on the L2 Japanese data in this paper, as will be seen in the L1 Japanese control data below, providing a context that biases a non-subject reading for overt pronouns does in fact succeed in eliciting a consistent (greater than chance) topic-shift interpretation, in contrast with the results of previous studies, which found native Japanese participants at chance. These results support the analysis of Japanese overt 3rd person pronouns put forth in this section, and provides a background against which to compare the behavior of L2 participants.

2.4 Implications for L2 Learners

If the analysis in Section 2.3 holds, then L1-English learners of Japanese face a different task than learners of Italian in acquiring native-like overt pronoun use. The latter group must adjust settings for overt 3rd person pronouns on the anaphora hierarchy, as the lack of null pronouns in English leave overts as the "lightest" anaphoric form, and therefore most likely to retrieve the most salient antecedents (i.e., subjects). Quantitative differences in performance in L2 Italian may result when this setting is slightly off, or due to the processing issues mentioned in Section 1.1.

L1-English/L2-Japanese speakers, on the other hand, must learn to ignore the anaphora hierarchy altogether when interpreting overt 3rd person pronouns in the L2. If they learn to ignore the hierarchy, L1-like interpretation should fall out from Cooperative Principle (i.e., no differences vs. L1 group). If they do not learn to ignore the hierarchy and instead fall back on an English-like interpretation of pronouns, there will be qualitative differences in interpretation (i.e., they will choose the subject much more often than Japanese native speakers).

3. This Experiment

3.1 Research Question and Possible Outcomes

The overarching research question is as follows:

- Will L1-English/L2-Japanese participants diverge from native-speaking Japanese participants in interpretation of Japanese overt 3rd person pronouns?

There are three possible outcomes:

i. L2 participants will *not* differ significantly from L1 participants, suggesting that they have learned to ignore the anaphora hierarchy when interpreting Japanese 3rd person pronouns.

ii. L2 participants will differ *qualitatively* from L1 participants, suggesting that they are interpreting overt pronouns in the L2 using settings for an English-like anaphora hierarchy.

iii. L2 participants will differ *quantitatively* but not qualitatively from L1 participants, which is not predicted by the analysis presented in Sections 2.3 and 2.4, but may, as found in previous IH studies, reflect a processing strategy that favors interpretations that maintain (rather than switch) reference.

3.2 Procedure

All participants first filled out a paper-and-pencil language-background questionnaire. At the start of the main experiment, participants underwent a training session in which they learned the names of the four characters used in the test items, as well as a straightforward practice session. In each trial, participants heard a mini-story consisting of three sentences while viewing a computer screen split into four pictures. They then heard a question eliciting their interpretation for the critical pronoun, which they answered by clicking relevant picture. Interpretation, reaction-time, and eye-tracking data were recorded. Participants were tested in a soundproof booth containing either a Tobii 1750 (Tokyo) or Tobii 1760 (NYC) eye-tracking computer, which was programmed on E-Prime software. The eye-tracking computers in both labs worked like a regular PC, without any headset, allowing participants a naturalistic computer-use experience. After the main experiment, L2 participants also took a brief proficiency test.

3.3 Test Items

Each test item consisted of a mini-story with three sentences: an Introduction Sentence, the Test Sentence, and a Concluding Sentence (see the example in (4) below). As argued above, native-speaker interpretation of 3rd person

pronouns in Japanese are particularly sensitive to context; as such, my test items provided context biasing a non-subject reading for the overt pronoun. Linguistic context was provided in the Introduction Sentence via specifically mention of two same-gender human referents engaged in some activity in a particular setting (riding a train, working in the office, etc.); visual context was provided by the images of the two possible referents on the screen. The availability of two (and only two) possible referents allowed for a topic-shift from one to the other to be a plausible reason as to why the speaker may have chosen to flout the Maxim of Quantity (as opposed to previous IH experiments, in which a third referent was available or Ueno & Kehler (2010)'s production experiment, in which participants filled in their own continuation sentences, thereby controlling the context).

Each Test Sentence contained two clauses, featuring an overt/null pronoun alternation in the subject of the matrix clause (Pronoun condition). The two clauses mentioned activities that could plausibly be committed by either a single person or two separate people simultaneously. Each mini-story then concluded with a final sentence designed to wrap up the story; this Concluding Sentence never contained any animate nouns. Participants then heard a Question designed to elicit the pronoun referent of the critical (matrix) clause in the Test Sentence. Below is a sample test item, along with the display that participants see on the screen.[8]

(4) *Example Test Item and Question*

Introduction Sentence
jon$_i$-san-to takeshi$_j$-san-wa kaigi-no-tame densha-de nagoya-e ikimasu. John-and Takeshi-TOP conference-for train-by Nagoya-to go "John$_i$ and Takeshi$_j$ go by train to Nagoya for a conference."
Test Sentence
takeshi$_j$-san-wa/ga[9] *biiru-o nondeiru-aida,* ***kare$_i$-ga/*pro$_j$** *keshiki-o nagametimasu.* Takeshi-TOP/NOM beer-ACC drink-while he-NOM/*pro* scenery-ACC view "While Takeshi$_j$ drinks a beer, **he$_i$/*pro*$_i$** views the scenery."
Concluding Sentence
inaka-no-tambo-ya hatake-wa totemo kirei desu. countryside-'s-rice.fields-and fields-TOP very beautiful be "The fields and rice paddies of the countryside are very beautiful."
Question
dare-ga keshiki-o nagametimasu-ka who-NOM scenery-ACC view-Q "Who views the scenery?"

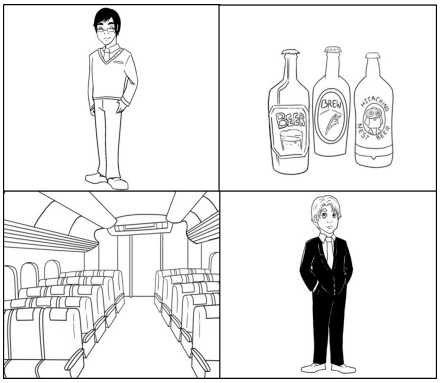


Figure 1. Screenshot from experiment.

[8] While technically participants could have chosen one of the two non-human images in response to the question, none ever did (except in filler items in which such answers were explicitly solicited).

[9] In addition to the main Pronoun condition, I included a secondary Particle condition in which the particle attached to the first NP of the Test Sentence alternated between the topic-marker *–wa* and the subject-marker *–ga*. A pilot survey found that native speakers found *–wa* more natural in the Null condition, but *–ga* more natural in the Overt condition, so I included both. The only notable effect was in the native-speaker Null data, which I do not explore in detail here. Interested readers may refer to my dissertation for further information (Nagano, 2015).

The experiment consisted of 32 test items (8 in each condition), 32 items designed to collect pilot data on the Overt Pronoun Constraint, and 32 pure filler items, a subset of which resembled the test items but included a gender mismatch that disambiguated the referent of the overt pronoun.

Half of the test items used the male pronoun *kare* ("he"); half used the female pronoun *kanojo* ("she"). Half of the *kare* items mentioned *Takeshi* in the test sentence (as in the example in (4) above) while half mentioned *John*; female items alternated between *Kyoko* and *Susan*. Items were presented in pseudo-randomized order; all participants saw all items. Items were recorded by a male native speaker of Japanese and were screened using Praat software for contrastive intonation in the critical clause; any such items were re-recorded.

3.4 Participants

Participants included native Japanese speakers tested in Tokyo (N = 21) and advanced L2 Japanese speakers (N = 20; 19 tested in NYC +1 tested in Tokyo). L2 speakers were given a proficiency test based on the listening comprehension sections of the N1, N2, and N3 (intermediate through advanced) levels of the Japanese Language Proficiency Test (Japan Foundation and Japan Educational Exchanges and Services, 2012; 2012a; 2012b), with a mean score of 80%. All L2 participants had lived in Japan for at least half a year, with a mean of 3.5 years (range of 0.5-19 years). Most began learning Japanese in their late teens (mean age 17 years), with only one participant younger than middle school age (9 years). Participants who were childhood bilinguals in English and a null-subject language were excluded from the study.

3.5 Data Analysis

For the interpretation data, participant responses were coded either 1 for topic-shift (non-subject) interpretation or 0 for subject interpretation, and then analyzed in *R* using the generalized linear mixed effects model function (glme4) (R Core Team, 2012; Bates, Maechler & Bolker, 2012). Random intercepts for participants and item were included to control for repeated measures effects. Starting with a null model, fixed effects (Group, Pronoun, Particle) and interactions thereof were added one by one. Each successive model was compared against previous models for goodness of fit using logLikihood and the Akaike Information Criterion (AIC). Statistics are therefore reported as chi-squares (comparison of the best-fit model to the previous best-fit model) and z-scores from post-hoc Tukey tests on significant interactions.

Eye-tracking data is presented in two forms: time-course graphs and inferential statistics based on target advantage scores. For the former, proportion of looks to each referent was binned over 50 ms windows and charted as a line graph across the course of the test sentence. For the latter, target advantage scores (with the topic-shift referent as target) were calculated by subtracting looks to the subject referent from looks to the topic-shift referent. This data was binned for statistical analysis by syntactic unit (DO2, V2, etc.) rather than 50 ms windows. I used the linear mixed effects model function in *R* to perform analyses in three time regions: PR, DO2, and V2. As in the interpretation data, I began with a null model with random intercepts for participant and item and successively added fixed effects and interactions. Although reaction time data was also recorded, there were no interesting effects, so I do not further report on reaction time in this paper.

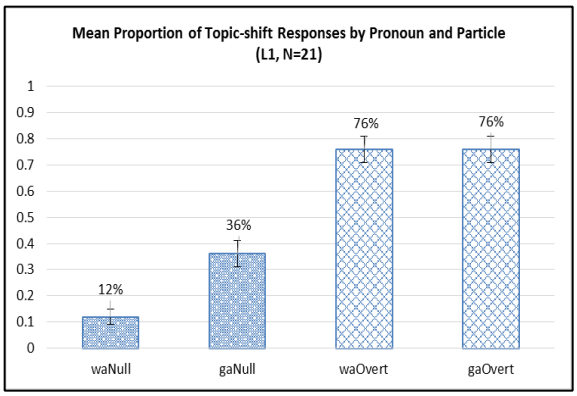
4. Results

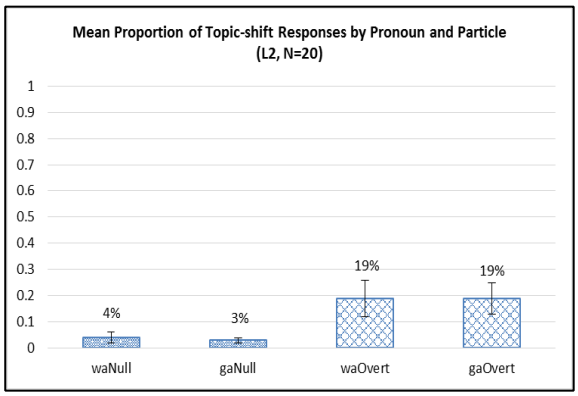
4.1 Interpretation Data

4.1.1 Group

The graphs in Figures 2 and 3 below show the mean proportion of topic-shift responses by each Group; that is, the percentage of trials in which they chose a non-subject referent. (Note that these graphs include the secondary Particle condition for those interested; there were no Particle effects in the L2 data so I do not discuss it here). The biasing context in the test items succeeded in eliciting a consistent topic-shift response in L1 Japanese controls in the Overt condition (76% of trials, regardless of Particle), in contrast with previous experiments in which participants were at chance between subject and non-subject interpretations. Advanced L2 participants, while choosing a non-subject referent more often in the Overt than in the Null, chose a non-subject referent in only 19% of Overt trials. L1 and L2 participants show qualitatively different interpretations in that, given a certain context, the former chose a non-subject referent for an Overt pronoun more often than not, while the latter chose a subject referent more often than not (as they would likely do in English).

Statistical analysis (as described in 3.5 above) showed a model with a three-way interaction of GroupXPronounXParticle to be a better fit than the model with two-way interactions only ($\chi 2(1) = 11.9$, $p = .006$). Post-hoc tests revealed that the L2 Group had significantly lower topic-shift rates than their L1 counterparts in every condition (*waNull*: $z = -3.01$, $p < .001$; *gaNull*: $z = -6.53$, $p < .001$; *waOvert*: $z = -7.02$, $p < .001$; *gaOvert*: $z = -7.1$, $p < .001$)





Figures 2 and 3. Percent of trials in which L1 and L2 participants chose a non-subject referent (topic-shift) by Pronoun and Particle type.

These results support possibility (ii) under the main research question in Section 3.1: L2 participants have not learned to ignore the anaphora hierarchy and instead fall back on an English-like setting for overt pronouns. Note that the difference between L1 and L2 Japanese groups is much greater than that between L1 and L2 Italian groups found in previous studies detailed in Section 2.1. This suggests that the differences between L1 and L2 participants in Japanese may be more representational than processing-based. We will explore the specifics of the processing aspects with the eye-tracking data in section 4.2. First, we consider the L2 individual data.

4.1.2 L2 Individual Interpretation Data

The individual L2 results for the Overt condition reveal bimodality: while seventeen participants look very different form L1 speakers (with six participants choosing the non-subject referent in 0% of trials), three participants trended with the L1 mean.

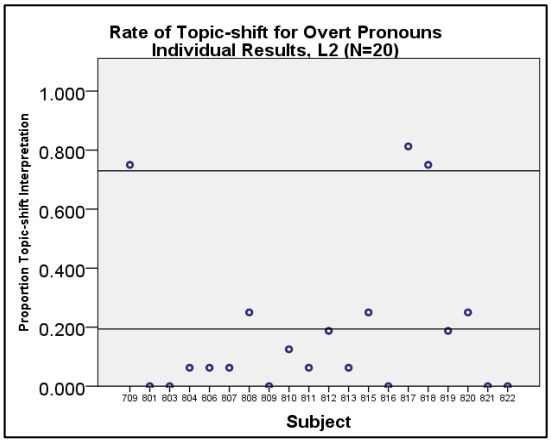


Figure 4. Rate of topic-shift interpretation for overt pronouns by individual L2 participants. Upper line = L1 mean; Lower line = L2 mean.

That is, it seems as if individual L2 participants either interpreted overt pronouns exactly like L1 participants (the three outliers) or completely differently (the remaining participants). No L2 participants showed the quantitative (but not qualitative) differences found in previous IH studies. In other words, the three native-like L2 participants support possibility (i) under the Research Question in 3.1, while the others support possibility (ii). None of the results support possibility (iii).

While there were no common traits among these three outliers (no correlations with proficiency, length of stay in Japan, etc.), one of these participants was the only participant tested in Japan, suggesting that current language input may play a role. Below, based on the eye-tracking data, I will argue that it is a decrease in the activation of English, rather than increased exposure to Japanese in and of itself, that is responsible for these differences.

4.2 Eye-tracking Data

4.2.1 Overview

The graphs below show eye-tracking data for L1 (N = 20) and L2 (N = 20) participants during the Test Sentence.[10] The Test Sentence in each trial followed the same template: a name marked with *–wa* or *–ga* (N-*wa/ga*), the direct object of subordinate clause (DO1), the verb of subordinate clause (V1), conjunction—always *aida* ("while")—(CONJ), an overt pronoun marked with *–ga* (PR-*ga*) OR a null pronoun (*pro*), the direct object of the matrix clause (DO2), and the verb of matrix clause (V2). The length of each of these constituents was measured for each individual test sentence and averaged to create time regions as represented on the eye-tracking graphs. The subordinate and matrix clauses are divided in the graphs by a bold vertical line.

Test Sentence Template

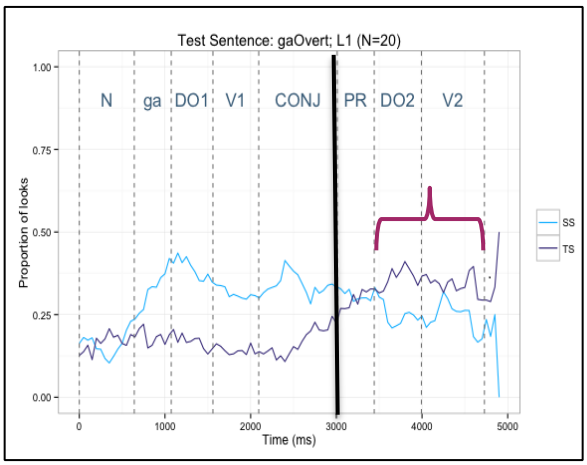
N-*wa/ga* DO1 V1 CONJ [PR-*ga* or *pro*] DO2 V2

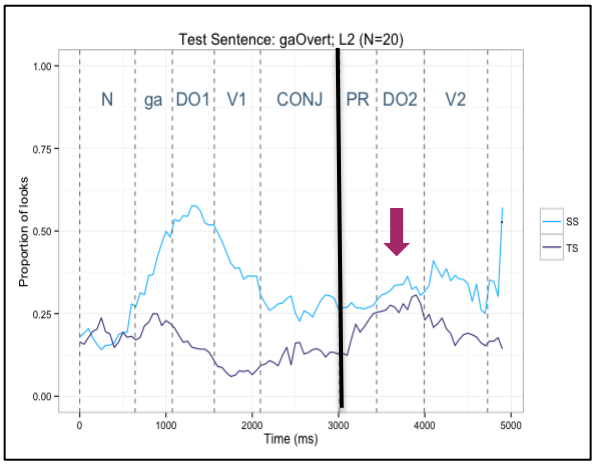
Subordinate Clause **Matrix Clause**

Of chief interest are the areas following the conjunction, i.e. the matrix clause: PR (if present), DO2, and V2. The x-axis represents time, while the y-axis represents proportion of looks. Note that the lines on the graph represent either the subject (SS) or non-subject (TS) referent; looks to the two filler images are not represented on the graphs (hence the sum of the two lines does not always add up to 100%). Note that during the Test Sentence, participants are listening passively, not completing a task. (Eye-tracking data was also recorded during the Question, during which participants actively considered their interpretation before clicking on their answer, but is left out here for space).

4.2.2 Results

The following graphs represent proportion of looks to the subject (SS-lighter line) and non-subject (TS-darker line) referent during the Test Sentence in the *ga*-Overt[11] condition by both L1 and L2 groups.





Figures 5 and 6. Eye-tracking graphs for L1 and L2 participants for the Test Sentence in the ga-Overt condition. SS = subject referent; TS = topic-shift (non-subject) referent.

As can be seen in Figure 5, for L1 participants, looks to the non-subject referent (darker line) increased during the conjunction (CONJ), equaled out with looks to the subject referent during the Pronoun (PR), and then dominated from DO2 through the end of the sentence (as indicated by the bracket). This is in line with L1ers' tendency to ultimately choose the non-subject interpretation for the Overt pronoun (compare to the *wa*-Null[12] condition in Figure 7 below, in which looks to the non-subject increase slightly during the conjunction but never overtake looks to the subject).

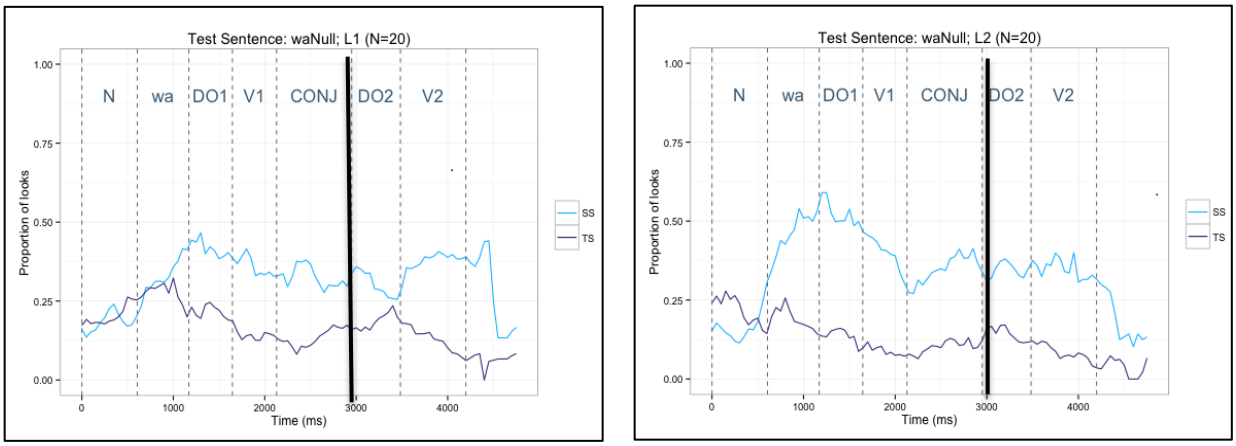
[10] Note that one L1 participant was excluded from the eye-tracking data due to a high proportion of track loss.

[11] I present the eye-tracking results for the *ga*-Overt condition here, since the *wa*-Overt condition is a more awkward syntactic construction. For full results, interested readers may refer to my dissertation (Nagano, 2015).

[12] Again, only the *–wa* variant is included here, as it represents the more natural utterance in the Null condition. There was a much stronger effect of Particle in the L1 Null condition than in the Overt, but as it is of more interest to Japanese sentence processing than second language acquisition, I do not explore it here.

Considering L2 participants differed qualitatively from L1ers in the interpretation data (showing a preference for the subject referent in Overt trials), their eye-tracking data did not diverge from the L1 data as greatly as expected. Specifically, like the L1 participants, L2 participants' looks to the non-subject referent increase during the conjunction (CONJ) and continued to increase during the pronoun (PR) (with no significant differences between groups in that time region) and well into DO2 before tapering off during the final verb. As to be expected from their ultimate interpretation, looks to the non-subject referent never exceeded those to the subject referent (as they do in the L1 data), but proportion of looks to the non-subject referent is clearly much greater in the Overt condition than in the Null Condition, as seen in Figure 8.

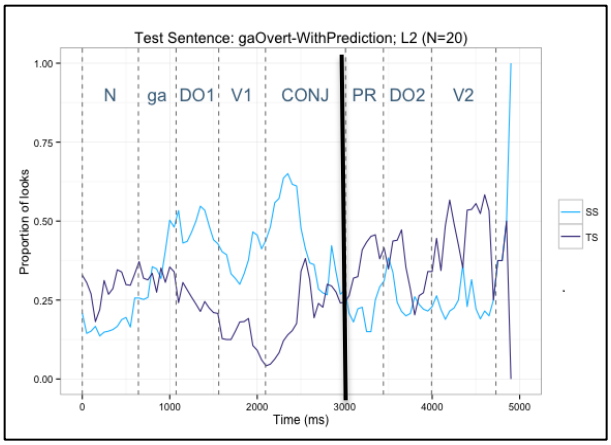
Statistical analysis (as described in Section 3.5) revealed no effect of Group during the pronoun itself (PR) in the Overt condition (i.e., the model with Group was not significantly better than the null model, $\chi2(1) = .12$, $p = .73$). During DO2, the best model included all three main effects (Group, Pronoun, Particle) and the interaction of GroupXParticle. which was significantly better than the model with just the main effects ($\chi^2(1) = 13.61$, $p < .001$), reflecting the fact that *both* L1 and L2 Groups showed significantly more looks to the non-subject referent in the Overt than the Null, but with the L1 group showing significantly more looks than the L2. (Particle effects are not explored here). During V2, the best model contained the main effects of Pronoun and Group and their interaction; the model with the interaction significantly improved the model with Group and Pronoun only ($\chi2(1) = 22.04$, $p < .001$). Post-hocs revealed that target advantage was higher for L1 than L2 participants in the Overt conditions ($z = -4.55$, $p < .001$).

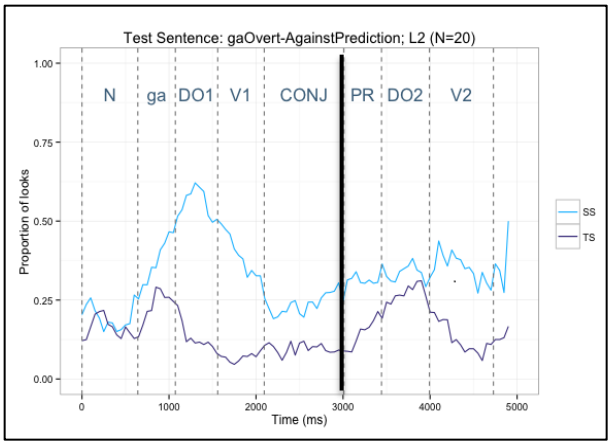


Figures 7 and 8. Eye-tracking graphs for L1 and L2 participants for the Test Sentence in the wa-Null condition. SS = subject referent; TS = topic-shift (non-subject) referent.

Furthermore, the increase in looks to the non-subject referent in the L2 Overt condition is *not* solely driven by the 19% of trials in which L2 participants choose a non-subject referent. Figures 9 and 10 below show the L2 *ga*-Overt data in Figure 6 split by ultimate response: Figure 9 reflects only the 19% of trials in which L2 participants chose the non-subject (topic-shift) referent (hence the grainy data), while Figure 10 reflects the 81% of trials in which participants ultimately chose the subject referent. Note that Figure 10 is almost identical to Figure 6, suggesting that even when L2ers ultimately give an English-like subject interpretation, they still consider the non-subject option to a greater extent in the Overt than in the Null. (It is difficult to tell due to the low amount of data, but Figure 9 seems to show looks to the non-subject referent dominating during the matrix clause, suggesting that when L2ers *do* choose an L1-like interpretation, they are also processing in an L1-like way).[13]

[13] Note that due to the unequal nature of the data when split by response type, I did not perform inferential statistics.





Figures 9 and 10. Eye-tracking graphs for L2 participants for the Test Sentence in the ga-Overt condition, separated by trials in which participants ultimately picked the topic-shift referent (left) and subject referent (right). SS = subject referent; TS = topic-shift (non-subject) referent.

4.3 Summary of Results

The interpretation data shows that:

- given a carefully chosen context, Japanese native-speakers choose a non-subject referent for an Overt pronoun more often than a subject referent, in contrast to previous experiments that found them at chance.
- L2ers qualitatively (not just quantitatively) differ from L1ers in Overt condition, supporting possibility (ii) under the Research Question.
- individual L2 data is bimodal, with L2ers either trending at the L1 mean (N = 3) or far below it (N = 17), supporting possibility (i) under the Research Question for the former group.

The eye-tracking data suggests:

- native Japanese participants' processing in the Overt condition is unsurprising considering the interpretation results.
- L2 participants process the Overt condition differently than the Null, with increased looks to the non-subject referent even in the majority of trials in which they ultimately choose a subject referent; this puts a twist in possibility (ii) which will be discussed below.
- L2ers seem to resemble L1ers in trials where L2ers choose L1-preferred interpretation, further supporting possibility (i).

5. Some Conclusions

The results summarized above provide support for the following conclusions. First, the L1 data supports the hypothesis that while there is no default, anaphora-hierarchy-based interpretation for Overt pronouns in Japanese, their interpretation can be analyzed via a one-off (particularized) conversational implicature analysis.

As such, Japanese L2ers face a different task than Italian L2ers in previous experiments: they must learn *not* to interpret the overt pronoun according to an anaphora hierarchy, and instead treat them as creating one-off (particularized) implicatures. That most L2 participants did not succeed in this task is evident in the fact that their results are qualitatively, not just quantitatively, different from L1ers, with most L2ers choose topic-shift (TS) interpretation for overts far less often than chance (like English), while L1ers choose TS more often than chance. This is in line with possibility (ii) under Research Question in Section 3.1

As outlined in possibility (i) under the Research Question section, if L2ers *do* manage to ignore the anaphora hierarchy, then L1-like interpretation should fall out directly from the Cooperative Principle, which, although the data is limited, seems to be the case for three L2 participants who trend at the L1 mean for overt pronoun interpretation, without the slight quantitative differences found in L2 Italian. Furthermore, eye-tracking data suggests L1-like looking patterns for trials in which L2ers ultimately choose the non-subject referent, although again the limited amount of data leaves this conclusion a tentative one for the time being.

The final question is *how* the three outlying L2ers managed to attain native-like performance. I suggest that the answer may lie in the suppression of English, rather than increased exposure to Japanese. As seen in the eye-tracking data, L2ers increased looks to non-subject referent after hearing pronoun in all Overt trials (during PRON-

DO2 regions), but then quickly look away during the verb (V2 region) in the trials for which they ultimately choose a subject interpretation.

This pattern suggests that the L2ers, when confronted with a surprising overt pronoun, at first consider the non-subject referent, but then, in the absence of any default interpretation (exacerbated by the scarcity of overt 3rd person pronouns in native Japanese and therefore in the input), fall back on an English-like interpretation rather than calculating a particularized conversational implicature like L1ers. It could be that the three L2 outliers were more successful in suppressing the English-like response, either due to decreased exposure to English (for the one outlier tested in Japan) or natural differences in inhibition ability. Further testing is required to provide more firm support for this explanation; comparing L2 groups in the US and Japan (who presumably have less exposure to English) would create further insights into this issue.

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