RESPONSIVITY TO GRAMMAR VIOLATIONS IN L2 JAPANESE SPEAKERS

by
Kyra Samuda
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This thesis was presented

by

Kyra Samuda

It was defended on

April 15, 2019

and approved by

Melinda Fricke, University of Pittsburgh, Department of Linguistics

Janet van Hell, Pennsylvania State University, Department of Psychology

Caitlin Rice, University of Pittsburgh

Thesis Advisor: Natasha Tokowicz, University of Pittsburgh, Department of Psychology

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This study examines the effects of cross-language similarity on the sensitivity of English speakers to grammatical violations in their second language, Japanese. Participants were presented with Japanese sentences that were either grammatical or ungrammatical. The word order of grammatical base sentences were modified to create ungrammatical sentences that involved constructions that were 1) similar between Japanese and English (noun-adjective ordering), 2) different between Japanese and English (object-verb ordering), or 3) unique to Japanese (topic marker *wa)*. Performance was measured using reading and response times for the sentences as well as accuracy scores for the grammaticality judgment tasks post-sentence. This study demonstrates results that contrast with previous findings related to cross-language similarity, with similarity having no significant effect on participants' reading times but having some influence over accuracy, with the "different" condition commanding the highest accuracy, despite little to no sensitivity demonstrated in previous studies.

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1.0 INTRODUCTION

Unlike children, when adults learn another language, they are able to transfer much of their first language onto their second language (Benson, 2002). This transfer can positively affect language learning in cases of similar patterns between the first language (hereafter referred to as L1) and their second language (hereafter referred to as L2). However, transfer can also negatively affect learning due to cross-language differences. Learners may mistakenly transfer cues from their L1 to their L2 despite the difference in patterns, although learners may be able to revise their L1-like structures to more closely resemble L2 structures (MacWhinney 1997; McDonald 1987). Due to the fact that correct matches are co-present with mismatches, learners have difficulty controlling their transfer.

A commonly cited model for understanding this transfer is the Competition Model (MacWhinney 1997). This model is based around four primary issues: lexical functionalism, connectionism, input-driven learning, and capacity. Functionalism is concerned with how the forms of language map onto their respective communicative functions. Within connectionist models, there are properties such as competition, emergence, gradience, and transfer, with the most relevant to L2 processing being transfer. Input-driven learning centers around the role that a specific input plays, with input being interpreted in terms of cue validity or cue strength.

According to the connectionist view, mental processes share a common set of cognitive structures, and that therefore beginner language learners should experience a large amount of transfer from their L1 to their L2. Learners eventually grow out of the immature L2 system by strengthening connections between L2 and underlying concepts, reducing interactions between L1 and L2 systems (Zhang 1995). Some learners may also have to take a known concept into multiple, new related concepts. For example, the English *know* covers two concepts in Spanish, *saber* and *conocer*. This is similar to English *is*, which takes the forms of topic markers *wa* and *ga* in Japanese. The wa/ga distinction also serves as an example of learners having to comprehend conceptual differences that were irrelevant in their L1 but have important distinctions in their L2, making the concept difficult for learners of Japanese. Cues from sentences can also influence learners' comprehension.

The role of input is also emphasized in the model, based on the constructs of cue vailidity and cue strength, which are believed to be important in adult learning processes (MacWhinney, 1997). Cue validity is a measure of how reliable a cue is, as in how often a cue leads the learner to the correct interpretation of the given stimuli. Cue strength is a composite measure influenced by the different properties of a cue: frequency (how often interaction with the linguistic construct occurs), availability (how present a cue is), simple reliability (how often that cue leads the learner to the correct interpretation), and conflict reliability (when appearing in a context with other cues, which cue dominates in that context). As an example, English relies heavily on word order and English speakers, as a result, also rely on word order as a cue, even erroneously, such as seeing a noun-verb-noun sentence and assuming that the sentence is subject-verb-object. With increased proficiency, learners become less reliant on their L1 cues. Past

studies have used the Competition Model to examine L1-L2 transfer and its effects on comprehension.

One study examined the extent to which beginning Spanish learners can implicitly process L2 Spanish sentences as well as the influence of L1 transfer and competition on this implicit processing (Tokowicz & MacWhinney 2005). To test predictions made in the Competition Model, three types of constructions were examined: the "similar" construction, where the L1 pattern matched the L2 pattern of the construction; the "different" construction, where the L2 pattern was in direct conflict with the manifestation of the L1 pattern; and the "unique" construction, which differed between the L1 and L2 without any direct competition. In English and Spanish, the pattern of auxiliary marking is shared ("similar"):

*Su abuela *cocinando/cocina muy bien*

"His grandmother *cooking/cooks very well."

The pattern for determiner number agreement mismatches between the two languages, with the English determiner ignoring number whereas the Spanish determiner must take number into account ("different"):

**El/los niños están jugando*

"*The-SING/The-PL. boys are playing."

The pattern for determiner gender is unique to Spanish as marking for gender does not exist within English ("unique"):

*Ellos fueron a *un/una fiesta*.

"They went to *a-MASC/a-FEM party."

Both online and offline measures were taken to observe the effects of type on learners' sensitivity.

Event-related potentials (ERPs) were used to measure implicit online processing in subjects whereas post-sentence grammaticality judgment tasks were used as a measure of learners' offline judgments. The study found that beginning learners were in fact implicitly sensitive to morpho-syntactic violations, although only for certain types of constructions. In line with the predictions in the Competition Model, the ERP readings demonstrated sensitivity to violations of the similar and unique constructions and no sensitivity to the different condition. Implicit sensitivity to the similar construction between English and Spanish supports the theory that positive transfer from the L1 (English) to the L2 (Spanish) would increase sensitivity to violations in learners because they make use of L1 cues; sensitivity to the unique is believed to increase as learners acquire the L2 system and make connections between the appropriate article forms and endings; and the lack of sensitivity to the different condition supports the idea that the L1 system takes over in the case of a mismatch between the L1 and the L2, leading learners to ignore violations for mismatched patterns. Whereas the implicit processing measures demonstrated learner sensitivity, the offline grammaticality judgment measures revealed that learners lacked the ability to make clear judgments. The low judgment accuracy following the significant sensitivity suggested that learners have more access to implicit knowledge than explicit knowledge when processing sentences and that beginning learners may not be able to incorporate their online interactions into their offline judgments. Other studies have examined beginning L2 learners' sensitivity, manipulating mode of presentation and other experimental parameters.

In Tokowicz and Warren (2010), learners' sensitivity to morphosyntactic violations was examined as a function of cross-language similarity. As Tokowicz and MacWhinney (2005) had found the learners lacked sensitivity to the different condition, this was accounted for in

Tokowicz and Warren (2010) through the use of the self-paced reading task. This would allow learners more time to interpret and respond to the stimuli, assuming that no sensitivity was found in the earlier study due to learners being slow to resolve the different cues between their L1 and L2. In addition to the similar, different, and unique conditions, a "similar2" condition was also incorporated into the study. Using reading times as online measures, the study found that learners were sensitive to the similar and different conditions but insensitive to the unique condition. Final-word reading times in the similar2 condition in the L2 (Spanish) showed the same grammatical/ungrammatical distinctions as in the L1 (English), suggesting that even though the learners were beginners, they were able to process this construction in a native-like way. In contrast to the sensitivity seen in reading times, accuracy on the grammaticality judgment tasks was generally poor, suggesting that learners may access different information when processing between the two languages. Similar to previous research, learners had low offline sensitivity to the unique condition, which may be a result of drawing grammatical information from the gist representation (Potter & Lombardi, 1990). As for the online sensitivity to the different condition demonstrated, the stimuli in Tokowicz and MacWhinney (2005) had critical nouns more likely to contain cues to gender. The difference could also be related to the rate of presentation, which was participant-controlled in this case. Although performance on the different condition was not consistent with predictions of the Competition Model, these findings did highlight the importance of taking cue information into account in addition to cross-language similarity when observing processing.

To examine the effects of cue strength in addition to transfer in L2 processing, Tuninetti, Warren, and Tokowicz (2015) implemented eye tracking and grammaticality judgment tasks to observe how Mandarin and Arabic speakers processed word order violations in L2 English

sentences. The study used conditions that differed in two distinct ways: both conditions varied in number of grammaticality cues they contained and the two conditions have different similarity to the participants' L1. The noun-article condition contained two or three cues to grammaticality depending on context and shared similarity between English and Arabic constructions whereas the noun-adjective condition only contained one cue to grammaticality and shared similarity between English and Mandarin constructions. The study found that in spite of language group, English, Mandarin, and Arabic speakers demonstrated sensitivity to the noun-article condition. In contrast to Competition Model predictions, Arabic speakers showed early disruption for the noun-adjective condition despite this construction being "different" for Arabic speakers and Mandarin speakers demonstrated difficulty in this condition despite the similarity between Mandarin and English. Overall, no evidence of language transfer was found, suggesting the importance of cue strength and availability in L2 processing. The lack of transfer observed may have occurred as a result of the relatively salient changes in word order compared to other studies and that because word order is a well-learned cue, it may be less susceptible to transfer. Another less likely factor discussed was the participants' proficiency, because the participants in that study were in an immersive L2 environment and possessed higher L2 proficiency compared to the beginner L2 learners in other studies (Tokowicz & MacWhinney, 2005; Tokowicz & Warren, 2010).

The current study is a follow-up to Tokowicz and Warren (2010), implementing a self-reading task to measure implicit processing as well as a grammaticality judgment task following each trial to account for offline processing. This research is interesting applied to Japanese because although language pairs such as English-Spanish are considered quite similar to each other (Marsden, Thompson, & Plonsky, 2018), Japanese and English as a pair are more different

to each other, relatively speaking. Also, although there has been previous research looking at relationships between Japanese and other languages, these studies have either looked at Japanese as an L2 with more similar languages such as Korean as the L1, or with Japanese as the L1 and English as the L2 for possible transfer (Fender, 2003).

To examine these issues, we used a similar condition based on the noun-adjective pattern. This construction is matched between English and Japanese, with the adjective coming before the noun it modifies. The object-verb pattern is used for the different condition. This construction is mismatched between English and Japanese; in English the object follows the verb in a sentence, whereas in Japanese, the verb typically comes after the object. The topic marker *wa* and nominative case *ga* are used for the unique condition. *Wa* is a particle used to mark the topic of a sentence whereas *ga* marks the subject and there is no equivalent to *wa* in English. It is also important to note that the *wa*/*ga* constructions are truly unique to the Japanese language when compared to English. For example, the following sentences from Shibatani (1990)

Hi-wa noboru 'The sun is rising (and that is an explicit fact)'

Hi-ga noboru 'The sun is rising (as I am seeing it)'

Although these two sentences can be roughly translated to the English sentence "The sun is rising," the particle *wa* functions to present information that is general and known to all whereas the particle *ga* marks personal experiences. Although these meanings can be expressed in English, English lacks these forms to represent these meanings in a similar way to Japanese.

In terms of instruction, learners encounter these constructions early on. The patterns are all learned within the first semester of Japanese language study at the University of Pittsburgh: the adjective-noun (similar) pattern is learned in lesson 3 and the object-verb (different) and

wa/*ga* (unique) patterns are learned in lesson 4 of the textbook *Japanese: The Spoken Language, Part 1*.

1.1 PREDICTIONS

Based on the Competition Model, the positive transfer from English to Japanese would cause the participants to be more sensitive to violations in the similar condition, resulting in slower reading times but higher accuracy. Competition between the different structures would result in learners being less sensitive to the violations, with less slowing of their reading times and lower accuracy than in the similar condition. Because there is no equivalent for the *wa*/*ga* unique grammar in English, the participants' sensitivity to unique violations may vary as a function of their L2 proficiency.

2.0 METHOD

2.1 DESIGN

We used a 3 cross-language similarity (similar, different, unique) × 2 grammaticality (grammatical, ungrammatical) within-participants design.

2.2 PARTICIPANTS

Participants were 14 students enrolled at the University of Pittsburgh who had some experience with the Japanese language after the age of 10. Data from two participants were excluded; one participant had too few critical items, the other participant's response pattern indicated that they were not paying attention to the task. In the language history questionnaire, 11 students reported learning Japanese through classroom experience and four reported having study abroad experience in Japan lasting at least one month. All participants were native English speakers. Participants were recruited through Facebook posts, flyers placed around campus, the university's Japanese department email, and by word of mouth. Each participant was compensated at a rate of $10 per hour. See Table 1 for demographic information.

Table 1 Participant Demographic Information

Gender	**M**	**F**
N	6	6
Age (years)	20.67 (1.86)	22.5 (3.39)
Time in USA (years)	17.83 (7.94)	22.33 (3.08)
	Self-rated proficiency	
English Reading	**9.50 (0.55)**	**9.83 (0.41)**
English Writing	9.00 (0.89)	9.67 (0.52)
English Speaking	9.33 (0.82)	10.00 (0)
English Listening	9.33 (0.82)	9.67 (0.82)
Japanese Reading	4.00 (2.10)	5.17 (2.04)
Japanese Writing	3.00 (1.26)	4.67 (1.63)
Japanese Speaking	3.67 (2.16)	5.67 (2.16)
Japanese Listening	4.17 (2.79)	6.17 (2.64)

Note: Participant include of 12 individuals of the original 14 due to removal of incomplete data and data within exclusion criteria.

2.3 MATERIALS

Three ungrammatical conditions created three levels of cross-language similarity in Japanese formed by modifying sentences from a grammatical base condition sentence. In the "similar" condition, the adjectives appeared in an ungrammatical position, coming after the nouns being modified as in English. In the "different" condition, the object-verb order was reversed, producing Japanese sentences that resembled the verb-object order of English. In the "unique" condition, the topic marker *wa* appears after the nominative case *ga*, resulting in ungrammatical sentences (see examples below); this is unique to Japanese in that English does not have such a topic marker.

Base (grammatical):	Natasha-ga oishii sushi-o tabeta. *Natasha ate tasty sushi.*
Adjective-Noun ordering (ungrammatical):	Natasha-ga sushi-o *oishii tabeta. *Natasha sushi *tasty ate.*
Object-Verb ordering (ungrammatical):	Natasha-ga tabeta sushi *oishii-o. *Natasha ate sushi *tasty.*
Topic marker disagreement (ungrammatical):	Natasha-ga oishii *sushi-wa tabeta. *Natasha tasty *sushi ate.*

There were a total of 192 critical items (48 base, 48 similar, 48 different, 48 unique; see Appendix A). All the critical items were four words long, with the critical two-word regions of the base, similar, and unique conditions being located at words 2-3, and at words 3-4 for the different condition. A two-word critical region was used because using a single target word, such as focusing on the third word, would result in the manipulation being confounded because the reading times for two different words would be compared across conditions. With a two-word critical region, the violation consistently occurs at the second word of the region across all conditions. As described below, counterbalancing lists were used so that participants saw 12 items from each condition; 36 grammatical filler items (from Tamaoka et. al, 2005) were included so that participants saw additional grammatically-correct items from a different grammatical structure (see Appendix B).

2.4 PROCEDURE

Participants completed one of four versions of the self-paced reading task. Each version included 3 practice items (the same across all versions), 48 critical items (12 base, 12 similar, 12 different, 12 unique, and 36 filler items (also the same across versions). A fixation cross appeared in the middle of the screen, and the participant used the center button on a response box to begin each sentence and progress through the sentence word-by-word, with each part of the sentence appearing in the middle of the screen. After the last word, a question mark appeared in the center of the screen. Participants were instructed to make a grammaticality judgment regarding the sentence previously read, either pressing the leftmost button on the response box to

indicate that the sentence was ungrammatical or pressing the rightmost button to indicate that the sentence was grammatical. For the first six subjects, in addition to grammaticality judgments, random comprehension questions were also presented after half of the filler items. To answer 'no' to these questions, participants pressed the leftmost button on the response box and the rightmost button to answer 'yes.'[1] Stimulus presentation, response times, and accuracy were recorded using E-Prime software (Psychology Software Tools).

After the grammaticality judgment task, participants filled out a language history questionnaire (Tokowicz, Michael, & Kroll, 2004). This collected demographic information such as gender and handedness as well as inquiring about participants' second (and subsequent, if applicable) languages, methods of acquisition, and proficiencies across speaking, reading, writing, and listening.

[1] Although I had intended to keep the comprehension questions for all participants, it was necessary to remove them due to significant problems with the script.

3.0 RESULTS

3.1 ANALYSIS APPROACH

The different condition was excluded from the analyses for critical reading times because the critical region overlaps with the end of the sentence where spillover and wrap-up effects also occur, likely obscuring the effect on reading times. This condition was included in analyses of accuracy.

3.2 ANALYSES OF VARIANCE

Critical RTs. Reading times for the critical region did not show a significant effect of cross-language similarity;, $F_1 < 1, MSE = 105964.25, p = .62, F_2 < 1, MSE = 1503037.51, p = .68$ ($M_{base} = 1644.23, M_{similar} = 1780.92, M_{unique} = 1722.93$).

Accuracy. Although there was not a significant effect of cross-language similarity by participants, there was by items (see Figure 1). Base sentences had the highest accuracy, followed by the different condition, then similar, and the unique condition had the lowest accuracy, $F_1 (3, 33) = 2.15$, $MSE = 0.09$, $p = .11$. $F_2 (3, 141) = 15.21$, $MSE = 0.06$, $p < .01$. A paired samples t-test was conducted to compare response accuracies across items in the

acceptable and unacceptable conditions. The Bonferroni correction was applied, resulting in a critical *p*-value of .008. All pairs reached significance with the exception of the different condition accuracy ($M = .77$) - similar condition accuracy pair ($M = .73$) ; $t(47) = 0.81, p = .42$.

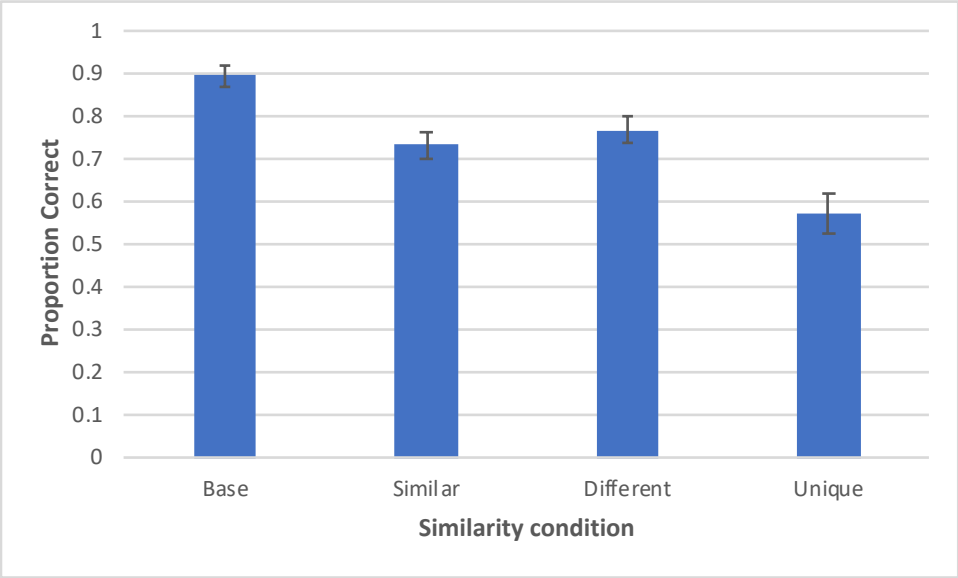

Figure 1 Accuracy of Response for Grammaticality Judgments by Items

Final word. Although not significant, there were interesting differences between the final word reading times across items. Base sentences had the fastest final word times ($M = 2354$), then the similar condition ($M = 3133$), and the unique condition had the slowest times ($M = 3465$), $F_1 (2, 22) = 1.04$, $MSE = 1284199.47$, $p = .37$, $F_2 (2, 84) = 1.81$, $MSE = 7706883.62$, $p = .17$.

Proficiency. Self-reported proficiency values of proficiency were correlated with accuracy across all conditions using the Pearson correlation test (see Table 2). A significant correlation was found only for the unique condition, $r = .60$, $p < .05$. Similar correlations were

performed on the critical region and final word reading times, but no significant correlations were found (see Appendix C).

Table 2 Mean Self-reported Japanese Proficiency Correlated with Accuracy by Grammatical Condition

	Japanese Proficiency	Base	Different	Similar	Unique
Japanese Proficiency	1	-.20	-.24	.51	.60*
Base	-.20	1	.11	.34	.18
Different	-.24	0.11	1	.15	-.15
Similar	.51	0.34	.15	1	.66*
Unique	.60*	0.18	-.15	.66*	1

Note: Japanese proficiency is an average rating of reading, writing, speaking and listening proficiency. N=12, *$p < .05$

4.0 DISCUSSION

The first prediction of the study was that participants would be more sensitive to grammatical violations in the similar condition than in the different condition based on the accuracy of the grammaticality judgment tasks. Contrary to the predictions, the different condition had higher accuracy than in the similar condition. This may be an indicator that English speakers who learn Japanese still rely on word order cues but are processing the different condition in a more native-like manner and are sensitive to violations of the SVO order of Japanese. This could also reflect the possibility that word order is a well-learned cue as suggested in Tuninetti et al. (2015). English-speaking learners of Japanese are more sensitive to violations at sentence endings because they have developed heightened awareness for observing information at sentence endings because of the salience in word order differences. Participants have become accustomed to waiting until the end to extract meaning from the sentence as a whole. Another possibility could be the flexibility of noun-adjective constructions in Japanese. Although structures that parallel English are grammatical (tasty sushi/*oishii sushi*), constructions in which the nominative case *ga* is used are also possible. In these cases, the noun-adjective order would be reversed:

Tasty sushi/*oishii sushi* → The sushi is tasy/ *Sushi-ga oishii*.

Due to the possibility of such variations, participants may have demonstrated less online and offline sensitivity based on past input implying that word order is less rigid for noun-adjective patterns.

The second prediction of the study was that participants would have faster reading times and lower accuracy for the different condition as compared to the similar condition due to competition between the L1 and L2 structures. The reading times for the critical regions did not differ significantly by condition, likely as a result of the short length of the sentences. Although, mean differences for final word reading times were observed across items. The reading times seemed to be affected by grammaticality and similarity. Grammatical base sentences had the fastest times overall. For the ungrammatical conditions, the similar condition had the fastest final word times, followed by the unique condition. This analysis did not reach significance, but if more participants had been tested then the study could have been able to achieve significant reading times for the final word or word $n + 1$. Such significant effects would also support previous findings of learners being implicitly aware of grammatical violations in the L2, even in cases where the implicit knowledge did not translate to their offline judgments (Tokowicz & MacWhinney, 2005; Sabourin & Stowe, 2008; Tokowicz & Warren, 2010).

The third prediction was that with higher L2 proficiency, participants would be more accurate in their grammaticality judgments and more sensitive to violations in the unique condition. There was a correlation that supported this hypothesis in that proficiency was positively correlated with accuracy for the unique condition. Previous research suggests that with more, salient L2 input, learners are able to give more attention to unique constructions that would have otherwise been ignored because of the constructions' absence in the L1 (Schmidt, 1990; Ellis 2006). However, it is important to note that self-report measures may be lacking in

terms of how accurate a measure they are of participants' L2. In future research, including other measures such as the number of years studied or performance on a standardized test may provide a more complete measure of proficiency. Similar to previous research, the current study demonstrated low offline sensitivity to the unique condition (Tokowicz & MacWhinney, 2005; Tokowicz & Warren, 2010), with the unique condition having the lowest accuracy in both the participants and items analyses. This is consistent with the Competition Model, which proposes that learners will have difficulty with unique constructions because, although there is no negative transfer resulting in competition, there is also no positive transfer to assist with learner comprehension, meaning that the learner would be less sensitive to its violations. Although the findings for the unique condition are consistent with previous research, the results for the different and similar condition are less consistent.

When compared, the online and offline measures were found to be discrepant from each other. The online measures of response times from the self-paced reading task did not demonstrate effects of similarity on the learners' online comprehension, suggesting that learners lacked sensitivity overall to grammatical violations, regardless of construction type. On the other hand, offline grammaticality judgment accuracy did demonstrate effects by condition, with the different condition displaying the highest accuracy. Such results suggest that cross-language similarity may not possess as active of a role in comprehension as previously believed and that learners may use their explicit knowledge of Japanese (such as grammar rules) rather than implicit knowledge. This discrepancy can also be seen in other studies. In Tokowicz and MacWhinney (2005), similar online and offline measures were found for responses to the similar condition, whereas the online and offline measures for the different and unique conditions varied. Learners had low online sensitivity but higher offline sensitivity for the different

condition and higher online sensitivity but lower offline sensitivity for the unique condition. Tuninetti et al. (2015) also found similar patterns between the online eye-tracking measures and offline grammaticality judgments, with learners demonstrating the most sensitivity to ungrammatical sentences in the noun-article condition. In contrast, Tokowicz and Warren (2010) had more similarity between online and offline measures. The online and offline measures both demonstrated higher sensitivity for similar and different constructions than for unique constructions (although the offline measures had low overall accuracy).

Cross-language similarity did not have an overall significant effect by subjects but was significant by items. In Tokowicz and MacWhinney (2005), there was no significant sensitivity demonstrated for the different condition. In Tolentino and Tokowicz (2014), constructions in the similar and unique condition had higher accuracy compared to the different condition as a function of cross-language similarity, and the similar and unique constructions were learned more rapidly to a higher degree than for the different condition. Results that bared similarity to that of the current study can be found in Tokowicz and Warren (2010). In the offline grammaticality judgments, participants had worse performance for the unique condition than for the other conditions (similar1, similar2, different). In the current study, participants also had lower accuracy for the unique condition than for the similar and different condition. Although the current study did not observe effects of similarity on reading times, Tokowicz and Warren (2010) did observe grammaticality effects for the similar1, similar2, and different conditions for which reading times for the critical regions were longer in the ungrammatical sentences for these conditions than for the grammatical. This effect was not seen for the unique condition. The sensitivity observed for the similar and different conditions but not for the unique suggests that

learners are more sensitive to systems that are common between their L1 and L2, even if the system manifests differently between the two languages, as is the case for the different condition.

It is interesting to find similarities between the current study and Tokowicz and Warren (2010) because although one might assume that English and Japanese would be much more different from each other than English and Spanish would be to each other, based on the predicted differences between how long a native English speaker would require in order to reach working proficiency in Spanish as compared to Japanese (Department of State).

The Competition Model predicted that sensitivity would be highest for the similar condition, due to the lack of competition between languages, and lowest for the different condition, due to the competition between languages, although participants were more accurate for their judgments of violations in the different condition than for the similar. The fact that there were no significant effects on reading times may suggest that participants are not implicitly sensitive to violations in the L2 regardless of type and rely more on explicit knowledge as seen by the accuracies for the grammatical judgment task. It also highlights the importance of taking information such as cue reliability and cue validity into account in addition to interpretations of cross-language similarity. The object-verb ordering in the different condition may carry more cues for grammaticality than the patterns in the similar and unique conditions, explaining why participants had better accuracy.

4.1 LIMITATIONS

A prominent limitation of the current study is the small sample size, with may have impacted the ability to achieve strong analytical results and is likely the reason why the experiment only showed effects in the items analysis. The imbalance caused by only having one "yes" condition and three "no" conditions was also unfavorable in terms of statistical analysis. The short length of the sentences may have also impacted the effects related to response time, particularly in the different condition in which the critical region overlapped with the final word. It would be more suitable in the future to use longer sentence items so that this overlap does not occur.

4.2 FURTHER STUDY

Within the area of L2 acquisition and processing, some research has aimed to examine effects of working memory and proficiency in L2 comprehension (Coughling & Tremblay, 2013; Sagarra & Herschensohn, 2010). The current study could be expanded on by including working memory tasks as well as using more objective measures of proficiency in addition to self-report (Marsden et al., 2018). The inclusion of a native speaker control group may also be interesting to compare the L2 learners' scores to in terms of observing how native-like their L2 processing is.

5.0 CONCLUSION

In conclusion, the present study examined sensitivity to grammar violations in L2 Japanese sentences in terms of response times and grammaticality judgment accuracy. We found that cross-language similarity did not have a significant effect on response times, and that the different condition had the highest grammaticality judgment accuracy of the ungrammatical conditions.

APPENDIX A

	Base	Similar	Different	Unique
1	Natasha-ga oishii sushi-o tabeta.	Natasha-ga sushi-o oishii tabeta.	Natasha-ga tabeta oishii sushi-o.	Natasha-ga oishii sushi-wa tabeta.
2	Amy-ga tsumetai ocha-o katta.	Amy-ga ocha-o tsumetai katta.	Amy-ga katta tsumetai ocha-o.	Amy-ga tsumetai ocha-wa katta.
3	Mark-ga chiisai ishi-o nageta.	Mark-ga ishi-o chiisai nageta.	Mark-ga nageta chiisai ishi-o.	Mark-ga chiisai ishi-wa nageta.
4	James-ga hurui shinbun-o yabutta.	James-ga shinbun-o hurui yabutta.	James-ga yabutta hurui shinbun-o.	James-ga hurui shinbun-wa yabutta.
5	Rosa-ga yasui huku-o kitta.	Rosa-ga fuku-o yasui kitta.	Rosa-ga kitta yasui fuku-o.	Rosa-ga yasui fuku-wa kitta.
6	Gale-ga mazui tabemono-o tsukutta.	Gale-ga tabemono-o mazui tsukutta.	Gale-ga tsukutta mazui tabemono-o.	Gale-ga mazui tabemono-wa tsukutta.
7	Corey-ga kitanai omizu-o wakashita.	Corey-ga omizu-o kitanai wakashita.	Corey-ga wakashita kitanai omizu-o.	Corey-ga kitanai omizu-wa wakashita.
8	Karen-ga takai bijutsu-o miseta.	Karen-ga bijutsu-o takai miseta.	Karen-ga miseta takai bijutsu-o.	Karen-ga takai bijustu-wa miseta.
9	Greg-ga kawaii neko-o katta.	Greg-ga neko-o kawaii katta.	Greg-ga katta kawaii neko-o.	Greg-ga kawaii neko-wa katta.
10	Pat-ga nigai chokoreeto-o totta.	Pat-ga chokoreeto-o nigai totta.	Pat-ga totta nigai chokoreeto-o.	Pat-ga nigai chokoreeto-wa totta.
11	Damen-ga wakai gakusei-o oshieta.	Damen-ga gakusei-o wakai oshieta.	Damen-ga oshieta wakai gakusei-o.	Damen-ga wakai gakusei-wa oshieta.
12	Mona-ga yasahii kanji-o kaita.	Mona-ga kanji-o yasashii kaita.	Mona-ga kaita yasashii kanji-o.	Mona-ga yasashii kanji-wa kaita.
13	Eileen-ga muzukashii shitsumon-ni kotaeta.	Eileen-ga shitsumon-ni muzukashii kotaeta.	Eileen-ga kotaeta muzukashii shitsumon-ni.	Eileen-ga muzukashii shitsumon-wa kotaeta.
14	Adrienne-ga aoi kami-o moratta.	Adrienne-ga kami-o aoi moratta.	Adrienne-ga moratta aoi kami-o.	Adrienne-ga aoi kami-wa moratta.
15	Nia-ga mezurashii ongaku-o kiita.	Nia-ga ongaku-o mezurashii kiita.	Nia-ga kiita mezurashii ongaku-o.	Nia-ga mezurashii ongaku-wa kiita.
16	Zara-ga atatakai gohan-o ageta.	Zara-ga gohan-o atatakai ageta.	Zara-ga ageta atatakai gohan-o.	Zara-ga atatakai gohan-wa ageta.
17	Chisom-ga kanashii shi-o yonda.	Chisom-ga shi-o kanashii yonda.	Chisom-ga yonda kanashii shi-o.	Chisom-ga kanashii shi-wa yonda.
18	Mike-ga kowai eiga-o mita.	Mike-ga eiga-o kowai mita.	Mike-ga mita kowai eiga-o.	Mike-ga kowai eiga-wa mita.
19	Paige-ga sabishii koto-o omoidashita.	Paige-ga koto-o sabishii omoidashita.	Paige-ga omoidashita sabishii koto-o.	Paige-ga sabishii koto-wa omoidashita.
20	Zuri-ga subarashii shousetsu-o	Zuri-ga shousetsu-o	Zuri-ga susumeta	Zuri-ga subarashii

	susumeta.	subarashii susumeta.	subarashii shousetsu-o.	shousetsu-wa susumeta.

	Base	Similar	Different	Unique
21	Aarthi-ga hazukashii tomodachi-o shoukai-shita.	Aarthi-ga tomodachi-o hazukashii shoukai-shita.	Aarthi-ga shoukai-shita hazukashii tomodachi-o.	Aarthi-ga hazukashii tomodachi-wa shoukai-shita.
22	Ben-ga tsumaranai bunpou-o benkyou-shita.	Ben-ga bunpou-o tsumaranai benkyou-shita.	Ben-ga benkyou-shita tsumaranai bunpou-o.	Ben-ga tsumaranai bunpou-wa benkyou-shita.
23	Allie-ga omoshiroi hon-o kaita.	Allie-ga hon-o omoshiroi kaita.	Allie-ga kaita omoshiroi hon-o.	Allie-ga omoshiroi hon-wa kaita.
24	Aria-ga amai pan-o utta.	Aria-ga pan-o amai utta.	Aria-ga utta amai pan-o.	Aria-ga amai pan-wa utta.
25	Jamie-ga tsumetai aisukuriimu-o katta.	Jamie-ga aisukuriimu-o tsumetai katta.	Jamie-ga katta tsumetai aisukuriimu-o.	Jamie-ga tsumetai aisukuriimu-wa katta.
26	Alex-ga omoi bokkusu-o hakonda.	Alex-ga bokkusu-o omoi hakonda.	Alex-ga hakonda omoi bokkusu-o.	Alex-ga omoi bokkusu-wa hakonda.
27	Helen-ga abunai dorobou-o oikaketa.	Helen-ga dorobou-o abunai oikaketa.	Helen-ga oikaketa abunai dorobou-o.	Helen-ga abunai dorobou-wa oikaketa.
28	Aki-ga hosoi men-o yudeta.	Aki-ga men-o hosoi yudeta.	Aki-ga yudeta hosoi men-o.	Aki-ga hosoi men-wa yudeta.
29	Juliet-ga tsumaranai kurasu-o kaeta.	Juliet-ga kurasu-o tsumaranai kaeta.	Juliet-ga kaeta tsumaranai kurasu-o.	Juliet-ga tsumaranai kurasu-wa kaeta.
30	Hermes-ga hutotta doubutsu-o katta.	Hermes-ga doubutsu-o hutotta katta.	Hermes-ga katta hutotta doubutsu-o.	Hermes-ga hutotta doubutsu-wa katta.
31	Brian-ga joubu-na dougu-o tsukutta.	Brian-ga dougu-o joubu-na tsukutta.	Brian-ga tsukutta joubu-na dougu-o.	Brian-ga joubu-na dougu-wa tsukutta.
32	Osamu-ga wakai hito-o tasuketa.	Osamu-ga hito-o wakai tasuketa.	Osamu-ga tasuketa wakai hito-o.	Osamu-ga wakai hito-wa tasuketa.
33	Shaun-ga hutoi enpitsu-o moratta.	Shaun-ga enpitsu-o hutoi moratta.	Shaun-ga moratta hutoi enpitsu-o.	Shaun-ga hutoi enpitsu-wa moratta.
34	Ami-ga yowai kame-o motta.	Ami-ga kame-o yowai motta.	Ami-ga motta yowai kame-o.	Ami-ga yowai kame-wa motta.
35	Jimmy-ga urusai kurasumeito-o ijimeta.	Jimmy-ga kurasumeito-o urusai ijimeta.	Jimmy-ga ijimeta urusai kurasumeito-o.	Jimmy-ga urusai kurasumeito-wa ijimeta.
36	Mary-ga atarashii fuku-o moratta.	Mary-ga fuku-o atarashii moratta.	Mary-ga moratta atarashii fuku-o.	Mary-ga atarashii fuku-o moratta.
37	Andy-ga atsui sara-o otoshita.	Andy-ga sara-o atsui otoshita.	Andy-ga otoshita atsui sara-o.	Andy-ga atsui sara-wa otoshita.
38	Jason-ga ookii hondana-o tsukutta.	Jason-ga hondana-o ookii tsukutta.	Jason-ga tsukutta ookii hondana-o.	Jason-ga ookii hondana-wa tsukutta.

39	Emily-ga akai kaban-o sagashita.	Emily-ga kaban-o akai sagashita.	Emily-ga sagashita akai kaban-o.	Emily-ga akai kaban-wa sagashita.

	Base	**Similar**	**Different**	**Unique**
40	Stacy-ga shiroi kutsu-o haita.	Stacy-ga kutsu-o shiroi haita.	Stacy-ga haita shiroi kutsu-o.	Stacy-ga shiroi kutsu-wa haita.
41	Killua-ga warui kotoba-o keshita.	Killua-ga kotoba-o warui keshita.	Killua-ga keshita warui kotoba-o.	Killua-ga warui kotoba-wa keshita.
42	Ilia-ga kiiroi sutanpu-o oshita.	Ilia-ga sutanpu-o kiiroi oshita.	Ilia-ga oshita kiiroi sutanpu-o.	Ilia-ga kiiroi sutanpu-wa oshita.
43	Phil-ga karai tabemono-o atatameta.	Phil-ga tabemono-o karai atatameta.	Phil-ga atatameta karai tabemono-o.	Phil-ga karai tabemono-wa atatameta.
44	Sally-ga usui hon-o tojita.	Sally-ga hon-o usui tojita.	Sally-ga tojita usui hon-o.	Sally-ga usui hon-wa tojita.
45	Ginny-ga ookii doa-o shimeta.	Ginny-ga doa-o ookii shimeta.	Ginny-ga shimeta ookii doa-o.	Ginny-ga ookii doa-wa shimeta.
46	Zach-ga amai koohii-o nonda.	Zach-ga koohii-o amai nonda.	Zach-ga nonda amai koohii-o.	Zach-ga amai koohii-wa nonda.
47	Minnie-ga okashii inu-o mita.	Minnie-ga inu-o okashii mita.	Minnie-ga mita okashii inu-o.	Minnie-ga okashii inu-wa mita.
48	Jiri-ga katai suteeki-o suteta.	Jiri-ga suteeki-o katai suteta.	Jiri-ga suteta katai suteeki-o.	Jiri-ga katai suteeki-wa suteta.

APPENDIX B

Kenji-ga Junko-ni hana-o okutta.
Taro-ga Junko-ni e-o miseta.
Jirou-ga Tomoka-ni riyuu-o ageta.
Tomoka-ga Jirou-ni kaimono-o tanonda.
Kazuko-ga Kenji-ni tomodachi-o shoukaishita.
Taro-ga Tomoko-ni kaban-o azuketa.
Kazuko-ga Jirou-ni piano-o naratta.
Kazuko-ga Taro-ni hon-o kashita.
Kazuko-ga Taro-ni purezento-o ageta.
Kenji-ga Junko-ni kamera-o muketa.
Daigaku-no shiken-ni ukatta.
Jikan-ga kakatta.
Tamago-no nedan-ga agatta.
Booru-ga korogatta
Onaka-ga suita.
Suugaku-ga wakatta.
Hito-ga atsumatta.
Kuruma-ga tomatta.
Jyugyou-ga owatta.
Hanashi-ga kawatta.
Hanae-ga omukae-ni itta.
Junko-ga Taro-ni tasukerareta
Tomoka-ga Taro-ni korosareta
Huransugo-de hanashita.
Tegami-ga kaitte-atta.
Biiru-o katte-oita.
Karaoke-o utatta.
Rajio-o naoshite-ageta.
Miitingu-ni kite-kureta.
Sensei-ga oshiete-kudasatta.
Asahi-ga yurushite-kurenakatta.
Jinja-de onegai-itashimashita.
Kouen-de hashitta.
Kyoushitsu-de benkyou-shita.

Kaado-de shiharatta.
Kanji-de kaita.

APPENDIX C

Correlations									
		Overall L2	Base	Different	Similar	Uniqe	Basefinal	Similarfinal	Uniquefinal
Overall L2	Pearson Correlation	1	-0.190	0.156	-0.383	0.077	0.235	0.221	-0.046
	Sig. (2-tailed)		0.554	0.629	0.220	0.823	0.463	0.491	0.887
	N	12	12	12	12	11	12	12	12
Base	Pearson Correlation	-0.190	1	.764**	.764**	.879**	-0.013	0.218	0.252
	Sig. (2-tailed)	0.554		0.004	0.004	0.000	0.968	0.496	0.430
	N	12	12	12	12	11	12	12	12
Different	Pearson Correlation	0.156	.764**	1	0.526	.784**	0.264	0.439	0.289
	Sig. (2-tailed)	0.629	0.004		0.079	0.004	0.408	0.153	0.362
	N	12	12	12	12	11	12	12	12
Similar	Pearson Correlation	-0.383	.764**	0.526	1	.689*	0.238	0.476	0.482
	Sig. (2-tailed)	0.220	0.004	0.079		0.019	0.456	0.118	0.113
	N	12	12	12	12	11	12	12	12
Unique	Pearson Correlation	0.077	.879**	.784**	.689*	1	0.306	0.490	0.426
	Sig. (2-tailed)	0.823	0.000	0.004	0.019		0.360	0.126	0.192
	N	11	11	11	11	11	11	11	11
Basefinal	Pearson Correlation	0.235	-0.013	0.264	0.238	0.306	1	.763**	0.469
	Sig. (2-	0.463	0.968	0.408	0.456	0.360		0.004	0.124

	tailed)								
	N	12	12	12	12	11	12	12	12
Similarfinal	Pearson Correlation	0.221	0.218	0.439	0.476	0.490	.763**	1	0.280
	Sig. (2-tailed)	0.491	0.496	0.153	0.118	0.126	0.004		0.377
	N	12	12	12	12	11	12	12	12
Uniquefinal	Pearson Correlation	-0.046	0.252	0.289	0.482	0.426	0.469	0.280	1
	Sig. (2-tailed)	0.887	0.430	0.362	0.113	0.192	0.124	0.377	
	N	12	12	12	12	11	12	12	12
**. Correlation is significant at the 0.01 level (2-tailed).									
*. Correlation is significant at the 0.05 level (2-tailed).									

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