AN EXPERIMENTAL STUDY ON ADJACENCY AND NOMINATIVE/GENITIVE ALTERNATION IN JAPANESE*

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1 Introduction

This study examines the adjacency effect on the nominative/genitive alternation (NGA) in Japanese through acceptability judgment and self-paced reading experiments. Since the syntactic properties of NGA have been controversial in the generative literature, we analyze the effect from an experimental perspective in order to provide new insight into the phenomenon for resolving the issue.

NGA refers to a phenomenon where a subject in a subordinate clause such as a relative clause can be marked by either the nominative *-ga* or the genitive *-no*.

(1) Kesa Naomi-wa [kyonen Ken-**ga/no** katta] hon-o mitsuketa.
this.morning Naomi-TOP last.year Ken-NOM/GEN bought book-ACC found
'Naomi found a book this morning that Ken bought last year.'

Since Harada (1971), which has brought the phenomenon to the generative framework, various approaches have been proposed (Shibatani, 1975, Inoue, 1976, Nakai, 1980, Miyagawa, 1993, Ura, 1993, Watanabe, 1996, Nishioka, 1998, Ochi, 2001, Kikuta, 2002, Hiraiwa, 2005, Miyagawa, 2011). As Miyagawa (2011) discusses, the previous studies can be categorized into two major approaches regarding whether the nominative and genitive subjects are structurally identical (e.g., Watanabe, 1996, Hiraiwa, 2005) or distinct (e.g., Ochi, 2001, Miyagawa, 2011). Following Miyagawa (2011), we call them the C-licensing and D-licensing hypotheses, respectively. In

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Section 2, we review the empirical observation of the adjacency effect and the two hypotheses for the syntactic structures of NGA.

2 Background

2.1 Adjacency

Harada (1971) points out that the acceptability of the genitive subject is degraded when the genitive subject and its predicate are not linearly adjacent, while such an effect is not detected in the nominative subject counterpart. The effect is illustrated in (2) below.

(2) a. Adjacent condition
Kesa Naomi-wa [kyonen Ken-**ga/no** katta] hon-o mitsuketa.
this.morning Naomi-TOP last.year Ken-NOM/GEN bought book-ACC found
'Naomi found a book this morning that Ken bought last year.'

b. Non-adjacent condition
Kesa Naomi-wa [kyonen Ken-**ga/??no** <u>America-de</u> <u>tomodachi-to</u> katta]
this.morning Naomi-TOP last.year Ken-NOM/GEN America-at friend-with bought
hon-o mitsuketa.
book-ACC found
'Naomi found a book this morning that Ken bought with (his) friend in the U.S. last year.'

In contrast to the nominative subject, the genitive subject with two intervening elements underlined in (2b) is degraded in its acceptability. Although many studies have addressed NGA, the adjacency effect has never been substantiated empirically. As the literature has confirmed, the acceptability of the genitive subject is conditioned by various factors (cf. Nambu, 2007, 2013), which is probably the reason for the varied acceptability of the genitive subject in the non-adjacent condition (Miyagawa, 2011:1274), and thus, it is necessary to disentangle the phenomenon by teasing apart these factors using experimental methods.

2.2 Syntactic Analysis of NGA

In this section, we introduce the two hypotheses on the syntactic properties of NGA. In short, the D-licensing hypothesis by Miyagawa (2011) assumes that the genitive subject is located in a different syntactic position from the nominative subject, whereas the C-licensing hypothesis by Hiraiwa (2005) assumes that the syntactic structures of the nominative and genitive are identical.

The D-licensing analysis presumes a structural distinction for the nominative and genitive subjects. The assumption is based on the fact that the genitive subject typically occurs in relative clauses with a head noun, as shown in (3a), but not in other types of clauses without a head noun, as in (3b).

(3) a. Kesa Taro-wa [kinoo Naomi-**ga**/**no** tsukutta] soba-o tabeta.
this.morning Taro-TOP yesterday Naomi-NOM/GEN made noodle-ACC ate
'Taro ate the noodle this morning that Naomi cooked yesterday.'

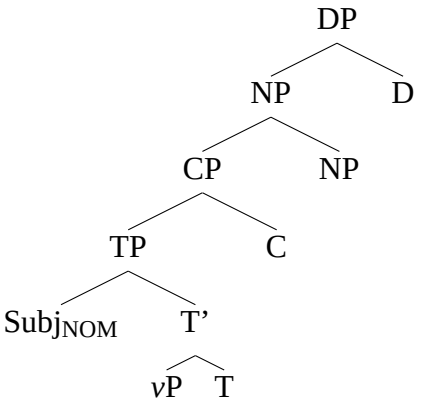
b. Naomi-**ga**/***no** kite-kara, Ken-wa soba-o tabeta.
Naomi-NOM/GEN come-after Ken-TOP noodle-ACC ate

'After Naomi came, Ken ate the noodle.'

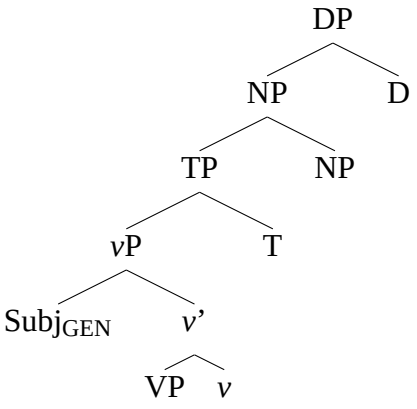
The D-licensing hypothesis stipulates that the genitive subject must occur in the domain of an NP with D to be licensed. The tree diagrams given in (4) are examples of the nominative and genitive subject structures in Miyagawa's approach. The trees show that the nominative structure in (4a) contains a CP, in contrast to the genitive structure in (4b). Miyagawa (2011) describes that the nominative subject is licensed by T under CP. In this structure, D above the CP cannot license the subject because the CP is a phase and blocks the D-licensing due to a violation of the Phase Impenetrability Condition (PIC) as defined in (5) (Chomsky, 2001, Asarina, 2011).

(4) D-licensing (Miyagawa, 2011)

a. Nominative Structure



b. Genitive Structure

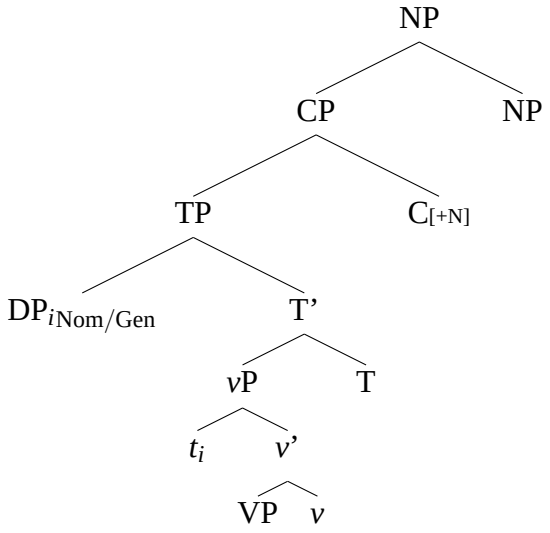


(5) Phase Impenetrability Condition (PIC) (Chomsky 2001, Asarina 2011)
In phase α with head H, the domain of H is accessible to operations outside α only until the next (strong) phase head is merged.

Under the assumption that D is a phase (e.g., Chomsky, 2001, Svenonius, 2004), a phasal domain created by the CP is not penetrable for the D to license the subject. The genitive structure, on the other hand, does not contain a CP between the genitive subject and the external D head; therefore, the D-licensing is successfully accomplished without violating the PIC.

In contrast, the C-licensing hypothesis by Hiraiwa (2005) assigns the same structure, which contains a CP, to both the nominative and genitive structures and adds a categorial feature [+N] on C for the genitive subject, as given in (6). When C carries [+N], the genitive subject can be licensed through the C-T relationship. Thus, in contrast to the D-licensing hypothesis, the C-licensing hypothesis predicts that the nominative and genitive are freely interchangeable under the structure with the feature [+N]. The following tree represents the structure under the assumption of Hiraiwa's approach.

(6)



What is relevant to the current study is whether these hypotheses can account for the adjacency effect. If, on the one hand, different behaviors of the nominative and genitive subjects in terms of adjacency are predictable by different syntactic structures, the D-licensing hypothesis is favored over the C-licensing hypothesis. In fact, Miyagawa (2011) has given a testable prediction for the adjacency effect based on the D-licensing hypothesis, as we introduce in Section 2.3. If, on the other hand, the difference has nothing to do with their syntactic structures, then neither of the hypotheses can provide an account and other factors need to be explored.

2.3 Theoretical Predictions

Miyagawa (2011) argues that the D-licensing hypothesis can explain the adjacency effect on the genitive subject. He describes that since T in the genitive structure in (4b) in Section 2.2 is not selected by C, it fails to inherit any formal grammatical features and lacks EPP, as in the case of infinitival clauses in English. Therefore, T does not trigger movement of the genitive subject that ends up staying at Spec,*v*P, as opposed to the nominative subject that moves to Spec,T.

Here are the predictions given in Miyagawa (2011). When the genitive subject occurs to the left of a temporal adverb as a TP-level adjunct on the surface level, the subject must undergo an unmotivated movement across the adjunct in order to arrive at the right word order; thus, it is uneconomical and leads to the low acceptability. However, the uneconomical movement is not needed when the structural position of an intervener is lower than the genitive subject, such as VP-level adjuncts, and the acceptability remains high.

Thus, Miyagawa's (2011) syntactic account predicts that the genitive subject allows VP adjuncts as an intervener but not adjuncts that occur higher than Spec,*v*P, where the genitive subject is located. This is what we can test empirically.

3 Acceptability Judgment Experiment

3.1 Procedure

To test the adjacency effect, we conducted a rating experiment using a 5-point scale (1: very unnatural, 5: very natural) with 40 native speakers of Japanese. The adjacency conditions (adjacent

vs. non-adjacent) and the two case particles (*ga* and *no*) were manipulated in a 2 × 2 design, yielding a total of four crucial conditions in the experiment. The non-adjacent conditions involved two interveners: a temporal adverb (TP-level adjunct) and a locative PP (VP-level adjunct). The adjacent conditions were constructed by moving the intervening elements of the non-adjacent conditions to the front of the sentences. Sixteen matched lexical sets were created and distributed among four lists using a Latin Square procedure so that the participants never saw lexically matched items in their particular questionnaire. We included 32 filler items in each list, which were balanced to ensure an equal number of acceptable and unacceptable sentences. In addition, all of the questionnaires started with the same 5 practice items (cf. Schütze and Sprouse, 2014), and thus, each list had 53 items in total. The order of items within each list was pseudorandomized so that related conditions were never presented successively. Furthermore, additional four lists were created in which the order of the items was reversed in order to avoid the effect of order, resulting in 8 different questionnaires in total. Example items from the lists are given in (7).

(7) a. Nom/Gen: Adjacent
Kyoo juku-de kodomotachi-**ga/no** naratta rekishi-wa
today cram.school-at children-NOM/GEN studied history-TOP
Heianjidai-nitsuite-dat-ta.
Heian.period-about-COP-PST
'The history that the children studied at a cram school today is about the *Heian* period.'

b. Nom/Gen: Non-adjacent
Kodomotachi-**ga/no** kyoo juku-de naratta rekishi-wa
children-NOM/GEN today cram.school-at studied history-TOP
Heianzidai-nitsuite-dat-ta.
Heian.period-about-COP-PST

3.2 Results

Table 1 shows the means with the standard deviations of the ratings for each condition. It indicates that the acceptability of the genitive *no* is lower in the non-adjacent condition than in the adjacent condition.

To confirm the difference, we transformed the ratings of each participant to z-scores for standardization in order to correct any possible scale bias between participants. Figure 1 displays the averaged z-scores of the nominative *ga* and the genitive *no* in the adjacent and non-adjacent conditions. Figure 1 shows that the acceptability of the genitive *no* in the non-adjacent condition becomes drastically low, while the nominative *ga* is stable across the two conditions.

	Adjacent	Non-adjacent
ga	4.31 (1.05)	4.32 (1.13)
no	3.61 (1.33)	2.69 (1.59)

Table 1: Means and standard deviations of the acceptabilities for each condition

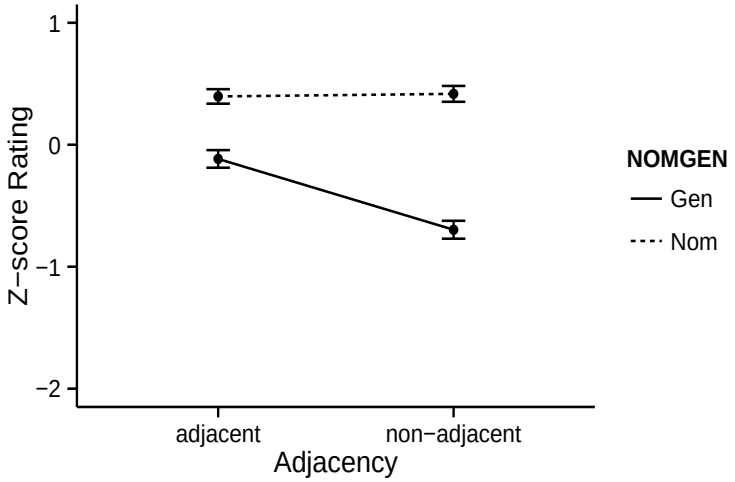


Figure 1: Z-score ratings of the nominative/genitive conditions

After verifying the effect visually, we constructed linear mixed-effects models with items and participants included as random factors and the adjacent/non-adjacent condition (ADJACENCY) and the case particles *ga* and *no* (NOMGEN) as fixed factors. The analysis was conducted using the lme4 and languageR libraries for the R statistic program. During the analysis, we also considered random slopes for each fixed factor and compared the models by likelihood ratio tests using the function `aov` in R. The best model included a random slope with NOMGEN*ADJACENCY and participants. Table 2 is a summary of the fixed factors of the model.

	Estimated	Standard Error	t-value	p-value
(Intercept)	-0.122	0.101	-1.21	.24
NOMGEN	0.533	0.093	5.716	<.001
ADJACENCY	-0.580	0.134	-4.342	<.001
NOMGEN*ADJACENCY	0.581	0.164	3.537	<.001

Table 2: Summary of fixed factors from the linear mixed-effects model for NGA and adjacency

Table 2 shows that there was a significant main effect of NOMGEN and ADJACENCY. There was also a significant interaction of NOMGEN and ADJACENCY, indicating that adjacency affected the nominative *ga* and the genitive *no* differently. As visually displayed in Figure 1, the acceptabilities of the genitive *no* are different between the two conditions, in contrast to the nominative *ga*. Thus, the results statistically confirm the effect on the genitive subject that led to the low acceptability in the non-adjacent condition.

4 Self-paced Reading Experiment 1

4.1 Procedure

Among the few previous studies of NGA in sentence processing, Kahraman (2012) reported that in the adjacent condition, there was no significant difference in reading times between sentences with nominative and genitive subjects. However, it is yet to be understood how the non-adjacent conditions are processed. In order to examine the locus of the adjacency effect that we observed in Section 3, we conducted a self-paced reading experiment with 67 native speakers of Japanese, using the same materials as in the judgment experiment. The experiment was conducted with Linger (v.2.88), a Tcl/Tk sentence presentation program written by Douglas Rohde, using Apple Mac mini computers on Mac OS X and 17-inch TFT displays. The program presented one sentence at a time on the computer monitor, left to right, word by word in a noncumulative, moving-window manner as the participant pushed the space bar (Just et al., 1982). The 16 sets (items) of four target conditions were distributed in a Latin Square design, resulting in four lists. Ninety filler items, of which 66 were items for other unrelated experiments, were added to each list. Among the filler items in each list, 10 were ungrammatical. The 106 sentences in a list were presented in a different pseudo-random order for each participant, such that no two target items were presented consecutively. The participants were asked to silently read the sentences. The experiment was preceded by brief instructions and 9 practice items. Each stimulus was immediately followed by a simple sentence that may or may not have matched the content of the sentence that was presented, and the participants were instructed to push either the F key (for yes) or the J key (for no) depending on the match. Visual feedback was provided for wrong answers. An opportunity for a break was given after every 20 trials.

For the data trimming, we used three procedures. First, we excluded two participants from our data; one had correct answers for less than 50% of the comprehension questions, and the other had an extremely long reading time for each region (z-score: 4.54). Second, we calculated the z-scored reading times of each region for each condition. We treated the ones above 5 as outliers and excluded them. Third, we excluded the data when a participant gave a wrong answer for the comprehension question that followed each target sentence.

4.2 Results

Our interest is in the behaviors of the reading times in the first five regions of the stimuli, i.e., up to the head noun of the embedded clause, as shown in (8).

(8) a. Adjacent Condition
TempAdv LocPP Subject-*ga*/*no* V HeadN ...
1 2 3 4 5

b. Non-adjacent Condition
Subject-*ga*/*no* TempAdv LocPP V HeadN ...
1 2 3 4 5

Note that we were not able to compare the reading times between the adjacent and non-adjacent conditions in the first three region individually, since different sets of lexical items were allocated for the adjacent and non-adjacent conditions. Figure 2 displays the mean reading times of the non-adjacent condition.

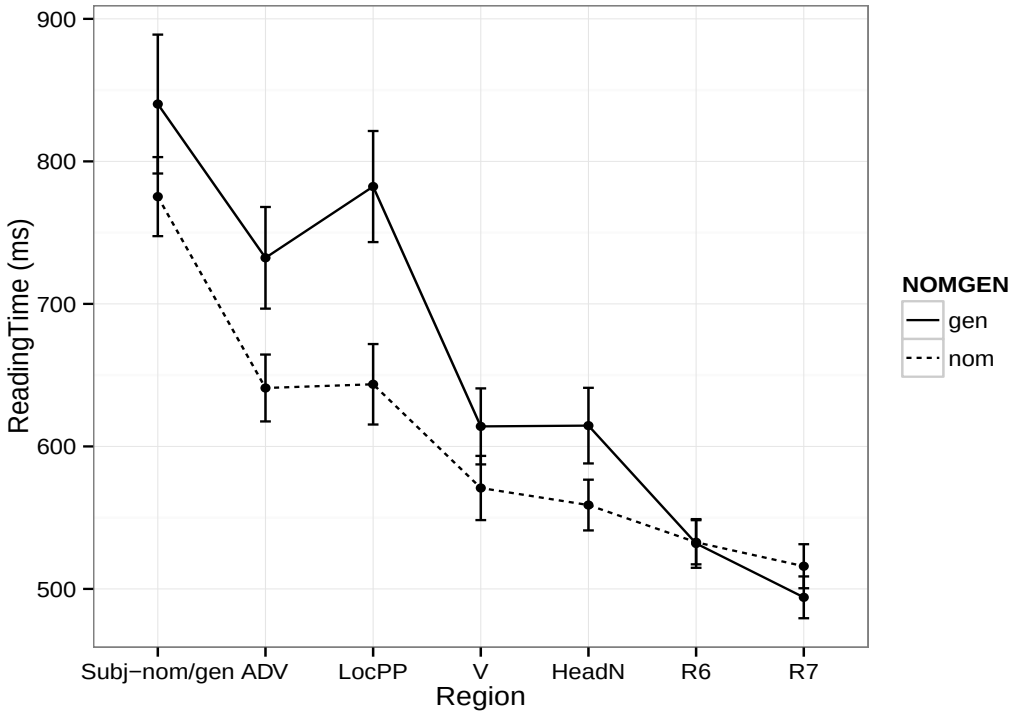


Figure 2: Mean reading times in the non-adjacent condition

In order to examine the difference between the nominative and genitive conditions in the first five regions, we conducted planned pairwise comparisons by constructing linear mixed-effect models in R in the same fashion as described in Section 3. The results revealed a significant slowdown in the genitive/non-adjacent condition compared with the nominative/non-adjacent condition, in the region containing the TP adjunct (t = -2.132, p = .036, "ADV" in Figure 2) and the following region (t = -2.963, p = .004, "LocPP" in Figure 2). We did not find significant differences between the nominative and genitive in other regions in either the adjacent or non-adjacent condition.

To summarize, we found that the reading time of the two interveners in the genitive/non-adjacent condition was significantly slower than the one in the nominative counterpart. Under Miyagawa's syntactic account, the delay at the temporal adverb with the genitive subject can be explained, since the TP-level adjunct requires the uneconomical movement of the genitive subject, as described in Section 2.3. However, the delay at the locative PP as the second intervener is not explicable. Thus, our next step is to identify why the locative PP as the second intervener shows the delay. One of the possible factors is a spillover from the previous region that contains a temporal adverb (cf. Kaiser, 2013). In order to examine whether there is any effect due to the spillover, we conducted another experiment replacing a temporal adverb (TP-level adjunct) with a manner adverb (VP-level adjunct).

5 Self-paced Reading Experiment 2

5.1 Procedure

In response to the results of the first self-paced reading experiment, we conducted another self-paced reading experiment with 86 native speakers of Japanese, partially modifying the materials for the previous experiment with new lexical items (to improve the naturalness) and also replacing the temporal adverbs with manner adverbs for the first interveners in the stimuli. The total number of the stimuli in one set was 80, including 64 fillers, of which 32 were items for other unrelated experiments. We adopted the same data-trimming procedure using in Experiment 1. Example items from the lists are given in (9).

(9) a. Nom/Gen: Adjacent
Kossori kaisha-de buchoo-**ga/no** nonda osake-wa torihikisaki-kara-no
in.secret at.work manager-NOM/GEN drank sake-TOP business.partner-from-GEN
sashiire-dat-ta.
gift-COP-PST
'The sake that the manager had at work was a gift from their business partner.'

b. Nom/Gen: Non-adjacent
Buchoo-**ga/no** kossori kaisha-de nonda osake-wa torihikisaki-kara-no
manager-NOM/GEN in.secret at.work drank sake-TOP business.partner-from-GEN
sashiire-dat-ta.
gift-COP-PST

5.2 Results

Figure 3 represents the mean reading times of the nominative/genitive sentences in the non-adjacent conditions. It indicates that the manner adverb as the first intervener ("ADV" in Figure 3) did not cause a significant difference between the nominative and genitive conditions, which is different from Experiment 1, which had a temporal adverb. However, there was a great difference in the reading times at the locative PP region between the nominative and genitive conditions ($t = -4.273$, $p < .001$), and the difference does not seem to be weakened compared to the results of the previous experiment. This constant delay in the locative region across the two experiments despite the reading time difference in the preceding region makes the spillover account untenable. If such is the case, what kind of properties of locative PP causes the effect? In Section 6, we provide two hypotheses that compensate for Miyagawa's syntactic account.

6 Discussion

The results of the two self-paced reading experiments revealed that the temporal adverb as a TP-level adverb caused a delay in the genitive/non-adjacent condition. This is predictable under Miyagawa's syntactic account, as described in Section 2.3. What was not expected is the delay at the locative PP. In this section, we explore two possible factors that contribute to the delay.

The first factor is the relationship between the frequency of use and the processing burden. Namely, the delay at the second intervener may have been caused by the low frequency of the

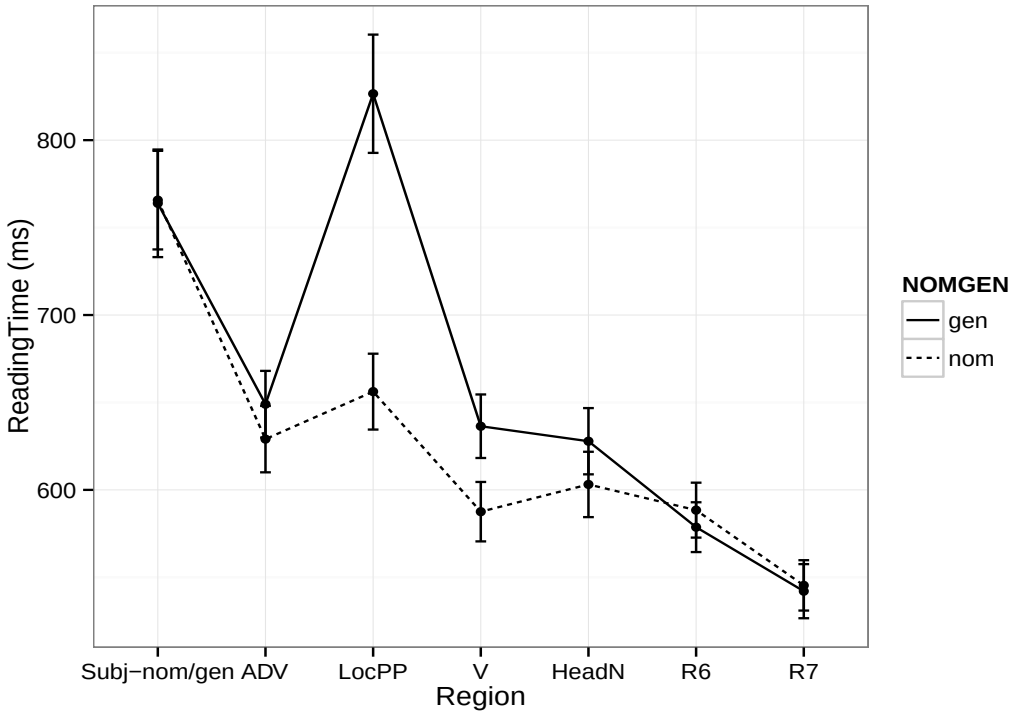


Figure 3: Mean reading times in the non-adjacent condition

genitive subject with two interveners in production. Nambu's (2013) corpus study shows the frequency of the genitive subject in the non-adjacent condition decreases drastically, as given in Table 3.

	Adjacent		Non-adjacent	
	MJD	CSJ	MJD	CSJ
Nom	82.9% (4,371/5,274)	89.4% (3,158/3,534)	98.5% (2,291/2,326)	99.8% (1,278/1,281)
Gen	17.1% (903/5,274)	10.6% (376/3,534)	1.5% (35/2,326)	0.2% (3/1,281)

Table 3: Frequency of the nominative/genitive subject in the adjacent/non-adjacent condition
MJD = minutes of Japanese diet, CSJ = corpus of spontaneous Japanese

The tendency in Table 3 is congruent with the results of the current experiments. More importantly, the corpus study provides the data that the genitive subject did not occur at all when there was more than one intervening element between the subject and its predicate. This rarity in production might be the factor that caused the processing burden on the locative PP as the second intervener.

The second potential factor is the structural position of locative PPs in Japanese. We assumed that locative PPs are VP-level adjuncts located lower than Spec,*v*P. Tamaoka et al. (2004), for

instance, suggest that the canonical word order with a locative adverb is S*adv*OV, claiming that locative adverbs are likely to modify a whole VP. However, we do not have well-established evidence that locative PPs in Japanese are not located higher than Spec,*v*P. If that is the case, the results that we observed in this study can be attributed to the structural position of locative PPs, supporting Miyagawa's syntactic account.

To test the effects of these two factors, it would be illuminating to conduct experiments with a locative PP as a single intervener, and with a temporal adverb and a manner adverb as interveners, which we leave for future studies.

7 Conclusion

In this study, we experimentally confirmed the adjacency effect on the genitive subject, where the acceptability becomes lower in the non-adjacent condition. Our self-paced reading experiments revealed the significant intervention effect of a TP-level adjunct (temporal adverb), as opposed to a VP-level adjunct (manner adverb), on the genitive subject condition, as predicted by Miyagawa's syntactic account. Furthermore, we suggested two possible explanations for the unexpected effect of locative PP, based on the relationship between frequency and processing burden and on the syntactic position of locative PP, although the verification of these factors is left open for future studies.

References

Asarina, Alya. 2011. Case in Uyghur and beyond. Doctoral Dissertation, Massachusetts Institute of Technology.

Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A life in language*, ed. Michael Kenstowicz, 1–52. Cambridge, MA: MIT Press.

Harada, Shin-ichi. 1971. Ga-no conversion and idiolectal variations in Japanese. *Gengo Kenkyu* 60:25–38.

Hiraiwa, Ken. 2005. Dimensions of symmetry in syntax: Agreement and clausal architecture. Doctoral Dissertation, MIT.

Inoue, Kazuko. 1976. *Henkei bunpoo-to nihongo [Transformational grammar and Japanese]*. Tokyo: Taishukan.

Just, Marcel Adam, Patricia A. Carpenter, and Jacqueline D. Woolley. 1982. Paradigms and processes in reading comprehension. *Journal of Experimental Psychology: General* 111:228–238.

Kahraman, Baris. 2012. Sentence processing of nominative-genitive conversion in Japanese by Turkish speaking learners and native speakers. In *The Proceedings of the Thirteenth Tokyo Conference on Psycholinguistics [TCP 2012]*, ed. Yukio Otsu, 81–102. Tokyo: Hituzi Syobo Publishing.

Kaiser, Elsi. 2013. Experimental paradigms in psycholinguistics. In *Research methods in linguistics*, ed. Robert J. Podesva and Devyani Sharma, chapter 8, 135–168. Cambridge: Cambridge University Press.

Kikuta, Chiharu. 2002. Ga-no kootai gensho-no hihaseitekibunseki: Jutsugorentaikei-no meishisei [Ga-No conversion in the new light : A non-derivational, mixed category analysis]. *Doshisha Studies in English* 74:93–136.

Miyagawa, Shigeru. 1993. Case-checking and minimal link condition. In *MIT working papers in linguistics 19: Papers on case and agreement*, ed. Collin Phillips, 213–254. Cambridge, MA.: MITWPL.

Miyagawa, Shigeru. 2011. Genitive subjects in Altaic and specification of phase. *Lingua* 121:1265–1282.

Nakai, Satoru. 1980. A reconsideration of Ga-No conversion in Japanese. *Papers in Linguistics* 13.

Nambu, Satoshi. 2007. Reconsideration of ga/no conversion based on a quantitative analysis. *Gengo Kenkyu* 131:115–149.

Nambu, Satoshi. 2013. Nominative/genitive alternation in Japanese: Theoretical implications of a quantitative study. In *NELS 41: Proceedings of the 41st Annual Meeting of the North East Linguistic Society*, ed. Yelena Fainleib, Nicholas LaCara, and Yangsook Park, 41–54. Amherst, MA: GLSA.

Nishioka, Izumi. 1998. Meisi syuusyokugo hyoozi-no “no” kakuzyosi-to ga/no kootai bun-no “no” kakuzyosi-no iti-no soui [The difference of place between ‘no’ as a marker modifying a noun and “no” as a marker in ga/no conversion]. *Kyuudai gengogaku kenkyusitu houkoku* 19.

Ochi, Masao. 2001. Move F and ga/no conversion in Japanese. *Journal of East Asian Linguistics* 10:247–286.

Schütze, Carson, and Jon Sprouse. 2014. Judgment data. In *Research methods in linguistics*, ed. Devyani Sharma and Rob Podesva. Cambridge: Cambridge University Press.

Shibatani, Masayoshi. 1975. Perceptual strategies and the phenomena of particles conversion in Japanese. In *Papers from the parasession on functionalism*, 469–480. Chicago: Chicago Linguistic Society.

Svenonius, Peter. 2004. On the edge. In *Syntactic edges and their effects*, ed. David Adger, Cécile de Cat, and George Tsoulas, 261–287. Kluwer, Dordrecht.

Tamaoka, Katsuo, Yayoi Miyaoka, Takane Ito, and Hiromu Sakai. 2004. The canonical position of instrumental and locative adverbs in the cognitive processing of Japanese sentences and noun phrases. In *The Proceedings of the 128th Meeting of the Linguistic Society of Japan*, 275–280.

Ura, Hiroyuki. 1993. L-relatedness and its parametric variation. In *MIT Working Papers in Linguistics*, ed. Collin Phillips, Vol. 19, 377–399.

Watanabe, Akira. 1996. Nominative-genitive conversion and agreement in Japanese: A cross-linguistic perspective. *Journal of East Asian Linguistics* 5:373–410.