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On the nature of the discourse effect on extraction in Japanese

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The present study tested whether the D-linked object moves from its thematic position over the subject or it originates where it appears in non-canonical sentences in Japanese. To this aim, we conducted acceptability judgment experiments that employed island effects as a diagnosis of movement and assessed whether the D-linking status of an extracted object of non-canonical OSV sentences escaped island effects. The results revealed that D-linking did not improve an acceptability of island violations, and therefore, a D-linked object of OSV does have a status of a moved constituent.

The present result contributes to an understanding of a relationship between syntactic representation and processing of filler-gap dependencies. According to recent event-related brain potential (ERP) studies, non-canonical sentences with a filler-gap dependency elicits a P600 effect when there is no felicitous context, but they do not reveal any effect when the filler is discourse-old information. The present result is inconsistent with the interpretation that the D-linked filler does not have a status of a moved constituent, thereby resulting in no filler-gap dependency formation in Japanese sentence comprehension. Instead, the present result is consistent with the view that the P600 effect is not a neural cost of the reconstruction but is elicited by other cognitive processes, such as the resolution of the unsatisfied presupposition encoded by scrambling.

1 Introduction

This study addresses the issue of a syntactic representation of non-canonical sentences with a discourse-old object (O) in Japanese. We examined whether the discourse-old O has a status of a moved constituent by conducting offline acceptability judgement experiments. Based on the result, we argue that a discourse-old O originates at its thematic position and moves over an S in non-canonical sentences. The result will also be discussed in relation to the implication for the processing theory.

In the following subsections, we briefly explain island effects and their factorial definition that the present study employed for testing our prediction.

1.1 Island and D-linking effects

Filler-gap dependency is one of the topics that has been studied in the literature of theoretical linguistics.[1] Previous studies have examined derivations/representations of sentences with such a dependency and have identified various factors that render sentences (un)grammatical, including domains accessible for extraction and landing sites, as well as

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[1] We refer to a dependency between a displaced constituent and its gap as a filler-gap dependency, although it is also used to refer to a dependency between PRO and its antecedent (cf. Sakamoto 1996).

the interactions with other syntactic phenomena, such as binding (e.g., Chomsky 1973; 1986; Rizzi 1978; Ross 1967; Saito 1985). It is well-known that, although a filler-gap dependency is unbounded in principle, there exist domains referred to as islands that prevent a constituent from being extracted in English, as presented in (1) (Ross 1967).

(1)　　　Sprouse et al. (2013: 25, 35)
　　　　　Complex NP island: What did you make the claim that John bought?
　　　　　Subject island: What do you think the speech about interrupted the TV show?
　　　　　Adjunct island: What do you laugh if John leaves at the office?
　　　　　Whether island: What do you wonder whether John bought?

It has been known that the Discourse-linked (D-linked) wh-phrases ameliorate island violations and superiority effects in English, as exemplified in (2) and (3) (Karttunen 1977; Pesetsky 1987; Rizzi 1990; see also Sprouse et al. 2016). D-link means that an NP refers to an entity previously introduced in contexts. For example, "*which of those books*" is a D-linked phrase because it delimits the set of entities that a hearer can draw an answer to the question from, while "*what*" is not.

(2)　　　a. ??What do you wonder whether John read?
　　　　　b.　 Which of those books do you wonder whether John read?

(3)　　　Pesetsky (1987: 104, 106)
　　　　　a.　*Mary asked what$_j$ who read e$_j$?
　　　　　b.　 Mary asked which book$_j$ which man read e$_j$?

1.2　The aim of the present study

The present study aimed to examine the discourse effect on syntactic representation of OSV sentences in Japanese. In the previous section, we mentioned that D-linked wh-phrases do not show a sensitivity to movement-related constraints in English. However, since Japanese is a wh-in-situ language, it is hard to test island and superiority effects in the same configuration. Furthermore, there are differences regarding D-linked wh-phrases in English and Japanese in terms of restriction (Huang & Ochi 2004). Therefore, it is possible that D-linked phrases behave differently in Japanese from in English.

　The standard analysis of the derivation of OSV in Japanese is to suppose that OSV derives from a syntactically basic SVO (e.g., Saito 1985). An O appears at the thematic position and merges with a V. After an S merges with the OV (i.e., SOV), the O moves over the S, resulting in OSV. Since one of the motivations for the use of OSV is to make an O topic (Kuno 1978; Saito 2010), it is natural that a D-linked O is scrambled over an S.[2]

　Alternatively, the apparently fronted discourse-old O does not have the status as a moved constituent (see e.g., Ueyama 2003 for discussion). According to Kuno (1973), topics (typically marked with '-*wa*') can be associated with a gap inside an island, as shown in (4), suggesting that topics can receive an O-like interpretation without forming a filler-gap dependency. There can be a *pro* in the thematic position of O and it is interpreted as co-indexed with the discourse-old O at the sentence initial position.

(4)　　　*Japanese* (Kuno 1973)
　　　　　Sono-e$_i$-wa　　　Taro-ga　 [$_{NP}$[$_{TP}$ sore$_i$-o/e$_i$ kaita] hito]-o　　　yoku shitteiru.
　　　　　that.picture-TOP Taro-NOM　　　it-ACC/e　drew　person-ACC well　know
　　　　　'Speaking of that painting, Taro knows the person who drew (it).'

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[2] According to a corpus analysis conducted by Imamura (2014), O of OSV in Japanese was discourse-old information in 81% of OSV occurrences.

One might wonder whether it is possible that the accusative-marked phrase of OSV can be interpreted as if it takes a thematic role of an O without a reconstruction. However, it is well-known that the O of OSV can be interpreted at the surface position in Japanese (see Saito 1992; Tada 1993). As shown in (5a), "*soitu* (the guy)" can be bound by "*dare* (who)" because "*dare*" c-commands "*soitsu,*" whereas it cannot in (5b) due to the lack of an appropriate c-commanding relationship between them. The important observation is a lack of weak cross over effect in (6b). The sentence in (6b) is acceptable, in which the accusative-marked "*dare*" c-commands "*soitu*" at the surface position but not in its thematic position, suggesting that the O of OSV cannot be reconstructed into the thematic position in Japanese (Tada 1993; see also Ueyama 1998).

(5)   *Japanese* (Tada 1993: 17)
        a. ?Dare$_i$-ga   soitsu$_i$-no   sensei-o   hinanshita-no.
            who-NOM   the.guy-GEN teacher-ACC   criticized-Q
            'Who$_i$ criticized the guy$_i$'s teacher?'
        b. *Soitsu$_i$-no   sensei-ga   dare$_i$-o   hinanshita-no.
            the.guy-GEN teacher-NOM   who-ACC   criticized-Q
            (Lit.) The guy$_i$'s teacher criticized who$_i$
            'Who did the guy's teacher criticized?'

(6)   *Japanese* (Tada 1993: 17)
        a. *[e Soitsu$_i$-o   hitome   mita] hito-ga   dare$_i$-o   sukininatta-no.
            the.guy-ACC one.glance saw   person-NOM who-ACC fell.in.love.with-Q
            (Lit.) The person who took a glance at the guyi fell in love with who$_i$?
            'Who did the person who took a glance at him fall in love with?'
        b. ?Dare$_i$-o   [e soitsu$_i$-o   hitome   mita] hito-ga   t$_i$ sukininatta-no.
            who-ACC   the.guy-ACC one.glance saw   person-NOM   fell.in.love.with-Q
            (Lit.) 'Who$_i$ the person who took a glance at the guy$_i$ fell in love with t$_i$?'

1.3 A factorial definition of island effects

The present study employed the factorial definition of island effects proposed by Sprouse et al. (2013), which takes processing factors into account. It has been known that the processing cost has an influence on how acceptable native speakers perceive a sentence to be. For example, sentences such as centre-embedded and garden-path sentences are grammatically well-formed but less acceptable or comprehensible. Thus, it is sometimes controversial as to whether the unacceptability of a sentence should be accounted for based on ungrammaticality or processing cost (e.g., Kluender & Kutas 1993). In the case of the island effect, Sprouse et al. (2013) argued that the length of filler-gap dependency and clause type should be considered when assessing the unacceptability of island-violating sentences. The island-violating sentence in (7d) involves the extraction of the wh-phrase from the O position of the interrogative embedded clause. The processing of such a long-distance dependency arguably degrades the acceptability of (7d). If (7d) violates a syntactic constraint, it should be even less acceptable after the independent processing effects of long filler-gap dependency and clause type are subtracted. Concretely, the difference of (7a) minus (7d) should be greater than the sum of the difference of (7a) minus (7c) and that of (7a) minus (7b). This effect is called the super-additive effect because the effect in (7d) is beyond the contribution of the two independent processing factors. Statistically, the effect appears as a significant interaction between these two factors.

(7)   a.   Non-island/Matrix:
            Who __ thinks that John bought a car?

       b.   Non-island/Embedded:
            What do you think that John bought __ ?

       c.   Island/Matrix:
            Who __ wonders whether John bought a car?

       d.   Island/Embedded:
            *What do you wonder whether John bought __ ?

2 Experiment 1

2.1 Material

The present study used adjunct and complex NP islands, which constrain scrambling in Japanese (Yoshimura 1984; 1992; Saito 1985).[3] For each Island type, we manipulated three factors, namely, D-linking (non-D-link vs. D-link), Island (non-island vs. island), and Word Order (canonical vs. scrambling), creating eight conditions for each island type.[4] In the present experiment, the D-linked conditions were created by adding "*sono*" (the/its) to object NPs. For example, "*sono shousetsu*" (the novel) has to refer to a specific novel in contexts while "*shousetsu*" (novel) do not. In Experiment 1, we refer to *sono* NPs as D-link conditions. However, *sono* NPs were not explicitly introduced in contexts (see Section 2.7 for discussion).

  We chose object NPs that have a low degree of referentiality (e.g., snack, novel, photo, book, article) to make this difference more salient. Nouns that can refer to a specific person/object without demonstratives or contexts (e.g., shushoo/shachoo (president)) are considered to have a high degree of referentiality and thus not used in the present experiments. Example sets of the stimuli are provided in (8) to (9). For convenience, the non-D-link ("*NP-o*", NP-ACC) and D-link ("*sono NP-o*", the NP-ACC) conditions are shown together.

(8)   Adjunct Island:
       a.   **non-island, canonical**
            chonan-wa   sakki   imouto-ga (sono) okashi-o   tabeta-to omotteiru.
            brother-TOP a while ago sister-NOM the   snacks-ACC ate-C   think
            'The brother thinks that his younger sister ate (the) snacks a little while ago.'

       b.   **island, canonical**
            choonan-wa sakki   imouto-ga (sono) okashi-o   tabeta-node
            brother-TOP a while ago sister-NOM the   snacks-ACC ate-because
            okotteiru.
            angry
            'The son is angry because his younger sister ate (the) snacks a little
            while ago.'

       c.   **non-island, scrambling**
            (sono) okashi-o$_i$ choonan-wa sakki   imouto-ga __$_i$ tabeta-to
            the   snacks-ACC brother-TOP a while ago sister-NOM   ate-C
            omotteiru.
            think

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[3] We also included *whether* islands in the experiment. However, because an anonymous reviewer commented that *whether* island has not been treated as an island in the literature of Japanese syntax (Yoshimura, 1984). Thus, we do not report the result here.

[4] The manipulation of Word Order is equivalent to that of short vs. long dependency in previous studies.

  d. **island, scrambling**
   (sono) okashi- o$_i$ choonan-wa sakki   imouto-ga $\_i$ tabeta-node
   the snacks-ACC brother-TOP a while ago sister-NOM ate-because
   okotteiru.
   angry

(9) Complex NP Island
  a. **non-island, canonical**
   hyouronka-wa kyonen goosutoraita-ga (sono) shousetsu-o kaita-to
   commentator-TOP last year ghost.writer-NOM the novel-ACC wrote-C
   shinjiteiru.
   believe
   'The commentator believes that the ghost-writer wrote (the) novel.'

  b. **island, canonical**
   hyouronka-wa kyonen goosutoraita-ga (sono) shousetsu-o kaita-toiu
   commentator-TOP last year ghost.writer-NOM the novel-ACC wrote-that
   hodo-o shinjiteiru.
   news-ACC believe
   'The commentator believes the news that the ghost-writer wrote (the) novel.'

  c. **non-island, scrambling**
   (sono) shousetsu-o hyouronka-wa kyonen goosutoraita-ga $\_i$ kaita-to
   the novel-ACC commentator-TOP last year ghost.writer-NOM wrote-C
   shinjiteiru.
   believe

  d. **island, scrambling**
   (sono) shousetsu-o hyouronka-wa kyonen goosutoraita-ga
   the novel-ACC commentator-TOP last year ghost.writer-NOM
   $\_i$ kaita-toiu hodo-o shinjiteiru.
    wrote-that news-ACC believe

Thirty-two sets of sentences in each Island Type were distributed into eight lists, using a Latin square design. Accordingly, no participant read more than one sentence from the same set. Each participant rated four items in each condition. Twenty ungrammatical items, such as (10), were added to each list to balance acceptable sentences and unacceptable sentences.

(10) [Kinou tencho-ga $\_i$ hometa-to]$_j$ yuushuuna shinjin-o$_i$
   [yesterday manager-NOM $\_i$ praised-C] talented newcomer-ACC
   arubaitoten'in-ga $\_j$ shinjiteiru.
   part.timer-NOM $\_j$ believe
   (Intended reading) 'The part-timer believes that the manager praised a talented newcomer yesterday.'

2.2 Participants

Participants in this experiment included 42 native Japanese speakers (26 females and 16 males, M = 21.5, SD = 1.5, range: 18.9–24.4). All were undergraduate or graduate students at Kyushu University and naïve to the purpose of the experiment. Written informed consent was obtained from all participants prior to the experiment, and they were paid for their participation.

2.3 Procedure

The acceptability of sentences was collected using Ibex Farm (http://spellout.net/ibex-farm/). Participants were instructed to rate each sentence from 1 (unacceptable) to 5 (acceptable). Experimental and filler sentences were presented in a randomized order for each participant. Two sentences, one totally acceptable and one unacceptable, were presented as practice trials to encourage the participants to use the full range of acceptability, although they were not told that they were practice trials.

2.4 Statistical analysis

Acceptability ratings were transformed to z-scores for each participant (cf. Sprouse et al. 2013). Statistical analyses were conducted for each Island Type because the interactions between Island and other factors were not of interest in the present study. Linear mixed-effects (LME) modes were fitted with the *lme4* package (Bates et al. 2015) in R (R Core Team 2016). The model included D-linking (non-D-link/D-link), Word Order (canonical/scrambling) and Island (non-island/island) as fixed factors. The participants and items were treated as random factors. We fitted the maximal models with random by-participant and by-item intercepts and slopes and selected final models in the backward stepwise method by comparing more and less complex models using the *anova* function.[5] *P*-values were calculated by submitting the final models to the *lmer* function of the *lmerTest* package (Kuznetsova et al. 2017).

2.5 Prediction

If the movement of an O across adjunct and complex NP clauses is prohibited because of the grammatical constraint, the interaction between Word Order and Island should be significant (i.e., the super-additive effect). The focus of the present study is whether this effect interacts with D-linking. If a D-linked O does not have a status of a moved constituent, a three-way interaction among D-linking × Word Order × Island should be significant because the interaction of Word Order × Island should be significant only in the non-D-link O conditions. Alternatively, if a D-linked moves out of the presumed islands, it would violate an island constraint as a non-D-linked O should be. Thus, the two-way interaction of Word Order × Island should be observed for both the D-linked and non-D-linked conditions.

2.6 Results

The mean acceptability of the sentences is presented in Figures 1 and 2. The adjunct and complex NP islands revealed a super-additive effect, as evidenced by the significant interaction between Word Order and Island (Tables 1 and 2). A planned comparison
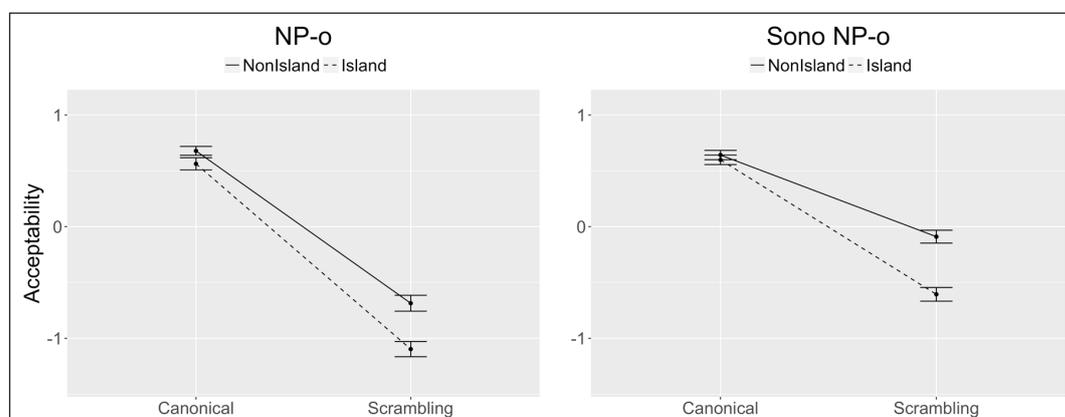

Figure 1: Adjunct island.

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[5] The results do not affect the significance of effects reported herein even if we employ the maximal models that converged successfully.
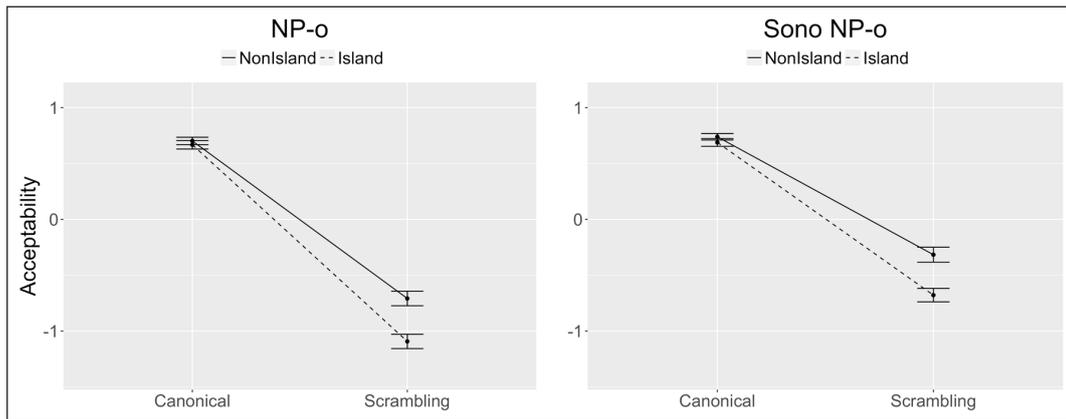
Figure 2: Complex NP island.

Table 1: Adjunct island.

	Estimate	SE	t	P	
(Intercept)	<0.01	0.03	<0.01	1.00	
D-Link	0.28	0.04	7.16	<0.01	**
Word Order (WO)	−1.24	0.04	−32.23	<0.01	**
Island	−0.27	0.04	−7.02	<0.01	**
D-Link × WO	0.54	0.08	6.99	<0.01	**
D-Link × Island	−0.03	0.08	−0.43	0.67	
WO × Island	−0.39	0.08	−5.04	<0.01	**
D-Link × WO × Island	−0.17	0.15	−1.12	0.26	

Table 2: Complex NP island.

	Estimate	SE	t	P	
(Intercept)	<0.01	0.04	<0.01	1.00	
D-Link	0.21	0.04	6.11	<0.01	**
Word Order (WO)	−1.4	0.04	−39.87	<0.01	**
Island	−0.21	0.04	−5.98	<0.01	**
D-Link × WO	0.37	0.07	5.35	<0.01	**
D-Link × Island	<0.01	0.07	0.06	0.95	
WO × Island	−0.33	0.07	−4.74	<0.01	**
D-Link × WO × Island	0.04	0.14	0.26	0.80	

at each level of D-linking exhibited a significant interaction between Word Order and Island in both D-link and non-D-link conditions (Adjunct/Non-D-link: Estimate $= -0.31$, $t = -2.70$, $p < 0.01$; Adjunct/D-link: Estimate $= -0.48$, $t = -4.96$, $p < 0.01$; Complex NP/Non-D-link: Estimate $= -0.36$, $t = -3.85$, $p < 0.01$; Complex NP/D-Link: Estimate: -0.33; $t = -2.46$, $p < 0.05$). The interaction between D-linking and Word Order was significant in these island types, indicating that the acceptability of the scrambled sentences improved when O was D-linked compared to when it was not D-linked (Adjunct: Estimate $= 0.54$, $t = 8.67$, $p < 0.01$; Complex NP: Estimate $= 0.39$, $t = 6.68$, $p < 0.01$), whereas D-linking did not affect the acceptability of the canonical sentences ($ps > 0.10$). Importantly, the three-way interaction of D-Linking $\times$ Word Order $\times$ Island was not significant in either of the two island types. This means that the interaction of

Word Order × Island did not differ between the D-linking and non-D-linking conditions. Figure 3 shows differences-in-differences (DD) scores, which are a measure of the size of island effects (Sprouse et al. 2013). They are calculated such that $(c - d) - (a - b)$ in each of (8) and (9). If a D-linked O does not have a status of a moved constituent, the right bars of each type of islands (the D-link conditions) should be significantly lower than the left bars (the non-D-link conditions). However, the results show that the size of island effects did not differ between the non-D-link and D-link conditions, in consistent with the lack of the three-way interaction.

2.7 Remaining problems

The result of the acceptability judgment experiment reveals a super-additive effect in the adjunct and complex NP islands in the D-link and non-D-lind conditions. However, there is a problem that the length of the scrambled phrases differed between the D-link ("*sono NP-o*") and non-D-link ("*NP-o*") conditions. According to corpus studies and acceptability judgement studies, long objects tent to be placed before short subjects, known as the long-before-short preference (Dryer 1980; Hawkins 1994; Yamashita & Chang 2001; Yamashita 2002; Omaki et al. 2019). This leaves the possibility that the sentences with demonstratives received the significantly higher mean acceptability judgments because they are more compatible with the preference. Furthermore, Experiment 1 did not provide explicit contexts to render the scrambled phrases literally D-linked, despite that "*sono NP*" conditions are referred to as D-link conditions. The present experiment design enabled us to closely match the D-link conditions with the non-D-link conditions, but required participants to come up with a felicitous context in the D-link conditions. The lack of an explicit context could have weakened the effect of D-linking on island violations.

3 Experiment 2

To address these issues, we conducted another acceptability judgment experiment, in which explicit contexts were provided and the length of O was matched between the D-link and non-D-link conditions.

3.1 Material

The sentences in (11) and (12) show an example of contexts for the D-link conditions. No context was provided in the non-D-link conditions to avoid making an O D-linked. Because some participants of a pilot experiment reported that it was more natural to use polite forms (-*mas*-) of verbs in contexts (i.e., non-polite form: *atta* vs. polite form: *arimasita*), we used polite forms for both the context and target sentences in Experiment 2. Note that the target sentences were identical between the D-link and non-D-link conditions because
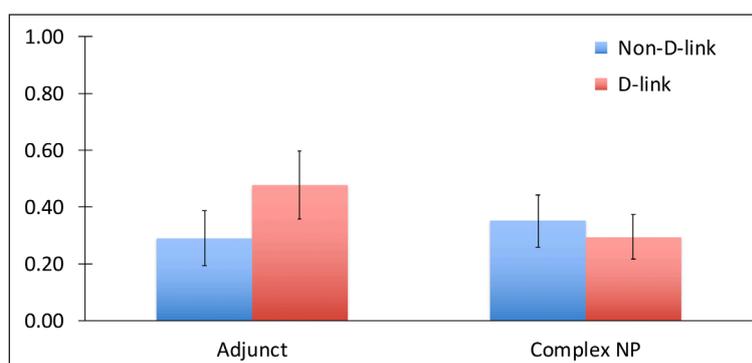

Figure 3: The differences-in-differences (DD) scores in each island type.

"*sono*" was removed to match the length of the O (see (8) and (9)). Because of this, object nouns were repeatedly used in the context and target sentences without a demonstrative. According to an anonymous reviewer, this is extremely unnatural. However, to preview our results, the acceptability of the D-linked/non-island/scrambling condition was within an acceptable range (3.76 in the adjunct condition and 3.04 in the complex NP condition). Therefore, the repetition of the same nouns seems natural for native Japanese speakers.

(11)   Context for (8)
         Daidokoro-ni okashi-ga   ari-mashi-ta.
         kitchen-LOC   snack-NOM   is-POL-PST
         'There was a snack in the kitchen.'

(12)   Context for (9)
         Shousetsu-ga naokishou-o   jushoushi-mashi-ta.
         novel-NOM   Naoki.prize-ACC receive-POL-PST
         'A novel received the Naoki Prize.'

3.2 Participants

Forty-seven native speakers of Japanese were recruited using Lancers.jp (https://www.lancers.jp) and presented with experimental sentences on Ibex Farm (15 females and 32 males, M = 39.5, SD = 7.5, range: 27.4–59.1, 33 with university degrees). Informed consent was obtained from all participants prior to the experiment, and they were paid for their participation.

3.3 Procedure

The experiment was conducted in the same way as in Experiment 1, except for an additional instruction that asked the participants to judge an acceptability of the second sentence (i.e., target sentence) within a context when they were presented with two sentences at the same time (i.e., D-link conditions).

3.4 Results

Figures 4 and 5 show the mean acceptability of the sentences in adjunct and complex NP conditions, respectively. The linear mixed-effects model showed a significant interaction of Word Order and Island in both adjunct and complex NP conditions, indicating a super-additive effect (Tables 3 and 4). The three-way interaction of Word Order, Island, and D-linking was not significant in neither island type. When non-D-link and D-link conditions
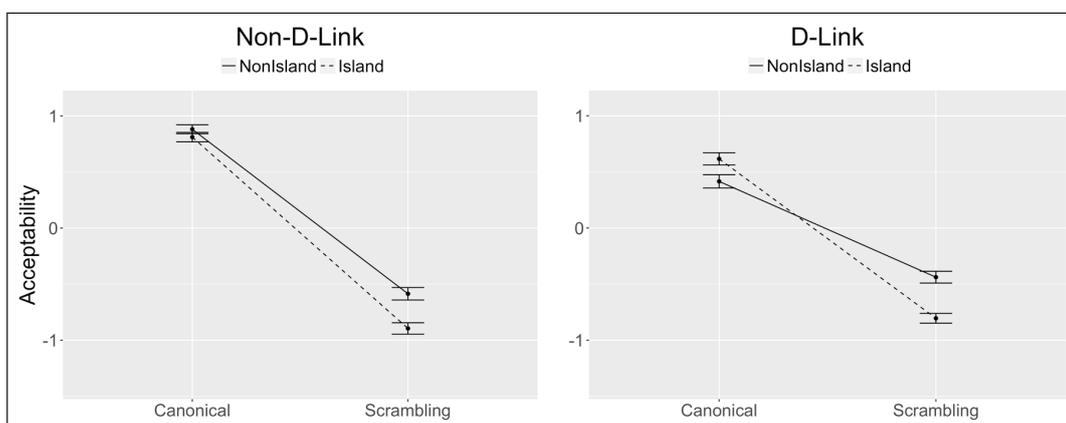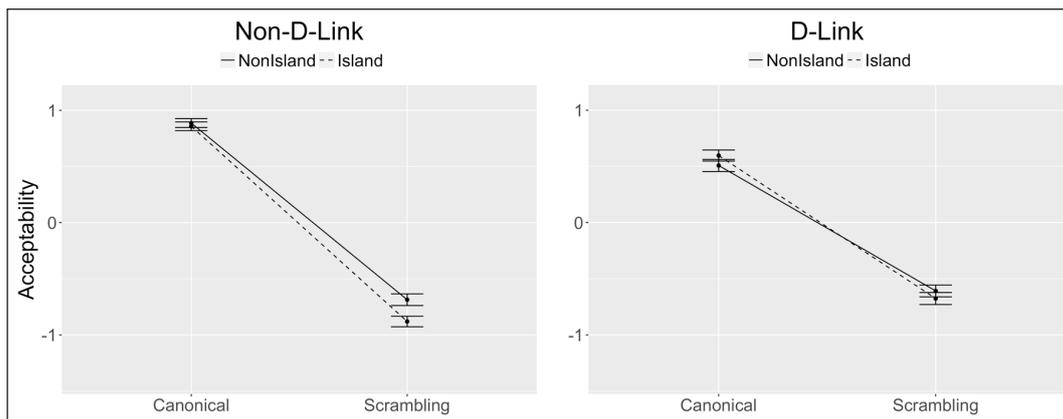

Figure 4: Adjunct island.

Figure 5: Complex NP island.

Table 3: Adjunct island.

	Estimate	SE	t	P	
(Intercept)	0.00	0.04	0.01	0.99	
D-Link	0.00	0.04	−0.08	0.94	
Word Order (WO)	−1.36	0.04	−38.51	<0.01	**
Island	−0.15	0.04	−4.07	<0.01	**
D-Link × WO	−0.08	0.07	−1.19	0.23	
D-Link × Island	−0.03	0.07	−0.38	0.70	
WO × Island	−0.36	0.07	−5.06	<0.01	**
D-Link × WO × Island	−0.07	0.14	−0.48	0.63	

Table 4: Complex NP island.

	Estimate	SE	t	P	
(Intercept)	0.00	0.04	0.03	0.98	
D-Link	0.01	0.03	0.34	0.73	
Word Order (WO)	−1.42	0.07	−20.86	<0.01	**
Island	−0.05	0.03	−1.58	0.11	
D-Link × WO	0.15	0.07	2.31	0.02	*
D-Link × Island	0.01	0.07	0.20	0.85	
WO × Island	−0.16	0.07	−2.42	0.02	*
D-Link × WO × Island	−0.16	0.13	−1.18	0.24	

were analysed separately, an interaction of Word Order and Island was significant, expect for the non-D-link conditions of the complex NP island (Adjunct/Non-D-link: Estimate $= -0.35, t = -3.50, p < 0.01$; Adjunct/D-link: Estimate $= -0.41, t = -4.11, p < 0.01$; Complex NP/Non-D-link: Estimate $= -0.10, t = -1.02, p = 0.31$; Complex NP/D-Link: Estimate: $-0.23; t = -2.36, p < 0.01$).

4 Discussion

4.1 D-linking effect on extraction

The result of Experiment 1 reveals a super-additive effect in the adjunct and complex NP islands. Note that the decrease in acceptability of the island sentences is not attributable to the processing cost induced by a structural reanalysis (i.e., garden-path: GP) occurring

presumably at the embedded S or V. If the Japanese parser actively posits a gap immediately after the matrix S ("*NP-wa*") (cf. Aoshima et al. 2004), the parser must revise such a structural analysis at the embedded S or V, which should induce a processing cost. However, this holds true for the non-island/scrambling condition, meaning that the GP effect cannot account for a super-additive pattern.

The major finding of Experiment 1 is that *sono* NPs did not weaken the significant interaction of Word Order and Island in adjunct and complex NP islands. However, *sono* NPs significantly improved the acceptability of the scrambled sentences, suggesting that the participants recognized the difference and the scrambled sentences being more natural when "*sono*" attached object NPs.

Experiment 2 provided explicit contexts in the D-link conditions and matched the length of objects between the non-D-link and D-link conditions. The result of Experiment 2 still showed a super-additive effect in the adjunct island, suggesting an island violation. As in Experiment 1, D-linking did not ameliorate the super-additive effect, as evidenced by the absence of a three-way interaction. This result of the adjunct islands is consistent with the view that the D-linked O moves from its thematic position to the surface position in Japanese. By contrast, the result implies that it is unnecessary to postulate a mechanism wherein the D-linked O base-generates higher than S and is interpreted by somehow associating it with an empty category in the thematic position.

Unlike Experiment 1, the adjunct conditions did not show an interaction of D-link and Word Order in Experiment 2. This suggests that an increase in the acceptability of D-link/scrambling conditions in Experiment 1 was due to the long-before-short preference. There is a preference for placing a longer object before a subject but the preference for placing a discourse-old object is not strong. Another difference between Experiments 1 and 2 in adjunct islands is the absence of a main effect of D-link in Experiment 2 in contrast to a significant effect in Experiment 1. This result indicates that objects with demonstratives are preferred to objects without them regardless of word order, while discourse-old objects are as acceptable as discourse-new objects. The significant main effect of Island in Experiments 1 and 2 is difficult to interpret because different verbs were used in the matrix clauses in addition to the manipulation of "*to* (that)" and "*node* (because)."

In Experiment 2, the complex NP island failed to show a super-additive effect in the non-D-link condition. This implies that the complex NPs are not islands with respect to scrambling in Japanese under the factorial definition of islands. In favour of this, Haig (1976) observed that the extraction from complex NP islands are weak in Japanese (in comparison to the extraction from relative clauses), as shown in (13) (see also Ross 1965).

(13)　　*Japanese* (Haig 1976: 369–370)
　　　a.　Complex NP
　　　　?Taroo o　　watasi wa Hanako ga　　aisite iru toiu　　koto o　　kiita.
　　　　Taroo-ACC I-TOP　　　Hanako-NOM loving is saying　that-ACC heard
　　　　'Taroo, I heard that Hanako loves ø.'

　　　b.　Relative clause
　　　　*Ano hon o　　watasi wa kaita　hito ni　　　aitai.
　　　　that book-ACC I-TOP　　　wrote　person-DAT want to meet
　　　　'That book, I want to meet the person who wrote ø.'

Alternatively, given that the non-D-link sentences were the same except for the form of verbs (non-polite form: *shinjiteiru* vs. polite form: *shinjiteimasu*) in Experiments 1 and 2, the participants recruited from different populations (students at Kyushu University vs. non-students) might have a different intuition with respect to complex NP islands. In other

words, it is possible that complex NP islands have greater inter-participant variabilities than adjunct islands.

Importantly, there was a significant interaction of Word Order and Island in the D-link conditions. Therefore, this result of the complex NP island is more consistent with the view that the D-linked O moves from its thematic position to the surface position.

The absence of a significant effect of D-link in the complex NP islands of Experiment 2 can be accounted for in the same way as discussed above. Japanese speakers prefer objects with demonstratives to objects without them regardless of word order, while they accept discourse-old and discourse-new objects to the same degree. Again, the effect of Island is difficult to interpret because of lexical differences between non-island and island conditions.

4.2 Implication for sentence processing

In this section, we discuss the implication of the present results for sentence processing. In psycholinguistics, previous studies have investigated how the parser forms a filler-gap dependency in real-time sentence comprehension and whether the comprehension is sensitive to grammatical constraints on filler-gap dependency. The major finding from behavioural studies is that the parser attempts to actively associate a fronted constituent with its first gap position that is licit in the grammar (Crain and Fodor 1985; Stowe 1986; Clifton and Frazier 1989; Frazier & Clifton 1989; Phillips 2006). For example, Stowe (1986) observed a reading slowdown at "*us*" in (14a) compared to (14b), indicating that the parser attempted to associate "*who*" with the direct object position. In contrast, the slowdown was not found at "*Greg's*" located inside the subject, i.e., subject island, in the comparison of (15a) and (15b), thus suggesting that the parser did not posit an illicit filler-gap dependency.

(14)   Stowe (1986: 234)
      a.   Wh condition:
           My brother wanted know who Ruth will bring us home to __ at Christmas.

      b.   Baseline (if) condition:
           My brother wanted to know if Ruth will bring us home to Mom at Christmas.

(15)   Stowe (1986: 234)
      a.   Wh condition:
           The teacher asked what the silly story about Greg's older brother was supposed to mean.

      b.   Baseline (if) condition:
           The teacher asked if the silly story about Greg's older brother was supposed to mean anything.

Event-related brain potential (ERP) studies provide a clearer picture of how the filler-gap dependency is formed. When an object was fronted over a subject in Japanese, Ueno and Kluender (2003) observed a sustained left anterior negativity (SLAN) from O to S and a P600 effect at S compared to the canonical SOV sentence. SLAN has been proposed to reflect the processes of actively maintaining a filler in the working memory (e.g., Kaan et al. 2000; Ueno & Kluender 2003; Erdocia et al. 2009). The P600 effect is interpreted as a reflection of the syntactic processing cost for reconstructing a filler into its gap (Rösler et al. 1998; Kaan et al. 2000; Ueno & Kluender 2003; Phillips et al. 2006; Hagiwara et al. 2007; Erdocia et al. 2009; Yasunaga et al. 2015).

In spite of these well-established observations, Yano and Koizumi (2018) reported that the SLAN and the P600 do not appear in scrambled OSV sentences in Japanese when the fronted O refers to discourse-old information. They manipulated word order (SOV vs. OSV) and givenness (discourse-new/discourse-old), as presented in (16) and (17). One might wonder whether repeating proper names in the context and the target sentences sounds unnatural because they are discourse-old information. However, Tsuchiya, Yoshimura, and Nakayama (2015) reported that native Japanese speakers preferred the use of referential nouns (e.g., definite NPs) to pronouns in the production task, unlike in English, in which pronouns are preferred to refer to a discourse-old referent. Hence, the repeated use of proper names is not problematic in Yano and Koizumi's (2018) study.

According to their ERP experiment, the OSV elicited larger SLAN and P600 effects than the SOV when the O was discourse-new, which is consistent with the previous ERP studies in Japanese and other languages, whereas it did not when the O was discourse-old. The P600 effect was also not observed at the V position (i.e., *yurushita*, forgive) when the O was discourse-old, suggesting that the lack of the P600 was not due to a delay of the integration process. Therefore, under the assumption that P600 effect is a reflection of the processing cost for reconstructing a filler into its gap, there is no ERP evidence indicating that the discourse-old O is reconstructed into its gap in incremental sentence processing.

(16)   *Japanese* (Yano & Koizumi 2018: 1342)
        Context:
        Kooban-ni   (a) Yoshida-san-ga /(b) Kimura-san-ga imasu.
        police.box-in Yoshida-Mr-NOM / Kimura-Mr-NOM   be
        '(a) Mr. Yoshida /(b) Mr. Kimura is in the police box.'

(17)   *Japanese* (Yano & Koizumi 2018: 1342)
        a.   SOV: Yoshida-san-ga   kinoo-no   yoru Kimura-san-o   yurushita
                   Yoshida-Mr-NOM yesterday-GEN night Kimura-Mr-ACC forgave
                   rashii.
                   seem
                   'It seems that Mr. Yoshida forgave Mr. Kimura last night.'
        b.   OSV: Kimura-san-o   kinoo-no   yoru Yoshida-san-ga   yurushita
                   Kimura-Mr-ACC yesterday-GEN night Yoshida-Mr-NOM forgave
                   rashii.
                   seem

A similar result was also found in Seediq, a Formosan language that is typologically distant from Japanese (Yano 2018). In Seediq, non-canonical SVO sentences elicited a P600 effect compared to canonical VOS sentences in the non-supportive context, but not in the supportive context.

As one of the possible explanations, Yano and Koizumi (2018) proposed that the P600 does not reflect a syntactic integration difficulty, which conflicts with Kaan et al.'s (2000) proposal. Rather, P600 may reflect the cost of the conflict resolution between the syntactic information that the discourse-new O is fronted to the sentence-initial position and the pragmatic information that O-fronting presupposes the existence of a shared referent in a discourse that directly or implicitly refers to an O (Kuno 1987; Imamura 2014). Accordingly, the parser must accommodate the unsatisfied pragmatic requirement when the O is not discourse-old, thus inducing a processing difficulty reflected by the P600 effect. The lack of P600 in the felicitous context is attributed to the lack of such a process. This view aligns with the ERP findings that the P600 is elicited by non-syntactic

manipulations and possibly reflects the integration of different types of information (e.g., Vissers et al. 2006; Kuperberg 2007; Bornkessel-Schlesewsky & Schlesewsky 2008; Brouwer et al. 2012; 2016).

However, this interpretation relies on the conjecture that the O was reconstructed into the thematic position in the discourse-old/OSV condition as well as in the discourse-new/OSV condition. However, one could imagine that a discourse-old O of OSV originates at the surface position and thus it does not have a status of a moved constituent. Accordingly, during incremental sentence processing, the discourse-old O is not reconstructed into the thematic position when encountering an S and thus no P600 was elicited. If this view is correct, the interpretation of P600 as a syntactic integration cost would not be abandoned.

The result of the present experiment is inconsistent with the latter interpretation with respect to the lack of the P600 effect. The supper-additive effect in the D-link conditions suggests that the discourse-old O moves from its thematic position to the sentence-initial position, as the discourse-new O is supposed to do. Provided that there is a filler-gap dependency between the D-linked O and its thematic position, OSV should elicit a P600 effect under the assumption that P600 effect reflects a syntactic integration cost. This prediction is at odd with the result of Yano and Koizumi (2018). In contrast, the result of the present experiment favours the former interpretation of Yano and Koizumi's (2018) result. The lack of the P600 effect can be explained by interpreting the P600 as a reflection of cognitive processes to resolve an unsatisfied presupposition encoded by non-canonical word orders rather than syntactic integration difficulty.[6]

It is further noted that a difference exists with respect to the type of scrambling used by Yano and Koizumi (2018) and the present study. The OSV sentences of their ERP experiment are categorized as M(iddle)-scrambling, i.e., movement within a clause, while those of the present study are L(ong)-scrambling, i.e., movement across a clause boundary. According to the literature on Japanese syntax, M-scrambling sometimes exhibits an A-movement profile, such that it can have an anaphoric relation at the surface position (see (6)). If one assumes that the M-scrambled O does not have to be reconstructed into its gap position because of its A-movement characteristic, it is not surprising that Yano and Koizumi (2018) failed to observe a P600 effect. However, this interpretation inevitably gives rise to a difficult question of why OSV elicits a P600 effect when O is not D-linked.

5 Conclusion

By conducting acceptability judgement experiments with a factorial design of island effects, we reported that the extraction of O from the adjunct and complex NP domains could not escape island effects when it was D-linked. This result implies that the discourse effect in the previous ERP experiments is not due to a syntactic representational difference in sentences with D-linked and D-linked fillers. Rather, it may reflect the fact that the P600 effect is not a reflection of the reconstruction but is elicited by other cognitive processes, such as the resolution of the unsatisfied presupposition encoded by scrambling. Overall, the present study (re)informs that formal acceptability collection is a useful technique to explore the relation between grammar and processing.

Abbreviations

ACC = accusative, C = complementizer, DAT = dative, GEN = genitive, NOM = nominative, POL = polite form, PST = past, Q = question particle, TOP = topic

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[6] We leave open the issue of the interaction between SLAN and discourse in Yano and Koizumi (2018) because the functional role of SLAN for long-distance dependency formation remains unclear (cf. Lau 2018).

Ethics and Consent

Acknowledgements

Competing Interests

The author has no competing interests to declare.

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