NPI licensing and intrusion effects in Japanese

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1 Introduction

Negative polarity items (NPIs) (e.g., *ever*, *any*, *yet* in English) are expressions whose distribution is restricted to particular licensing environments, i.e., they must occur within the scope (e.g., c-command domain)[1] of a downward-entailing licensor (Ladusaw 1979).

(1) a. **No** student [that the professor liked] will **ever** pass the exam.
　　b. *The student [that the professor liked] will **ever** pass the exam.
　　c. *The student [that **no** professor liked] will **ever** pass the exam.

In (1a), the NPI *ever* is grammatically licensed by the determiner *no*, as it is c-commanded by the negative phrase. In contrast, NPIs fail to be licensed when a licensor is not present (1b), or when the NPI is outside the licensor's c-commanding domain. Such is the case of (1c), where the licensor in the relative clause fails to c-command the matrix NPI, resulting in ungrammaticality. However, it has been observed that sentences containing improper licensors (1c) are judged to be more acceptable than sentences with no licensor (1b). In the literature, this illusory licensing effect is referred to as *intrusive* NPI licensing (Drenhaus *et al.* 2005).

Previous studies have found robust NPI intrusion effects in languages such as English and German (Xiang *et al.* 2009, Drenhaus *et al.* 2005, a.o.), where the NPI-licensor dependency is *retrosrpective*, i.e., NPIs appear after their licensors, as in (1a). In recent years, there has been an increasing interest in the study of intrusive NPI licensing in languages such as Korean, where the NPI-licensor dependency is *prospective*, i.e., the NPI precedes its licensor, as shown in (2).

(2) *Keni-ka   **amwuto** mannaci-**anh**-ass-ta.*
　　Ken-NOM anyone   meet-NEG-PST-DEC
　　'Ken didn't meet anyone.'

While intrusion effects involving prospective dependencies have been reported in Turkish and Korean (Yanilmaz & Drury 2018, Yun *et al.* 2018, Lee & Yun 2022), the status of intrusive NPI licensing in languages with prospective NPI-licensor dependencies remains poorly understood. Here we contribute to the empirical landscape of the phenomenon by investigating the processing profile of intrusive NPI licensing in Japanese, another language with prospective NPI licensing. In two experiments (an offline acceptability judgment task and a self-paced reading study),

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[1]Formally, node A c-commands node B if every node dominating A also dominates B, and neither A nor B dominates the other.

we show that while Japanese gives rise to intrusion effects, these are only detectable in offline dependent measures.

This paper is organized as follows. Section 2 introduces two distinct features of Japanese NPI licensing as well as previous findings on intrusion effects both in languages with prospective and retrospective NPI dependencies. Section 3 presents the results of an acceptability judgment task (Experiment 1) that examines whether Japanese exhibits NPI intrusion effects. Section 4 presents results from a self-paced reading experiment (Experiment 2) that investigates the online blueprint of the intrusion effects detected in Experiment 1. Section 5 contains the discussion of our experimental results, and Section 6 concludes the paper.

2 Background
2.1 Intrusion effects

Most previous studies on intrusive NPI licensing have focused on languages such as English and German, where the NPI-licensor dependency is retrospective. For instance, in a series of experiments, Xiang *et al.* (2013) investigate the licensing conditions of the English NPI *ever* and the licensors *no* and *only*. Xiang *et al.* find that sentences containing intrusive licensors (3b) are rated signigicantly lower than sentences containing proper licensors (3a). Crucially, they also find evidence for intrusion effects in the form of higher acceptability ratings for sentences with intrusive licensors (3b) compared to their unlicensed counterparts (3c).

> (3)   a. **No/only** documentaries [that the network TV stations have played during prime time] have **ever** been very controversial.   [**Licensed**]
>
>   b. *The documentaries [that **no/only** network TV stations have played during prime time] have **ever** been very controversial.   [**Intrusive**]
>
>   c. *The documentaries [that the network TV stations have played during prime time] have **ever** been very controversial.   [**Unlicensed**]

Xiang *et al.* also examine the online profile of intrusion effects through a series of self-paced reading (SPR) studies. The reading time (RT) results only partially replicated the acceptability judgment patterns: while the negative licensor *no* gave rise to intrusion effects, such that on average the NPI in the intrusive condition (3b) was read faster compared to the unlicesed condition (3c), no significant difference was found for the licensor *only*. Taken together, these results suggest that the time resolution of intrusion effects is not homogeneous across different types of licensors.

Parker & Phillips (2016) also find variable intrusion effects with different types of NPIs. In an SPR study, the authors report intrusion effects for the NPI *ever* and the licensor *no* (4a), thus replicating Xiang *et al.*'s findings (Cf. Vasishth *et al.* (2008) for similar effects in German). However, they fail to detect parallel intrusion effects for the NPI *any* (4b), suggesting that intrusion effects are not a general property of NPIs either.[2]

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[2]The same asymmetry between *ever* and *any* was found in a speeded acceptability judgment task, such that *ever* but not *any* gave rise to intrusion effects.

(4) a. **No/**the authors [that **no/**the critics recommended] have **ever** received
acknowledgement for a best-selling novel.

   b. **No/**the authors [that **no/**the critics recommended] have received **any**
acknowledgement for a best-selling novel.

Finally, Parker & Phillips point out a third axis along which intrusive effects
may vary. These authors argue that intrusive effects are further modulated by the
amount of time spanning between the NPI and its potential licensor. In a speeded ac-
ceptability judgment task, Parker & Phillips find that the facilitatory effects incurred
by intrusive licensors (5a), compared to a control unlicensed condition, disappear
when a parenthetical (italicized) intervenes between the NPI and the irrelevant li-
censor (5b).[3]

(5) a. *As the editors mentioned*, the authors [that **no** critics recommended for
the assignment] have **ever** receved a pay raise.

   b. The authors [that **no** critics recommended for the assignment] have, *as
the editors mentioned*, **ever** received a pay raise.

We now turn to prospective NPI dependencies. Lee & Yun (2022) investigate
intrusion effects in Korean NPI licensing. Besides displaying a prospective depen-
dency, in Korean the NPI and its licensor must be realized in the same clause. As
a result, both the intrusive sentences in (6a) and (7a) are ungrammatical. In (6a),
the NPI *amwuto* is in the matrix clause while the negation *an-* is in the embedded
clause; in (7a), *amwuto* is in the embedded clause while *an-* is in the matrix clause.

In terms of offline acceptability, Lee & Yun detected clear intrusive effects, such
that (6a) and (7a) were judged to be more acceptable compared to their unlicensed
counterparts in (6b) and (7b) respectively.[4]

(6) a. ***Amwuto** [Cenguni-ka Seoul-ey **an**-ka-ss-tako] ha-ess-ta.*
anyone   Cengun-NOM Seoul-LOC NEG-go-PST-that say-PST-DEC

(Lit.) 'Anyone said that Cengun didn't go to Seoul.'   [**Intrusive**]

   b. ***Amwuto** [Cenguni-ka Seoul-ey   ka-ss-tako] ha-ess-ta.*
anyone   Cengun-NOM Seoul-LOC go-PST-that say-PST-DEC

(Lit.) 'Anyone said that Cengun went to Seoul.'   [**Unlicensed**]

(7) a. **Cenguni-ka [amwuto* Seoul-ey   ka-ss-tako] **an**-ha-ess-ta.*
Cengun-NOM anyone   Seoul-LOC go-PST-that NEG-say-PST-DEC

(Lit.) 'Cengun didn't say that anyone went to Seoul.'   [**Intrusive**]

   b. **Cenguni-ka [amwuto* Seoul-ey   ka-ss-tako] ha-ess-ta.*
Cengun-NOM anyone   Seoul-LOC go-PST-that say-PST-DEC

(Lit.) 'Cengun said that anyone went to Seoul.'   [**Unlicensed**]

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[3]It is worth noting that unlike Xiang *et al.* (2013), Parker & Phillips did not find intrusive
effects in offline acceptability in the same configurations tested by Xiang *et al.*, despite the fact that
the relative clauses used in Xiang *et al.*'s study were longer in terms of number of words.

[4]A similar result was found for Turkish, another language with prospective NPI dependencies.
See Yanilmaz & Drury (2018) for further details.

The online profile of intrusive effects in Korean seems nevertheless far less clear. Lee & Yun (2022) report results from an SPR task, where contrary to what has been previously found in English and German, there were no obvious facilitatory effects in the intrusive conditions (6a-7a) compared to the unlicensed ones (6b-7b). In fact, the intrusive conditions display slower RTs than the unlicensed conditions with both matrix and embedded NPIs (though in the latter case no significant difference was found at the matrix verb between the intrusive condition and a grammatical condition containing only negation).

2.2   NPI licensing in Japanese

Just like Korean, Japanese NPI licensing differs from languages like English in that the NPI precedes its licensor in the sentential linear order. This is exemplified in (8), where the NPI *daremo* 'anyone' is licensed by the upcoming negative morpheme *-nakat*.

(8) *Taro-ga   **daremo** awa-**nakat**-ta.*
     Taro-NOM anyone meet-NEG-PST

     'Taro didn't meet anyone.'

From a processing perspective, establishing the NPI-licensor dependency in languages such as Japanese, where the dependency is prospective, arguably involves different mechanisms compared to languages such as English, where the dependency is retrospective. In Japanese, encountering the NPI triggers the expectation of an upcoming licensor downstream. In English, on the other hand, encountering an NPI requires retrieving a previously interpreted lincensor from short term memory and checking that the proper syntactic configuration between licensor and licensee obtains.

A second difference is that the licensing environment is much more restricted in Japanese compared to English. Similar to what was observed for Korean, Japanese NPIs can be licensed solely by a clause-mate negation (Sohn 1995, Shimoyama 2011). Given this configurational constraint, mismatches between the syntactic positions of the NPI and the potential licensor can give rise to different types of intrusive conditions.

(9) a. ***Daremo** [Kenta-ga Tokyo-e   it-ta-to]   iwa-**nakat**-ta.*
        anyone   Kenta-NOM Tokyo-LOC go-PST-that say-NEG-PST

        'No one said that Kenta went to Tokyo.'   [**Licensed**]

     b. ***Daremo** [Kenta-ga Tokyo-e   ika-**nakat**-ta-to] it-ta.*
        anyone   Kenta-NOM Tokyo-LOC go-NEG-PST-that say-PST

        (Lit.) 'Anyone said that Kenta didn't go to Tokyo.'   [**Intrusive**]

(10) a. *Kenta-ga   [**daremo** Tokyo-e   ika-**nakat**-ta-to] it-ta.*
        Kenta-NOM anyone   Tokyo-LOC go-NEG-PST-that say-PST

        'Kenta said that no one went to Tokyo.'   [**Licensed**]

     b. **Kenta-ga* [**daremo** Tokyo-e   it-ta-to]   iwa-**nakat**-ta.*
        Kenta-NOM anyone   Tokyo-LOC go-PST-that say-NEG-PST

(Lit.) 'Kenta didn't say that anyone went to Tokyo.' **[Intrusive]**

As seen in the grammatical examples in (9a)-(10a), the NPI and its licensor are clause-mates: both are either in the matrix clause (9a) or in the embedded clause (10a). In contrast, in the ungrammatical examples (9b) and (10b), the NPI and its licensor belong to two different clauses.

3 Experiment 1: Acceptability judgments

The goal of Experiment 1 is to determine whether Japanese gives rise to offline intrusion effects comparable to those found in other languages with prospective NPI-licensor dependencies such as Korean and Turkish. Our results show clear intrusion effects parallel to those previously detected in languages with prospective and retrospective NPI licensing.

3.1 Materials

Our experiment manipulated two factors: the position of the NPI *daremo* 'anyone' (M: matrix, E: embedded) and the position of the negative morpheme *-nakat* (M: matrix, E: embedded, Ø: none). The two factors were fully crossed resulting in the six conditions exemplified in Table 1. Conditions a and d consist of the grammatical *licensed* conditions, where the NPI and the licensor are both in matrix position (a: NPI_M-NEG_M) or in embedded position (d: NPI_E-NEG_E). Conditions b and e contain the *intrusive* conditions, since the NPI and its licensor are in mismatched syntactic positions (b: NPI_M-NEG_E; e: NPI_E-NEG_M). Finally, conditions c and f represent the *unlicensed* conditions, since no negation is present to license the NPI in the matrix (c: NPI_M-$NEG_Ø$) or the embedded clause (f: NPI_E-$NEG_Ø$). In all items the matrix clause (regions 1-5) was followed by another clause (regions 6-8).[5]

Thirty-six sets of items were distributed across six lists following a Latin Square design. Besides the 36 experimental trials, participants saw 54 filler sentences. A comprehension question followed each of the sentences. Participants were presented with three possible answers to the question.

3.2 Participants

A total of 21 Japanese native speakers (mean age = 28.0) participated in the experiment. They were recruited from italki (https://www.italki.com/), an online language learning platform. All participants were compensated for their participation.

3.3 Procedure

The experiment was run on PCIbex Farm. Participants were instructed to rate each item in terms of its acceptability on a scale from 1-7 (1: least acceptable, 7: most acceptable). Next, participants responded to a comprehension question by selecting one of three possible answers. There was no time restriction, and all participants were able to finish the experiment within 30 minutes.

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[5]This was done in order to avoid sentence-final wrap up effects in Experiment 2, an SPR experiment that tested the same exact set of stimuli.

|	NPI	NEG	Region 1	2	3	4	5	6	7	8
a.	M	M	[**Daremo**	[Kenta-ga	Tokyo-e	itta-to]	iwa-<u>nakat</u>-ta-node]	Rie-ga	wadai-o	kaeta.
			[anyone	[K.-NOM	Tokyo-LOC	went-that]	say-NEG-PST-because]	R.-NOM	topic-ACC	changed
			'Rie changed a topic because no one said that Kenta went to Tokyo.' **[Licensed]**							
b.	M	E	*[**Daremo**	[Kenta-ga	Tokyo-e	ika-<u>nakat</u>-ta-to]	itta-node]	Rie-ga	wadai-o	kaeta.
			[anyone	[K.-NOM	Tokyo-LOC	go-NEG-PST-that]	said-because]	R.-NOM	topic-ACC	changed
			Lit.'Rie changed a topic because anyone said that Kenta didn't go to Tokyo.' **[Intrusive]**							
c.	M	Ø	*[**Daremo**	[Kenta-ga	Tokyo-e	itta-to]	itta-node]	Rie-ga	wadai-o	kaeta.
			[anyone	[K.-NOM	Tokyo-LOC	went-that]	said-because]	R.-NOM	topic-ACC	changed
			Lit. 'Rie changed a topic because anyone said that Kenta went to Tokyo.' **[Unlicensed]**							
d.	E	E	[Kenta-ga	[**daremo**	Tokyo-e	ika-<u>nakat</u>-ta-to]	itta-node]	Rie-ga	wadai-o	kaeta.
			[K.-NOM	[anyone	Tokyo-LOC	go-NEG-PST-that]	said-because]	R.-NOM	topic-ACC	changed
			'Rie changed a topic because Kenta said that no one went to Tokyo.' **[Licensed]**							
e.	E	M	*[Kenta-ga	[**daremo**	Tokyo-e	itta-to]	iwa-<u>nakat</u>-ta-node]	Rie-ga	wadai-o	kaeta.
			[K.-NOM	[anyone	Tokyo-LOC	went-that]	say-NEG-PST-because]	R.-NOM	topic-ACC	changed
			Lit.'Rie changed a topic because Kenta didn't say that anyone went to Tokyo.' **[Intrusive]**							
f.	E	Ø	*[Kenta-ga	[**daremo**	Tokyo-e	itta-to]	itta-node]	Rie-ga	wadai-o	kaeta.
			[K.-NOM	[anyone	Tokyo-LOC	went-that]	said-because]	R.-NOM	topic-ACC	changed
			Lit.'Rie changed a topic because Kenta said that anyone went to Tokyo.' **[Unlicensed]**							

Table 1: A sample set of experimental stimuli

3.4 Results and Discussion

Answers to comprehension questions pertaining to filler trials were used as attention checks. We determined an 80% accuracy threshold that was met by all participants. Therefore, data from the 21 participants tested were analyzed.

Experiment 1 results are presented in Figure 1. A linear mixed effects model was fit to the data using the R package lme4 (Bates *et al.* 2012). Acceptability ratings were predicted from the fixed effects predictors NPI POSITION and NEG PO-SITION and their interaction. Random intercepts and slopes for the fixed effects predictors by subjects and by items were also included. Because the interaction term did not reach significance ($p > 0.05$), we proceeded to collapse the data across NPI position. To examine the effect of grammaticality, we first contrasted the grammatical conditions a/d against b/e and c/f. Results revealed a significant difference such that the grammatical conditions were rated significantly higher than the ungrammatical ones ($\beta = -3.18$, SE = 0.33, $t = -9.612$, $p < 0.001$). To determine the effect of intrusive licensing, we further compared the intrusive conditions (b/e) against the unlicensed conditions (c/f). Results revealed that the intrusive conditions were rated significantly higher than the unlicensed ones ($\beta = -1.63$, SE = 0.38, $t = -4.320$, $p < 0.001$). Our results therefore show significant effects of both grammaticality and intrusion, though these effects were not modulated by the syntactic position of the NPI.

4 Experiment 2: Self-paced reading

The goal of Experiment 2 was to examine the online processing signature of the offline intrusion effects detected in Experiment 1. To this end, we conducted an SPR study that tested the same stimuli set used in Experiment 1. Intrusion effects were predicted to arise in the form of higher RTs in the unlicensed condition, relative to the intrusive condition.
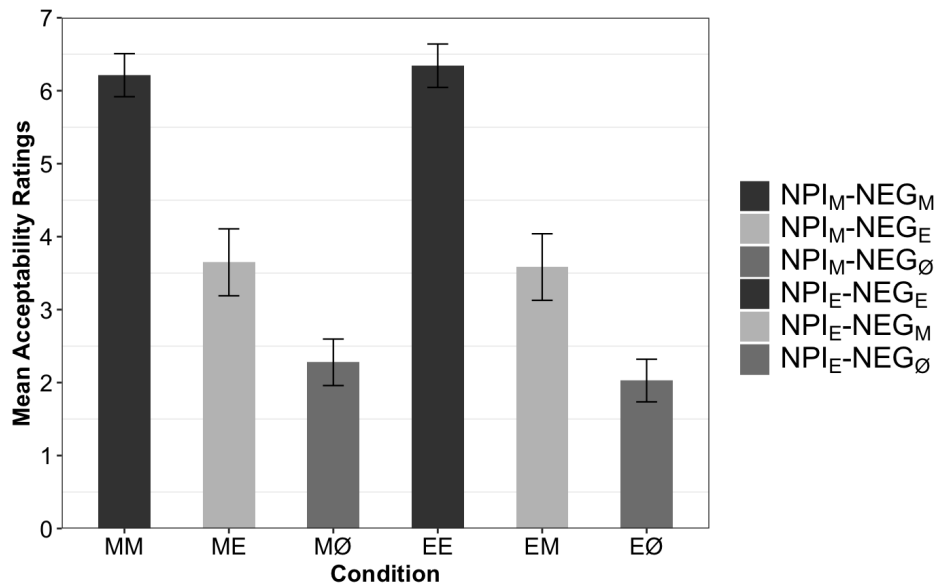
Figure 1: Experiment 1 acceptability judgment results.

4.1 Materials

The materials used in Experiment 2 where the same as in Experiment 1.

4.2 Participants

Thirty-two Japanese native speakers (mean age = 26.2) participated in Experiment 2. All participants were compensated for their participation.

4.3 Procedure

The experiment was run on PCIbex Farm, and used a moving window, self-paced reading task. Participants read each sentence on a computer screen one segment at a time. Each sentence was followed by a comprehension question. To answer the question, participants were instructed to choose one of three possible answers. On average, participants completed the experiment in approximately 30 minutes.

4.4 Results and Discussion

As in Experiment 1, answers to filler trials' comprehension questions were used as attention checks. All participants had an accuracy rate above 80%, so data from all participants were included in subsequent analyses. Data points consisting of RTs below 200 ms or 3 SD away from the region mean were removed from data analysis (3.79% of the data). Next, all RTs were log transformed. To control for within-region length differences across conditions, we fitted a mixed effects model to the log transformed RTs using number of characters and segment position as fixed effects predictors and by participant random intercepts. The residuals extracted from such model were used as the new dependent variable in all subsequent data analyses.

We start with the analyses corresponding to the conditions with NPIs in matrix position. Figure 2 shows the average segment-by-segment log RT residuals for such conditions. To determine any potential grammaticality effects, we fit a linear mixed effects model to the data pertaining to the critical region, i.e., the matrix verb region (region 5), which is the point where a potential NPI-licensor dependency could be established. The model predicted the residual log RTs from the fixed effects of GRAMMATICALITY (grammatical vs. intrusive/unlicensed conditions) and NEG POSITION (matrix vs. embedded). Random intercepts for subjects and items, as well as random slopes for all the fixed effects predictors were also included. Results revealed a significant grammaticality effect, such that the grammatical condition was read faster than the ungrammatical conditions ($\hat{\beta} = 0.28$, SE = 0.07, $t = 3.920$, $p < 0.001$). Crucially, no further distinction was detected at region 5 between the two ungrammatical conditions (intrusive vs. unlicensed: $p > 0.5$), indicating that participants did not display intrusion effects.
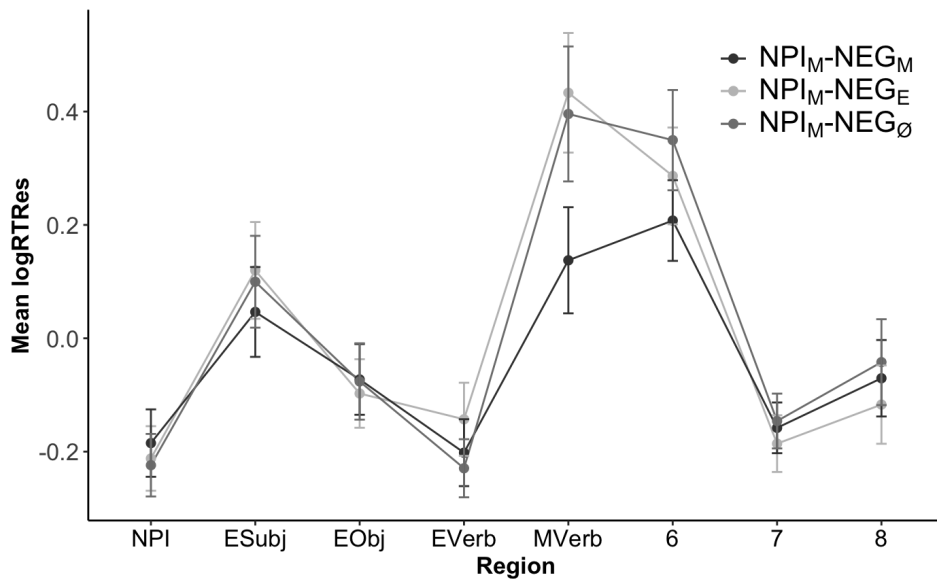
Figure 2: By-region log RT residuals corresponding to conditions with matrix NPIs.

Figure 3 shows the average segment-by-segment log RT residuals for sentences with embedded NPIs. The same model fit to the conditions with matrix NPIs was fit to the data pertaining to conditions containing embedded NPIs. We first analyzed region 4, which contains the point at which the NPI-licensor dependency could be potentially established, i.e., the embedded verb. No significant differences across the three embedded NPI conditions were detected in region 4. However, the following region, containing the matrix verb (region 5), displayed interesting differences. As in the matrix NPI conditions, a significant effect of grammaticality was detected, with the grammatical condition being read faster than the ungrammatical ones ($\beta = 0.24$, SE = 0.07, $t = 3.297$, $p < 0.01$). Finally, the comparison between the NPI_E-NEG_M and NPI_E-$NEG_\emptyset$ conditions did not reach difference ($p > 0.05$).
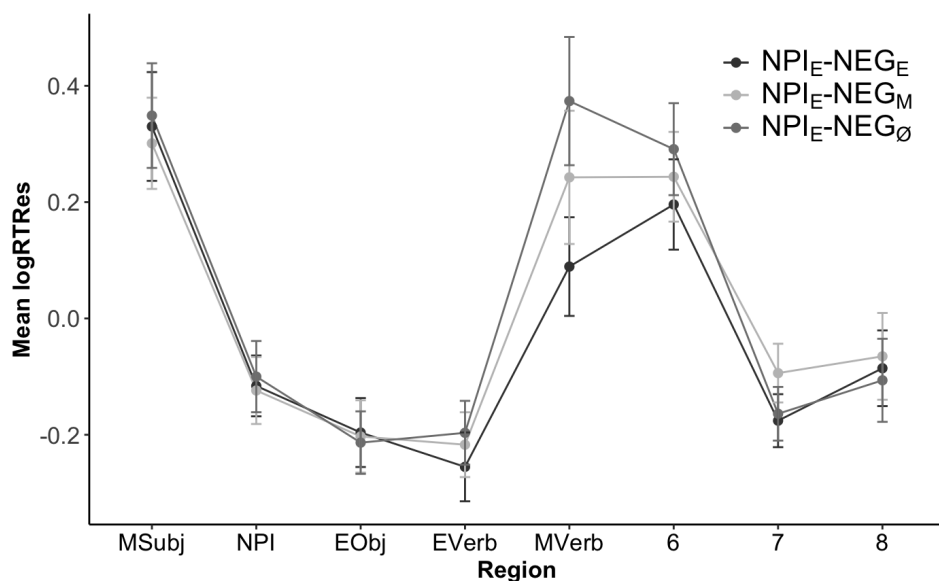
Figure 3: By-region log RT residuals corresponding to conditions with embedded NPIs.

5 General discussion

Our offline acceptability judgments confirmed the existence of intrusion effects in Japanese NPI licensing. That is, ungrammatical sentences with an intrusive licensor were judged as more acceptable than ungrammatical sentences with no licensor. However, no intrusion effects were detected in Experiment 2, which consisted of an SPR task. Our SPR results therefore parallel those reported by Lee & Yun (2022) for Korean, where the intrusive conditions did not display facilitation effects during reading. In this respect, languages with prospective dependencies seem to differ from retrospective languages, for which online intrusion effects have been successfully elicited using self-paced reading.

Much remains to be understood about intrusive NPI licensing in languages with prospective dependencies. For instance, compared to English, not much is known about how factors such as the distance between the NPI and the licensor affect the strength of intrusion effects, or whether intrusion effects generalize to other NPIs beyond *daremo* or *amwuto* in Japanese and Korean respectively. The space of possible explanations for the asymmetric status of intrusion effects reported in Experiments 1 and 2 is therefore quite large. Here, we would like to propose that the mechanisms supporting the online processing of prospective licensing, as opposed to retrospective licensing, might be responsible for the lack of online intrusion effects in Experiment 2. When the dependency is prospective, encountering the NPI triggers the expectation of a downstream licensor. Such expectation is never triggered in languages with retrospective dependencies, since the point at which the NPI is encountered is also the point at which the dependency is resolved. It is therefore possible that processing a prospective NPI-licensor dependency incurs higher working memory demands for the processor. More specifically, the expectation of having to establish a downstream dependency would require keeping the NPI highly

activated in working memory, particularly during the maintenance phase, so that the NPI representation can be readily retrieved once negation is encountered. The expectation of an NPI licensor and/or higher working memory demands during the processing of prospective dependencies might result in increased violations when the dependency fails to be established, resulting in an increase in RTs that masks any potential early facilitation effects of intrusive licensing.

6   Conclusion

To summarize, we have presented the first empirical evidence showing that Japanese gives rise to intrusive NPI licensing effects. In line with what has been reported for other languages with prospective NPI dependencies such as Korean, intrusion effects were observed in offline acceptability judgments (Experiment 1), but not in reading times (Experiment 2). The current results therefore suggest that the online processing of intrusive NPI dependencies—as gauged through reading times—differs when such dependency is prospective as opposed to retrospective. In particular, in the latter case intrusive effects have been successfully detected using self-paced reading and other time-sensitive behavioral measures. We have proposed that this asymmetry could be a direct consequence of the fact that prospective dependencies trigger a strong expectation of an upcoming licensor as soon as the NPI is encountered. When a proper dependency cannot be established either because there is no licensor, or because the licensor is not in the proper syntactic configuration, such expectation is violated, thus incurring early processing costs. Further research will be required in order to pinpoint the exact mechanisms (e.g., effects of working memory maintenance) underlying this increased processing cost.

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