

# **NPI Licensing and Intrusion Effect in Korean**

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## **1 Introduction**

Human cognition has been shown to be subject to illusions of various types. Language is no exception. Linguistic illusions in sentence processing are cases where speakers appear to accept ill-formed sentences during the early processing stages. One example is the so-called Negative Polarity Item (NPI) licensing illusion. While processing the sentences containing NPIs such as

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*ever* as in (1), speakers tend to be tricked by the illicit negation *no student* and often judge the ungrammatical sentence as grammatical.

- (1) \* The professor that no student liked *ever* finished a class on time.

Linguistic illusions involving NPI licensing have recently drawn a lot of attention among psycholinguists. The growing body of studies have provided insight into understanding the underlying cognitive mechanisms of human sentence processing. This study intends to join the discussion by providing new empirical data from the case study of Korean NPI licensing illusions.

This paper is structured as follows. Section 2 briefly sketches the properties of NPI licensing and illusion in Korean. Section 3 presents the experiment, illustrating the details of its design and summarizing the results. Section 4 discusses the results of the experiment that pose a challenge to the existing accounts and proposes a new account on NPI illusions in Korean. Section 5 concludes the paper.

## 2 Background

In this section, we overview previous studies on NPI illusion first and then present the distinctive properties of NPI licensing constructions in Korean.

### 2.1 NPI Licensing Illusion

NPIs (e.g., *ever*, *any*, or *at all* in English) are lexical items that are required to occur within the scope of an appropriate licenser, typically a negator. As in (2), the English NPI *ever* can be licensed by the negatively quantified NP *no professors* in (2a), but the lack of the negative quantifier in (2b) induces ungrammaticality of the sentence.

- (2) a. *No professors* that the students liked *ever* finished a class on time.  
b. \* The professors that the students liked *ever* finished a class on time.  
c. \* The professors that *no students* liked *ever* finished a class on time.

In addition, the licensing must also satisfy structural constraints, namely, a c-command relation between an NPI and its licenser. The negatively quantified NP in (2a) is in a position that c-commands *ever*. If the potential licenser *no students*, however, fails to c-command the NPI as in (2c), this leads to ungrammaticality.

Numerous online processing studies using various measures (e.g. ERP, eye-tracking, speeded acceptability judgment, and self-paced reading) have

reported that even though the potential licenser as in (2c) is not in a structurally accessible position, speakers often accept the sentence (Drennhaus et al. 2006, Vasishth et al. 2008, Xiang et al. 2009, Parker & Phillips 2016, Yanilmaz & Drury 2018). This phenomenon is called an *illusion effect* because the effect is cursory. When enough reflection time is given, the readers easily judge sentences like (2c) as unacceptable (Parker and Phillips 2016).

## 2.2 Selectivity of NPI Illusion

Previous studies in English and German have shown that it is not the case that all classes of NPI and NPI licensers are susceptible to the illusion phenomenon (Parker & Phillips 2016, Dios-Flores et al. 2017, Mendia et al. 2018).

- (3) English
- a. \* The professors [that *no students* liked] *ever* finished a class on time. (Illusion)
  - b. \* The professors [that *no students* liked] finished *any* class on time. (No illusion)
  - c. \* The professors [that the students did *not* like] *ever* finished a class on time. (No illusion)

As shown in (3), NPI licensing illusions are extremely selective on the type of NPIs and NPI licensers. The NPI *ever* in (3a) elicits an illusion, but *any* in (3b) does not. Also, the combination of quantificational negation *no* and a noun phrase elicits an NPI illusion, but sentential negation *not* does not, as shown in the comparison between (3a) and (3c).

However, this selectivity is not crosslinguistic. In Turkish (Yanilmaz & Drury 2018) and Korean (Yun et al. 2018), which have a considerably different syntactic construction from English and German, the NPI *any* and sentential negation cause an NPI illusion effect as in (4).

- (4) Korean
- |   |  |                              |            |
|---|--|------------------------------|------------|
| [ <sub>Matrix</sub> <i>Amwuto</i><br>anyone<br><i>kaci-ahn-ass-tako</i><br>go-NEG -PAST-DEC<br>(Lit.) ‘Anyone said that Cengun didn’t go to Seoul.’ | [ <sub>Embedded</sub> <i>Cenguni-ka</i><br>Cengun-NOM<br><i>malha-yss-ta</i><br>say-PAST-DEC | <i>Seoul-ey</i><br>Seoul-LOC | (Illusion) |
|---|--|------------------------------|------------|

In the next section, the details of NPI constructions in Korean will be discussed.

### 2.3 Korean NPI Licensing Conditions and Illusion

The syntactic constraints on building NPI constructions in Korean and the mechanism for processing them are very different from those in languages like English or German where previous investigations of such illusions have focused.

First, Korean allows very restricted NPI licensors. In English, NPIs are allowed in non-negative constructions such as interrogative constructions or conditional constructions as in (5).

- (5) a. Has the student *ever* finished his syntax assignment?  
 b. If *anyone* comes to the conference room, I will leave.

Korean NPIs, however, cannot appear in those contexts without negation as seen in (6).

- (6) a. \* *Cenhye Seoul-ey ka-poncekiss-ni?*  
**ever** Seoul-LOC go-Present perfect- Question  
 ‘Have you ever been to Seoul?’  
 b. \* *Amwuto o-myen ttena-lke-ta*  
**anyone** come-if leave-will-DEC  
 ‘If anyone comes, I will leave.’

Note that negative determiners such as *no* in English do not exist in Korean, so sentential negation is required for proper NPI licensing.

In addition, as shown in (7) and (8), while embedded NPIs can be licensed under the scope of a matrix negation in English, Korean NPIs are licensed only by the licensors in the same clause (“clause-mate condition” of H. Choe (1988) and Kuno (1998)).

- (7) a. *No professors* said [that *anyone* finished the assignment.]  
 b. The professor *didn’t* say [that *anyone* finished the assignment.]

- (8) a. [<sub>Matrix</sub> *Cenguni-ka* [<sub>Embedded</sub> *amwudo* *Seoul-ey*  
 Cengun-NOM **anyone** Seoul-LOC  
*kaci-ahn-ass-tako*] *malha-yss-ta*]  
 go-NEG -PAST-DEC say-PAST-DEC  
 ‘Cengun said that no one went to Seoul.’  
 b. \* [<sub>Matrix</sub> *Cenguni-ka* [<sub>Embedded</sub> *amwudo* *Seoul-ey*  
 Cengun-NOM **anyone** Seoul-LOC  
*ka-ss-tako*] *malhaci-ahn-ass-ta*]  
 go-PAST-DEC say-NEG-PAST-DEC  
 ‘Cengun didn’t say that anyone went to Seoul.’

Therefore, the potential licenser in matrix in (8b) presumably causes an illusion effect. The constructions where NPI illusions can be caused in Korean are configured in (9).

- (9) a. \* [Matrix NPI [Embedded ... NEG-V] ... ∅-V]  
 b. \* [Matrix ... [Embedded NPI ... ∅-V] ... NEG-V]

The direction of NPI Licensing in Korean is also very different from English or German.

- (10) English  
*No* students has *ever* finished the assignment on time.



As illustrated in (10), when NPIs are encountered in these languages, processing mechanisms need to inspect the previous context to check if there is an appropriate NPI licenser. This kind of NPI licensing exemplifies a typical retrospective dependency. In Korean, on the other hand, since an NPI linearly appears earlier than a NPI licenser, as in (11), the encountered NPI *amwudo* predicts an upcoming licenser *ahn*.

- (11) *Amwuto*      *Seoul-ey*      *kaci-ahn-ass-ta*  
 anyone          Seoul-LOC          go-NEG -PAST-DEC  
 NPI    Licensor  
 ‘No one went to Seoul.’

Thus, in Korean, an NPI and a licenser form a prospective dependency.

Once again, most of the previous works on NPI processing are based on a typologically limited set of languages like English and German, where NPI-licenser dependencies are retrospective. To the best of our knowledge, there are only a few Korean NPI illusion studies, and they are all based on offline processing. With that in mind, this study considers the case of Korean, where NPI licensing happens prospectively, and aims to investigate the online processing profile of NPI licensing and intrusion in Korean.

### 3 Experiment

In order to examine whether NPI licensing illusions occur in online processing in Korean and what the processing profile of NPI licensing and intrusion is, we conducted a self-paced reading experiment.

### 3.1 Stimuli and Procedure

In our stimuli, we controlled for two factors: i) the location of the NPI *amwuto* (either in a matrix clause or in an embedded clause) and ii) the location of a sentential negation (either in a matrix, in an embedded, or no negation). The example set of stimuli is in (12) and (13); the NPI *amwuto* ‘anyone’ is in the embedded clause in (12) and in the matrix clause in (13).

- (12) a. [Matrix *Cenguni-ka* [Embedded *amwudo* *Seoul-ey*  
           *Cengun-NOM*                   **anyone**           *Seoul-LOC*  
           *an-ka-ss-tako*]           *ha-nikka*]           *Minswu-ka*  
           NEG-GO-PAST-DEC           say-because           Minswu-NOM  
           *hwacey-lul*           *cenhwanha-yss-ta*  
           topic-ACC           change-PAST-DEC           (GRAMMATICAL)  
           ‘Because Cengun said that no one went to Seoul, Minswu  
           changed the topic.’
- b. [Matrix *Cenguni-ka* [Embedded *amwudo* *Seoul-ey*  
           *Cengun-NOM*                   **anyone**           *Seoul-LOC*  
           *ka-ss-tako*]           *an-ha-nikka*]           *Minswu-ka*  
           GO-PAST-DEC           NEG-say-because           Minswu-NOM  
           *hwacey-lul*           *cenhwanha-yss-ta*  
           topic-ACC           change-PAST-DEC           (ILLUSION)  
           (Lit.) ‘Because Cengun did not say that anyone went to Seoul,  
           Minswu changed the topic.’
- c. [Matrix *Cenguni-ka* [Embedded *amwudo* *Seoul-ey*  
           *Cengun-NOM*                   **anyone**           *Seoul-LOC*  
           *ka-ss-tako*]           *ha-nikka*]           *Minswu-ka*  
           GO-PAST-DEC           say-as           Minswu-NOM  
           *hwacey-lul*           *cenhwanha-yss-ta*  
           topic-ACC           change-PAST-DEC           (UNGRAMMATICAL)  
           (Lit.) ‘Because Cengun said that anyone went to Seoul,  
           Minswu changed the topic.’
- (13) a. [Matrix *Amwuto* [Embedded *Cenguni-ka* *Seoul-ey*  
           **anyone**                   *Cengun-NOM*           *Seoul-LOC*  
           *an-ka-ss-tako*]           *ha-nikka*]           *Minswu-ka*  
           NEG-GO-PAST-DEC           say-because           Minswu-NOM  
           *hwacey-lul*           *cenhwanha-yss-ta*  
           topic-ACC           change-PAST-DEC           (ILLUSION)  
           ‘Because anyone said that Cengun didn’t go to Seoul,  
           Minswu changed the topic.’

- b. [Matrix *Amwuto* anyone  
*ka-ss-tako* go-PAST-DEC  
*hwacey-lul* topic-ACC] [Embedded *Cenguni-ka* Cengun-NOM  
*an-ha-nikka* NEG-say-because  
*cenhwanha-yss-ta* change-PAST-DEC] *Seoul-ey* Seoul-LOC  
*Minswu-ka* Minswu-NOM  
(GRAMMATICAL)  
'Because no one said that Cengun went to Seoul, Minswu changed the topic.'
- c. [Matrix *Amwuto* anyone  
*ka-ss-tako* go-PAST-DEC  
*hwacey-lul* topic-ACC] [Embedded *Cenguni-ka* Cengun-NOM  
*ha-nikka* say-as  
*cenhwanha-yss-ta* change-PAST-DEC] *Seoul-ey* Seoul-LOC  
*Minswu-ka* Minswu-NOM  
(UNGRAMMATICAL)  
(Lit.) 'Because anyone said that Cengun went to Seoul, Minswu changed the topic.'

We used a short-form negation *an-* instead of a long-form negation *-ci ahn* to avoid the word length effect. The “matrix” clause was followed by another clause to avoid the sentence-final effect, rendering region 1 to 5 as the target of the analysis. For the baseline measure, we also included three additional control conditions, representing all three negation conditions without NPIs. We created 36 item lists across 9 conditions.

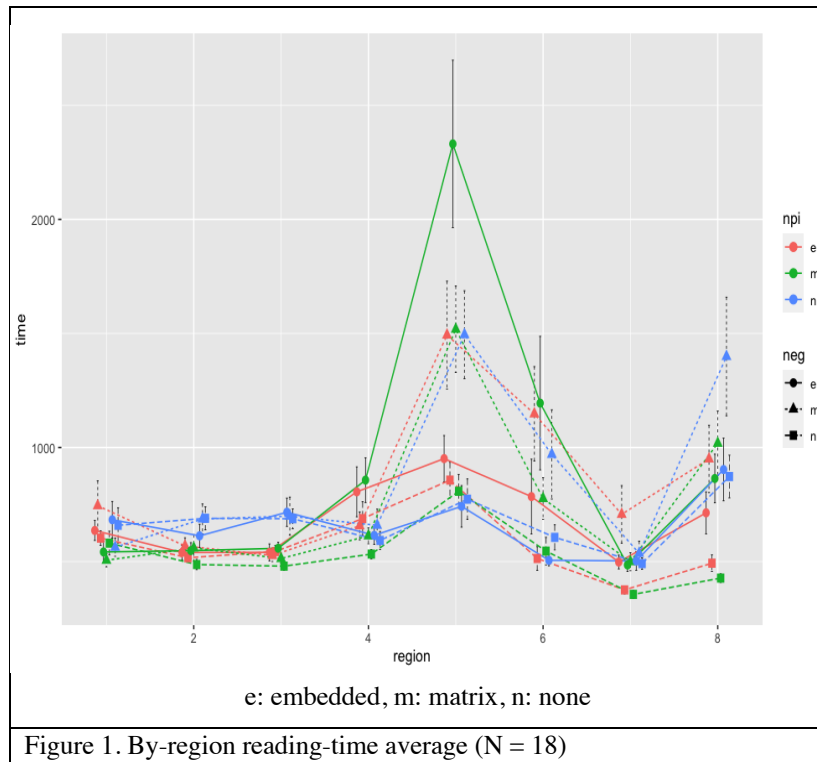
### 3.2 Participants and Procedure

Twenty-one adult native Korean speakers (age > 18) participated in the experiment. We recruited them in various ways including advertisements in social networking services and personal solicitation by email. Participation in the experiment was anonymous and voluntary.

The experiment consists of a self-paced reading task and an acceptability judgment task. It was conducted on the web-based survey platform PCIBEX Farm using a self-paced non-cumulative moving window design. In our experiment, participants read 36 target sentences with fillers. After reading each sentence, they were asked to judge the acceptability of those sentences—whether the sentence was acceptable or not acceptable, for example. There was no time limit for completing tasks.

### 3.3 Results

Even though 21 Korean native speakers participated in this experiment, the responses from 3 participants were excluded in the analysis because their answers were deemed unreliable.<sup>1</sup> The overall results from 18 participants are in figure 1.



The target regions of the analysis are region 4 (embedded verbs) and region 5 (matrix verbs), where the negation appears.

First, let us consider the results of the embedded NPI conditions. Figure 2 shows the average reading times for sentences with embedded NPis and sentences without NPis. The red solid line indicates a grammatical condition, the blue line indicates an ungrammatical condition, and the green solid line indicates an intrusive condition. The dotted lines are baselines. There is no significant reading time difference in the illusion condition in region 5, which

<sup>1</sup> They rejected all sentences including grammatical filler sentences that must be easy to process.



shows that the typical NPI illusion effect is not attested in this online processing. Interestingly, we found that negation has an effect on region 4. When there is a negation on the embedded verb, both the sentence with an NPI and the sentence without an NPI are grammatical. The NPI condition, however, was significantly slower than the non-NPI condition (linear mixed effect model:  $p < 0.01$ ). We conjecture that this slow reading time is caused by licensing cost.

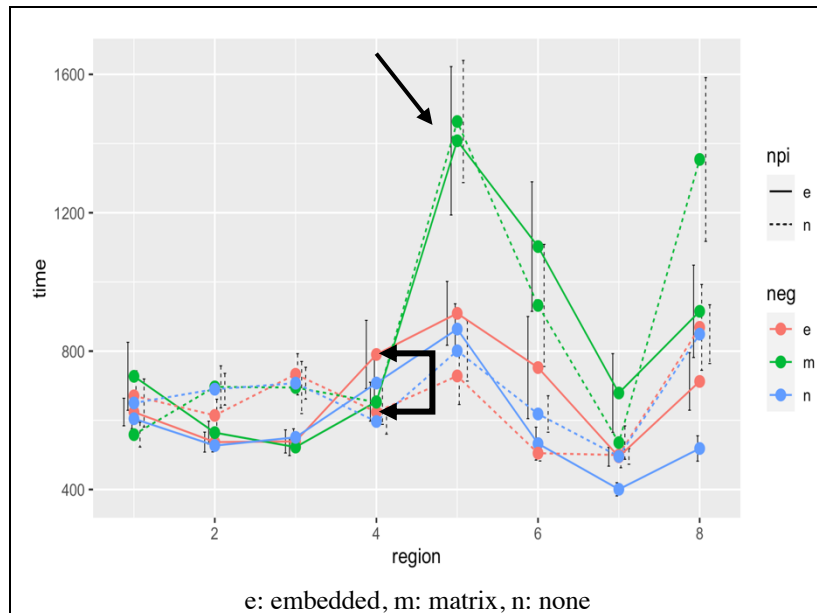
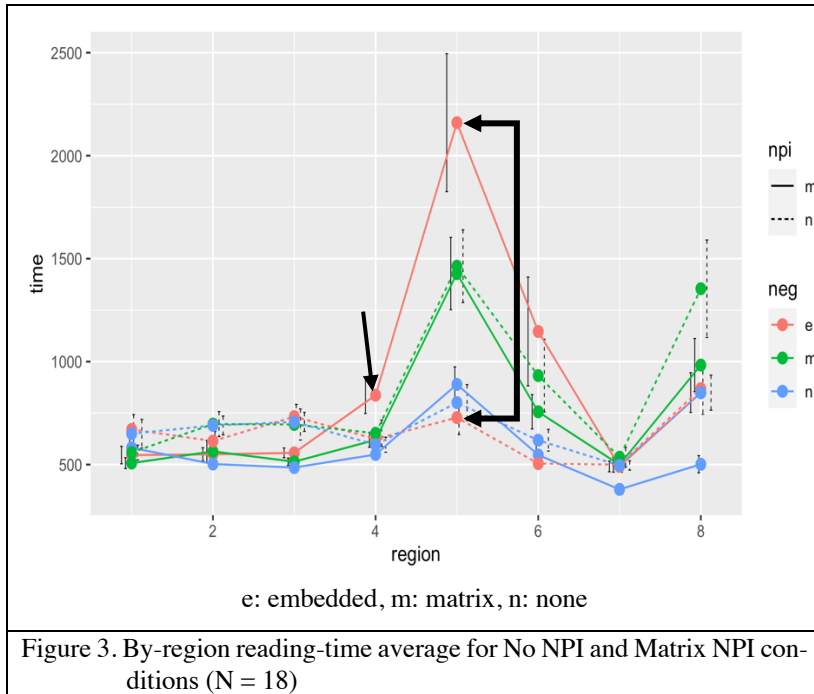
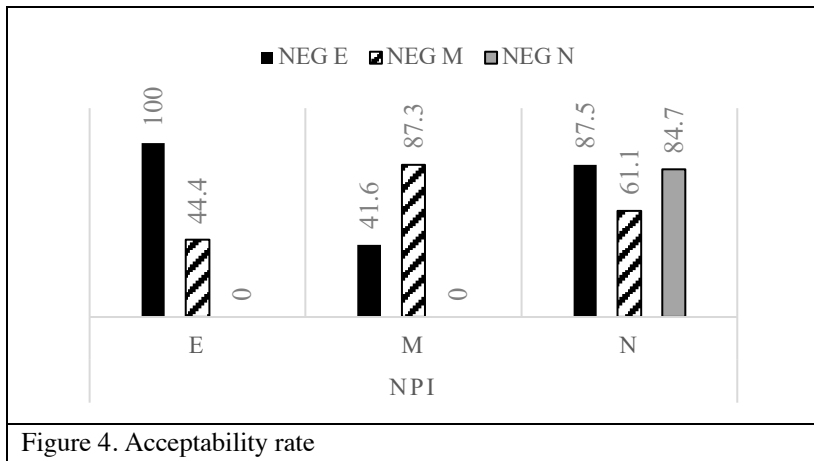


Figure 2. By-region reading-time average for No NPI and Embedded NPI conditions (N = 18)

Figure 3 below shows the average word-by-word reading times for sentences with matrix NPIs and sentences without NPIs. Here, with the NPI in a matrix clause, the green line indicates a grammatical condition, the red line indicates intrusive condition, and the blue line indicates an ungrammatical condition. We found a significant slowdown in region 5 for the intrusion condition but not for the grammatical or ungrammatical conditions. Contrary to the cases where NPIs appeared in an embedded clause, an illusion effect was found when NPIs appeared in a matrix clause. We found the negation effect in region 4 again. We conjecture that this may be related to the strong expectation of upcoming negation.



Finally, the results of acceptability judgment tasks are summarized in figure 4. The results conform to those of the previous study (Yun et al. 2018), which reported the illusion effect in Korean for offline processing with no time limit.



## 4 Discussion

There have been three main approaches to account for NPI illusions. To wit: memory retrieval partial syntactic feature checking (Vasishth et al. 2008), pragmatic inference (Xiang et al. 2009), and frequency expectation (de Dios Flores et al. 2017).

The memory retrieval account proposes that NPI illusions occur when syntactic requirements are partially matched. An NPI requires a licensor that bears a [+negative] feature and is in a c-commanding position. But in online processing, simply having a potential licensor with a [+negative] feature is enough to satisfy the parser, even if it's not in a c-commanding position as in (14).

(14)	* The professor that <i>no</i> student liked <i>ever</i> finished a class on
	time. <span style="float: right;">[+negative, c-commanding]</span>

This is an intuitive and simple account, and it has the added benefit that we can use the same explanation for other kinds of linguistic illusions, such as agreement illusions (e.g. subject-verb number feature agreement). However, the problem is that sentences like (15) are known to show an NPI licensing illusion because of the licensor ‘only’, but obviously the lexical item ‘only’ itself does not bear [+negative] feature.

- (15) The documentaries that *only* network TV stations have played during prime time have *ever* been very controversial

Another suggested account for the NPI licensing mechanism, particularly for apparent non-negative licensors, is that a pragmatic inference, or implicature, can create a negative context.

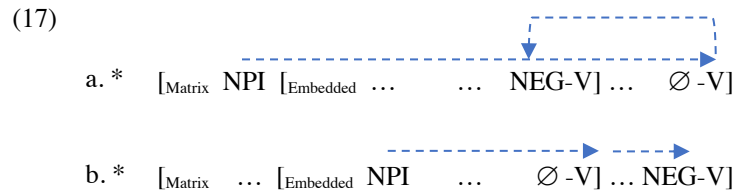
- (16) a. The students [who had studied more than 10 hours a week] passed the exam.  
 b. The students [who had studied 10 or fewer hours a week] did not pass the exam.

The proposition in (16a) implies the one in (16b), demonstrating that restrictive relative clauses generally induce inferences about a contrastive set of referents. According to Xiang et al. (2009), this contrast can lead to an erroneous pragmatic inference that causes NPI illusions. However, this account is also problematic in that it cannot explain selective NPI illusion phenomena

either. Furthermore, since Korean has very restricted NPI licensing context, it is not applicable to Korean data.

Lastly, we have the frequency and expectation approach. A corpus study by de Dios Flores et al. (2017) shows that contexts with a negative quantifier *no* were six times more likely to also contain *ever* than were contexts with sentential negation *not*, leading them to claim that the illusion effect with quantificational negation is caused by the expectation of NPI-negation dependency. However, as discussed in section 2, Korean NPI licensing is prospective. Since NPIs precede licensors in Korean, the dependency is predicted as soon as an NPI is encountered, which creates a strong expectation for NPI-negation dependency. This account therefore cannot explain the fact that illusion effects are a function of NPI position in Korean.

None of the previous approaches can account for the results of our study. That being the case, how are the results to be interpreted, particularly the results that vary as a function of NPI positions in Korean? We propose that the fact that NPI illusion effects only appear in a matrix NPI intrusive condition is caused by expectation and memory retrieval.



As shown in (17a), when an NPI is in the matrix clause, the parser will wait until encountering the matrix clause verb for licensing. After failing to license the NPI, a memory retrieval happens to seek for the potential licensor; the effort required for this corresponds to the very slow reading time in region 5 in our experiment. However, in (17b), even though the embedded NPI is not licensed on the embedded verb, the parser will keep predicting an upcoming negation. Thus, we observe no significant slow-down on the matrix clause verb including the potential licensor.

## 5 Conclusion

In this study, we have highlighted an asymmetry between NPI intrusive profiles of online processing and offline processing. In offline processing, we see a strong intrusion effect regardless of the position of NPI. In online processing, we find an illusion effect when an NPI is in a matrix clause but no illusion effect when an NPI is in an embedded clause. The illusion effect in Korean seems related to the strong expectation of upcoming negation and

retrieval processing. In sum, this study provides new empirical data demonstrating a sensitivity to syntactic position in the online processing of NPI sentences and shows that the illusion effect of Korean NPI licensing is potentially related to memory retrieval.

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