

Factivity and Veridicality in Korean Predicates

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Abstract Recent work in analyzing inference patterns has suggested that factive predicates exist in English (Kane, Gantt & White 2022). In this paper, we investigate factivity and veridicality projection of 30 Korean predicates by gathering gradient judgments from native speakers. The preliminary result shows that Korean predicates follow a major projection pattern of English predicates that factivity is observed in emotives and miratives. However, some classes of predicates, such as speculatives and communicatives, do not display a similar pattern, suggesting a difference in general inference pattern between the two languages.

Keywords: factivity, veridicality, inference patterns, Korean

1 Introduction

Presupposition projection differs depending on the type of predicate used. For example, the reading of (1) triggers an inference (3) while (2) does not.

- (1) Alfonso knows that Joanna came.
- (2) Alfonso pretends that Joanna came.
- (3) Joanna came.

Factive predicates trigger an inference that the content of the embedded clause is true and consistent under the projection test (Kiparsky & Kiparsky 1970, Karttunen 1971). For example, the verb *knows* from (1) is often called cognitive factive and it produces consistent inferences under entailment canceling operators such as negation (4), question (5) and conditionals (6) that (3) is true.

- (4) Alfonso doesn't know that Joanna came.
- (5) Does Alfonso know that Joanna came?
- (6) If Alfonso knows that Joanna came, he will be surprised.

In English, it is claimed that there are factive predicates (Kane, Gantt & White 2022) while some doubts exist due to the difficulty in formulating a categorical distinction with the unsettled definition of factive predicates (Degen & Tonhauser 2022). In Korean, however, this claim has not been studied yet. There exists a previous study on factive predicates, but it focuses on analysis in intersection with prosody (Jeong 2021), rather than isolating the effect of the predicate itself.

Our central aim of this paper is to investigate the factive predicates in Korean. We first provide an additional support to the claim that responsiveness (Lahiri 2001) does not relate with factivity (White & Rawlins 2017). Then we conduct a pilot experiment to collect judgements on factive predicates by native Koreans to analyze which classes of predicates are factive while comparing other projection patterns with English.

2 Background

2.1 Matrix Sentence Construction

In Korean, *-tako* is a suffix that functions as a connective ending (Kang 2017). This suffix, similar to the English word *that*, allows the construction of a matrix clause like (7) where (8) is grammatical as well.

- (7) 조-는 보-가 공부-했-다고 믿-었다.
Jo-NOM Bo-NOM study-PST-C know-PST
'Jo believed that Bo studied.'

- (8) 보-가 공부-했다.
Bo-NOM study-PST
'Bo studied.'

There are other connective endings with similar function in Korean such as *-tamyeo* and *-n jul*. In this paper, however, we utilize this suffix to keep the consistency of the complex sentence formation as *-tako*.

2.2 Inference Frames

The construction of two inference frames is necessary in order to determine factivity and veridicality of a given predicate. In this paper, we adopt frames used in White & Rawlins (2017) and Kane, Gantt & White (2022): positive matrix polarity and negative matrix polarity. By performing such matrix negation, we can identify whether the verb is factive or not (Kiparsky & Kiparsky 1970, White 2019). Factivity of a predicate can be observed if a predicate triggers an inference of an embedded

clause under both frames while veridicality of a predicate can be observed if a predicate triggers an inference under only the positive matrix polarity frame.

- (9) Positive Matrix Polarity Frame: A *{predicate}* that C happened.
 $\{\rightsquigarrow C \text{ happened.}, \nrightarrow C \text{ happened.}\}$
- (10) Negative Matrix Polarity Frame: A didn't *{predicate}* that C happened.
 $\{\rightsquigarrow C \text{ happened.}, \nrightarrow C \text{ happened.}\}$

3 Factivity and Responsivity in Korean

The responsivity of a predicate, whether the verb takes both interrogative and declarative complements (Lahiri 2001), has been found not to correlate factivity and veridicality in English (White & Rawlins 2017). In Lahiri (2001), factive predicates like *know*, *forget*, and *remember* are classified as verdical-responsive predicates, as well as non-factive predicates like *tell* and *communicate*. These communicative verbs, however, display factivity under certain contexts (Spector & Egré 2015).

- (11) Sue told someone that she is pregnant. $\rightsquigarrow$ Sue is pregnant. (S&E ex. 27)

Here, we further support this claim by presenting the use of communicative verbs in Korean also displaying ambiguity between factive and non-factive use. We present a minimal pair in Korean using two communicative verbs *알리다* and *전하다*. These responsive predicates both have a meaning of 'tell', with one notable difference that *전하다* triggers a stronger factive inference that the speaker is more certain about the content compared to *알리다*.

- (12) 보-는 조-에게 모-가 공부-했-다고 알-렸다.
 Bo-NOM Jo-DAT Mo-NOM study-PST-C tell-PST
 'Bo told Jo that Mo studied.'
- (13) 보-는 조-에게 모-가 공부-했-다고 전-했다.
 Bo-NOM Jo-DAT Mo-NOM study-PST-C tell-PST
 'Bo told Jo that Mo studied.'
- (14) 모-가 공부-했-다.
 Mo-NOM study-PST
 Mo studied.'

Both (12) and (13) triggers a factive inference (14). However, (14) inferred from (13) appears to have more 'factivity' compared to that from (12), which could be a supporting claim for the Gradient Projection Principle (Tonhauser, Beaver & Degen

2018) and evidence for ambiguity in factive and non-factive reading. Apart from the comparative factivity between predicates, this example demonstrates that there is no relationship between responsivity and factivity in Korean as well. However, no relationship does not suggest a clear nor unclear distinction between factive and non-factive predicates.

4 Experiment

To further examine the observation made in section 3, we conducted a pilot experiment on native Korean speakers to analyze the projection judgment in gradient scale.

As this paper targets to perform a cross-linguistic study of inference projection that was done for English in Kane, Gantt & White (2022), we utilize the list of clusters labeled with examples in that paper. The list has 15 verb classes with 2 examples and the exhaustive version of the list with translations for each English example to Korean can be found in Appendix A.

Each translated predicate was put under one of the two frames: positive matrix polarity frame (15) or negative matrix polarity frame (16). In constructing these frames, we utilize the template bleaching method used in White & Rawlins (2016) to minimize the noise in one’s judgment and thus isolate predicate-specific effects. The construction below uses the predicate *think* as an example.

(15) Positive Matrix Polarity Frame in Korean

누군가-는 무언가-가 일어-났다고 생각-했다.
Somebody-NOM something-NOM happen-PST-C think-PST

‘Somebody thought that something happened.’

(16) Negative Matrix Polarity Frame in Korean

누군가-는 무언가-가 일어-났다고 생각하지 않-았다.
Somebody-NOM something-NOM happen-PST-C think NEG-PST

‘Somebody didn’t think that something happened.’

4.1 Methods

4.1.1 Participants

A total of 6 native Korean speakers were recruited as participants. Then the participants were randomly split into half where one group evaluated predicates under the

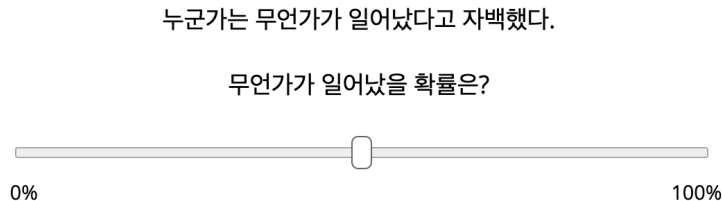


Figure 1 An example of the trial for positive matrix polarity frame

positive matrix polarity frame and the other group evaluated predicates under the negative matrix polarity frame.

4.1.2 Materials

We utilize the list mentioned in section 4. From each verb class, a single word is randomly assigned into either frame (15) or (16). A total of 15 frames were included in each trial while participants did not see predicates from the same class. The order of predicates was randomized and the tense of verbs was restricted to be in the simple past.

Inspired by the method used in [Degen & Tonhauser \(2022\)](#) and [Kane, Gantt & White \(2022\)](#), we constructed a slider bar that captures a gradient of one's judgment in scalar value from 0 to 100.

As Figure (1) shows, each trial includes a stimuli, a question, and a slider bar. Translation of the stimuli and question in Figure 1 are in (17) and (18). Each participant gave their responses on a slider marked 0% on the left end and 100% on the other end. Participants were forced to use the slider in order to move on to the next stimuli.

(17) Translation of Stimuli in Figure (1):

누군가-는 무언가-가 일어-났-다고 자백-했다.
 Somebody-NOM something-NOM happen-PST-C confess-PST
 'Somebody confessed that something happened.'

(18) Translation of Question in Figure (1):

무언가-가 일어-났-을 확률-은?
 Something-NOM happen-PST-ACC possibility-NOM

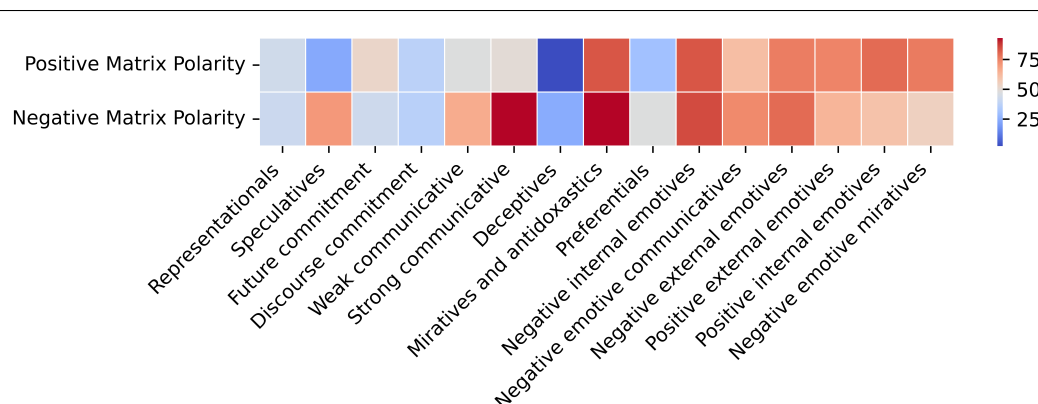


Figure 2 Mean inference projection judgments for each verb class

‘What is the probability for something happened?’

Each participant was randomly given an experiment in the positive matrix polarity or negative matrix polarity frame. The average completion time of each experiment was 2 minutes.

4.2 Results

In Kane, Gantt & White (2022), it was concluded that there is a distinguishable subclass of factive predicates (emotives and miratives) while some classical factive predicates fall under ‘weaker’ inferences, supporting the existence of gradience in projection.

The result of this experiment shows that inference patterns in Korean share some key features with English. To interpret Figure 2, factivity can be demonstrated as both cells being dark orange, veridical as only the top cell being dark orange, nonveridical as both cells being light orange or white, and antiimplicative as the top cell being blue and the bottom cell being orange.

The first key feature is that emotives and miratives are subclasses for factivity as predicates under that verb classes resulted in a high probability that an event happened. The second key feature is that deceptives demonstrated the strongest unlikelihood that the event happened under the positive matrix polarity frame. This pattern is similar to English while deceptives were not antiimplicative as it demonstrated moderate unlikelihood under the negative matrix polarity frame as well. Instead, speculatives is a possible candidate for antiimplicatives in Korean. Another notable point is that discourse commitment did not demonstrate the most similar pattern to factivity while communicatives (especially strong communicatives) were

better candidates. However, these points may have risen due to the small number of participants recruited for this experiment, which is further discussed in section 5.

Still, interpreting the result of this experiment shown in Figure 2, we can claim that there are some classes of predicates that follow a similar pattern compared to English predicates. Thus, there is evidence for factive predicates in Korean as well.

5 Discussion

The scale of this experiment for this paper is small. As mentioned in section 4.1.1, only 6 native Korean speakers were recruited, compared to 300 for Degen & Tonhauser (2022) and 272 for Kane, Gantt & White (2022). As the number of participants is small, variability for most verb classes under both frames is high, as is evident in Figure 3. Despite high variability in most verb classes (with an exception of strong communicatives), miratives and negative internal emotives still display features of factive predicates. There is, however, a potential appearance of gradience in emotives and miratives especially under the negative matrix polarity frame.

A scaled-up version of this experiment may overturn the claim made in section 4.2. There are mainly two components that can be scaled up: the number of predicates and participants. We have explored only 30 verbs, which is a small number compared to the predicates available in the natural language. Also, as mentioned previously, an increased number of participants with normalized scores is necessary to generalize the result.

Despite the scale of the experiment in this paper, the result still resembles some major features of inference projections of English may suggest that Korean might have some different inference projection patterns for verb classes other than emotives, miratives, and deceptives. One notable pattern is found in speculatives and communicatives. In English, it has been claimed that no communicative predicates are factive (Anand & Hacquard 2014). Considering the inference pattern shown in Figure 2, this might not be the case for communicatives in Korean, especially strong communicatives which include *confess* (자백하다) and *admit* (인정하다).

Another point to mention is the difference between the basic syntactic structure between English and Korean. In the English construction of a matrix clause, readers view the target predicate before looking at the subordinate clause. Meanwhile, in Korean, readers view the content of the subordinate clause before looking at the target predicate. For instance, assuming that readers read sentences sequentially from left to right, the construction of (19), shows the difference in the order of the placement of a predicate. Square brackets were used to visualize the boundary of the subordinate clause. The effect of this syntactic structure has not been studied in this paper but could be an influential feature of some differences in inference projection patterns between two languages.

- (19) 조-는 [보-가 놀-았-다고] 의심-했다.
 Jo-NOM [Bo-NOM play-PST-C] suspect-PST
 'Jo suspected that [Bo played].'

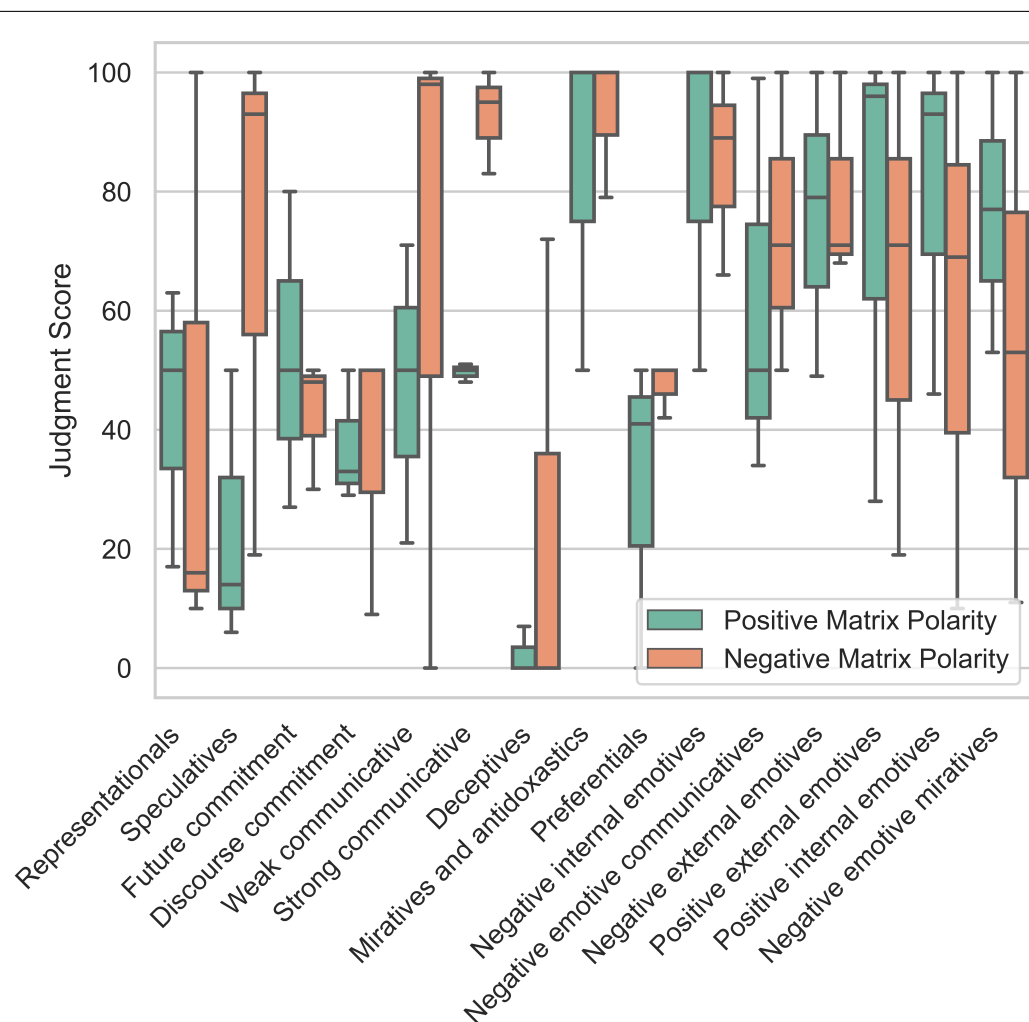


Figure 3 Variability of inference projection judgments for each verb class

6 Conclusion

We conducted a pilot experiment and investigated factivity and veridicality projection in Korean and compared the result with English. The preliminary results support

that there are subclasses of factive predicates in Korean due to several classes (emotives and miratives) aligning with the inference patterns found in Kane, Gantt & White (2022). Because of the size of the experiment, we did not fully assess the unsupervised dataset and thus we leave scaled versions of this experiment as a future work.

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A Clusters and Example Translations

Cluster Type	English	Korean
Representational	thought	생각했다
	believed	믿었다
Speculatives	guessed	추측했다
	gossiped	힘담을 했다
Future Commitment	promised	약속했다
	ensured	보장했다
Discourse Commitment	maintained	주장했다
	swore	맹세했다
Weak Communicative	reported	알렸다
	remarked	언급했다
Strong Communicative	confessed	자백했다
	admitted	인정했다
Deceptives	lied	거짓말했다
	misled	오해했다
Miratives and Antidoxastics	surprised	놀랐다
	stunned	어리둥절했다
Preferentials	hoped	기대했다
	recommended	추천했다
Negative Internal Emotives	frightened	겁 먹었다
	disgusted	혐오했다
Negative Internal Communicatives	screamed	소리쳤다
	ranted	고함쳤다
Negative External Emotives	whined	징징거렸다
	whimpered	흘쩍였다
Positive External Emotives	congratulated	축하했다
	whimpered	칭찬했다
Positive Internal Emotives	pleased	기뻐했다
	enthused	열광했다
Negative Emotive Miratives	dazed	멍해졌다
	alarmed	불안해했다