The Effect of Prosody on Veridicality Inferences in Korean

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Abstract. Certain attitude verbs in Korean such as *al-* and *gieogha-* (standardly translated as 'know' and 'remember', respectively) may give rise to veridicality inferences, i.e., inferences that their propositional complements are true. These inferences arise systematically, but selectively. In particular, they arise only under certain prosody. When they do arise, they project through various entailment-canceling operators and are understood to be backgrounded, suggesting that they are presuppositional in nature. I characterize these patterns as *prosodically-conditioned factivity inferences*. I propose an analysis that can capture this systematic variation in factivity, which crucially occurs below the level of projection (i.e., variation within 'local contexts'). The analysis is in the vein of Abusch (2010) and Simons et al (2017), in that it makes use of a general pragmatic reasoning process involving alternatives. I argue that asymmetries in meaning between the positive verbs (*al-* 'know', *gieokha-* 'remember') and their negative suppletive counterparts (*moreu-* 'not know', *ggameok-* 'forget') play an important role in deriving the prosodically-conditioned factivity inferences. In connection with this claim, I propose a new pragmatic principle that governs how alternatives come into contrast with each other. Via the activation of this principle, interpretations of verbs that are presuppositionally underspecified can obtain factive interpretations whenever their contrasting factive alternatives are activated.

Keywords: veridicality, factive presupposition, attitude verbs, prosody, focus, alternatives

1 Introduction

When attitude predicates such as *know, regret, remember, be right,* etc. in English take propositional complements, they standardly give rise to the inference that the embedded proposition is true, as shown in (1).

(1) Wheein knows that Moonbyul went home.
$\rightsquigarrow$ Moonbyul went home.

This is known as a veridicality inference (White 2019, i.a.). When such an inference displays characteristics of a presupposition, such as projecting outside entailment-canceling operators (as shown in (2)) and being understood as 'backgrounded' in a given discourse, we call it a *factive* inference.

(2) Wheein doesn't know that Moonbyul went home.
⇝ Moonbyul went home.

The questions that arise are what the source(s) of these factive presuppositions are, and how they come about. Answers to them vary along a few key points: First, the inference may be argued to be directly encoded by a given expression or may be taken to arise systematically from compositional interactions between more abstract meanings of multiple expressions. In the former case, theories vary as to what the source expression is: verb (Hintikka 1962, Karttunen 1974), complement clause (Kiparsky and Kiparsky 1970), etc. In the latter case (e.g., Ozyildiz 2017), they vary as to what the relevant abstract meanings are, and how they compose. Alternatively, the inference may be argued to arise from general pragmatic process, possibly interacting with some conventional/semantic component (Abusch 2010, Abrusán 2011, i.a.). In this case, theories vary as to what the relevant pragmatic mechanism is (e.g., a general conversational implicature (Stalnaker 1977), a kind of scalar implicature (Chemla 2009, Romoli 2014), reasoning about at-issueness (Simons et al 2010), etc.), and what kinds of conventionalized ingredients, if any, interact with pragmatics to derive the inference.

Against this backdrop, I present patterns of veridicality inferences in Korean that are likely to be factive in nature, but have certain characteristics that set them apart from how factivity is expressed in languages like English. In Korean, verbs such as *al-*, which native speakers standardly translate as *know* in English, give rise to veridicality inferences only under certain prosody (Lee To appear). A rough generalization is as follows: Veridicality inferences standardly arise when the matrix attitude verb is accentuated, as exemplified in (3). However, they do not arise when any element of the embedded clause is accentuated instead, as exemplified in (4). (Underlines henceforth mark prosodic prominence.)

(3) Solar-neun Moonbyul-i noraeha-n-jul <u>án-da</u>
Solar-NOM Moonbyul-NOM sang-PP-C know-DEC
≈ 'Solar knows that Moonbyul sang.'
⇝ Moonbyul sang.

(4) Solar-neun Moonbyul-i noraeha-n-<u>júl</u> an-da
Solar-NOM Moonbyul-NOM sang-PP-C know-DEC
≈ 'Solar believes (based on evidence) that Moonbyul sang.'
↛ Moonbyul sang.

When the veridicality inference does arise, as in (3), it is understood by a listener to be backgrounded, and persists even when the sentence is embedded under entailment canceling operators. In this sense, the inference appears to be *factive* in nature. However, the prosodic emphasis crucially needs to remain on the matrix verb in order to elicit these presuppositional behaviors. In sum, certain expressions in Korean appear to systematically give rise to factive inferences, but these inferences arise conditionally depending on the prosody.

These Korean data provide novel perspectives in pursuing the two questions regarding factive presuppositions outlined above. This is because, as Ozyildiz (2017) notes, previous work on factivity have focused primarily on dealing with variation at the level of *projection*. Consequently, they are not geared towards providing an explanation of systematic variation in factivity inferences in the absence of any entailment canceling operators (see however, Ozyildiz (2017) and Lee (2018)).

My aim in this paper is to engage with the two questions we started out with, namely, what the source(s) of factive presuppositions are, and how they come about, in light of the Korean factivity data, which I characterize as *prosodically conditioned factive inferences*.

To this end, I begin by clarifying the empirical landscape of veridicality inferences in Korean. I use this empirical background to delimit the range of data that will be the focus of my analysis. Given the wealth of factors that can have an effect on generating veridicality inferences in Korean (verbs, complementizers, complement clause type, prosody) I focus only on specific pairs verbs (*al-* 'to know', *moreu-* 'to not know', *gieokha-* 'to remember', *ggameok-* 'to forget') and a single complementizer (*jul*), in order to bring into relief the interaction between verbs and prosody and control for other factors that can potentially affect veridicality inferences.

I then propose an analysis that captures the *prosodically conditioned factive inferences* of these verbs and the complementizer *jul*. The analysis is in the vein of Abusch (2010) and Simons et al (2017), and crucially makes use of a general pragmatic reasoning process involving alternatives. Prosody is argued to enter into the picture by generating different focus alternatives, which systematically constrain the discourse salient alternatives that are targeted by the pragmatic component.

In order to extend the alternative-based pragmatic account of factive presupposition to capture the Korean data, I argue that asymmetries in meaning between the positive verbs (*al-* 'know', *gieokha-* 'remember') and their negative counterparts (*moreu-* 'not know', *ggameok-* 'forget') play an important role, and propose a new principle that governs how alternatives come into contrast with each other. Via the activation of this principle, interpretations of verbs that are presuppositionally underspecified can come to obtain factive interpretations only when the contrasting factive alternatives are activated via focus prosody.

2 The empirical landscape

In this section, I present a brief overview of factors that can affect the patterns of verdicality inferences in Korean. My aim here is to navigate through various types of complementizers, complement clauses, and attitude verbs, in order to identify a pocket of empirical space that highlights the interaction between verbs and prosody that is of interest to this paper. A comprehensive overview of the interplay between verbs and complementizers in generating factive inferences is

provided in Lee (2018). An analysis of Turkish factive inferences, again with an emphasis on verb and complementizer interaction, is provided in Ozyildiz (2017).

2.1 Complementizers

It has been noted that in languages like Korean, Turkish, Hungarian, etc., types of complementizers systematically affect factive inferences (Ozyildiz 2017, Lee 2018, i.a.). For instance, when an attitude verb combines with an embedded clause headed by a nominal complementizer *geot* in Korean, inferences about the truth of the propositional complements arise without exception, irrespective of prosody. Furthermore, these veridical inferences project, and behave like presupposition.

(5) Solar-neun Moonbyul-i noraehan-geot-eul an-da
Solar-NOM Moonbyul-NOM sang-NC know-DEC
≈ 'Solar knows (the fact) that Moonbyul sang.'
⇝ Moonbyul sang.

Crucially, when the CP is headed by *geot*, factive inference arises regardless of the choice of attitude verbs. For example, the inference arises not only when *geot* combines with verbs such as *al-* 'know'[1], but also when it combines with other verbs such as *saengakha-* 'think' and *mit-* 'believe', which are standardly translated as non-factives and do not give rise to veridical inferences in other linguistic contexts. Korean patterns are unlike Turkish in this respect. In the case of Turkish, the nominal complementizer gives rise to factivity inferences, but only when combined with certain types of attitude verbs.

(6) Solar-neun Moonbyul-i noraehan-geot-eul mitneun-da
Solar-NOM Moonbyul-NOM sang-NC believe-DEC
≈ 'Solar believes (the fact) that Moonbyul sang.'
⇝ Moonbyul sang.

Previous work have often remarked on the close connection between nominalization morphology and factivity (Moulton 2009, Kastner 2015, Hanink and Bochnak 2017 i.a.). Based on this, we may conclude that in examples like (5)–(6), the complementizer *geot*, one way or another, functions as an independent source of the observed factive inference. As we are concerned primarily with verb/prosody interactions in generating factive inferences, we will set these examples outside the scope of our discussion.

The situation is different, however, for other types of Korean complementizers. In particular, when a CP is headed by the complementizer *go* or the

[1] Though *al-* will be shown not to lexically encode factivity, for the time being, I will maintain the standard translation 'know' as its gloss. This is partly because the attitudinal relations it picks out are epistemic in nature rather than merely doxastic; see sec. 2.2 for more discussion.

complementizer *jul*, veridicality inferences do not always arise. These patterns are summarized in (7)–(8).

(7) Solar-neun Moonbyul-i noraeha-ess-da-go an-da
Solar-NOM Moonbyul-NOM sang-PAST-DEC-C know-DEC
≈ 'Solar believes (based on evidence) that Moonbyul sang.'
?⇝ Moonbyul sang.

(8) Solar-neun Moonbyul-i noraeha-n-jul an-da
Solar-NOM Moonbyul-NOM sang-PP-C know-DEC
≈ 'Solar believes (based on evidence) that Moonbyul sang.'
?⇝ Moonbyul sang.

The complementizer *go* has a quotative flavor and can combine with a wide rage of attitude verbs. It embeds a clause which is fully inflected in mood. The complementizer *jul* combines with a more restricted range of attitude verbs: it is used primarily with *al-* 'know' and *moreu-* 'not know', but occasionally also with verbs such as *gieokha-* 'remember', *ggameok-* 'forget', and *yaegyeonha-* 'predict'. As we will see in more detail below, sentences with embedded clauses headed by *go* and *jul* may systematically obtain factive inferences, but only when combined with certain types of attitude verbs and only under certain prosody.

The upshot of the section is this. Sentences involving certain complementizers such as *geot* appear to always derive factive inferences. This indicates that complementizers can function as an independent source of factivity. Cases involving other complementizers such as *go* or *jul* however, do not reliably generate factive inferences. This indicates that when the inferences do arise in such cases, their sources must trace back to factors other than (just) complementizers. As we will see shortly, the key factors in these cases amount to verb type and prosody.

2.2 Verbs

One factor that appears to determine whether factive inferences arise from embedded clauses with complementizers like *go-* and *jul-* is verbs. When *go-* and *jul-* combine with attitude verbs such as *al-* 'to know', and *gieokha-* 'to remember', factive inferences may reliably emerge, depending crucially on prosody (see sec. 2.3). When they combine with verbs like *saengakha-* 'think' and *mit-* 'believe', however, factive inferences do *not* arise, regardless of prosody. In short, it is impossible to obtain a factive inference from examples such as (10), while such an inference may arise from examples such as (9), depending on prosodic conditions.

(9) Solar-neun Moonbyul-i noraeha-ess-da-go an-da
Solar-NOM Moonbyul-NOM sang-PAST-DEC-C know-DEC
≈ 'Solar believes (based on evidence) that Moonbyul sang.'
?⇝ Moonbyul sang.

(10) Solar-neun Moonbyul-i noraeha-ess-da-go mitneun-da
Solar-NOM Moonbyul-NOM sang-PAST-DEC-C believe-DEC
≈ 'Solar believes that Moonbyul sang.'
$\not\rightarrow$ Moonbyul sang.

This suggests that the ways in which verbs such as *al-* 'know' and *gieokha-* 'remember' are interpreted play a role in deriving factive inferences.

At this point, it is worth noting that the verb *al-* encodes something more than mere doxastic relations denoted by non-factive attitudinal verbs such as 'think' and 'believe'. This may come off as a bit surprising. Given that even within 'local contexts'[2], *al-* doesn't always give rise to factive inferences, 'believe' may seem like a suitable first approximation of *al-*, since 'believe' is often treated as a non-factive counterpart of 'know'.

However, even when used non-factively, *al-* calls for a state in which the agent comes to form a belief about p based on having obtained some knowledge-formulating evidence about the truth of p. The use of *al-* can be non-factive in the sense that this evidence may turn out to be misguided. Nevertheless, the presence of such evidence is necessarily presumed by the use of *al-*, unlike in the case of 'believe'. For instance, (9) can be felicitously used in a scenario whereby Solar hears from the tour manager that Moonbyul sang at a concert, and concludes that this was indeed the case. But (9) cannot be used in a scenario whereby Solar believes that Moonbyul sang simply because she thinks that all rappers inevitably end up singing during the last leg of the tour. One would need to use the verb *mit-* in such case. (Ozyildiz (2017) considers analogous contrasts in Turkish.)

Put differently, verbs such as *saengakha-* 'think' and *mit-* 'believe' appear to tap into doxastic accessibility relations, whereas verbs such as *al-* appear to tap into some kind of extended epistemic accessibility relations which govern beliefs/knowledge formed based on 'conclusive' or 'sufficient' evidence (conclusive/sufficient from the point of view of the agent). As a shorthand for epistemic relations along this line, which do not encode factivity and appear to be associated *al-*, I will henceforth use $\mathscr{K}$. Likewise, I will use $\mathscr{M}$ as a shorthand for the relations denoted by *gieokha-*, which is translatable to 'remember', but without the associated factive inference. I will also provisionally assume that $\mathscr{K}$ and $\mathscr{M}$ provide adequate glosses for *al-* and *gieokha-*, respectively, as examples like (9)–(10) suggest that factivity is likely not hard-wired into the semantics of these verbs but rather derived systematically.

To summarize, we conclude that verbs such as *al-* '$\mathscr{K}$' and *gieokha-* '$\mathscr{M}$' contribute some meaning component that can come to derive the factive inferences, while likely not directly encoding factivity. In contrast, verbs such as *mit-* and *saengakha-* do not appear to contribute any analogous factivity-deriving meaning components. In the remainder of the paper, we focus on the former type of verbs: *al-* '$\mathscr{K}$' and *gieok-* '$\mathscr{M}$' and their negative counterparts, and examine

[2] This isn't a theory-neutral term, but I will use it informally to refer to linguistic contexts that do not introduce the issue of projection.

their interaction with prosody. As emotive factives combine with a completely different range of complementizers and clausal structures, they will not be our concern here.

2.3 Prosody: generalizations

Sentences containing the verbs mentioned above, namely, *al-* '$\mathscr{K}$' and *gieok-* '$\mathscr{M}$', may systematically give rise to the inference that the embedded complements are true, even in the absence of nominal complementizers like *geot*. However, these inferences do not always arise.

The generalization is this: Veridicality inferences arise when the matrix attitude verb bears the nuclear pitch accent (henceforth NPA), as exemplified in (3) and (11). However, they do not arise when any element of the embedded clause bears the primary accent instead, as exemplified in (4) and (12). In the case of (4), the complementizer bore the NPA. In the case of (12), the embedded subject bears it instead. In neither cases do veridical inferences arise. In fact, for both (4) and (12), listeners often obtain enriched, anti-veridical inferences that the propositional complements are false (e.g., the inference that in fact, Moonbyul did not sing, for (12)).

(11) Solar-neun Moonbyul-i noraehan-jul án-da
Solar-NOM Moonbyul-NOM sang-PP-C know-DEC
≈ 'Solar knows that Moonbyul sang.'
⇝ Moonbyul sang.

(12) Solar-neun Móonbyul-i noraehan-jul an-da
Solar-NOM Moonbyul-NOM sang-PP-C know-DEC
≈ 'Solar believes (based on evidence) that Moonbyul sang.'
↛ Moonbyul sang.

As mentioned earlier, When the veridicality inferences do arise, as in (3) and (11), they appear to be *factive* in the sense that they project, i.e., persist even when the sentences are embedded under entailment canceling operators. Example (13) demonstrates this. Even when the clause is embedded under the *eojjeomyeon . . . molla* 'perhaps. . . ' construction, the factive inference survives, as long as the NPA remains on the matrix verb.

(13) Eojjeomyeon Solar-neun Moonbyul-i noraehan-jul ál-jidomo-la
Perhaps Solar-NOM Moonbyul-NOM sang-PP-C know-perhaps-DEC
≈ 'Perhaps Solar knows that Moonbyul sang.'
⇝ Moonbyul sang.

The last point is important. The prosodic emphasis (i.e., the NPA) crucially needs to remain on the matrix verb to elicit these presuppositional behaviors. If it is shifted, the factive inference goes away.

In sum, in the absence of factive complementizers like *geot*, sentences with verbs such as *al-* '$\mathscr{K}$' and *gieokha-* '$\mathscr{M}$' obtain factive inferences only when the

verbs themselves are accented (receive the NPA). Interestingly, similar prosodic generalizations have been drawn for Turkish (Ozyildiz 2017), and for English (Beaver 2010, Tonhauser 2016, and Simons et al 2017). In the case of English however, the generalization is drawn at the level of projection (i.e., accent on the matrix verb increases the likelihood that the factive presupposition will *project*), whereas the one drawn here governs factivity variation within 'local contexts' as well. Despite the subtle differences, there appears to be a robust and thus likely non-accidental connection between the presence of prosodic emphasis on attitude verbs and the presence of factive inference regarding their clausal complements. This state of affairs calls for a cross-linguistically generalizeable explanation, which would likely have to tap into a common mechanism via which prosody manages meaning.

3 Towards an analysis

The previous section presented data which suggest that interactions between certain attitude verbs and prosody give rise to systematic variation in factive inferences, even in the absence of any entailment canceling operators. How can we capture this prosody-dependent patterns of factive inferences? As mentioned earlier, most accounts dealing with variation in factivity cannot by themselves resolve this question, because they are concerned primarily with variation at the level of projection. For instance, analyses which explain the presence/absence of factive inferences based on the distinction between local vs. global accommodation cannot be used to capture the current data (Heim 1983, Van der Sandt 1992, i.a.), as the variation examined here all occurs within local contexts. Likewise, analyses which capture the presence/absence of factive inferences based on general pragmatic principles cannot apply straightforwardly to the present data, as they also focus primarily on capturing variation in projection. Nevertheless, I will show that the analysis I develop here is in the spirit of these pragmatic analyses, which crucially posit a general pragmatic process that makes use of a discourse salient alternative set. Explanations using alternative sets provides a natural pathway via which prosody can enter into the picture. This is because it is widely accepted that prosody marks focus, and focus in turn systematically constrains pragmatic alternatives.

The core pragmatic process I posit in my analysis is most analogous to the ones proposed in Abusch (2010) and Simons et al (2017). However, I claim that in order to be able to extend this line of account to capture systematic factivity variation within 'local contexts', we need an additional principle which governs how alternatives contrast with each other. I argue that this principle is motivated by discourse pragmatics (Stalnaker 1977). Furthermore, I claim that asymmetries in meaning within pairs of attitude verbs play a crucial role in how this proposed principle comes to have an interpretive effect. In sum, the basic ingredients of my analysis are as in (14)–(16):

(14) Prosody (NPA) marks focus, and focus constrains relevant pragmatic alternatives

(15) There exists a general pragmatic reasoning process which gives rise to the presupposition that the disjunction of these alternatives is true

(16) Alternatives of attitudinal predicates that feed into the above pragmatic process cannot contrast along more than one semantic dimension.

I now go over each component of the analysis in more detail.

3.1 Focus and pragmatic alternatives

We begin with the standard assumption that prosody, in particular, the placement of nuclear pitch accent (NPA), determines focus and that focus generates alternatives (Rooth 1992, i.a.). For instance, the ordinary vs. focus semantic values of expressions such as *Moonbyul* would be as in (17-a) and (17-b), respectively.

(17) a. $[\![\text{Moonbyul}]\!]^o = \textsc{Moonbyul}$
b. $[\![\text{Moonbyul}]\!]^f = \{x \mid x \in D_e\}$
$= \{\textsc{Moonbyul}, \textsc{Wheein}, \textsc{Hwasa}, \textsc{Solar} \dots\}$

Via point-wise functional application, the focus semantic values we obtain for the two sentences we examined in (11) and (12), which contrast in prosody and factive inferences, are as in (18-a) and (19-a), respectively.

(18) Solar-neun Moonbyul-i noraehan-jul [an$_F$]-da
Solar-NOM Moonbyul-NOM sang-PP-C know-DEC
a. $[\![(18)]\!]^f = \{\, p$: Solar R that Moonbyul sang $\}$
$=$ { Solar *al-* that Moonbyul sang, Solar *moreu-* that Moonbyul sang, Solar *gieokha-* that Moonbyul sang, ... }
b. $\text{ALT}_{(18)} =$ { Solar *al-* that Moonbyul sang, Solar *moreu-* that Moonbyul sang }

(19) Solar-neun [Moonbyul$_F$]-i noraehan-jul an-da
Solar-NOM Moonbyul-NOM sang-PP-C know-DEC
a. $[\![(19)]\!]^f = \{\, p$: (Solar *al-* that) x sang $\}$
$=$ { (Solar *al-* that) Moonbyul sang, (Solar *al-* that) Hwasa sang, (Solar *al-* that) Wheein sang ... }
b. $\text{ALT}_{(19)} =$ { (Solar *al-* that) Moonbyul sang, (Solar *al-* that) Hwasa sang }

The set of focus alternatives of a given expression φ are indiscriminate in that it includes all elements that are of the same semantic type as φ. Therefore, it is standardly assumed that discourse salient alternatives, whether they be conceptualized as Question Under Discussions (QUDs; Roberts 1996, Ginzburg 1996, i.a.) or other objects, are subsets of focus alternatives, as constrained further by context and other factors. Let us henceforth refer to this context-sensitive alternative set of φ as ALT_φ, and following Simons et al (2017), posit that ALT_φ is a contextually determined non-empty, non-singleton subset of $[\![\varphi]\!]^f$ which includes φ itself.

Furthermore, let us posit that the ALT set derived from focused verbs such as *al-* '$\mathscr{K}$' and *gieokha-* '$\mathscr{M}$' always includes their suppletive negative counterparts *moreu-* 'not know' and *ggameok-* 'forget', as exemplified in (18-b). This assumption is motivated in part by the native speakers' intuition that *al-*/*moreu-* and *gieokha-*/*ggameok-* are often evoked as pairs, such that the use of one automatically makes the other discourse salient.

3.2 The pragmatic component

A strain of work which aims to provide a pragmatic account of (factive) presupposition posits a pragmatic process which targets these alternative sets. The general idea goes as follows. Certain expressions, including focus (e.g., (18), (19), (21)) and questions (under Hamblin-style denotations; e.g., (20)) contribute alternative sets, which interact with context to produce ALT. One way or another, listeners reason pragmatically that the disjunction of the elements in ALT, i.e., $\vee$ALT is presupposed (i.e., under the Stalnakerian view, is entailed by the context set).

(20) Who sang?
  a. $\text{ALT}_{(20)}$ = { Moonbyul sang, Solar sang, Wheein sang ... }
  b. $\rightsquigarrow$ Someone sang

(21) [Moonbyul]$_F$ sang
  a. $\text{ALT}_{(21)}$ = { Moonbyul sang, Solar sang, Wheein sang ... }
  b. $\rightsquigarrow$ Someone sang

Questions such as (20) and sentences such as (21) are therefore predicted to generate a (defeasible) existential presupposition in (20-b) and (21-b).

Abusch's implementation of this general idea, realized under the dynamic semantics framework, is as follows: if ψ embeds a clause φ which introduces ALT_φ, then the local context of φ entails the disjunction of ALT_φ. In comparison, Simons et al (2017)'s implementation, which focuses on capturing variation in presupposition projection, links ALT_φ with the notions of QUD and at-issueness. It is roughly as follows: a factive presupposition φ projects iff the current Question Under Discussion (QUD), as indicated by focus, entails φ. And a question entails φ if a disjunction of its elements (i.e., possible answers to the question) entails φ. As difference in focus indicates difference in QUD, the analysis predicts that projection may vary depending on prosody.

The two accounts diverge regarding the question of what the source and the nature of ALT is. According to Abusch (2010), ALT can reduce to QUD, but may also be a lexically determined alternative set that can operate at a local level. According to Simons et al (2017), the relevant ALT that generates the pragmatic inference is always the QUD, because fundamentally, at-issueness is what governs projection (an inference projects iff it is not at-issue, i.e., iff it is entailed by the QUD).

Here, we will not go into much detail about the nature of ALT, as the data examined here do not involve complex filtering/compositional phenomena that

may tease apart the predictions of the two accounts. All that matters for us is that ALT is a contextually salient alternative set determined systematically by focus.

Can we adopt this line of '∨ALT' analysis to capture the Korean data? To be able to answer this, we first need to determine if $[\![al\text{-}]\!]^o$ and $[\![al\text{-}]\!]^f$ encode factivity. This is beginning to sound suspiciously circular, so let me elaborate. If $[\![al\text{-}]\!]^o$ does not encode factivity, as defined in (22), then we correctly predict that sentences such as (19) do not give rise to factive inferences. In (19), focus alternatives of Moonbyul combine point-wise with ordinary semantic value (22) of *al-* to generate (19-a), and subsequently the ALT set in (19-b). Given (22), ∨ALT amounts to: $\mathscr{K}$(Solar, Moonbyul sang, w) ∨ $\mathscr{K}$(Solar, Hwasa sang, w). This only results in the presupposition that Solar knows that someone sang, but does not result in any factive inference.

(22) $[\![al\text{-}]\!]^o = \lambda p.\lambda x.\lambda w.\mathscr{K}(x, p, w)$

(23) Working analysis – to be discarded
$[\![(18)]\!]^f = \{\, \mathscr{K}(S, p, w) \wedge p,\ \neg\mathscr{K}(S, p, w) \wedge p, \ldots \}$[3]
where S = Solar, p = Moonbyul sang

So far so good. However, in order to be able to predict that cases like (18) do systematically give rise to factive inferences, we additionally need to posit that when *al-* is interpreted as an element of an alternative set ALT, it (as well as other alternatives in the set) somehow contributes factivity. Put differently, we need to assume that the *focus* semantic value of *al-* collects relational functions R, all of which encode factivity, resulting in alternatives such as (23). With this assumption, correct predictions emerge. In (18), focus alternatives of *al-* go through composition in the usual fashion to generate (18-a), and subsequently the ALT set in (18-b). Given (23), ∨ALT amounts to: ($\mathscr{K}$(Solar, Moonbyul sang, w) ∧ (Moonbyul sang)) ∨ ($\neg\mathscr{K}$(Solar, Moonbyul sang, w) ∧ (Moonbyul sang)). This results in the observed factive inference that Moonbyul sang.

But the assumption outlined in (23) seems stipulative and unmotivated. Why would verbs like *al-* contribute factivity only when it is evaluated as a part of the alternative set, but not when it is evaluated in the ordinary semantic domain?

Rather than try to answer this question, I will instead argue that verbs like *al-* do not encode factivity, regardless of whether they are interpreted as alternatives or not. Instead, the factive inference gets introduced via an independent principle which governs how alternatives contrast with each other.

3.3 Asymmetry in attitude predicates

Before getting into what this interpretive principle is, I first highlight certain semantic properties of attitude verbs that function as alternatives to verbs like *al-* '$\mathscr{K}$' and *gieokha-* '$\mathscr{M}$'. Recall that *al-* and *gieokha-* have salient negative counterparts *moreu-* 'not know' and *ggameok-* 'forget'.

[3] For ease of exposition, I encode the factive inferences conjunctively as in Stalnaker (1977), though additional considerations may favor alternative renditions.

It turns out there is an interesting asymmetry among these pairs. Predicates such as *moreu-* and *ggameok-*, denoting negative attitudinal relations between an agent and a proposition, do appear to lexically encode factivity, unlike their positive counterparts.

For one, veridicality inferences arise for sentences containing these verbs irrespective of prosody, as exemplified in (24) and (25). The latter in particular demonstrates that even when the NPA falls on an element of the embedded clause, we obtain the veridicality inference.[4] Likewise for *ggameok-* 'forget'.

(24) Hwasa-neun Wheein-i gan-jul <u>móreun-da</u>
Hwasa-NOM Wheein-NOM left-PP-C notknow-DEC
≈ 'Hwasa doesn't know that Wheein left.'
⇝ Wheein left.

(25) Hwasa-neun <u>Whéein-i</u> gan-jul moreun-da
Hwasa-NOM Wheein-NOM left-PP-C not-know-DEC
≈ 'Hwasa doesn't know that Wheein left.'
⇝ Wheein left.

In sum, the veridical inferences arising from verbs *moreu-* and *ggameok-* are not prosody-dependent. Furthermore, these inferences project across entailment-canceling operators, suggesting that they are factive in nature. Based on this, I conclude that there exists a lexical semantic asymmetry, such that *al-* does not encode factivity, but *moreu-* does. Likewise, *gieokha-* does not encode factivity, but *ggameok-* does.

I won't try to answer why such an asymmetry exists in the first place. But I will show that this lexical asymmetry in factivity among contrasting attitudinal verbs generative interesting interpretive consequences, combined with the principle I propose below.

3.4 Derivation from alternatives

The final piece of the analysis is a new interpretive principle, which I characterize as follows.

(26) **Unidimensional Heterogeneity of Alternatives**
Elements of a discourse salient set of alternatives ALT that enter into the disjunctive pragmatic inference ∨ALT can vary only along a single semantic dimension.

Specifically, in the context of attitude predicates, I propose that the constraint above amounts to the following:

[4] Prosody/focus does have the predicted effect in the sense that (25) additionally gives rise to the presupposition that someone left (or that Hwasa doesn't know that someone left). But crucially, the inference about the truth of the complement also arises in both (24) and (25).

(27) Attitudinal predicates in ALT can contrast with each other in only one of the two following semantic dimensions:

a. relation between proposition p and agent x's mental state
b. relation between proposition p and the actual world

The semantics of attitude verbs may conventionally encode both (27-a) and (27-b), or just (27-a). The verb *moreu-* specifies both ($\neg\mathscr{K}$ relation between x and p, and $w \in p$ relation between w and p), whereas *al-* specifies only the former ($\mathscr{K}$ relation between x and p), and is underspecified with regards to whether $w \in p$ (i.e., whether p is true).

When *al-* is not focused, as in (19), the ALT set introduces contrasts between alternatives which observe (26), as elements in (19-b) vary only along the identity of the subject (Moonbyul or Hwasa). Furthermore, as the relevant contrasts evoked by ALT do not involve contrasts between attitude verbs, the verb *al-* merely obtains the lexical, non-factive interpretation.

When *al-* is focused however, as in (18), the ALT set is predicted to be as follows, based on the asymmetrical lexical semantics of *al-* and *moreu-* proposed in sec. 3.3:

(28) $\text{ALT}_{(18)} = \{\, \mathscr{K}(S,p,w),\ \ \neg\mathscr{K}(S,p,w) \wedge p \,\}$

Without pragmatic enrichment, the elements in this set cannot be used to generate the $\vee$ALT inference, as they violate (26): the two elements may potentially contrast in both (27-a) and (27-b) dimensions of meaning. As the (27-a) and (27-b) aspects of *moreu-* is already fixed, and as the (27-a) aspect of *al-* already contrasts with that of *moreu-*, the only way for a listener to interpret the sentence while observing (26) is to enrich and saturate the lexically underspecified (27-b) dimension of *al-* meaning with $p = 1$ (such that it agrees with, i.e., does not contrast with the (27-b) dimension of *moreu-*). Consequently, *al-* in $\text{ALT}_{(18)}$ is in effect interpreted as $\mathscr{K}(S,p,w) \wedge p$. Via the general pragmatic process outlined in sec. 3.2, we obtain the observed factive inference that Moonbyul sang, as $\vee$ALT = ($\mathscr{K}$(Solar, Moonbyul sang, w) $\wedge$ (Moonbyul sang)) $\vee$ ($\neg\mathscr{K}$(Solar, Moonbyul sang, w) $\wedge$ (Moonbyul sang)).

The principle proposed in (26) is motivated pragmatically. Stalnaker (1977) was the first to recognize an interpretive constraint that is somewhat along this vein. As a way of analyzing the factive presupposition of *know*, he notes as follows: if a speaker were to assert that x knows that P where the truth of P is in doubt or dispute, he would be 'saying in one breath something that could be challenged in two different ways', thus leaving unclear 'whether his main point was to make a claim about the truth of P, or to make a claim about the epistemic situation of x' (Stalnaker 1977: 206).

The motivation behind the principle in (26) is similar in spirit to Stalnaker (1977)'s claim above, but also differs in e.g., the following respect: The current analysis predicts that the drive to convey a single dimension of meaning comes into force only when the associated expression enters into active contrast with alternatives (i.e., only when the expression is ALT-generating). This makes

intuitive sense, because under many views of how alternatives function in the discourse, such as Simons et al (2017), ALT-generating property is considered to be closely associated with the 'at-issue' status of a given meaning (i.e., something is at-issue if it is ALT-generating).

Put differently, ALT is a way of representing information-structural differences of a given sentence. Via ALT, information-structurally salient aspects of a sentence enters into contrast with unsaid alternatives. When such a contrast is evoked, it would be functionally useful to adopt certain interpretive strategies to ensure that the core contrast that is at-issue can be *uniquely* identified by the listener. Otherwise, there would be multiple potential contrasts that could be at issue, which would burden the listener. The constraint in (26) can be construed as one possible trigger for such interpretive strategies.

4 Looking ahead

In this paper, I've focused on a particular type of variation in factive inferences, which I characterized as prosodically conditioned factive inferences. I've provided an analysis of this variation. It remains an open question if the analysis proposed here can extend to cover analogous data involving other complementizers, e.g., *go*. Before answering this however, perhaps the next step to take at this point is to obtain clearer empirical data on whether *go* and *jul* display comparable prosody-sensitivity, or if there exists subtle differences between the two. A controlled experiment gathering patterns of veridical inferences in Korean across a wide range of verbs, complementizers, and prosody is currently underway.

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