Gradability as a Window into the Semantics of Semifactives*

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Abstract

I present a short initial study of *realize*-comparatives, constructions in which a comparative *than*-clause contains a semifactive predicate such as *realize* (e.g. *Ava is taller than I realized*). Such examples present challenges for classical views of factivity. I argue that they support a new understanding of the lexical semantics of semifactives: these require not the truth of their complement but informational coherence and consistency between their complement and their base index of evaluation. The picture that emerges is broadly consistent with recent pragmatic approaches to factive presupposition generation and projection. The account turns on an underlying notion of graded awareness, a core property of knowledge that is reflected in the linguistic behavior of knowledge predicates.

1 Introduction

This is more complicated than I realized. A sentence like the preceding might be uttered by a newcomer to the recent literature on factivity. It might arise in reaction to the bevy of work on how factive presuppositions arise, how they are projected, and how they are suspended—or, depending on one's perspective, how they fail to arise in the first place (see, among others, Abusch 2010, Beaver 2010, Abrusán 2011, 2016, Tonhauser et al. 2013, Simons et al. 2017, Djärv 2019, Djärv & Bacovcin 2020, Degen & Tonhauser 2022). It would bespeak the level of empirical detail and theoretical sophistication found in this recent literature, as researchers have used factivity to investigate the deeper nature of presupposition in natural language.

It would not, however, be a sentence whose own import has been widely recognized. Here I aim to fill that gap. What follows is a short study of comparative constructions in which the *than*-clause contains a semifactive main predicate like *realize*. Through careful attention to the properties of such gradable-predicate constructions, we can gain novel insight into the lexical semantics of semifactives. Specifically, I argue that semifactives require informational coherence and consistency between their complement and their base index of evaluation. This is distinct from a truth requirement on the complement. The account turns on a notion of graded awareness, a property underwritten by the intuition that knowledge can be incomplete but never (as it were) overfull. As I argue below,

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gradable-predicate constructions reveal how graded awareness is reflected in the linguistic behavior of knowledge predicates.

A core question in the factivity literature is whether factive presuppositions are lexically encoded in the semantics of the selecting predicates, or whether instead they arise pragmatically through the interaction of focus, the question under discussion (QUD), and possibly other factors. The behavior of *realize*-comparatives suggests that there is indeed a lexical requirement at work—namely, the requirement for informational consistency between complement and base index of evaluation—but that presupposition generation and projection in the more familiar sense are governed by pragmatic factors. Data of the sort introduced below can thus help steer us toward a better and more general understanding of factivity and presupposition.

2 Core Data

Factive predicates, in the classic telling originating with Kiparsky & Kiparsky (1970), are those that presuppose the truth of their clausal complements. But for almost as long as factivity has been on the linguistic radar, we have known that factive presuppositions are suspendable with certain predicates in certain environments. Karttunen (1971: 63ff.) introduces the term SEMIFACTIVE for those predicates that appear to lose their factivity under the relevant circumstances, offering the minimal pairs in (1) and (2).

(1) a. John didn't regret that he had not told the truth.
b. John didn't realize that he had not told the truth.

(2) a. If I regret later that I have not told the truth, I will confess it to everyone.
b. If I realize later that I have not told the truth, I will confess it to everyone.

Karttunen observes that, while both *regret* and *realize* involve a presupposition that John had not told the truth in (1), they come apart in (2). There, the complement of factive *regret* is still presupposed true—in (2a), the presupposition that the speaker has not told the truth projects from the conditional antecedent to the matrix context—while the complement of semifactive *realize* in (2b) is not.[1] More recently, researchers have seized on contrasts like this one to interrogate the deeper nature of presupposition generation, projection, and suspension.

Turning to our topic of interest—semifactives in comparative *than*-clauses—an initial question then is what, if anything, the semifactive complement presupposes. Consider (3).

(3) Ava is taller than I realized.

Adopting a standard semantics for comparatives (more on this in the next section), we might paraphrase the truth conditions of (3) as something like 'Ava is tall to a degree exceeding the degree to which I realized she was tall'. How are we to understand 'the degree to which I realized she was tall'? In particular, what are we to make of the complement of *realize* and its presuppositional status?

It is tempting to conclude that there is no truth requirement on the complement of *realize* here. Setting aside the technical matter of resolving the locally free degree variable found within this

[1] There are clear lexical semantic tendencies associated with semifactivity: *regret* and *realize* exemplify classes of predicates that have come to be known as emotive and cognitive factives, respectively.

complement,[2] it seems intuitively obvious from the overall meaning of the sentence that, whatever the speaker previously knew or believed about Ava's height, it was not identical to the truth. Perhaps, then, these degree complements are simply another environment where semifactives lose their factivity.

A wider look around quickly reveals this conclusion to be too hasty. Consider the infelicity of an example like (4).

(4) # Ava is not as tall as I realized.

In (4), the speaker is once again laboring under a misapprehension about Ava's height. But unlike in (3), this misapprehension cannot be expressed by composing *realize* with the relevant combination of logical and degree operators. We have detected a signal about the semantics of semifactives; something more is at play.

Exploring a bit further, we can see that the contrast between (3) and (4) is due to an asymmetry in logical strength rather than scalar position. The problem in (4) is not that 'the degree to which I realized Ava is tall' exceeds Ava's actual height; it is that the *realize*-degree exceeds the actual degree in an environment where we are measuring scalar positions vis-à-vis the bottom of the relevant scale. If we choose a gradable adjective of the opposite scalar polarity (Kennedy 2001, Takahashi 2006, Rett 2015), we can produce a corresponding result in the opposite direction: the comparative in (5a) can be used to express the speaker's prior mistaken belief that Ava's height was greater than it actually is, while the equative in (5b) cannot be used to express an analogous belief that his height was lower than it actually is.

(5) a. Ava is shorter than I realized.
b. #Ava is not as short as I realized.

What these examples collectively suggest, then, is that semifactive complements cannot asymmetrically entail what is true. Informally speaking, you can realize things to something less than their full degree, but you cannot realize things to a degree that surpasses reality (with 'surpass' understood relative to the operative scalar polarity in a given case). Much of the present paper will be devoted to sharpening this empirical generalization, giving it a workable formal characterization, and exploring its consequences for our understanding of factivity and presupposition.

In this connection, the contrast between semifactives like *realize* and nonfactives like *think* is striking. As (6) shows, there is nothing wrong in general with expressing the relevant sort of degree misapprehension with a comparative construction; rather, there is something about semifactives in particular that is incompatible with the relevant cases.

(6) a. #Ava is not as tall as I realized.
b. Ava is not as tall as I thought.

Finally, as shown in (7), we find a wide variety of semifactive predicates in comparative *than*-clauses. The pattern adduced here is by no means a lexical quirk of *realize*.[3]

(7) a. Our Constitution was a far more dramatic departure from history than I had appreciated.[4]

[2] On the thorniness of this issue, see Karttunen (1971: 58–60).

[3] The sentences in (7) are all attested examples found via web search. I leave it to the reader to confirm that the corresponding *not as ADJ as* equatives are infelicitous, like their counterparts in (4) and (5b).

[4] https://www.romney.senate.gov/our-constitutional-order-freedom-responsibility-and-power, accessed 2021-11-29.

b. I'm feeling, as I'm starting to get a little distance, that this record may be better than I was aware of.[5]

c. This sequencing of images in a physical book feels so much closer to films (movies, not physical Kodaky film-film), than I had noticed before.[6]

In what follows, we will explore what these comparative constructions can tell us about the lexical semantics of semifactives and the nature of their factive presuppositions. First, we will take a closer look at the syntax and semantics of comparatives, in order to establish plausible logical forms for the sentences of interest.

3 The Semantics of the Comparative

How are comparatives built and interpreted? The question takes on a particular urgency in the present case, as different answers will suggest quite different conclusions about the lexical semantics of the semifactive predicates we find in *than*-clauses. For example, if we adopt a version of the "A-not-A" semantics for comparatives (Seuren 1973), we might propose that the sentence *Ava is taller than I realized* has the truth conditions in (8). (Here and throughout, I assume that *realize* has an elided clausal complement at LF that goes missing via comparative deletion, on which see Bresnan 1973, Kennedy 2002.)

(8) $\exists d$[Ava is d-tall and $\neg$(I realized Ava is d-tall)]

This semantics says that there is a degree d such that Ava is tall to d and the speaker didn't realize that Ava is tall to d. This will be true whenever the speaker has failed to realize the full extent of Ava's height, as desired.

The manner in which the A-not-A semantics derives these truth conditions has important consequences for any analysis of semifactives that we might try to pair with it. As we can see in (8), the A-not-A treatment effects a semantic structural connection between the matrix degree and the *than*-clause degree: they are bound by the same operator. Bracketing the issue of *realize*'s presupposition, this means that we are not responsible for giving content to the *than*-clause degree on its own. In other words, the question we posed earlier—how are we to understand 'the degree to which I realized Ava is tall'?—simply does not arise in this setting.

Can we get away so easily? Apparently not. The A-not-A analysis of comparatives encounters a number of difficulties, the details of which need not concern us here (the interested reader can find overviews and discussion in von Stechow 1984, Schwarzschild 2008, Alrenga & Kennedy 2014, Fleisher 2016). The weight of evidence has led scholars of comparatives toward analyses where the *than*-clause degree is not structurally linked with the matrix degree in the manner shown in (8). We will need to venture an answer to our question after all.

A better candidate for the truth conditions of *Ava is taller than I realized* is shown in (9).

(9) $\textsc{max}(\lambda d.\text{Ava is } d\text{-tall}) > \textsc{max}(\lambda d.\text{I realized Ava is } d\text{-tall})$

[5] https://www.loudersound.com/news/lars-ulrich-metallica-album-may-be-better-than-i-was-aware-of, accessed 2021-11-28.

[6] https://craigmod.com/roden/041/, accessed 2021-11-28.

On this semantics, we have maximality operators (MAX) in the *than*-clause and the matrix clause. The MAX operator yields a degree description, returning the greatest degree in the set that serves as its argument.[7] The expression in (9) is true just in case Ava's maximal degree of height (in layman's terms: Ava's height) is greater than the maximal degree d such that the speaker realized Ava is tall to d. This latter value is just the one we are seeking a definition for: 'the degree to which I realized Ava is tall'.

The upshot for the matter at hand is that we must provide a semantic characterization of semifactives on which (i) the semifactive complement contains a locally free degree variable and (ii) this variable is not structurally tethered to anything in the matrix clause. It is to this task that we now turn.

4 Semifactives: Basic Semantics

How are we to understand degree descriptions like 'the degree to which I realized Ava is tall'? What sorts of requirements are associated with semifactives like *realize*, such that we get the pattern of acceptability observed above? Here I suggest that the behavior of semifactives reflects what I call GRADED AWARENESS, a property relating an attitude holder to a possibly incomplete state of knowledge or awareness. Being a state of knowledge, it must be true, but it need not be the whole truth; it may be a weaker scalar alternative of the whole truth.[8] Informally speaking, you can realize something to less than its full extent, but you cannot realize something to an extent that exceeds reality. As discussed further in the next section, I propose that this is a lexical requirement of semifactives.

The basic semantic story is simple: 'the degree to which I realized Ava is tall' describes the greatest degree d such that the speaker knew that Ava was d-tall. It is the degree that the speaker would give in answer to the question 'How tall is Ava?' (though as we have seen, not all speakers' answers to this question are felicitous descriptions here). The expression MAX(λd.I realized Ava is d-tall) from (9) above picks out this degree; call it d_k. Crucially, the expression is defined only if the open proposition that is the complement of *realize—Ava is d-tall*—is true when we substitute d_k for the free variable d. This condition—let us provisionally call it the REALITY LIMIT—will be satisfied whenever d_k is less than or equal to Ava's actual height,[9] but not when d_k exceeds Ava's actual height. This accounts for the disparity observed above, repeated in (10).

(10) a. Ava is taller than I realized.
b. #Ava is not as tall as I realized.

The proposition expressed in (10a) is true iff Ava's actual height is greater than d_k, while that in

[7] The maximality-based approach to comparatives is widespread, and implementations differ across analyses: sometimes maximality involves the greatest degree, sometimes it involves the maximally informative scalar interval, and sometimes it involves something else (see, e.g., von Stechow 1984, Rullmann 1995, Schwarzschild & Wilkinson 2002, Heim 2006, Beck 2010, Alrenga & Kennedy 2014). As these details of implementation are secondary to our interests here, I choose what I take to be the simplest available exposition in (9). Note that maximality-based approaches tend to assume certain restrictions on the argument of the MAX operator, in particular that it characterize a convex set of degrees (though see Sauerland 2010).

[8] As we will see in section 5, stating things in terms of truth is actually a bit too strong, but this formulation will do for the moment.

[9] Here I assume an 'at least' semantics for gradable predicates like *tall*, where the expression *Ava is d-tall* means that Ava is at least d-tall, not necessarily that Ava is exactly d-tall. Absent compelling reasons to adopt an 'exactly' semantics for the adjective, I forgo stepping through the somewhat more complicated implementation this would entail for the analysis of semifactives.

(10b) is true iff Ava's actual height is not as great as d_k. In the former case, the reality limit is satisfied: it is true that Ava is (at least) d_k-tall. In the latter case, the reality limit is violated: it is false that Ava is (at least) d_k-tall, and the result is infelicity for (10b). Our proposal thus accounts for the core disparity.

Further evidence for the reality limit, and its grounding in knowledge or awareness, comes from comparing semifactives with belief predicates. As observed earlier, *Ava is not as tall as I thought* is impeccable. There is no general problem with this combination of logical, degree, and attitude operators. Rather, the infelicity of examples like (10b) is due to the specific requirements of semifactives like *realize*. This is the heart of graded awareness. In the next section we take a closer look at the source of this requirement.

5 Stalking the Reality Limit

Where does the reality limit come from? Is it a bit of projective content? How does this requirement, and graded awareness more generally, fit with our understanding of factive and semifactive presupposition generation and projection?

Here I propose that the reality limit is not the result of a factive or semifactive presupposition in the familiar sense. There are strong empirical and theoretical reasons to doubt that the clausal complement of *realize* in the examples above is presupposed. Rather, I suggest that *realize*-comparatives reveal a more general lexical requirement of semifactives, namely that their matrix environment and complement constitute a consistent and coherent information state. This requirement, which could be modeled as a type of presupposition in its own right, is distinct from the more well-studied class of factive presuppositions. What *realize*-comparatives offer us, then, is novel insight into the lexical semantics of semifactives. On broader questions about the nature of projective content, we are left with a picture that is broadly consistent with pragmatic, rather than lexical, approaches.

The idea that the reality limit reflects the operation of an ordinary (semi)factive presupposition immediately encounters a number of difficulties. To begin, it is unclear what exactly the presupposed content is meant to be: as discussed above, in examples like *Ava is taller than I realized* the semifactive complement is an open proposition. Even if we assume that the free degree variable can get valued in a suitable way for purposes of assessing a semifactive presupposition,[10] the relationship of this content to the asserted portion of the sentence is unusual, in that they are both answers to the same question (viz. 'How tall is Ava?'). Indeed, it does not seem to be the case that an interlocutor is required to know or accommodate any information about Ava's height beyond the asserted content of the sentence, which overrides the purported presupposition in any case. The semifactive presupposition itself thus appears to be missing in action here.

If the semifactive presupposition is empirically nowhere in evidence, its absence is far from theoretically unexpected. A bevy of recent work on factivity has converged on the idea that projection is tied to information-structural status. While specific proposals and implementations differ, the core observation is that factive and semifactive complements project when they are backgrounded, not at-issue, or not the main point of the utterance. By contrast, when such complements contain a focus, provide an answer to the current question under discussion (or one of its subquestions), or are otherwise at-issue, they tend not to project (Abusch 2010, Beaver 2010, Abrusán 2011, 2016, Tonhauser et al. 2013, Simons et al. 2017).[11]

[10] Hardly an innocent assumption; see footnote 2.

[11] For related work on using factive complements to provide hearer-new information, see Spenader (2002, 2003). For a

The semifactive complement in *realize*-comparatives falls quite naturally into the latter group. While there is no focus within the complement of *realize*—indeed, its complement is deaccented to the point of ellipsis—this complement is clearly congruent to the question under discussion. A speaker who utters *Ava is taller than I realized* is first and foremost conveying information about Ava's height, even as they simultaneously say something about the deficiency of their immediately prior information state. But the matter of Ava's height is just what the complement of *realize* addresses itself to. Little wonder, then, that this content fails to project. Similar observations hold, *mutatis mutandis*, for other comparatives with semifactives like those shown above in (7).

If the reality limit is not the work of an ordinary semifactive presupposition, where the semifactive complement is presupposed true in the semifactive predicate's base context of evaluation, then what is it? I propose that the reality limit reflects a different sort of lexical requirement of semifactives: namely, that the complement and the base context jointly constitute a consistent information state. This is weaker than a truth requirement on the semifactive complement, but it still imposes restrictions on the propositions toward which one can bear a semifactive attitude. As I will show, this requirement successfully distinguishes the different semifactive degree cases discussed above while still differentiating semifactives from belief predicates.

At the core of the proposal is a fact discussed earlier: knowledge can be incomplete, but it cannot overflow. In question-and-answer terms, you can know a proposition in the answer set that is asymmetrically entailed by a question's strongest true answer, but you cannot know one that asymmetrically entails that strongest true answer.[12] In felicitous semifactive comparatives like *Ava is taller than I realized*, the speaker asserts that Ava's height exceeds the greatest degree d such that the speaker previously knew that Ava was d-tall; as above, let us call this degree d_k. Ava's height can exceed d_k if the speaker's previous knowledge of Ava's height was incomplete. This prior knowledge is compatible with the context as updated via the speaker's assertion: they jointly constitute a consistent information state. In particular, the speaker's prior knowledge is compatible with the possibility that Ava is in fact taller than d_k, if knowledge can by nature be incomplete.

In the infelicitous cases, like #*Ava is not as tall as I realized*, the speaker asserts that d_k exceeds Ava's actual height. It follows from this assertion that the speaker's prior knowledge overflowed the bounds of reality: the speaker knew an answer that asymmetrically entails the strongest true answer to the relevant question. But this is just what knowledge cannot do. We cannot construct a consistent information state from the speaker's prior knowledge and the speaker's assertion in this case. The result is infelicity.

This approach offers a natural explanation for the contrast between semifactives and belief predicates. Unlike knowledge, beliefs can be false. In uttering *Ava is not as tall as I thought*, the speaker asserts that Ava's actual height is below d_b, where d_b is the greatest degree d such that the speaker previously believed that Ava was d-tall. But there is no informational inconsistency here: beliefs, by their nature, can be mistaken in any direction. In present terms, they can be incomplete and they can also overflow. Since knowledge and its informational requirements are not in play, examples like this are perfectly felicitous.

Note further that the requirement for informational consistency is not the same as a requirement

recent interrogation of the very notion of factivity, see Degen & Tonhauser (2022). For a defense of the lexical view of factivity, see Djärv (2019) and Djärv & Bacovcin (2020).

[12]The "in the answer set" qualification is important. It is of course possible in general to know propositions that asymmetrically entail a question's strongest true answer, e.g. the conjunction of that answer with p, for arbitrary contingent p.

for truth in the context of utterance. We can see this by introducing operators that suspend truth commitments. For example, in the scope of *suppose*, we find exactly the same asymmetry that we have been associating with the "reality" limit:

(11) a. Suppose Ava was taller than you realized.
b. #Suppose Ava was not as tall as you realized.

Examples like (11b) have a Moore-paradoxical flavor to them (cf. #*Suppose it's raining but it might not be*; Yalcin 2007). There is something incoherent about the very task of supposition here: we are being asked to imagine a scenario that is internally inconsistent. It is thus not truth in the context of utterance that matters for *realize*-comparatives and semifactives more generally, but the more basic phenomenon of informational coherence and consistency.

In this light, we can return to Karttunen's examples in (2). The conditional antecedent *if I realize later that I have not told the truth* asks us to suppose a future context in which the speaker's knowledge has developed in such a way that they come to know that what they previously said was false. But there is no informational inconsistency here: on the contrary, by supposition, the semifactive's immediate context within the *if* -clause is one that entails its complement. *Realize*'s lexical requirement is thus satisfied. As to the failure of projection noted by Karttunen, this flows from the information structure of the clause and its supporting intonation. As Beaver (2010) and subsequent authors have pointed out, the non-projection reading here tacitly relies on an intonation where primary stress falls within the semifactive complement (most likely at its right-hand edge, in this case). Placing primary stress on *realize—If I REALIZE later that I haven't told the truth*—pushes us rather strongly toward a projection reading, in line with the predictions of pragmatic accounts of factive presupposition generation and projection.

6 Summary

Gradability provides an illuminating probe into the semantics of factivity. Starting with a construction whose behavior is difficult to square with the classical view of factive presuppositions (*realize*-comparatives), we uncovered a novel empirical generalization (the reality limit) and distilled a new and improved characterization of the lexical requirements of cognitive factives and semifactives (informational coherence). The understanding that we have arrived at is consistent with and supported by the pragmatic approach to factive presupposition generation and projection, which I take to be a positive result.

Many open questions remain. What else can be said about the nature of graded awareness and its relevance for natural language? What are the limits of the informational coherence requirement (and over what spans of linguistic structure does it operate)? How naturally does the present account extend to emotive factives, where knowledge and awareness are crucially involved but characteristically have a different information-structural status than they do with cognitive factives and semifactives?[13] Space precludes a fuller investigation of these questions here. For now, I hope to have shown that gradability offers a rich domain of evidence for the investigator to draw upon.

[13] As witnessed by, e.g., the relative infelicity of placing (non-contrastive) focus within the emotive-factive complement (#*I regret that JOHN is tall*) and of performing A′-extraction from it (#*Ava is taller than I regretted she was*).

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