On the lack of lower-bound denoting degree modifiers

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Abstract

This paper puts forth the following conjecture: there are no lower-bound denoting degree modifiers in natural language. The semantic import of such a modifier, call it **schmopletely**, would be to signal that an adjectival property is manifested to a minimal degree. I argue that such a lexicalization gap is explained by an *at least* semantics for degree expressions combined with a grammatical ban on certain trivial expressions (the Logicality Hypothesis; Gajewski 2002; Fox & Hackl 2006; Chierchia 2013): the interpretation of an adjectival phrase modified by **schmopletely** would be that an adjectival property is manifested to a degree greater than or equal to the lower bound of the scale, which is trivially true. Finally, I suggest that the reason why trivialities cannot be 'saved' by covert strengthening (as noted by Haida & Trinh 2020 for *at least zero*) lies in the not-at-issue status of strengthening (as proposed by Bassi, Del Pinal & Sauerland 2021).

Keywords: degree modification, Logicality, strengthening, exhaustification

1 Introduction

Kennedy & McNally (2005) discovered that natural language expressions are sensitive to the properties of scales associated with the properties denoted by gradable adjectives. For example, the modifier *half* is only compatible with adjectives associated with fully closed scales: scales that both half a lower bound (a minimal degree) and an upper bound (a maximal degree).

(1) Scalar requirements of *half*

a. The glass is half full. (fully closed)

b. #The glass is half clean. (upper closed)

c. #The glass is half dirty. (lower closed)

d. #The glass is half tall. (fully open)

Other items, like *completely*, are compatible with adjectives associated with scales with an upper bound (fully closed and upper closed scales). Another property of *completely* is that it is not simply sensitive to the upper bound, but it seems to denote it. When a glass is completely full, it means that it has reached its maximum capacity: the upper bound has been reached. Similarly, when a glass is completely clean, it means that it cannot get any cleaner: it is clean to the maximum degree.

(2) Scalar requirements of *completely*

a. The glass is completely full. (fully closed)

b. The glass is completely clean. (upper closed)

c. #The glass is completely dirty. (lower closed)

d. #The glass is completely tall. (fully open)

The puzzle this paper is concerned with is the following conjecture: there are no natural language expressions like imaginary **schmopletely** which would express that the adjectival property is manifested to the minimal degree. Insofar as the conjecture is correct, the lexicalization gap regarding lower bound degree modifiers is worth exploring.

(3) Scalar requirements of imaginary **schmopletely**

a. The glass is **schmopletely** full. (fully closed)

b. #The glass is **schmopletely** clean. (upper closed)

c. The glass is **schmopletely** dirty. (lower closed)

d. #The glass is **schmopletely** tall. (fully open)

The idea pursued in this paper is that a sentence with a modifier like **schmopletely** would have trivial truth-conditions: regardless of the lexical content of the sentence, there would be no state of affairs in which a sentence with **schmopletely** is false. Following the Logicality hypothesis (Gajewski 2002; Fox & Hackl 2006; Chierchia 2013; see the overview in Del Pinal 2022), such triviality results in ungrammaticality, which explains the lexicalization gap: no language would lexicalize an item that is only able to occur in ungrammatical sentences. More concretely, I claim that if **schmopletely** existed, it would denote that an adjectival property is manifested to a degree which is greater than or equal to the lower bound. Such a denotation is trivially true.

The paper is structured as follows. In section 2, I present the necessary background on the semantics of degree modifiers and make the case that a lower-bound denoting degree modifier will necessarily result in trivial truth-conditions for the modified adjectival phrase (the case will be based upon the *at least* semantics for degree expressions). In section 3, I review the literature on Logicality

and explicate how trivial semantics of **schmopletely** leads to its ungrammaticality, while also making a suggestion regarding the observation that trivially true expressions cannot be strengthened into non-triviality (Haida & Trinh 2020). Section 4 concludes.

2 Semantics of degree modifiers and adjectives

This section presents the necessary background on the semantics of adjectives and degree modifiers. Core claim of this section is the following: while equality semantics for adjectives (Cresswell 1976; used in a noncommittal way in Kennedy & McNally 2005) makes it possible for a lower-bound degree modifier **schmopletely** to have non-trivial meaning, there are good arguments against such a semantics coming from behavior of adjectival phrases in downward entailing environments and from association of degree modifiers with *only*. The *at least* semantics for adjectives (Heim 1985 among others), however, necessarily makes an expression with a lower-bound degree modifier **schmopletely** import trivial truth-conditions.

2.1 Background on semantics of adjectives

Let us start with a somewhat of a consensus semantics for positive form of an adjective (assuming a silent morpheme POS, per tradition). The crucial part of this denotation for our purposes is that the core of the lexical meaning of adjectives is the mapping of individuals to a degree according to a lexically specified measurement function.

(4) $[\![\text{[POS tall]}]\!] = \lambda x.\ \mu_{tall}(x) \geqslant d_{standard}$

There are, however, complications, once we consider the lexical meaning of the adjectives. For

present purposes, I focus on one particular split: whether the core adjectival meaning encodes an equality relation (and thus maps an individual to a single degree; Cresswell 1976) or an *at least* relation (and thus maps an individual to a set of degrees; Heim 1985). For the purposes of this paper, I ignore whether the type of the denotation of the adjective is $\langle d, \langle e, t\rangle\rangle$ or $\langle e, \langle d, t\rangle\rangle$. The choice between the two is of little consequence for the contents of this paper.

(5) Two ideas for the semantics of adjectives

a. $[\![\text{tall}]\!] = \lambda d.\lambda x.\ \mu_{height}(x) = d$ (*equality* semantics)

b. $[\![\text{tall}]\!] = \lambda d.\lambda x.\ \mu_{height}(x) \geqslant d$ (*at least* semantics)

What matters for our purposes is that the two proposals make different predictions for the truth conditions of adjectival phrases that include degree modifiers, which would import a context-insensitive standard of comparison (and are thus in complementary distribution with silent POS, as in Kennedy & McNally 2005). Consider the Kennedy & McNally (2005)-style lexical semantics for degree modifiers *half* and *completely*.

(6) a. $[\![\text{completely}]\!] = \lambda G.\lambda x.\ \exists d.\ d = max(G) \wedge G(d, x)$

b. $[\![\text{half}]\!] = \lambda G.\lambda x.\ \exists d.\ ((max(G) - d) = (d - min(G))) \wedge G(d, x)$

When these degree modifiers are composed with the adjectives, the following truth conditions are predicted, depending on the semantics of the adjective (demonstrated for *completely*, but it is straightforward to calculate the predictions for *half*).

(7) a. $[\![\text{completely full}]\!] = \lambda x.\exists d\ \mu_{volume}(x) = d \wedge d = max(\text{VOLUME})$

b. $[\![\text{completely full}]\!] = \lambda x.\exists d\ \mu_{volume}(x) \geqslant d \wedge d = max(\text{VOLUME})$

For the current purpose of figuring out the reason behind the lexicalization gap concerning **schmopletely** suppose that it has the semantics in (8), which is parallel to *completely*.

(8) $[\![\textbf{schmopletely}]\!] = \lambda G.\lambda x.\ \exists d\ d = min(G) \wedge G(x)$

The two approaches to the lexical semantics of adjectives predict the following truth conditions for an adjectival phrase containing the modifier **schmopletely**.

(9) a. $[\![\textbf{schmopletely}\ \text{full}]\!] = \lambda x.\exists d\ \mu_{volume}(x) = d \wedge d = min(\textsc{volume})$

b. $[\![\textbf{schmopletely}\ \text{full}]\!] = \lambda x.\exists d\ \mu_{volume}(x) \geqslant d \wedge d = min(\textsc{volume})$

The crucial observation is that the truth-conditions in (9b) are trivial: any degree on the scale is greater than or equal to the lower bound. Importantly, however, the truth-conditions in (9a) are not trivial: under the assumption that any individual entity x exhibits the property G to one and only one degree, the equality semantics for modified adjectival phrases gives non-trivial truth-conditions for **schmopletely**. While section 3 shows that the truth-conditions in (9b) provide an explanation for the lexicalization gap, it needs to be shown why truth conditions in (9a) are not available or, in other words, why is equality semantics for modified adjectival phrases wrong. Next subsection presents two argument against equality semantics: (i) behavior of modified adjectival phrases in downward entailing environments; (ii) association of degree modifiers with *only*.

2.2 Against equality semantics of modified adjectival phrases

This subsection presents two arguments against an equality semantics of modified adjectival phrases. The first argument concerns the behavior of modified adjectival phrases in downward entailing environments (parallel to similar arguments in the literature on numerals; see the overview in Spector

2013): as with numerals, equality semantics has troubles with accounting for all available interpretations. The second argument concerns association with *only*: given the ban on vacuous *only* (Alxatib 2020), the equality semantics overgenerates oddness of degree modifiers associated with *only*. I should note, however, that both argument only establish that an *at least* interpretation of adjectival phrases is necessary (thus, they do not rule out an *equality* interpretation). However, the possibility of deriving an *equality* interpretation from *at least* interpretation via strengthening suggests that no ambiguity is necessary.

2.2.1 Behavior in DE environments

Consider the sentence in (10). Suppose you have been issued such an order, and you see that the glass is 75 percent full. The intuitive judgement seems to be that, in order to comply with the order, you should call John.

(10) If the glass is half full, call John.

The equality semantics does not predict such an interpretation. A paraphrase of the equality semantics can be given with a modified numeral *exactly N*. Consider the example (11) and assume that the glass has a volume of 1L. Under the context described above, calling John would not be in compliance with the order.

(11) If the glass has exactly 500 ml of milk in it, call John.

However, as is the case with bare numerals (see Spector 2013), it is not the case that the interpretation predicted by the equality semantics is never available. Under negation, for example, it is possible to get an equality interpretation, as shown by the example (12).

(12) Context: you asked your lab assistant to fill the 1L jug with 500ml of a liquid.

The jug isn't half full! There's too much liquid!

A similar example can be constructed for conditional antecedents as well.

(13) Context: the experiment requires a 1L jug to have exactly 500ml of a liquid to get the measurements right.

If the jug is half full, then it is possible to conduct the experiment. If it is 75 percent full, then it is not.

The behavior in DE environments, then, seems to establish that an *at least* interpretation of modifier adjectival phrases is available but does not establish that equality semantics is unavailable (insofar as local strengthening is possible, equality semantics in DE environments cannot be ruled out).

2.2.2 Association with *only*

This argument builds upon the following observation: equality semantics for modified adjectival phrases makes *only* vacuous, when associated with the degree modifier. Under the assumption that for any individual x and the measure function G, there is only one degree d such that $G(x) = d$, a sentence like *The glass is half full* implies that for any other degree d' the formula $G(x) = d'$ is false. Therefore, a sentence where the degree modifier associates with the focus particle *only* is predicted to be vacuously true: its assertion is entailed by its presupposition.

(14) The glass is only $[\text{half}]_{\text{F}}$ full.

However, as Alxatib (2020) argues, any sentence with vacuous *only* results in pragmatic oddness, demonstrated by the oddness of *only* associating with *every* in example (15). Therefore, an equality semantics for modified adjectival phrases falsely predicts (14) to be odd.

(15) #Only [every]$_F$ boy jumped.

The *at least* semantics for modifier adjectival phrases, however, correctly predicts that *only* is only infelicitous when associated with an upper-bound modifier like *completely*: since *completely full* entails truth of every other alternative, the assertion with *only* is vacuous since the domain of quantification is empty.

(16) #The glass is only [completely]$_F$ full.

This argument shows that modified adjectival phrases cannot have equality semantics as their only option. Given the availability of local strengthening, I will assume that all contexts that involve equality semantics involve local strengthening of an *at least* denotation for modified adjectival phrases.

2.3 Consequences for schmopletely

As mentioned in the end of the section 2.1, the equality semantics of modified adjectival phrases allows for a non-trivial denotation of an adjectival phrase modified by a lower-bound degree modifier like **schmopletely**. Section 2.2, however, showed that there are good reasons to think that the equality semantics for modifier adjectival phrases cannot be correct. Therefore, if **schmopletely** existed, any sentence with it would have trivial truth-conditions. Next section explains why that gives rise to the lexicalization gap.

3 Triviality and lexicalization gaps

Consider a parallel to the hypothesized semantics of **schmopletely** from the domain of modified numerals. Sentences with *at least zero* are odd regardless of the context (Haida & Trinh 2020).

(17) Sentences with *at least zero* are odd.

a. #At least zero children came.

b. #Every human has at least zero children.

As Trinh and Haida argue, the oddness of the examples (17) are due to their triviality, following the research program of Logicality: the idea that certain trivial expressions are ruled out by the grammar itself (Gajewski 2002; Fox & Hackl 2006; Chierchia 2013). This section is structured as follows: first, I review the main tenets of the Logicality hypothesis, flesh out how it relates to lexicalization gaps, and address some concerns regarding my analysis that come from the applicability of my reasoning to the embedded modified adjectival phrases. Finally, I return to the observation in Haida & Trinh 2020 and suggest that trivially true expressions can not be saved from ungrammaticality by strengthening due to the not-at-issue status of scalar implicatures (Bassi, Del Pinal & Sauerland 2021).

3.1 Connecting logicality and lexicalization gaps

Logicality (also known as L-triviality, L-analyticity) is the idea that the grammatical system of natural language rules out certain trivial expressions (see Del Pinal 2022 for a recent overview). Logicality has been used as an explanation for distributional properties of connected exceptives (Von Fintel 1993), NPI licensing (Chierchia 2013), certain degree expressions under negation (Fox &

Hackl 2006). Of course, not all trivial expressions are to be ruled out by logicality: sentences like (18), while trivial in some sense, are nevertheless acceptable.

(18) John is and isn't smart.

The leading hypothesis is that the trivialities that get ruled out are trivial by the virtue of their 'logical' vocabulary. It is clear how Logicality may result in lexicalization gaps: there is no way to lexicalize an item as a part of the 'logical' vocabulary if any sentence involving this item ends up ungrammatical. Let me provide a quick example.

While many works have tackled the question regarding the lack of lexicalization of the binary logical connective NAND (p NAND q iff $p \wedge q$ is false), a much easier question concerns the lack of lexicalization of trivial binary connectives that return true or false regardless of the values of its operands. As Uegaki (2023) and Bar-Lev & Katzir (2023) conclude, lack of such connectives in natural languages is explained by Logicality.

We are now equipped with the required conceptual background to claim that the imaginable degree modifier **schmopletely** is not lexicalized, because a sentence like *The glass is **schmopletely** full* gets trivial truth-conditions in (19).

(19) $[\![\textit{The glass is } \textbf{\textit{schmopletely}} \textit{ full}]\!] = \mu_{volume}(g) \geqslant d \wedge d = min(\textsc{volume})$

However, I have only shown that a matrix predicative use of an adjectival phrase modified by **schmopletely** results in trivial truth conditions. It is not entirely clear that the explanation extends to embedded predicative uses and adnominal uses. Next subsection deals with this objection.

3.2 Addressing triviality in embedded contexts

The paper up to this point has established that a matrix predicative use of an adjectival phrase that contains the lower-bound modifier **schmopletely** is trivially true. However, on its own, this conclusion entails nothing about the behavior of such predicative uses in embedded contexts and about the adnominal uses of such adjectival phrases. My response to both possible issues is to show that embedding the modified adjectival phrase either does not resolve triviality or is ruled out by appeal to redundancy conditions (Katzir & Singh 2014; Meyer 2014).

First, consider a rather straightforward case: embedding under negation. Embedding a trivially true sentence under negation results in a trivially false sentence which is ungrammatical by Logicality. Now, let us consider three binary connectives: *or*, *and*, *if*. Disjunction is true whenever one of its disjuncts is true. Therefore, disjunction with a trivially true expression is trivially true and thus ruled out by Logicality. The same holds for *if* p, q when q is trivially true.

Conjunction $p \wedge q$ and conditional *if* p, q where p is trivially true present a more involved case: they are truth-conditionally equivalent to q. I suggest that these options are ruled out by appealing to redundancy conditions that rule out complex sentences with truth-conditionally equivalent subconstituents (simplification; see a formal definition in Katzir 2007). DP-internal **schmopletely**-modified adjectives are amenable to a similar treatment: redundancy, when understood through the lens of a Katzirian simplification, arises whenever there is a constituent in the sentence that can be replaced by its subconstituent without a truth-conditional difference. Therefore, NP-internal redundancy results in oddness too.

3.3 Why strengthening can not circumvent triviality

The discussion in section 2 has implicitly relied on the idea that *equality* semantics for a modified adjectival phrase can be derived from *at least* semantics by covert strengthening (exhaustification). The question is, then, why exhaustification cannot strengthen adjectival phrases modified with **schmopletely** into a non-trivial meaning?

My suggestion is that it is due to the fact that exhaustification does not change the assertive component of the utterance, as argued for in the presuppositional exhaustification literature (Bassi, Del Pinal & Sauerland 2021; Del Pinal, Bassi & Sauerland 2024). If strengthening is indeed presuppositional, then the assertive component of adjectival phrases modified with **schmopletely** is nevertheless trivial, resulting in ungrammaticality. The cases of non-salvation of oddness of sentences *at least zero* by exhaustification discussed by Haida & Trinh 2020 can be derived similarly.

4 Conclusion

This paper has addressed the lexicalization gap of a degree modifier like **schmopletely** that denotes the lower bound of the scale. The solution is based on the idea that if **schmopletely** existed, it would be associated with trivial truth-conditions, which, following the Logicality hypothesis, result in ungrammaticality, providing an explanation for the lexicalization gap. Additionally, I have suggested that covert strengthening cannot save trivially true expressions due to the idea that strengthening is not-at-issue (as argued for in the presuppositional exhaustification literature).

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