

An Argument for a Strong Force Semantics of *Believe*

Abstract: The English verb *believe* is usually taken to encode universal quantification over possibilities (Hintikka 1969) and thus it is predicted to carry a strong modal force. Faced with the intuition that *believe* feels weaker than uncontroversially strong modals like *sure*, Hawthorne et al. (2016) instead propose that *believe* carries a weak modal force, requiring that the agent’s degree of certainty exceed some vague standard and drawing a parallel to relative gradable adjectives like *tall*. The current contribution takes to heart the idea that *believe* is gradable but shows that its scale properties in fact argue against a weak force semantics: the scale of *believe* is upper-closed and so its default standard must be the scale maximum (Kennedy and McNally 2005; Kennedy 2007). This results in a strong modal force, suggesting that the felt weakness of *believe* may be rooted in its ‘subjective’ modal flavor (cf. Lyons 1977; Kratzer 1981) arising from the fact that *believe* maps propositions to degrees of credence.

Keywords: *believe*, modal strength, gradability, subjectivity

1 The weakness of *believe*

Ever since Hintikka (1969) it has become standard to analyze *believe* as encoding universal quantification over possibilities. More specifically, a belief attribution has been taken to state that the prejacent (the clausal complement of *believe*) is true across all of the agent’s doxastic alternatives. This is usually rendered as in (1), where $Dox_{x,w}$ stands for the set of x ’s doxastic alternatives in a world w .

$$(1) \quad \llbracket \text{believe} \rrbracket^w = \lambda p \lambda x. \forall w' \in Dox_{x,w} : p(w')$$

Importantly, due to the presence of a universal quantifier, this semantics ascribes to *believe* a strong modal force.

Faced with examples like (2), [Hawthorne et al. \(2016\)](#) (see also [Rothschild 2020](#)) point out that *believe* appears to convey a lower degree of certainty than do uncontroversially strong epistemic modals like *sure*.

- (2) I believe the Patriots will win, but I’m not sure they will.

Contra the traditional Hintikkan analysis, [Hawthorne et al. \(2016\)](#) propose that *believe* owes its weakness to its non-maximal modal force, requiring that the agent’s degree of certainty exceed some vague threshold and invoking a parallel to relative gradable adjectives like *tall*. This view is summarized in (3).¹

- (3) x believes p is true if and only if the degree of certainty that x assigns to p exceeds some contextually supplied threshold.

When translated into a standard degree-based semantics ([Cresswell 1976](#); a.m.o.), this view amounts to analyzing *believe* as a relation between individuals, propositions, and degrees. This is formalized in (4), where the measure function Cr maps propositions to ‘credences’, i.e., degrees of personal belief. Following much of the gradability literature, in the absence of overt degree morphology the relevant threshold $\theta_{P,c}$ (for a predicate P in a context c) is selected by the covert degree morpheme POS, see (5).² The resulting semantic composition is illustrated in (6).

¹[Hawthorne et al. \(2016: 1400\)](#) additionally require that the prejacent be (significantly) more likely than its salient alternatives. Here I will ignore this second truth condition since the main argument presented below already puts into question the weaker version stated in (3).

²Following [Kennedy and McNally \(2005\)](#), POS has the more general meaning in (i).

(i) $\llbracket \text{POS} \rrbracket^{w,c} = \lambda P \lambda x. \exists d [\text{std}_c(d, P) \wedge P(d)(x)]$

- (4) $\llbracket \text{believe} \rrbracket^w = \lambda p \lambda d \lambda x. Cr_{x,w}(p) \succeq d$
- (5) $\llbracket \text{POS} \rrbracket^{w,c} = \lambda P \lambda x. \exists d [d \succ \theta_{P,c} \wedge P(d)(x)]$
- (6) a. $[_{\text{TP}} \text{ Alex } [_{\text{DegP}} \text{ POS } [_{\text{VP}} \text{ believes it is raining}]]]$
b. $Cr_{alex,w}(\text{rain}) \succ \theta_{bel,c}$

The current contribution argues that the core intuition of [Hawthorne et al. \(2016\)](#) is on the right track: *believe* behaves like a gradable predicate and can plausibly be assigned the meaning in (4), which will be adopted here. However, its scale properties turn out to posit a challenge to the proposed weak force semantics. The main argument is based on the observation that *believe* can be modified by maximality modifiers (*fully*, *completely*, *entirely*, etc.), suggesting an upper-closed scale. If so, given the strong correlation between scale boundedness and standard of comparison ([Kennedy and McNally 2005](#); [Kennedy 2007](#)), *believe* must be an absolute predicate that takes the scale maximum as a default standard, thus conveying a strong modal force. This finding has the important implication that the felt weakness of *believe* is likely due to its modal ‘flavor’, i.e., the kind of epistemic content encoded by the measure *Cr*. One attractive possibility, sketched in the final section, is that *believe* lexicalizes ‘subjective’ epistemic modality (cf. [Lyons 1977](#); [Kratzer 1981](#); [Nuyts 2001](#); [Papafragou 2006](#); [Portner 2009](#)), and so it entails a lower level of commitment despite its maximal force.

Here the standard-selection relation $\text{std}_c(d, P)$ is assumed to amount to different conditions depending on the features of the gradable predicate P : $d \succ \theta_{P,c}$ if the scale S_P of P lacks endpoints (relative predicates), $d \succ \min(S_P)$ if S_P is lower-closed (minimum-standard predicates), and $d = \max(S_P)$ if S_P is upper-closed (maximum-standard predicates). Section 2 provides more discussion.

2 The argument from scale boundedness

Prior work has suggested that the English verb *believe* is grammatically gradable (Bolinger 1972: ch.9; Lassiter 2021). And indeed, it can participate in various degree constructions, including equatives, comparatives, and superlatives. The naturally occurring examples in (7)–(9) provide an illustration.

- (7) Each [farmer] believes as strongly as the other that his crops will not survive another week without water, and each cares as much as the other about the survival of his crops.
- (8) He believes more strongly than I do that the organization of the executive branch of the federal government matters a great deal.
- (9) What group on this map most strongly believes that climate change is not real?

As a sidenote, notice that in the above examples *believe* is accompanied by the adverb *strongly*. Although this is a common pattern, *strongly* is not always required in order to compare degrees of belief. As the two naturalistic examples in (10) demonstrate, in comparatives *believe* may also occur on its own.

- (10) a. No one believes more than me that fitness should be a top priority in our lives.
 - b. What do you believe more, that the CIA killed JFK or that the government did 9/11?
- (cited in Lassiter 2021)

There are two possible lines of analysis here. We could say that gradable VPs interact directly with degree morphemes more generally, although in the case of *believe*-VPs this is dispreferred for some reason. We could also say that *strongly* in VP comparison is always present but may be covert, as in the case of VPs headed by gradable verbs such as *like*, *matter*, *trust*, etc. Whichever line is chosen, the key point is that the distribution of *strongly* does not correspond with an obvious semantic contrast. That is, in both (7)–(9) and (10) we seem to be comparing degrees of belief.

The fact that *believe* is gradable does not prejudge the issue of whether this verb carries a weak or a strong modal force. The reason is that, in the absence of overt degree morphology, gradable predicates may pick different standards of comparison. Unger (1971) was the first to distinguish between two kinds of gradable adjectives, depending on how the default standard is chosen. The standard of ‘relative’ adjectives like *tall* is vague and falls somewhere in the middle of the scale, while the standard of ‘absolute’ adjectives like *bent*, *straight*, *full* is fixed as the minimum or the maximum of the scale. A theory of *believe* that treats it as relative, i.e., as having a vague standard, corresponds to treating it as carrying a weak force. Likewise, a theory that treats *believe* as absolute, with a maximal standard, corresponds to treating it as carrying a strong force.

Kennedy and McNally (2005) and Kennedy (2007) convincingly argue that the relative–absolute distinction boils down to differences in scale boundedness (see also Rotstein and Winter 2004 and Burnett 2017). They classify gradable predicates depending on whether the associated scale has open or closed ends,

deriving the typology in (11).³

(11) a. open scale	○————○	<i>tall, short</i>
b. lower-closed scale	●————○	<i>bent, wet</i>
c. upper-closed scale	○————●	<i>straight, dry</i>
d. totally closed scale	●————●	<i>full, empty</i>

This typology is empirically supported by the distribution of degree modifiers that make reference to scale endpoints. That is, minimality modifiers (like *slightly*) typically only occur with adjectives whose scale is lower closed, maximality modifiers (like *perfectly*) are only compatible with adjectives whose scale is upper closed, and proportional modifiers (like *half* or *mostly*) require adjectives with totally closed scales. Adjectives with open scales are generally incompatible with any of these modifiers.

Kennedy and McNally (2005) establish the following key generalization regarding the link between scale boundedness and standard of comparison: adjectives with open scales take vague standards, whereas adjectives with (partially or totally) closed scales take fixed standards. For example, *tall* is associated with an open scale (it does not occur with minimality or maximality modifiers like *slightly* or *completely* without a shift in meaning) and takes a vague standard that

³Kennedy and McNally (2005) characterize open scales as lacking and closed scales as having the relevant endpoints, thus drawing a parallel to open and closed intervals over real numbers. However, if a scale consists of a finite number of degrees (say, because it is constructed from equivalence classes over a finite domain of individuals; cf. Bale 2008), there will necessarily be a maximal and a minimal degree. Faced with this problem, Burnett (2017: 5.3) proposes that scales differ in how they can be extended. That is, open scales allow for fresh degrees that add new endpoints, closed scales do not.

depends on the contextually supplied comparison class. By contrast, *straight* has an upper-closed scale (e.g., it accepts modification by *completely*) and takes the scale maximum as a default standard. The explanation for the first part of the Kennedy–McNally generalization is straightforward: if a scale lacks endpoints, an adjective associated with it needs contextual support in order to find an appropriate standard. The explanation for the second part of the generalization requires an optimization principle called Interpretive Economy (Kennedy 2007), according to which truth conditions favor conventional meaning over contextual information. Given this principle, if a scale provides endpoints, an adjective must use these when picking a standard before it involves the context.

We can now employ the Kennedy–McNally generalization to determine whether *believe* takes a vague or a fixed standard. The key question is, what kind of scale is *believe* associated with? The naturalistic data in (12) argues for an upper-closed scale, due to compatibility with maximality modifiers like *fully*, *completely*, or *entirely*.

- (12) a. My boss fully believes that family comes first.
- b. For one, I completely believe that Wal-Mart is a monopoly, if you thought I was defending Wal-Mart.
- c. But Kathleen didn't entirely believe it.

Given that its scale is upper closed, the Kennedy–McNally generalization predicts that *believe* associates with a fixed rather than a vague standard. This prediction is in line with *believe* taking as its default standard the scale maximum rather

than some degree from the middle part of the scale. We may conclude that *believe* carries a strong modal force, contra Hawthorne et al. (2016). That is, though gradable, an unmodified use of *believe* ascribes to the agent a maximal degree of credence.⁴

Two remarks are in order here. The first is that the above argument is as good as the Kennedy–McNally generalization itself, which has been further qualified (McNally 2011; Toledo and Sassoon 2011; Solt 2012) or directly challenged (Lasnik 2017: 4.2). However, even if this generalization is not entirely correct, then there would be at least a strong expectation that *believe* carries a strong modal force, judging by the overall behavior of other gradable predicates.

The second remark is that, as long as *believe* has a unique meaning across different contexts, it does not matter whether its measure and pertaining scale are native to the verb, as stipulated in (4), or are introduced externally by some additional degree morphology (cf. Pasternak 2019; Wellwood 2019). That is, since *believe* does not carry the hallmarks of multidimensionality (cf. ?*Kim believes in some/most/all respects that it is raining outside*; see Sassoon 2013), this verb must be associated with a fixed scale that exhibits the properties just described.

3 Further evidence

Three tentative pieces of evidence further strengthen the empirical parallel be-

⁴The conclusion that unmodified *believe* targets the scale maximum begs the question of what maximality modifiers as in (12) contribute to its meaning, if anything at all. While I will not stake out a position here, two plausible options are that such modifiers (i) remove potential imprecision (Lasnik 1999; Sauerland and Stateva 2011; Solt 2014; Burnett 2017: ch.5; Klecha 2018) or (ii) access extreme values that fall outside the salient part of the scale (Morzycki 2012). Notably, this issue extends to all maximum-degree predicates (cf. *full* vs. *completely full*) and so it asks for a general solution.

tween maximum-degree predicates and *believe*. The first piece of evidence involves insertion of a phrase that restricts the comparison class (Klein 1980; Kennedy 2007; Bale 2011; a.o.). Since relative predicates like *tall* pick flexible standards, such overt phrases are expected to delimit the range of options and increase informativity. By contrast, absolute predicates like *full* select a fixed standard, so trying to restrict the comparison class should lead to redundancy. The contrast in (13), from Lassiter (2017: 101), confirms these predictions.⁵

- (13) a. Bill is tall for a fourteen-year-old.
 b. ?? This room is full for a classroom.

Believe behaves like an absolute predicate in this respect, i.e., an unmodified form of this verb may not co-occur with a phrase that specifies a comparison class. This contrasts with relative modals such as *likely* (Yalcin 2010; Klecha 2014; Lassiter 2017), which more readily allow for overt comparison phrases. (14) provides an illustration.

- (14) a. (?) Compared to an invasion of another neighboring country, an invasion of Ukraine is likely.
 b. # Compared to an invasion of another neighboring country, I believe that Ukraine will be invaded.

⁵Absolute predicates may be sensitive to the kind of object being ascribed to—e.g., a wine glass would be considered full if it is filled to about half of its capacity. However, such combinations are not natural with comparison class restrictors (cf. *?This glass is full for a wine glass*). The explanation proposed in the literature is that the standard for absolute predicates is based on rules (McNally 2011) or intensional counterparts of the object of predication (Toledo and Sassoon 2011), rather than based on similarity to some class of extensional objects determined by the restrictor phrase.

A second piece of evidence involves antonym pairs. It has been pointed out that the negation of an absolute adjective entails its antonym, while the negation of a relative adjective does not entail its antonym (Cruse 1986: ch.9; Kennedy 2007; Lassiter 2017). Similarly, one cannot negate both an absolute adjective and its antonym, although one can negate a relative adjective and its antonym. The rationale behind these contrasts is that absolute antonym pairs cover complementary portions of the same scale, while relative antonym pairs leave a ‘gray zone’ between the two denotations. The examples in (15)–(16) are taken from Lassiter (2017: 100) and illustrate these contrasts for the absolute antonym pair *bent*–*straight* and the relative antonym pair *tall*–*short*.⁶

- (15) a. The rod is not bent. \rightsquigarrow The rod is straight.
 b. # The rod is not bent, but it is not straight either.
- (16) a. Bill is not tall. \nrightarrow Bill is short.
 b. Bill is not tall, but he is not short either. (He is just average.)

Notably, *believe* and its apparent antonym *doubt* seem to pattern with absolute adjectives in this respect. To see that, let us assume that Jack is ‘epistemically engaged’ with a given proposition *p* in some way (e.g., by finding *p* impossible, possible, likely, or certain), so that we may not judge sentences of the form *Jack believes/doubts p* false merely because Jack has not entertained *p* at all in

⁶To be precise, the reported patterns about absolute predicates hold only for maximum–minimum antonym pairs. Importantly, *believe*–*doubt* fit the bill, assuming that *believe* is maximum-degree and *doubt* is minimum-degree (see the following paragraph). Lassiter cites *full*–*empty* as an example of a maximum–maximum absolute pair that does not obey the patterns in (15).

his mind. Assuming epistemic engagement, Jack’s not doubting p entails Jack’s believing p , and Jack cannot simultaneously not believe and not doubt p . This is illustrated in (17).⁷

- (17) a. Jack doesn’t doubt that Jill is at the party. \rightsquigarrow Jack believes that Jill is at the party.
- b. # Jack doesn’t believe that Jill is at the party, but he doesn’t doubt it either.

Relative modals seem to exhibit the opposite behavior to *believe* in not requiring complementarity. This is shown in (18) for the antonym pair *likely–unlikely*.

- (18) *Context: The chance that Jill is at the party is exactly 50 percent.*
- a. Jill is likely to be at the party. (False)
- b. Jill is unlikely to be at the party. (False)

A third piece of potential evidence involves interaction with percentage modifiers. Klecha (2014) and Lassiter (2017) notice that maximum-degree modal adjectives prefer percentage modifiers that are close to the top of the scale, whereas

⁷Notice that (17a) is stated as an entailment from $\neg \text{doubt}(p)$ to $\text{believe}(p)$ rather than as the logically equivalent entailment from $\neg \text{believe}(p)$ to $\text{doubt}(p)$. This is as intended and was done for two reasons. The first reason is that negating *believe* invites the possibility of neg-raising (Bartsch 1973; Horn 1989; Gajewski 2007; Romoli 2013; Homer 2015; a.o.), which would strengthen the reading to $\text{believe}(\neg p)$ and automatically guarantee the entailment to $\text{doubt}(p)$. The second reason is that in an upward-entailing context $\text{doubt}(p)$ is usually taken to mean not just ‘not believe p ’ but ‘believe not p ’ (Anand and Hacquard 2013), thus seemingly invalidating the entailment from $\neg \text{believe}(p)$ to $\text{doubt}(p)$. Crucially though, this strengthened meaning has been attributed to exhaustification arising from the fact that English *doubt* lacks a stronger scalemate that means ‘believe not’ (Uegaki 2021). This explains why the strengthened meaning of *doubt* melts away in downward-entailing contexts like (17a), where $\neg \text{doubt}(p)$ simply means $\text{believe}(p)$.

relative modal adjectives impose no clear preference. This property is illustrated for *certain* and *likely* in (19).

- (19) a. It's ??5 / ?50 / 99 percent certain that Biden will win.
b. It's (?)5 / 50 / 99 percent likely that Biden will win.

While most speakers I consulted rejected combinations of percentage modifiers and *believe* across the board, some speakers found *believe* acceptable with high percentage modifiers. This divergence in judgments is shown in (20).⁸

- (20) I believe #5 / #50 / %99 percent that Biden will win.

I do not know why such a restriction on percentage modifiers should be in place. However, its existence suggests that—at least for some speakers—*believe* belongs in this respect in the same class as less controversial instances of maximum-degree predicates.

4 Conclusion and outlook

There is a pervasive intuition that English *believe* conveys some sense of epistemic weakness, in contrast to strong epistemic modals like *sure*. In spite of this intuition, I have developed an argument against a weak force semantics for *believe*, based on the observation that its scale is upper closed and so it must take the scale

⁸To corroborate these findings, three counterpart sentences to (20) were presented on Prolific to nine native speakers of American English and asked to rate such these on a scale from 1 (very unnatural) to 5 (very natural). Participants consistently rejected the combinations *believe 5 percent* (mean = 1.3) and *believe 50 percent* (mean = 1.5). However, the results for the combination *believe 99 percent* seemed to follow a bimodal distribution. That is, two participants found it fully acceptable (a ceiling effect) while the remaining seven participants found it quite unacceptable (a bottom effect).

maximum as a default standard (Kennedy and McNally 2005). This places the empirical picture on *believe* somewhere in between the classical analysis of Hintikka (1969) and the recent proposal in Hawthorne et al. (2016). That is, as predicted by the former account, unmodified *believe* conveys a strong modal force. At the same time, as expected on the latter account, *believe* behaves like a gradable predicate, although it shares properties with maximum-degree predicates like *straight* or *full* rather than relative predicates like *tall*. Is there a way to preserve the virtues of these two views?

Here I outline one potential direction, leaving the details for future research. One general consideration is that the modal strength of epistemic terms is a child of two parents, i.e., their force and their content. In the classical Hintikkan analysis in (1), the force component of *believe* is encoded by a universal quantifier and the content component is encoded by *Dox*, the domain of quantification. In the gradable semantics for *believe* in (4), endorsed here, the force component is conveyed by the default standard (i.e., the scale maximum) and the content component is encoded by the credence measure *Cr*. Now, having established that *believe* carries a strong modal force and yet conveys some sort of modal weakness, a natural idea would be that this weakness lies in the type of modal content being expressed. Can this idea be made more precise?

One attractive possibility is that, while maximum degree, *believe* lexicalizes epistemic content that is subjective and thus ‘weak’ in some intuitive sense. This line of analysis builds on the broader distinction, drawn in prior literature, between ‘subjective’ and ‘objective’ epistemic modality. Lyons (1977: ch.17) was the first

to point out that *might* and (epistemic) *must* can be read subjectively or objectively, where the former reading is based on less reliable evidence and merely voices an opinion, while the latter reading is based on knowledge and entails commitment to truth. For example, *Alfred must be unmarried* could be uttered as a somewhat risky conclusion after learning that Alfred is dating someone, or it could be the result of a logical deduction—e.g., exactly one faculty member is unmarried, every faculty member but Alfred is married, so Alfred must be unmarried. The subjective–objective distinction has been fleshed out in various ways, depending on whether the pertaining evidence is taken to be publicly defensible (Kratzer 1981), accessible to all speech participants (Nuyts 2001; Papafragou 2006), or both (Portner 2009: 4.2). For concreteness, let us take this distinction to be about public commitment, hewing closest to Lyons’s (1977) basic intuition and the implementation in Kratzer (1981).

Against this background, endowing *believe* with subjective epistemic flavor could potentially reconcile the intuition of weakness with its strong force. Specifically, if we grant that the epistemic adjective *sure* can receive an objective interpretation, we will get a handle on examples like (2)/(21a), which illustrate most vividly the modal weakness of *believe*. We need not say anymore that such examples are evidence for the weak force of *believe*. Rather, having established that *believe* is strong force, such examples can now be taken to juxtapose full subjective certainty with the lack of reliable evidence, resulting in the sense of a hedged commitment towards the prejacent. The formal analysis is sketched in

(21b), where *Com* is some measure of commitment and sp_c is the current speaker.⁹

(21) a. I believe the Patriots will win, but I'm not sure they will.

b. $Cr_{sp_c, w}(patriots.win) = 1 \wedge Com_{sp_c, w}(patriots.win) \prec 1$

More generally and building on the above discussion, one could speculate that epistemic modals fall into three large groups: (i) those that are lexically encoded as subjective (e.g., *believe*), (ii) those that are lexically encoded as objective (e.g., *know*), and (iii) those whose subjectivity properties are not lexically specified and are fixed by the linguistic context (*might*, *must*, *sure*, etc.). The substantiation of this typology is left for future work.

⁹Notice that *sure* seems able to receive a subjective interpretation as well, as seen from (i)–(ii).

(i) (?) I'm sure she was at the party, but I don't know it.

(ii) I was sure that the Patriots would win, and yet they lost.

That is, assuming that *know* is inherently objective, its negation in (i) suggests that *sure* must be read subjectively. Example (ii), from an anonymous reviewer, makes the same point by contrasting the speaker's internal certainty expressed by *sure* with an objective non-modal claim stating the opposite.

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