Assertability Differences between Epistemic Adverbs and Adjectives

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It is well known that epistemic (E-) adjectives and adverbs show distinct interaction patterns with semantic operators, e.g. with negation (cf. Ballert 1977, Wolf 2015), as shown in (1a) and (1b).

(1) a. This rock is (*not) certainly / probably / possibly a meteorite.
b. It is (not) certain / probable / possible that this rock is a meteorite.

Such differences have been explained by the assumption that E-adverbs are subjective whereas E-adjectives are objective (cf. Hengeveld 1988, Nuyts 2001), i.e. with the parameter for the epistemic authority set to the speaker or to some group of experts (cf.von Fintel and Gillies 2007). This helps to explain why both types of E-operators may co-occur, and why they can diverge (Nilsen 2004).

(2) a. It certainly is possible that the Fed will increase rates again.
b. It is possible that Le Pen will win, even though she certainly won't.

The assumption that E-adverbs are subjective whereas E-adjectives are objective predicts that cognate operators will be used in slightly different ways. Lassiter (2016) assumes that subjective *certainly* and *possibly* are used less strictly than objective *certain* and *possible*, as private subjective judgements can be defended more easily. That is, *certainly/possibly* should be assertable more broadly than *certain/possible*. Lassiter's experiment confirmed the prediction for *certainly*, but, interestingly, showed that *possibly* is less assertable than *possible*. We propose that with *possibly*, the speaker wants to introduce a proposition as a relevant option in the discourse, which is not necessarily the case with *possible*, which explains why the latter is less assertable. We predict:

(3) a. it is certain that ϕ < certainly ϕ where $\alpha < \beta$: α is less assertable than β.
b. possibly ϕ < it is possible that ϕ i.e.: α can be asserted $\Rightarrow$ β can be asserted

We hypothesise that the subjectivity of E-adverbs makes them more assertable in contexts in which probabilities are non-measurable (NM-condition) than in contexts where they are (M-condition).

We report on two experiments investigating these predictions. They go beyond Lassiter in two respects: (a) Lassiter used an experimental setup that involves narrow-scope negation for *certain* and *certainly* that may distort the results; (b) he only considered an M-condition with probabilities, provided by a lottery. We compared judgement on assertability in an M- and NM-condition.

Experiment 1: In order to compare the assertability of E-adjectives (*certain* and *possible*) and E-adverbs (*certainly* and *certainly*) in M- and NM- conditions, we adapted the raffle-scenario from Lassiter's study for M condition. In the raffle-scenario, participants read a set-up story that explained that total of 1000 raffle tickets were sold. Of those, *N*-many tickets were purchased by Jay, a wealthy local businesspeson. The number of tickets that Jay bought determines the exact mathematical probability, in terms of how likely that Jay won the raffle.

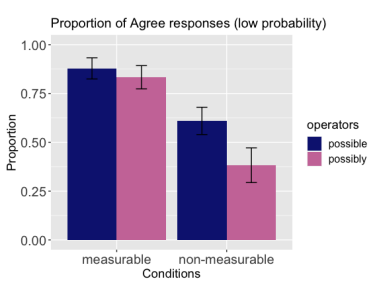
(4) a. It is *certain* that Jay won the raffle.
b. Jay *certainly* won the raffle.

(5) a. It is *possible* that Jay won the raffle.
b. Jay *possibly* won the raffle.

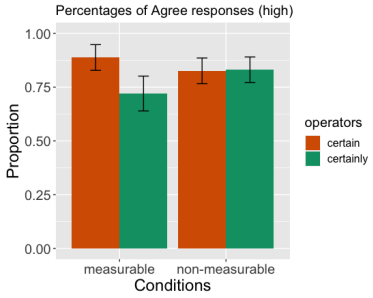
For the NM-condition, we designed a scenario (a crime story) with two lists of evidence, one each for high and low probabilities. We conducted a norming study to estimate the perceived probability that participants would assign to the two lists of evidence. Based on the norming study, we set the probability to 95% and 10%, departing from Lassiter's probabilities (99.9%/0.1%), adjusting the number of tickets bought by the protagonist to 950 and 100, in order to have similar probabilities

for both conditions. Each participant responded to a single scenario and a single sentence with a simple response (**agree** or **disagree**), in order to avoid effects that participants try to stay consistent across operators (unlike in Ricciardi et al. 2020).

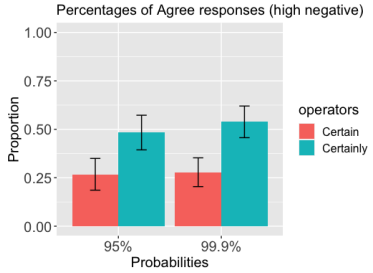
1131 native speakers of English participated in this study (Amazon MTurk platform). We used generalized logistic regressions models (glmer) using lme4 package (R) to analyze the data. Our results show that, (3b) was supported in low probability NM-condition (61% for *possible* compared to 38.3% for *possibly*: $p<0.01$) but not in M-condition. There was no interaction between the E-operator type and type of probabilities (N vs. NM) ($p=0.216$). As for high probability conditions, we obtained a significant but opposite result in the M-condition (88.8% for *certain* and 72.0% for *certainly*: $p<.01$). Both results from M-conditions were puzzling, in light of Lassiter's results. Recall that two aspects of Lassiter's setup (the percentage/probability used and the use of negation) were changed for Experiment 1. We tested the effect of these changes in Experiment 2.



(a) 10% probability



(b) 95% probability



(c) negative and higher %

Experiment 2: 621 native English speakers participated in two conditions testing the assertability of E-operators in positive sentences with 99.9% and 0.1% probability scenarios, and 483 speakers participated in the conditions testing the assertability of E-operators with negation with 95% and 10% probability scenarios. 581 speakers participated in replication conditions of Lassiter's study.

In the 99.9% condition without negation, significantly more people agreed to *certainly* than to *certain* (58.2% vs. 77.4%: $p<.01$). With the 0.1% condition, 88.4% agreed to the sentence in (5a) while 72.0% did so for (5b) ($p<.01$).

With negation, overall, we obtained the main effect of operator type, which was not necessarily present with positive sentences. Whether the probability is extreme (99.9%/0.1%) or moderate (95%/10%) did not have a significant effect (27.9% and 26.8% agree to *certain not*, and 53.8% and 48.3% agree to *certainly not*, 87.8% agree for *possible not*, respectively.)

Discussion Our experimental results support the overarching hypotheses: there is a difference between E-adverbs and E-adjectives in assertability ((3a) and (3b)) under M and NM probability conditions. We examined the effect of two changes we made to Lassiter's conditions, and show that the effect of extreme probabilities seem to depend on the polarity. In general, we suspect that the rhetorical potential of the performatively used E-adverbs might be responsible for the assertability of these sentences if the probability is less extreme or negation is part of the setup.

One remaining puzzle is the high probability NM-scenarios. One possible explanation is that it is an artefact of the presentation by a story: even the best attempts to make it unlikely that a character committed a crime may prompt readers of detective stories to conclude that character did commit the crime for that reason. Further studies with a setup less prone to this effect would be warranted.

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