

Evidentiality and mirativity in English polar interrogatives: An experimental study

Introduction A variety of polar interrogative (PQ) constructions in English have been argued to be associated with what is called ‘evidential bias’ ([17], [4]). For instance, preposed negation questions (e.g., (1b)) involving inner negation (henceforth IN-PNQs) are claimed to be associated with contexts in which the addressee indicated that $\neg p$ (negative evidential bias: [10], [14]), and are known to convey a mirative flavor (i.e., the speaker didn’t expect $\neg p$).

In this paper, we establish the existence of evidential and mirative flavor in two additional PQ constructions: PQs with strong NPIs like *ANYTHING* or *lift a finger* ([9]), e.g., (1c), and PQs with both preposed negations (PN) and strong NPIs, e.g., (1d). Specifically, we present an experimental study that compares the evidential/mirative potentials of four PQ constructions, introducing a novel experimental paradigm that can probe the complex interplay of evidential, epistemic, and mirative biases that emerge as discourse unfolds.

Based on the results, we address the open question of how the observed evidential/mirative biases in English PQs can be captured, what their status is, and how they are different from paradigmatic evidential/mirative markers ([11], [13], a.o.).

Motivation PNQs are often claimed to convey both positive epistemic bias and non-positive evidential bias. However, the status of the evidential bias as well as the availability of the inner negation reading (IN-PNQs) have recently been called into question ([6], [15]).

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|-----|----|------------------------------------|-------------|
| (1) | a. | Did Jane help? | PQ |
| | b. | Didn’t Jane help? | (ON/IN) PNQ |
| | c. | Did Jane lift a finger to help? | SNPI-Q |
| | d. | Didn’t Jane lift a finger to help? | SNPI-PNQ |

PQs involving strong NPIs (henceforth SNPI-Qs), such as (1c), have been argued to function as rhetorical questions with strong negative bias ([9], [7], [1], a.o.). Additionally, they appear to be associated with specific conditions of use that are evidential in flavor. However, the existence of this evidential bias has not yet been probed or corroborated. Finally, PQs involving both PN and SNPI (henceforth SNPI-PNQs) appear to maintain characteristics of both PNQs and SNPI-Qs ([2]; cf. [3], [18]), but an adequate descriptive generalization of their complex biases has not yet been established. In sum, the existence and the status/nature of the evidential biases of the four PQ constructions in (1) remains an open issue. To get a better empirical handle on this, we conducted an experimental study.

Experiment In the experiment, participants read cartoon strips representing a variety of discourse situations. The cartoons were revealed incrementally, and participants were asked to infer the epistemic and evidential status of interlocutors in the hidden preceding contexts.

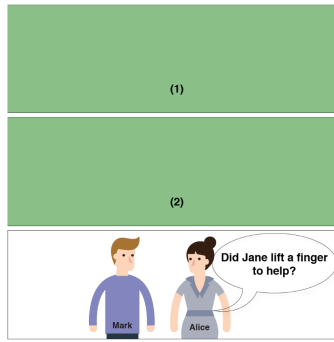
Methods. We included a variety of content radicals, and both minimizer NPIs (MNPIs) and stressed NPIs (SNPIs). Each content radical was associated with four types of PQ constructions. A sample paradigm with a MNPI was presented in (1); one with a SNPI is presented in (2).

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|-----|----|------------------------------|----------|
| (2) | a. | Did Nora bring something? | PQ |
| | b. | Didn’t Nora bring something? | ON-PNQ |
| | c. | Did Nora bring ANYTHING? | SNPI-Q |
| | d. | Didn’t Nora bring ANYTHING? | SNPI-PNQ |

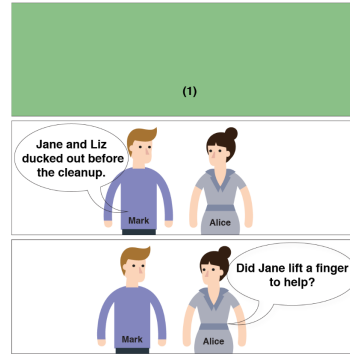
In each trial, participant saw a given item in one of the four available PQ constructions, embedded as a last panel in a cartoon. The cartoon was presented in two parts (e.g., fig. 1). After seeing only part 1 (e.g., fig. 1a), participants answered a question probing inferred evidential bias, exemplified in (3) Q1. Upon answering this, part 2 (e.g., fig. 1b) was revealed, and they

Please take a look at the dialogue below and answer a few questions. Preceding parts of the cartoon, which are hidden, have been labelled (1) and (2).

Suppose that the preceding context was as revealed below. Please answer a few more questions.



(a) Sample stimuli: part 1



(b) Sample stimuli: part 2

Figure 1: Experimental paradigm

subsequently answered questions probing inferred (prior) epistemic bias and mirativity, exemplified in (3) Q2–3. All questions involved assigning ratings on a 0–100 scale.

- (3) Q1: (*after part 1*) How likely is the following? $\neg p$ **evidential bias**
 Before Alice spoke, Mark indicated or implied in (2) that Jane did *not* help.
 Q2: (*after part 2*) How likely is the following? p **epistemic bias**
 Before Mark spoke, Alice believed in (1) that Jane helped, at least a little bit.
 Q3: (*after part 2*) How surprised does Alice sound in the last panel? **mirativity**

The four PQ constructions were counterbalanced across trials. 200 native speakers of American English were recruited from Amazon Mechanical Turk. In a separate experiment involving 240 native speakers, we also gathered the acceptability ratings of the four types of PQ constructions exemplified in (1) and (2).

Results. The acceptability ratings gathered from a separate experiment indicate that SNPI-PNQs elicit comparable acceptability ratings as other PQ constructions, including simple PQs. Thus, unlike the IN-PNQs involving *either* in [15], the IN-PNQs involving NPIs such as *lift a finger* and *ANYTHING* were considered to be fully felicitous, suggesting the availability of inner negation reading in PNQs ([10], [14]; cf. [6]).

The results from the main experiment are summarized in fig. 2. Responses to Q1 (fig. 2a) indicate that SNPI-PNQs, SNPI-Qs, and PNQs are all associated with significantly higher negative evidential bias (the inference that the addressee indicated that $\neg p$ in the immediately preceding context) than simple PQs (SNPI-PNQ, PNQ, SNPI-Q > PQ).¹

Responses to Q2 (fig. 2b) indicate that constructions involving preposed negation (PNQs and SNPI-PNQs) elicit significantly higher positive (speaker) epistemic bias rating than other constructions.² In particular, prior bias towards p was signaled in the following order: SNPI-PNQ, PNQ > PQ > SNPI-Q. Finally, responses to Q3 (fig. 2c) suggest that the mirative flavor

¹We also observe an interesting divergence between ON vs. IN-PNQs in the predicted direction: In paradigms involving SNPIs (right panel of fig. 2a), PNQs were disambiguated as ON-PNQs (see e.g., (2b)). Since ON-PNQs do not necessitate negative evidential bias and can be used in suggestion contexts ([10]), the $\neg p$ evidential rating of PNQs in SNPI cases are significantly lower than SNPI-PNQs or SNPI-Qs. In paradigms involving MNPIs (left panel of fig. 2a), PNQs were ambiguous between ON and IN readings (see e.g., (1b)). Since IN-PNQs require contexts marked with negative evidential bias ([14]), the $\neg p$ evidential rating of PNQs in MNPI cases are as high as SNPI-PNQs or SNPI-Qs.

²For reasons of space, we focus on results for MNPIs and omit details of the statistical analysis.

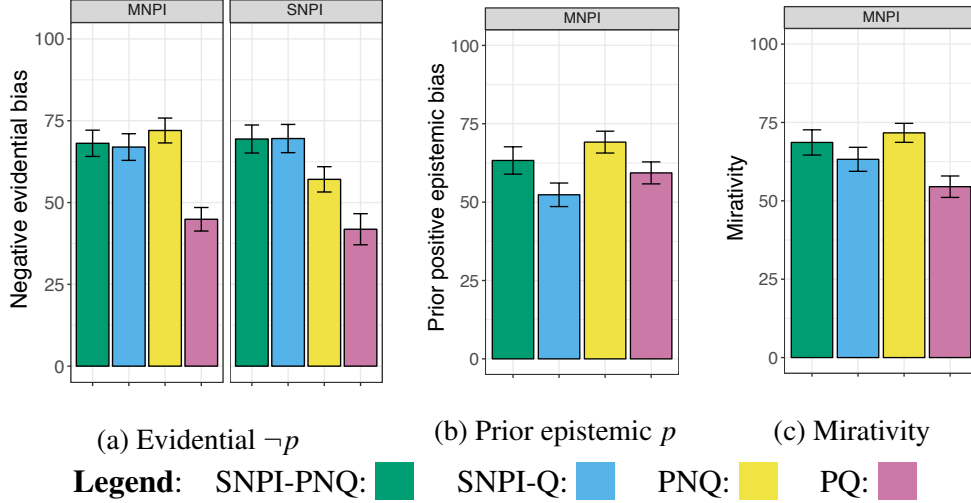


Figure 2: Experimental results: means and standard errors

is derived from the interplay between epistemic and evidential bias: mirativity is higher for constructions that elicit higher ratings in both Q1 and Q2 (i.e., strong p expectation and strong $\neg p$ evidence), and are ordered as follows: SNPI-PNQ, PNQ > SNPI-Q > PQ.

Discussion & Conclusion The results suggest that PNQs, SNPI-Qs, and SNPI-PNQs all have a close connection with negative evidential bias: they are expected in contexts where $\neg p$ was indicated in the preceding discourse by the addressee. When an inference of positive prior epistemic bias is generated in tandem, we end up with questions that convey a mirative flavor.

To capture the evidential bias of SNPI-Qs, we propose that strong NPIs necessarily contribute a silent EVEN operator (see also [2], [18]), and define it as in (4). To capture the evidential and mirative bias of IN-PNQs, we adopt the proposal by [5], which is based on [14], and assume the existence of a silent VERUM operator in IN-PNQs, as defined in (5).

Given (4), SNPI-Qs generate the following presupposition: all whether- q questions (where q is a non-minimal alternative to p , e.g., Lily helped, Nora brought something) have been settled. Since SNPI-(PN)Qs become questionable only if they were settled with negative answers, we end up with the negative evidential bias that $\neg p'$ for all alternatives p' to p .

Given (5), IN-PNQs end up generating roughly the following meaning: *Are you, the hearer, sure that $\neg p$ should be in the CG?* This follows from the shift in origo to the hearer (reminiscent of the interrogative flip in evidential markers; [16], [8]). This move is predicted to be felicitous when the addressee has indicated $\neg p$, capturing a subtly different kind of negative evidential bias from the one associated with SNPI-Qs.

Finally, the biases of SNPI-PNQs, which reflect aspects of both SNPI-Qs and PNQs (e.g., right of fig. 2a and fig. 2b) can be compositionally derived from these two operators ([2]; cf. [7]).

$$(4) \quad \llbracket \text{EVEN} \rrbracket = \lambda C. \lambda p : \forall q [q \in C \wedge q \neq p \rightarrow q \in CG \vee \neg q \in CG]. p$$

where C is a set of contextually salient alternatives

$$(5) \quad \llbracket \text{VERUM} \rrbracket = \lambda p : [\forall w' \in \text{Epi}_{\text{Origo}}(w) : \forall w'' \in \text{Conv}_{\text{Origo}}(w') : p \in CG_{w''}]. p$$

In sum, unlike the evidential/mirative markers in e.g., [13], evidentiality and mirativity are not directly encoded in English PQ constructions, but are rather derived as felicity conditions (evidential) or pragmatic inferences (mirative). What triggers these derivations are presuppositional CG management operators ([12]) like VERUM ([14], [5]) and EVEN. These operators provide additional mechanism via which flavors of evidentiality and mirativity can be derived, enriching the typology of evidential expressions, broadly construed.

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