

## When does *hope* neg-raise?: An experimental report on four languages

Neg-raising predicates (NRPs) form natural semantic classes: across languages, weak necessity modals (e.g., *think*, *want*, *believe*)—but not strong necessity modals (e.g., *have to*, *must*)—allow neg-raising, while factive verbs (Kiparsky & Kiparsky 1971) and existential modals (e.g., *able*, *possible*; Horn 1989) never do. These cross-linguistic regularities suggest that NRP membership is semantically motivated rather than arbitrary (Horn 1978). However, HOPE presents a challenge: Dutch *hopen* and German *hoffen* are NRPs, while Farsi *omid* lacks NR readings; English *hope* was reported as a non-NRP but has recently been shown to allow NR (An & White 2019). Given such idiosyncrasies, existing semantic-pragmatic and syntactic accounts ultimately treat NR as a lexically stipulated property (Collins & Postal 2014; Gajewski 2005; Romoli 2013; a.o.). This study provides experimental and cross-linguistic evidence that the variation is systematic: NR and non-NR HOPEs differ in whether their bouletic component is asserted or presupposed.

**Hypotheses.** HOPE has a bouletic and a doxastic component (Anand & Hacquard 2013, Portner & Rubinstein 2020). Languages vary in whether these meanings are asserted or presupposed.

- (1) John hopes that [Mary wins]<sub>*p*</sub>.
  - a. **Bouletic:** *In every world compatible with John's desires, *p* is true*
  - b. **Doxastic:** **p* is compatible with John's beliefs*

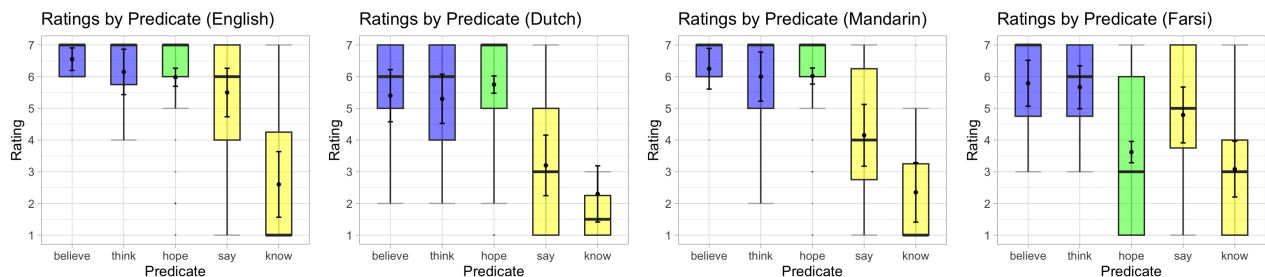
We hypothesize that ***hope* allows neg-raising only in languages where its bouletic meaning is asserted**. This correlation is confirmed by data from neg-raising and continuation experiments in four languages: English, Dutch, Mandarin, and Farsi.

**Experiment 1: Neg-raising.** To test whether *hope* acts as a neg-raiser across languages, we conducted sentence-likelihood rating tasks. Each of our stimuli consisted of a high-negation context and a low-negation statement, as in (2).

- (2) (Context: John and his friends are discussing whether Andy passed the physics exam. **No one hopes that Andy failed.**) Everyone hopes that Andy didn't fail.

We included eight target items and four controls: two neg-raisers (*think*, *believe*) and two non-neg-raisers (*say*, *know*). In our within-subjects design, participants read all items in randomized order and rated how likely each statement was true in the given context on a 7-point Likert scale. We recruited 20 native speakers for each language via Prolific and personal contacts.

**Results.** To compare the ratings of *hope* and NR controls, we fit a Cumulative Link Mixed Model (CLMM) using `ordinal` in R. In Farsi, *hope* was rated significantly **less likely to neg-raise** than *believe*/*think* ( $p < .0001$ ). In Dutch, *hope* was rated significantly **more likely to neg-raise** than *believe*/*think* ( $p = .02$ ). In English ( $p = .59$ ) and Mandarin ( $p = .55$ ), we found **no significant rating differences** between *hope* and NR controls.



**Experiment 2: Continuations.** To determine whether negation targets the bouletic or the doxastic component of *hope* in each language, we conducted sentence-naturalness rating tasks. Each of our stimuli consisted of a negated *hope*-statement and a continuation that denied either the attitude holders' bouletic desires (**BOU**) or the epistemic possibilities (**DOX**), as in (3). The statement also

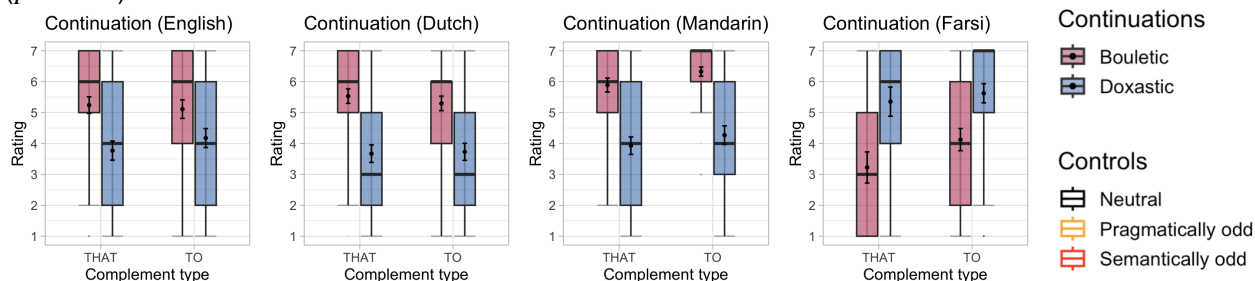
varied in COMPLEMENT TYPE (*to* vs. *that*). For Farsi, we additionally manipulated AUXILIARY (*budan* ‘be’ vs. *daštan* ‘have’) as a pseudo-factor, with each level randomly assigned to half of the items.

(3) None of my friends hope that they become a millionaire. ...

- a. All the millionaires they know live a miserable life.
- b. There is no realistic way for them to make that much money.

We included 16 target and 24 control items (8 neutral, 8 semantically odd, and 8 pragmatically odd, following Zhu & Ahn 2023). In our within-subjects design, each participant read all 40 items in randomized order and rated their naturalness on a 7-point Likert scale. We recruited 40 speakers per language and excluded participants whose mean rating of neutral items was below 5.

**Results.** To compare ratings of continuations, we fit a CLMM using `ordinal` in R. We found a main effect of CONTINUATION in all four languages ( $p < .0001$ ): BOU continuations were rated significantly higher than DOX in English ( $\beta = -1.84$ ), Dutch ( $\beta = -2.54$ ), and Mandarin ( $\beta = -2.58$ ), whereas the pattern reversed in Farsi ( $\beta = 1.98$ ). We also found a main effect of COMPLEMENT in Farsi ( $p = .028$ ) and a significant interaction of CONTINUATION and COMPLEMENT in English ( $p = .039$ ). There was no effect of AUXILIARY in Farsi.



**Discussion.** Our experimental findings confirm a systematic correlation between the neg-raising behavior of *hope* and the assertive status of its bouletic component. For *hope*, the bouletic component is a universal modal, as in (4-a), while the doxastic component is an existential modal, as in (4-b). A NR reading arises only when this universal bouletic component is asserted and can be targeted by negation.

	<i>hope</i> = NRP?	BOULETIC	DOXASTIC
EN	✓	asserted	asserted
DU	✓	asserted	presup.
MA	✓	asserted	–
FA	✗	presup.	asserted

A NR reading arises only when this universal bouletic component is asserted and can be targeted by negation.

- (4) a. **Bouletic:**  $\forall w' \in \text{DES}_\alpha(w) : \phi(w') = 1$       b. **Doxastic:**  $\exists w' \in \text{DOX}_\alpha(w) : \phi(w') = 1$

Crucially, the availability of NR correlates with universal modal force, rather than bouletic modal flavor. For example, universal doxastic predicates such as *believe* allow NR.

- (5)  $\llbracket \alpha \text{ believe } \phi \rrbracket^w = \forall w' \in \text{DOX}_\alpha(w) : \phi(w') = 1$

Therefore, theories of NR must explain the systematic contrast in NR availability between languages that assert negated universal modals and those that do not. This pattern calls for a non-lexical account that can derive NR readings for negated universal (cf. existential) modals.

**Typological variations.** The microvariation in the semantics of *hope* extends beyond our experimental findings. English and Dutch differ in whether the doxastic component is asserted or presupposed: The question ‘Do you hope to win?’ may ask about the epistemic possibility in English but not in Dutch. Additionally, Mandarin *hope* lacks a doxastic component entirely: whether the desired outcome is realistic plays no role in the meaning of *hope*.

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