

When does *hope* neg-raise?: Experimental evidence and typological variation

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Neg-raising predicates (NRPs) form natural semantic classes: across languages, weak necessity modals (e.g., *think*, *want*, *believe*) allow neg-raising, while factive verbs (Kiparsky & Kiparsky 1971) and existential modals (e.g., *able*, *possible*; Horn 1989) never do. These robust semantic regularities suggest that membership in the class of NRPs is not arbitrary but semantically motivated (Horn 1978). Nevertheless, HOPE shows cross-linguistic variations: Dutch *hopen* and German *hoffen* are NRPs, while Farsi *omid* lacks NR readings; English *hope* was reported to be a non-NRP but is recently shown to allow NR (An & White 2019). Given such idiosyncrasies, even semantic and pragmatic approaches ultimately treat NR as a lexically stipulated property (Collins & Postal 2014; Gajewski 2005; Romoli 2013; a.o). We argue for a non-lexical account of NR, showing experimentally that this variation is not random: NR and non-NR HOPE's differ systematically in whether their bouletic meaning 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]_p.
 - 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 only in languages where the bouletic meaning is asserted, *hope* neg-raises. This correlation is confirmed experimentally in a neg-raising and a continuation experiment.

Neg-raising Experiment: We investigated whether English *hope* and Dutch *hopen* are neg-raisers via sentence judgment tasks. Stimuli: We created 8 high-negation contexts, varying in complements (*to* vs. *that*). Each context was followed by a low-negation statement, as in (2).

- (2) (Context: John and his friends are discussing whether Andy passed the physics exam. **Neither John nor his friends hope that Andy failed.**) Everyone hopes that Andy didn't fail.

Procedure: We showed each participant 2 neg-raisers (*think*, *believe*) and 2 non-neg-raisers (*say*, *know*) as controls and 8 target *hope*-items in randomized order. Participants rated how likely these statements are true in the given contexts on a 7-point Likert scale.

Results: We fit a Cumulative Link Mixed Model via `ordinal` in R. Our results ($n = 21$ EN; $n = 22$ DU) showed **no main effect of PREDICATE** ($p = 0.259$ EN; $p = 0.173$ DU), suggesting no significant rating difference between *hope* and neg-raisers. Thus, *hope* is a neg-raiser.

Continuation Experiment: We further examined whether negation can target the bouletic or doxastic component of *hope* in English and Dutch, using a sentence judgment task. Stimuli: We created 80 target items evenly distributed in continuations (**BOU** vs. **DOX**), complement types (*to* vs. *that*), and negation forms, and included 24 control items (8 neutral, 8 semantically odd, and 8 pragmatically odd). Example (3) shows a negated *hope*-statement with a **bouletic** continuation, denying the desires, or a **doxastic** continuation, denying the epistemic possibility.

- (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.**

Procedure: In our between-subject design, each participants read 40 target and 24 control items in randomized order. Participants rated the naturalness of the items on a 7-point Likert scale.

Results: We fit a CLMM in R. Our results ($n = 40$ EN & DU) showed **a main effect of continuation** ($p < 0.05$ EN & DU), complement types ($p < 0.05$ EN; $p < 0.001$ DU), and negation forms ($p < 0.001$ EN; $p < 0.05$ DU). Our findings indicate that in both languages, the bouletic component is more easily targeted by negation.

Farsi. Farsi *hope* is not a neg-raiser. For example, negation must be interpreted high in (4-a) and the neg-raising reading in (4-b) is unavailable.

- (4) na John na doost-ha-š omid na-dar-and ke Andy rad be-š-e
 not John not friend-PL-their hope neg-HAVE-3PL that Andy fail IMPF-become.SUBJ-3SG
 a. ✓John and his friends think it's impossible that Andy failed.
 b. ✗Everyone hopes that Andy didn't fail. [Data confirmed by 10 native Farsi speakers]

Negation can only target the doxastic component of *hope* in Farsi. In (5-a), the bouletic continuation is infelicitous with a negated *hope*-statement because the bouletic meaning is presupposed.

- (5) hič-kodoom az dust-ha-m omid na-dar-and milioner be-š-and
 none of friend-PL-my hope NEG-have-3PL millionaire IMPF-become.SUBJ-3PL
 'None of my friends hope to 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. [n = 10]

Theoretical implications. Our empirical findings confirm the correlation between the NR ability of *hope* and the assertive status of its bouletic meaning. For *hope*, its bouletic component is a universal modal, as in (6-a), while its doxastic component is an existential modal, as in (6-b). We have observed that only when this bouletic component can be negated, a NR reading arises.

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

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

- (7) $[\![\alpha \text{ believe } \phi]\!]^w = \forall w' \in \text{DOX}_\alpha(w) : \phi(w') = 1$

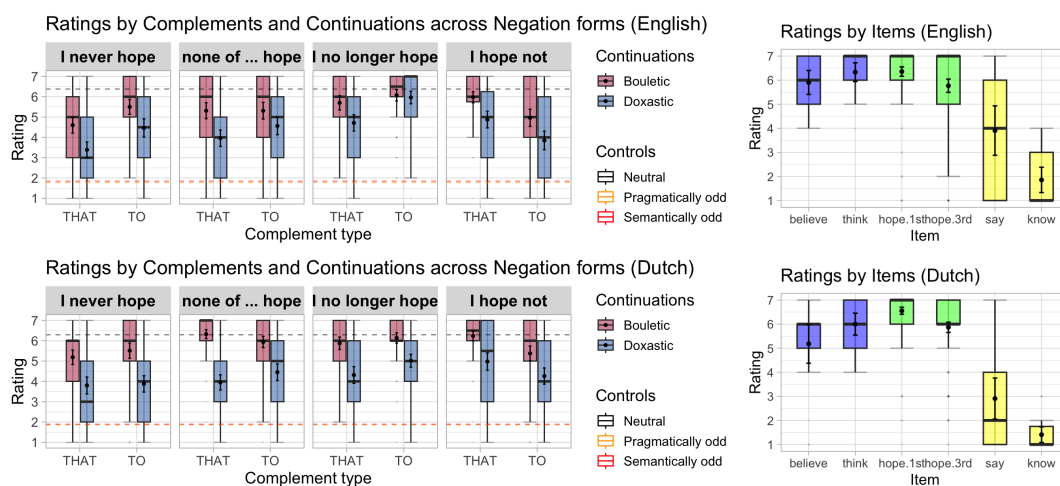
We further observe that in a language where *hope* only asserts a universal bouletic statement, it freely exhibits NR. This prediction is borne out in Mandarin: (8) shows that Mandarin *hope* has no doxastic component (i.e., the hope can be realistic or not) and (9) shows that it is a neg-raiser.

- (8) Zhangsan xiwang chengwei fuweng. (9) meiyou ren xiwang chengwei fuweng.
 Zhangsan hope become millionaire no person hope become millionaire
 'Zhangsan hopes to become a millionaire.' 'No ones hope to become a millionaire.' =
 ... and he knows this is possible/impossible. *Everyone hopes that they don't become millionaire*

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

Typological variations. We have identified four languages representing the micro-variations in the semantics of *hope*. English and Dutch differ in whether the doxastic component is asserted or presupposed. For example, a *hope*-question may ask about the epistemic possibility in English but not Dutch.

	BOULETIC	DOXASTIC	Is <i>hope</i> NRP?
EN	asserted	asserted	✓
DU	asserted	presupposed	✓
FA	presupposed	asserted	✗
MA	asserted	–	✓



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