Perfectivity disrupts neg-raising

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1. Introduction

The neg-raising (NR) inference is the inference from sentences like (1a) to ones like (1b).

(1) a. Zoé ne pense pas qu'il pleut.
Zoé NEG think NEG that=it rain
Zoé doesn't think that it's raining.

b. Zoé pense qu'il ne pleut pas.
Zoé think that=it NEG rain NEG
Zoé thinks that it's not raining.

The availability of **NR interacts with lexical aspect**. This is known but not yet well understood.[1]

(2) **NR ⇒ stative**
All NR predicates are stative, and in case an eventive counterpart of a NR predicate exists, this eventive counterpart does not trigger the NR inference.
modified from Bervoets (2014: p. 112)

We focus on the French predicate *penser*:

- It can be NR—in (1a).
- But, when forced to be eventive, in (3a), NR is not triggered—as expected per **NR ⇒ stative**.

  We use the perfective *passé composé* to force eventivity.

(3) **Eventive and not NR in the perfective**

a. Zoé n'a pas pensé qu'il pleuvait.
Zoé NEG=AUX NEG think that=it rained
Zoé didn't think$_{\text{PFV}}$ that it was raining.

b. Zoé a pensé qu'il ne pleuvait pas.
Zoé AUX think that=it NEG rained NEG
Zoé thought$_{\text{PFV}}$ that it wasn't raining.

Focusing on this subcase of this generalization, we set out to understand why it holds.
(We leave eventive *penser* in, e.g., the progressive, to another occasion.)

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Roadmap:

- The availability of NR is affected by perfectivity: Imperfective *penser* reports can be stative and NR, perfective *penser* reports must be eventive and cannot be NR (Sections 2 & 3).

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[1] Horn (1978: p. 206) attributes this to Polly Jacobson. Early sources on NR discuss it under various guises and oppose 'parenthetical,' 'performative' or 'metaphorical' uses to the 'literal' uses of a predicate, where only the former are NR (Lakoff, 1969; Jackendoff, 1971; Prince, 1976; Horn and Bayer, 1984). The link with aspect receives renewed attention in work by Bervoets (2014, 2020), Xiang (2014), Özyıldız (2021) and Bondarenko (2022).

- Conservative extensions of Excluded Middle based accounts (Bartsch, 1973; Gajewski, 2005) do not lead to expect that the availability of NR should be conditioned by aspect (Section 4).
- Treating the NR inference as a *Scaleless Implicature* (Jeretič 2021, 2022, cf. Mirrazi and Zeijlstra 2021) is able to capture, and in fact *predicts* the **NR** ⇒ **stative** generalization (Section 5).

2. *Penser* is not neg-raising in the *passé composé*

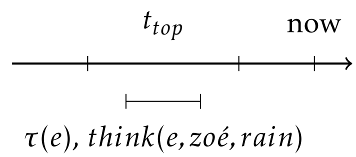
Background The French tenses *passé composé* and *imparfait* contrast in perfectivity.

The *passé composé* is a past perfective, locating the runtime of an eventuality within topic time.

(4) **Passé composé**

a. Hier, Zoé a pensé qu'il pleuvait.
yesterday Zoé AUX think.PTCP that=it rain.PST.IPFV
Yesterday, Zoé thought$_{\text{PFV}}$ that it was raining.

b. $\exists e\ think(e, zoé, rain) \wedge \boxed{\tau(e) \subseteq t_{top}}$
(to be strengthened so that e is bounded)

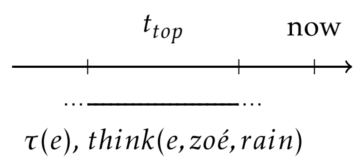


The *imparfait* is a past imperfective, locating topic time within the runtime of an eventuality.[2]

(5) **Imparfait**

a. Hier, Zoé pensait qu'il pleuvait.
yesterday Zoé think.PST.IPFV that=it rain.PST.IPFV
Yesterday, Zoé thought$_{\text{IPFV}}$ that it was raining.

b. $\exists e\ think(e, zoé, rain) \wedge \boxed{t_{top} \subseteq \tau(e)}$



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In English, the simple past is imperfective with statives, perfective with eventives, and ambiguous with predicates that can be either. The subscripts IPFV and PFV disambiguate the translations. The French facts below should replicate with *think*, given appropriate controls for perfectivity.

Intuitions about naturally occurring negated perfectives The following examples report on the $\boxed{\text{non-occurrence of a thought that } p}$, and not on the occurrence of a thought that $\neg p$.[3]

(6) *Context: A retail worker welcomes someone in who robs her store. Why did she open the door?*

Elle n'a pas pensé que c'était quelqu'un de mal intentionné.
she NEG=AUX think.PTCP NEG that it=was someone P bad intentioned
She didn't think$_{\text{PFV}}$ that it was someone whose intentions were bad.

✓ She did not think: "This is a bad person." — no NR
✗ She thought: "This is not a bad person." — NR

[2] The *imparfait* and *passé composé* have other aspectual values, not relevant for today. Our semantics for the imperfective and the perfective are attributed to Klein (1994). The function τ maps an eventuality onto its runtime.

[3] Links to ex. (6). and ex. (7).

(7) *Context: Criticizing a law that limits adopted children's access to their birth records.*

On n'a pas pensé que les enfants adoptés deviendraient des adultes.
IMPERS NEG=AUX NEG think.PTCP that DET children adopted would become DET adults
We didn't think$_{\text{PFV}}$ that adopted children would become adults.

- ✓ We did not think: "Adopted children will become adults." — no NR
- ✗ We thought: "Adopted children will not become adults." — NR

These examples only show that NR *can be* suspended in the perfective, not that it *has to be*. We make the latter, stronger claim.

Continuations The continuation in (8) forces an attitude report to be NR if it can be.

(8) *Quand elle est entrée dans une église pour la première fois...*
When she entered a church for the first time...

Isa ne pensait pas que Dieu existait. Sa mère pensait ça aussi.
Isa NEG think.PST.IPFV NEG that God existed her mom think.PST.IPFV that too
Isa didn't think$_{\text{IPFV}}$ that God existed. Her mom thought that too.

This is because:

- "Thought that too" presupposes the existence of an antecedent *positive* thought report.
- Interpreting *didn't think*$_{\text{IPFV}}$ *p* as *thought*$_{\text{IPFV}}$ *not p* satisfies this presupposition.

If an attitude report can't be NR, the continuation is infelicitous. *Prétendre*, in (9), is not NR.

(9) *Quand elle est entrée dans une église pour la première fois...*
When she entered a church for the first time...

Isa ne prétendait pas que Dieu existait. #Sa mère prétendait ça aussi.
Isa NEG claim.PST.IPFV NEG that God existed her mom claimed.PST.IPFV that too
Isa wasn't claiming$_{\text{IPFV}}$ that God existed. #Her mom claimed that too.

Crucially, with *penser* reports in the *passé composé*, the continuation fails.

(10) *Quand elle est entrée dans une église pour la première fois...*
When she entered a church for the first time...

Isa n'a pas pensé que Dieu existait. #Sa mère pensait ça aussi.
Isa NEG=AUX NEG think.PST.PFV that God existed her mom think.PST.IPFV that too
Isa didn't think$_{\text{PFV}}$ that God existed. Her mom thought that too.

These examples suggest that NR *has to be* suspended in the perfective.
(See strict NPI data in the Appendix.)

3. The *passé composé* requires eventive predicates

Eventuality predicates in the *passé composé* are interpreted as maximal.

The *imparfait* does not impose maximality (not shown).

(11) a. Aurore a dessiné un cercle. ⇒ Aurore finished drawing a circle.
Aurore AUX draw.PTCP a circle
Aurore drew$_{\text{PFV}}$ a circle.

b. Aurore a vécu à Boston. ⇒ Aurore no longer lives in Boston.
Aurore AUX live.PTCP in Boston
Aurore lived$_{\text{PFV}}$ in Boston.

♠

This property of the *passé composé* can be captured by making PFV select for maximal predicates.

(12) a. **PFV selects for maximal predicates**
PFV $:= \lambda P_{vt} : P$ is maximal$. \exists e\ P(e) \wedge \tau(e) \subseteq t_{top}$

b. **Maximality**
An eventuality predicate P is maximal iff $\forall e, e'\ [P(e) \wedge e \sqsubset e'] \rightarrow \neg P(e')$
"Whenever P holds of an eventuality e, it holds of none of its supereventualities e'."

- Maximality can come from the semantics of particular predicates:
  A complete drawing of a circle cannot be a proper part of a completed drawing of a circle.

- But states are not inherently bounded:
  Eventualities of living in Boston can be proper parts of eventualities of living in Boston.
  So maximality is introduced in the derivation with the aspectual coercion operator MAX (Bary, 2009; Homer, 2021).

  (13) MAX $:= \lambda P_{vt} \lambda e_v . P(e) \wedge \forall e'\ e \sqsubset e' \rightarrow \neg P(e')$

- **Maximality is a property of eventive predicates.**[4]

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Applying PFV and MAX to a *penser* report yields:

(14) a. Zoé a pensé qu'il pleuvait.
Zoé AUX think.PTCP that=IT rained
Zoé thought$_{\text{PFV}}$ that it rained.

b. ⟦ PFV [MAX [Zoé think that it rained]] ⟧ =
$\exists e\ think(e, zoé, rain) \wedge \forall e'\ e \sqsubset e' \rightarrow \neg think(e', zoé, rain) \wedge \tau(e) \subseteq t_{top}$

c. "There is a maximal eventuality of Zoé-thinking-that-rain whose runtime is contained within topic time."

And when (14) is negated, we obtain (15). (Note the presence of MAX in this case as well.)

(15) a. Zoé n'a pas pensé qu'il pleuvait.
Zoé NEG=AUX NEG think.PTCP that=IT rained
Zoé didn't think$_{\text{PFV}}$ that it rained.

[4]More accurately, the equivalent notion of quantization is a property of telic predicates, whichare all eventive.

b. ⟦ NEG [PFV [MAX [Zoé think that it rained]]] ⟧ =
$$\neg\exists e\ think(e, zoé, rain) \wedge \forall e'\ e \sqsubset e' \rightarrow \neg think(e', zoé, rain) \wedge \tau(e) \subseteq t_{top}$$

c. "There is no maximal eventuality of Zoé-thinking-that-rain whose runtime is contained within topic time."

♠

We have seen that the absence of the NR inference with *penser* in the perfective was an instance of the **NR** ⇒ **stative** generalization.

(2) **NR ⇒ stative**
All NR predicates are stative, and in case an eventive counterpart of a NR predicate exists, this eventive counterpart does not trigger the NR inference.
modified from Bervoets (2014: p. 112)

Let us now see how to derive this empirical result.

4. Excluded Middle-based accounts do not predict lack of NR in the perfective

NR can be explained with an Excluded Middle requirement associated with thought reports, which amounts to saying that *think*'s attitude holder is always opinionated about *think*'s prejacent (Bartsch, 1973; Gajewski, 2005).

(16) a. **Assertion:**
Zoé doesn't think that it's raining.

b. **Excluded Middle presupposition:**
Zoé thinks that it's raining or she thinks that it's not raining.

c. **Conclusion:**
Zoé thinks that it's not raining. = the NR inference

How does this presupposition interact with the perfective? We may suppose that a past perfective thought report presupposes a past perfective statement of opinionatedness:

(17) a. **Assertion:**
Zoé n'a pas pensé qu'il pleuvait.
Zoé didn't think$_{\text{PFV}}$ that it was raining.

b. **Excluded Middle presupposition:**
Zoé a pensé qu'il pleuvait ou elle a pensé qu'il ne pleuvait pas.
Zoé thought$_{\text{PFV}}$ that it was raining or she thought$_{\text{PFV}}$ that it wasn't raining.

c. **Conclusion:**
Zoé a pensé qu'il ne pleuvait pas.
Zoé thought$_{\text{PFV}}$ that it wasn't raining. ⇒ NR incorrectly derived

This may be the form of a *pragmatic presupposition* (= a condition normally expected to hold when an expression is uttered) as proposed by Bartsch (1973).

A view of the EM as a *semantic presupposition* (Gajewski, 2005) (a lexically-encoded property) does not predict exactly the same.

- We will see that NR is not derived, but neither is lack of NR.

To see how the EM presupposition interacts with aspectual operators, we transpose a standard lexical entry for *think* (Hintikka, 1969) into event semantics (cf. Hacquard 2006, a.m.o).

(18) a. $[\![\text{think}]\!] = \lambda p_{st}.\lambda x_e.\lambda e_v.dox(x,e) \subseteq p$
b. $dox := \lambda x_e.\lambda e_v.\{w \mid w \text{ is compatible with the content of } e \text{ and } e \text{ is a belief state of } x\}$

(19) $[\![\text{Zoé think that it's raining}]\!] = \lambda e.dox(zoé,e) \subseteq \{w \mid rain(w)\}$

To redefine the EM presupposition relativized to an event variable, we close it off universally, as in (20b).[5]

(20) a. EM presupposition (original "no events" version)
$[\![\text{a think p}]\!] = dox(a) \subseteq p$ *presupposes:* $dox(a) \subseteq p \vee dox(a) \subseteq \neg p$
b. EM presupposition redefined in event semantics
$[\![\text{a think p}]\!] = \lambda e.dox(a,e) \subseteq p$ *presupposes:* $\forall e[dox(a,e) \subseteq p \vee dox(a,e) \subseteq \neg p]$

This presupposition derives NR in the imperfective as desired[6]:

(21) NEG [IPFV [a think p
a. **Presupposition:** $\forall e'[dox(a,e') \subseteq p \vee dox(a,e') \subseteq \neg p]$
b. **Assertion:** $\neg\exists e[t_{top} \subseteq \tau(e) \wedge dox(a,e) \subseteq p]$
$\equiv \forall e[t_{top} \subseteq \tau(e) \rightarrow dox(a,e) \not\subseteq p]$
c. **Conclusion:** $\forall e[t_{top} \subseteq \tau(e) \rightarrow dox(a,e) \subseteq \neg p]$ ✓NR

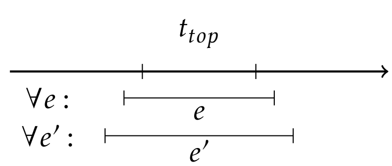
- $\neg p$ is ascribed to all belief states containing t_{top}. This is a NR inference.

Turning to the perfective, the EM presupposition predicts disruption of NR, but not as desired.

(22) NEG [PFV [MAX [a think p
a. **Presupposition:** $\forall e'[dox(a,e') \subseteq p \vee dox(a,e') \subseteq \neg p]$
b. **Assertion:** $\neg\exists e[dox(a,e) \subseteq p \wedge \tau(e) \subseteq t_{top} \wedge \forall e'[e \sqsubset e' \rightarrow dox(a,e') \not\subseteq p]]$
$\equiv \forall e[\tau(e) \subseteq t_{top} \wedge \forall e'[e \sqsubset e' \rightarrow \underline{dox(a,e') \not\subseteq p}] \rightarrow \underline{dox(a,e) \not\subseteq p}]$
c. **Conclusion:** $\forall e[\tau(e) \subseteq t_{top} \wedge \forall e'[e \sqsubset e' \rightarrow \underline{dox(a,e') \subseteq \neg p}] \rightarrow \underline{dox(a,e) \subseteq \neg p}]$ $\equiv \top$
✗NR
✗non-NR

The presupposition here has the effect of strenghtening the maximality conjunct to $dox(a,e') \subseteq \neg p$. The result is not an NR claim. Instead it is a tautology, here's why:

- (22c) reads: every e running in t_{top} such that all superevents of e are $\neg p$ thoughts is also a $\neg p$ thought.



$$dox(a,e') \subseteq \neg p \rightarrow dox(a,e) \subseteq \neg p$$

[5]There are different ways of doing this, including existentially and universally projecting the EM presupposition.

[6]The truth conditions in (21b) are compatible with a thinking eventuality whose runtime is properly contained within t_{top}, and the ones in (22b), by one whose runtime properly contains t_{top}. We are happy to talk about these 'wrinkles' during the question period.

- However, this already follows from the stativity of *think*:

  (23) A predicate P is stative iff $\forall e$ if $P(e)$ then $\exists e'\ e' \sqsubset e$ and $\forall e''\ e'' \sqsubset e \rightarrow P(e'')$

  $\Rightarrow$ it suffices for a superevent of e to be a $\neg p$ thought for e to be $\neg p$ thought, so the conclusion in (22) is a tautology.

(Note: The EM presupposition also predicts an undesirable result with non-negated perfective.)

5. Scaleless implicatures disrupted by the perfective

We will derive the observed disruption of NR in the perfective using an account of NR as a 'scaleless implicature', following Jeretič (2022) (see also Mirrazi and Zeijlstra (2021))

NR as a scaleless implicature NR can be derived as a scaleless implicature from the application of an operator EXH to a negated thought report:

(24) $[\![$EXH [NEG [a think p]]$]\!] \Rightarrow [\![$a think NEG p$]\!]$

- **Scaleless implicature** (Jeretič, 2021):
  - a strengthening from a weak quantificational meaning to a strong one:
    - $\exists \rightsquigarrow \forall$
    - $\neg\forall \rightsquigarrow \forall\neg$
  - predicted by theories of scalar implicatures computed in the grammar (Fox, 2007; Bar-Lev and Fox, 2020), as an effect of an exhaustivity operator EXH
  - occurs when a quantifier lacks a scalar alternative, and has subdomain alternatives

- *Think* as a quantifier that can trigger a scaleless implicature:
  - 'Think' is a universal quantifier whose *domain* is a set of possible worlds provided by *dox* applied to an individual (ignoring the event variable for now):

    (25) $[\![\text{think}]\!] = \lambda p.\lambda x.dox(x) \subseteq p \equiv \lambda p.\lambda x.\forall w \in dox(x)[p(w)]$

  - *Think*'s alternatives:
    - No scalar alternative, because no appropriate lexical existential scalemate in French/English with meaning $\lambda p.\lambda x.\exists w \in dox(x)[p(w)] \approx$ 'allow for the possibility'
    - Subdomain alternatives:

      (26) SubdAlt(a think p) = $\{\forall w \in D[p(w)] | D \subseteq dox(a)\}$

- **Simplified NR derivation:**
  - $[\![$ EXH p $]\!]$ (Bar-Lev and Fox, 2020):
    - asserts $[\![$p$]\!]$
    - negates Innocently Excludable (IE) alternatives of p (which can be excluded non-arbitrarily and consistently with $[\![$p$]\!]$)

* asserts Innocently Includable (II) alternatives of p (which can be included non-arbitrarily and consistently with $[\![p]\!]$ and excluded IE alternatives)

- Take a toy context with $dox(a) = \{w_1, w_2\}$

(27) a. $[\![$ NEG [a think p] $]\!] = \{w_1, w_2\} \nsubseteq p$ (before exhaustification)
b. Alternatives:
(i) $\{w_1\} \nsubseteq p$
(ii) $\{w_2\} \nsubseteq p$

* No IE alternatives, because excluding (i) and (ii) with (27a) leads to contradiction:

(28) $\{w_1, w_2\} \nsubseteq p \wedge \{w_1\} \subseteq p \wedge \{w_2\} \subseteq p \equiv \bot$

* All alternatives are II:

(29) $[\![$ EXH [NEG [a think p]] $]\!]$
$\equiv \{w_1, w_2\} \nsubseteq p \wedge \{w_1\} \nsubseteq p \wedge \{w_2\} \nsubseteq p$
$\equiv \{w_1, w_2\} \nsubseteq p \wedge \{w_1\} \subseteq \neg p \wedge \{w_2\} \subseteq \neg p$
$\equiv \{w_1, w_2\} \subseteq \neg p$

* NR is derived.

What this analysis predicts with aspectual operators We now want to show that a scaleless implicature with negated *think* is derived in the imperfective, but not in the perfective:

(30) a. $[\![$EXH [NEG [IPFV [a think p]]]$]\!] \Rightarrow [\![$a think NEG p$]\!]$
b. $[\![$EXH [NEG [PFV [MAX [a think p]]]]$]\!] \nRightarrow [\![$a think NEG p$]\!]$

Recall, to combine with aspectual operators, *think*'s lexical entry needs to be relativized to an event variable:

(31) $[\![$a think p$]\!] = \lambda e.dox(a, e) \subseteq p$

Redefining *think*'s subdomain alternatives accordingly:

- This is not straightforward: We can't define subdomain alternatives as simply replacing the domain of *think* with its subsets, since the domain is not fixed.

- Instead, subdomain alternatives need to be defined relative to **subsets of** $dox(a, e)$ **for *every* value of** e

  - We do this using choice functions (following Jeretič 2022):

    (32) Alt(a think p) = $\{\lambda e.F(\mathcal{P}(dox(a, e))/\varnothing) \subseteq p \mid F$ is a choice function defined on $\mathcal{P}(dox(a, e))/\varnothing$ for all $e \in D_v\}$

    In the term $F(\mathcal{P}(dox(a, e))/\varnothing)$, the choice function F picks a member of the power set of $dox(a, e)/\varnothing$, or the set of non-empty subsets of $dox(a, e)$. Each F is defined for a given e.

Derivation for a negated imperfective

(33) $[\![$ NEG [IPFV [a think p]] $]\!]$ (before exhaustification)

a. $\equiv \neg\exists e[dox(a,e) \subseteq p \wedge t_{top} \subseteq \tau(e)]$
$\equiv \forall e[t_{top} \subseteq \tau(e) \rightarrow dox(a,e) \nsubseteq p]$

b. **Alts:** $\{\forall e[t_{top} \subseteq \tau(e) \rightarrow F(\mathcal{P}(dox(a,e))/\varnothing) \nsubseteq p] \mid$
F is a choice function defined on $\mathcal{P}(dox(x,e))/\varnothing$ for all $e \in E\}$

Result of EXH application (see details in Appendix):

(34) ⟦ EXH [NEG [IPFV [a think p]]] ⟧
$\equiv \forall e[t_{top} \subseteq \tau(e) \rightarrow dox(a,e) \subseteq \neg p]$

This corresponds to a NR inference.

Derivation for a negated perfective

(35) ⟦ NEG [PFV [MAX [a think p]]] ⟧ (before exhaustification)

a. $\equiv \neg\exists e[\tau(e) \subseteq t_{top} \wedge dox(a,e) \subseteq p \wedge \forall e'[e \sqsubset e' \rightarrow dox(a,e') \nsubseteq p]]$
$\equiv \forall e[\tau(e) \subseteq t_{top} \wedge \forall e'[e \sqsubset e' \rightarrow dox(a,e') \nsubseteq p] \rightarrow dox(a,e) \nsubseteq p]$

b. **Alts:** $\{\forall e[\tau(e) \subseteq t_{top} \wedge \forall e'[e \sqsubset e' \rightarrow \underline{F(\mathcal{P}(dox(a,e'))) \nsubseteq p}] \rightarrow \underline{F(\mathcal{P}(dox(a,e'))) \nsubseteq p}] \mid$
F is a choice function defined on $\mathcal{P}(dox(a,e))/\varnothing$ for all $e \in E\}$

Result of EXH application (see details in Appendix):

(36) ⟦ EXH [NEG [PFV [MAX [a think p]]]] ⟧
$\equiv \forall e\ [\tau(e) \subseteq R \wedge \forall e'\ [e \sqsubset e' \rightarrow dox(a,e) \nsubseteq p] \rightarrow dox(a,e) \nsubseteq p] \wedge$
$\boxed{\forall e\ [\tau(e) \subseteq t_{top} \wedge \forall e'\ [e \sqsubset e' \rightarrow \underline{dox(a,e) \subseteq \neg p}] \rightarrow \underline{dox(a,e) \subseteq \neg p}]}$

- The complete resulting inference, instead of being NR, is a **tautology**, in the same way that the result with the EM presupposition in (22) is tautological: any event included in the topic time and has $\neg p$ thoughts as superevents is also a $\neg p$ thought, which already follows from *think*'s stativity

- What is the difference between this result and the one obtained with the EM presupposition?

  – With the presupposition, the assertion itself together with the presupposition *is* a tautology, and the non-NR meaning is unrecoverable.

  – Here, we have the base negated perfective meaning left intact, and it is simply *conjoined* to the tautological inference (as one does with implicatures). We are left with an expression equivalent to the unenriched meaning of a negated perfective thought report, as desired.

6. Concluding remarks

- We've provided evidence from French that supports the generalization that NR is not available with eventive thought reports: if *penser* is perfective-marked, it must be eventive, and there is no NR.

- We showed that treating NR as a scaleless implicature explains the unavailability of NR for the latter.

- **Big picture takeaway:** We need to study the logical properties of attitude ascriptions (like NR) in tandem with their event structural properties.
  - Lexical choice is not sufficient to trigger the inference.
    Penser is a "NR predicate" but unless it is used statively, no inference.
  - Special contexts are not necessary to suspend the NR inference.
    A *penser* report can be uttered in a context that fully *supports* the NR inference, but unless it is stative, no inference.

Open questions

- Can this account extend to other instances of eventive predicates where NR is also unavailable, like thought reports in the **progressive**? (e.g. 'I'm not thinking that it's raining')

- **NR in the perfective:** There do seem to be contexts in which passé composé *penser* remains able to give rise to the NR inference.

  (37) Al: Alors, t'en as pensé quoi de mon travail?
  So what did you think of my work?
  Jo: J'avoue que j'ai pas pensé qu'il était très convaincant. Zoé a pensé ça aussi.
  I admit that I didn't think that it was very convincing. Zoé thought that too.

  We're not sure what's going on here: Euphemism? Opinionated speaker? Different aspectual values of the passé composé—some of which do not disrupt NR?

- **Desire predicates.** Predicates like 'want' remain NR in the perfective.

  (38) Ce matin, Axelle n'a pas voulu que Salomé dorme de tout l'après-midi$_{\text{NPI}}$.
  This morning, Axelle didn't want$_{\text{PFV}}$ that Salomé sleep.SUBJ all afternoon.

  - There are differences between perfective thought and desire reports, for example, in embedded mood: The subjunctive is obligatory under PFV *vouloir*, impossible under PFV *penser*.
  - What we propose covers thought/belief reports. But for reasons to think that NR arises for different reasons depending on classes of predicates, see Jeretič (2021).

- **Clause embedding**

  NR predicates are thought to be incompatible with embedded questions (**believe wh-*).[7]

  Do they *become compatible* with embedded questions when the predicates are made to be eventive—and hence not NR?

[7] Zuber (1982); Theiler et al. (2019); Mayr (2019), a.m.o.

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Appendix

6.1 Additional evidence that perfective *penser* is not NR: Strict NPI licensing

Strict NPIs in the complement of a negated predicate also force an attitude report to be NR if it can be[8]:

(39) a. Bill doesn't think that Sue slept a wink.
b. #Bill doesn't know that Sue slept a wink.

♠

French *dormir de toute la nuit* is one such NPI. In (40), we see that it is acceptable under negated *penser* in the *imparfait*, but not when the predicate is in the *passé composé*.

(40) a. Ce matin, Jo ne pensait pas que Al avait dormi de la nuit$_{\text{NPI}}$.
This morning, Jo didn't think that Al had slept a wink.

b. #Ce matin, Jo n'a pas pensé que Al avait dormi de la nuit$_{\text{NPI}}$.
This morning, Jo didn't think that Al had slept a wink.

Again, the non-NR (40b) patterns like other non-NR sentences, and the strict NPI is licensed by negation embedded under perfective *penser*:

[8] See Lakoff (1969), Horn (1978), van der Wouden (1995), Gajewski (2005), van der Wouden (1995), a.o.

(41) a. #Ce matin, Jo ne prétendait pas que Al avait dormi de la nuit$_{\text{NPI}}$.
This morning, Jo wasn't claiming that Al had slept a wink.

b. Ce matin, Jo a pensé que Al n'avait pas dormi de la nuit$_{\text{NPI}}$.
This morning Jo thought$_{\text{PFV}}$ that Al hadn't slept a wink.

6.2 Empirical support for aspectual coercion for positive and negated statives

Statives are often unacceptable in the *passé composé* out of the blue—again, both in positive and negated sentences.

(42) a. #Pierre a été assis cet après-midi.
Pierre AUX BE.PTCP seated this afternoon
Pierre was$_{\text{PFV}}$ seated this afternoon. Homer (2021)

b. #Pierre n'a pas été assis cet après-midi.
Pierre NEG=AUX NEG BE.PTCP seated this afternoon
Pierre wasn't$_{\text{PFV}}$ seated this afternoon.

Sentences like (42) improve with the addition of quantificational or durational adverbs:

(43) a. Il y a un moment où Pierre a été assis cet après-midi.
there was a moment where Pierre AUX BE.PTCP seated this afternoon
There was a moment this afternoon where Pierre was$_{\text{PFV}}$ seated. Homer (2021)

b. Il y a un moment où Pierre n'a pas été assis cet après-midi.
there was a moment where Pierre NEG=AUX NEG BE.PTCP seated this afternoon
There was a moment this afternoon where Pierre wasn't$_{\text{PFV}}$ seated.

6.3 Deriving NR in the scaleless implicature framework

Definition of EXH. We define our exhaustivity operator below, taken from Bar-Lev and Fox (2020).

(44) a. $IE(p,C) = \bigcap\{C' \subseteq C : C' \text{ is maximal } \& \ \{\neg q : q \in C'\} \cup \{p\} \text{ is consistent}\}$
b. $II(p,C) = \bigcap\{C'' \subseteq C : C'' \text{ is maximal } \& \ \{r : r \in C''\} \cup \{p\} \cup \{\neg q : q \in IE(p,C)\} \text{ is consistent}\}$

(45) $[\![\text{EXH}]\!](C)(p)(w) \equiv \forall q \in IE(p,C)[\neg q(w)] \wedge \forall r \in II(p,C)[r(w)]$

NR with negated imperfective thought reports.

(46) NEG [IPFV [a think p]] (before exhaustification)

a. **ass :** $\neg\exists e[dox(a,e) \subseteq p \wedge t_{top} \subseteq \tau(e)]$
$\equiv \forall e[t_{top} \subseteq \tau(e) \rightarrow \neg(dox(a,e) \subseteq p)]$

b. **alts:** $\{\forall e[t_{top} \subseteq \tau(e) \rightarrow \neg(F(\mathcal{P}(dox(a,e))/\varnothing) \subseteq p)] \mid$
F is a choice function defined on $\mathcal{P}(dox(x,e))/\varnothing$ for all $e \in E\}$

To show the derivation, we use an unrealistic model containing two eventualities associated with 2-world doxastic states: $dox(a,e_1) = \{w_1, w_2\}$, $dox(a,e_2) = \{w_3, w_4\}$. An example alternative of (46) evaluated with respect to this toy model is shown in (47).

(47) $\neg(\{w_1, w_2\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_3\} \subseteq p \wedge R \subseteq \tau(e_2))$

There are no IE alternatives: we can see this by attempting to exclude the strongest alternatives, i.e. those least likely to affect the result, which correspond to those obtained by replacing the domain with a singleton subset. The conjunction of the negation of these alternatives is equivalent to the negation of the prejacent. Excluding them would result in a contradiction, and excluding some but not all of these would be arbitrary; this means there are no IE alternatives.

(48)
$$\begin{aligned}&[\{w_1\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_3\} \subseteq p \wedge R \subseteq \tau(e_2)]\\ &\wedge[\{w_1\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_4\} \subseteq p \wedge R \subseteq \tau(e_2)]\\ &\wedge[\{w_2\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_3\} \subseteq p \wedge R \subseteq \tau(e_2)]\\ &\wedge[\{w_2\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_4\} \subseteq p \wedge R \subseteq \tau(e_2)]\\ &\equiv \exists e[dox(a,e) \subseteq p \wedge R \subseteq \tau(e)]\end{aligned}$$

In contrast, all alternatives are II; we show in (49) the result of conjoining the same singleton-based alternatives to (46) (the non-singleton-based alternatives are also II; but their inclusion doesn't further affect the result, as we have already obtained a universal claim, the strongest result possible).

(49)
$$\begin{aligned}&[\![\text{EXH } [(46)][\text{Alt}((46))]\,]\!] \equiv \neg\exists e[dox(a,e) \subseteq p \wedge R \subseteq \tau(e)]\\ &\wedge\neg(\{w_1\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_3\} \subseteq p \wedge R \subseteq \tau(e_2))\\ &\wedge\neg(\{w_1\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_4\} \subseteq p \wedge R \subseteq \tau(e_2))\\ &\wedge\neg(\{w_2\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_3\} \subseteq p \wedge R \subseteq \tau(e_2))\\ &\wedge\neg(\{w_2\} \subseteq p \wedge R \subseteq \tau(e_1) \vee \{w_4\} \subseteq p \wedge R \subseteq \tau(e_2))\\ &\equiv \neg\exists e[dox(a,e) \subseteq p \wedge R \subseteq \tau(e)] \wedge \forall e[R \subseteq \tau(e) \rightarrow dox(a,e) \subseteq \neg p]\end{aligned}$$

No NR with negated perfective thought reports.

(50) NEG [PFV [MAX [a think p

a. **ass:** $\neg\exists e[\tau(e) \subseteq R \wedge dox(a,e) \subseteq p \wedge \forall e'[e \sqsubset e' \rightarrow \neg(dox(a,e') \subseteq p)]$
$\equiv \forall e[\tau(e) \subseteq R \wedge \forall e'[e \sqsubset e' \rightarrow \neg(dox(a,e') \subseteq p)] \rightarrow \neg(dox(a,e) \subseteq p)]]$

b. **alts:** $\{\neg\exists e[F(\mathcal{P}(dox(a,e))) \subseteq p \wedge \tau(e) \subseteq R \wedge \forall e'[e \sqsubset e' \rightarrow \neg F(\mathcal{P}(dox(a,e'))) \subseteq p)]]|F$ is a choice function defined on $\mathcal{P}(dox(a,e))/\varnothing$ for all $e \in E\}$

Like above, no alternative is IE (left to the reader), but all alternatives are II. The effect of EXH is in (51); we show the inclusion of one alternative, the rest to be filled out.

(51)
$$\begin{aligned}&[\![\text{EXH}[(50)][\text{Alt}((50))]]\!] \equiv \neg\exists e[dox(a,e) \subseteq p \wedge \tau(e) \subseteq R \wedge \forall e'[e \sqsubset e' \rightarrow \neg(dox(a,e') \subseteq p)]]\\ &\wedge\neg(\{w_1\} \subseteq p \wedge \tau(e_1) \subseteq R \wedge \forall e'[e_1 \sqsubset e' \rightarrow \neg(\{w_1\} \subseteq p)]\\ &\vee\{w_3\} \subseteq p \wedge \tau(e_2) \subseteq R \wedge \forall e'[e_2 \sqsubset e' \rightarrow \neg(\{w_3\} \subseteq p)])\wedge \ldots\\ &\equiv \neg\exists e[dox(a,e) \subseteq p \wedge \tau(e) \subseteq R \wedge \forall e'[e \sqsubset e' \rightarrow \neg(dox(a,e') \subseteq p)]]\\ &\wedge\forall e[\tau(e) \subseteq R \wedge \forall e'[e \sqsubset e' \rightarrow dox(a,e') \subseteq \neg p)] \rightarrow dox(a,e) \subseteq \neg p]\end{aligned}$$

6.4 Expectations about English.

The English past simple is interpreted as imperfective with statives and perfective with eventives. With ambiguous predicates, one may access either interpretation.
Sentences like (52) are ambiguous:

(52) When I got to base camp, I thought that I wouldn't reach the summit until tomorrow.

When one forces the predicate to be NR, here by including a strict NPI in the embedded clause, the perfective reading disappears. (No way of interpreting (53) as . . .)

(53) When I got to base camp, I didn't think that I'd reach the summit until tomorrow.

One could think that this is about negation, but there is a perfective reading for (54) (with negation, without until).

(54) When I got to base camp, I didn't think that I'd reach the summit.