Embedded questions, lexical aspect and neg-raising

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An account of the neg-raising inference

The **Excluded Middle Presupposition:**
Some propose that neg-raising predicates presuppose that their subject is opinionated.

(1) Alice believes that it’s raining.
   a. Presupposes:
      \[ \text{believe}'(a, \text{rain}) \lor \text{believe}'(a, \neg \text{rain}) \]  
      EMP
   b. Asserts:
      \[ \text{believe}'(a, \text{rain}) \]
   c. Presupposition & Assertion:
      \[ \text{believe}'(a, \text{rain}) \]

In the positive case, this presupposition has no effect.
An account of the neg-raising inference

(2) Alice doesn’t believe that it’s raining.
   a. Presupposes:
      \[ \text{believe}'(a, \text{rain}) \lor \text{believe}'(a, \neg \text{rain}) \]  
      \text{EMP}
   b. Asserts:
      \[ \neg \text{believe}'(a, \text{rain}) \]
   c. Presupposition & Assertion:
      \[ \text{believe}'(a, \neg \text{rain}) \]

In the negative case...

- \[ \neg \text{believe}'(a, \text{rain}) \] on its own is compatible with Alice having no opinion one way or another.
- For (2) to be defined, its presupposition must be true.
- The only way for both the EMP and the assertion (2b) to be true is if Alice has the negative belief \[ \text{believe}'(a, \neg \text{rain}) \].

This derives the NR inference.
The EMP and anti-rogativity

(3) *Alice believes whether it’s raining.

a. Presupposes:
   \[ \text{believe}'(a, \text{rain}) \lor \text{believe}'(a, \neg \text{rain}) \]  

b. Asserts:
   \[ \text{believe}'(a, \text{rain}) \lor \text{believe}'(a, \neg \text{rain}) \]  

With question complements...

- The sentence’s assertion is the same as its presupposition.
- Because of this, whenever the sentence is defined, it is true.
- This kind of tautologous meaning is perceived as ungrammaticality (Gajewski 2005).
‘Think’ and embedded questions
‘Think’ and question embedding

Unacceptable sentences

There are examples where *think wh-* is unacceptable:

(4)  
   a. *John thought who Bill saw.  
      (Grimshaw 1979)  
   b. *John thought why Mary left.  
      (Rawlins 2013)  
   c. *I thought who will be invited to the party.  
      (Dayal 2016)  
   d. *John thinks whether Mary drinks.  
      (Mayr 2019)

These motivate the following kind of explanation:

think’s Excluded Middle presupposition  \rightarrow  
\begin{array}{c}
\text{neg-raising with declaratives}  \\
\text{tautology with questions} \rightarrow *
\end{array}
‘Think’ and question embedding
Acceptable sentences (White 2021)

But there are also examples where *think wh-* is acceptable.

(5) People **will have to think whether** they want four more years of that.

(6) I’m **trying to think whether** I’d have been a star today or not.

(7) Often, when listening to other players, I **start to think whether** there’s an unwritten law for guitarists to never play an interval bigger than the major third.

(8) I **was thinking whether** there was a way to help more than one person.
Questions

- What are some general facts about the environments where *think wh-* is acceptable, and the ones where it not?
- What kind of event or state does *think wh-* describe, when it is acceptable?
I was so preoccupied with the thought of whether or not I could win 10 giant bears from Knott's Berry Farm, I didn't stop to think whether I should win 10 giant bears from Knott's Berry Farm.

i.imgur.com/lmowOp...
The kind of eventuality description introduced by ‘think’ depends, in part, on the type of its sentential complement:

- ‘Think that’ may describe a state or an event.
- ‘Think wh-’ must describe an event.

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States and events (background)

Sentences contain eventuality descriptions.

- They are contributed by a verb + arguments & modifiers
- They belong to different ‘lexical aspectual’ categories, which are based on world knowledge and grammar.

(9)  a. Stative
    Dani likes snails.

    b. Dynamic
    Kim is examining a patient.

- Properties of a verb’s arguments may affect categorization.

(10) a. Floris drank orange juice. −end point

    b. Floris drank the orange juice. +end point
Aktionsart vs. grammatical aspect

To determine the category of a predicate, we rely on differences in behavior relative to material that is ‘higher up.’
Diagnostics I: Ongoing interpretations

- Stative predicates may describe an ongoing state in the present simple, not in the present progressive.
  
  (11) Dani likes/is liking snails

- Dynamic predicates may describe an ongoing event in the present progressive, not in the present simple.
  
  (12) Kim examines/is examining a patient.

- Dynamic predicates in the present simple receive ‘special interpretations.’
  
       b. Kim walks in. She examines a patient. She walks out.
Diagnostics I: ‘Think that’ can be stative or dynamic

‘Think that p’ can describe…

▶ an ongoing state in the present simple

(14) Alice thinks that she should invite Tom.

▶ an ongoing event in the present progressive

(15) Alice is thinking that she should invite Tom.

‘Think that p’ has both interpretations, it passes both tests.
Diagnostics I: ‘Think wh-’ must be dynamic

‘Think wh-’
► can describe an ongoing event in the present progressive
  (16) Alice is thinking whether she should invite Tom.
► can’t describe an ongoing state in the present simple
  (17) #Alice thinks whether she should invite Tom.
Diagnostics I: ‘Think wh-’ must be dynamic

(17) #Alice thinks whether she should invite Tom.

- This judgment is a # and not a *
- The sentence does have
  - a habitual reading:
    Alice usually thinks whether she should invite Tom.
  - a play by play reading:
    Alice pops in, thinks whether she should invite Tom, and pops out.

This is further evidence for the eventivity of ‘think wh-’

- The sentence can’t mean *know or have a thought about whether p*
Diagnostics II: Narrative time advancement

In a narrative sequence in the simple past,

▶ stative predicates provide background information.

(18) Dani arrived at the restaurant. 
\textbf{She knew the menu.} 
She ordered the snails. \textbf{[2 things happened]}

▶ dynamic predicates move narrative time forward.

(19) Dani arrived at the restaurant. 
\textbf{She read the menu.} 
She ordered the snails. \textbf{[3 things happened]}

English statives in the simple past are imperfective, but dynamic predicates, perfective.
Diagnostics II: ‘Think that’ can describe a state or an event

In the simple past, ‘think that p’ may provide background information or move narrative time forward.

(20) Dani arrived at the restaurant.
She thought that she should have something fun.
She ordered the snails.

[ambiguous: 2 things happened or 3]
In the simple past, ‘think wh-’ cannot provide background information and must move narrative time forward.

(21) Dani arrived at the restaurant.
She thought whether she should have something fun.
She ordered the snails. [3 things happened]
The kind of eventuality description introduced by ‘think’ depends, in part, on the type of its sentential complement:

- ‘Think that’ may describe a state or an event.
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White’s acceptable examples involved:

- People will have to think whether…
- I’m trying to think whether…
- Often, I start to think whether…
- I was thinking whether…

The unacceptable examples we saw were in the present simple:

- #Alice thinks whether…

Our core generalization covers all of these cases:

- The first set of frames are ones where dynamic predicates are allowed to live.
- The second only hosts dynamic predicates under special interpretations (which we saw we could bring out).
Wrinkle 1 with the data

The English past simple is ok with statives and with eventives.

(22)  
- Einstein lived in Princeton. [stative]
- Einstein wrote many papers. [dynamic]

‘Think wh-’ should then be acceptable here. And yet. . .

(23)  *John thought who Bill saw.  
Grimshaw (1979)

This isn’t a wrong prediction, but it is vexing.

Some options:

- ‘Think’ is not equally acceptable with all kinds of questions.
- Additional factors determine whether ‘ambiguous’ predicates are more easily read as stative or as dynamic.
Wrinkle 2 with the data

Uses of *think* that is close to *stative and question embedding*.

(24) When asked whether she thought whether she may have come across as slightly obsessive, Becky replied, ‘No.’

Situation described by (24):

(25) A asks B: “Do you think that you may have come across as obsessive?”
   a. ✓ What is your opinion?
   b. × Do you engage in thinking that?

Similarly:

(26) I was thinking whether we should leave.
    ≈ I think that we should leave.

Thanks to a participant at Edinburgh ling circle.
Wrinkle 2 with the data

My reactions:

- Do these examples replicate with kinds of embedded questions other than with *whether*?
- Present simple “think whether” is still odd in these frames.

(27)  
a. #I think whether I may have come across as obsessive.
   b. #I think whether we should leave.

- Highlighting?
- Euphemism?
- Complementizer agreement??
Back to neg-raising
Managing our expectations re: “NR ⇒ anti-rogative”

Should we be surprised by *think (wh-)*? Definitely…

- An attitude predicate’s aspectual properties depend on the type of its complement clause.
- We don’t know how to model this.

Does *think wh-* say anything about “NR/EM ⇒ anti-rogative”? Possible consequences on…

- The theoretical derivation of this generalization.
- The descriptive generalization itself.

The data & analytical options are subtle. I’ll present “official positions.”
Consequences for some theories of
“NR/EM $\Rightarrow$ anti-rogative”
Theiler et al.’s (2019) theory is very strong. The reason:

There are ways of suspending the NR inference (Bartsch 1973).

(28) Bill doesn’t know anything about Roman history, so…
He doesn’t think that Brutus killed Caesar.

If NR/EM is the culprit, *think wh-* should improve here.

But *think wh-* appears not to improve when NR is suspended:

(29) Bill doesn’t know anything about Roman history, so…
*He doesn’t think whether Brutus killed Caesar.

So Theiler et al. set up their system so that *think wh-* should be unacceptable *independent of NR suspension.*
Optional neg-raising and question embedding

(30)  Bill has no knowledge of Roman history. So... #He doesn’t think whether Brutus killed Caesar.

We have an explanation for this:

▶ The negated present simple still doesn’t host dynamic predicates:

  (31)  #Alice doesn’t draw a circle.

▶ Unless these receive special interpretations.

  (32)  Alice doesn’t walk to school. [habitual]

▶ And special interpretations *are* available for (30)
  Just add ‘usually.’

▶ (The unacceptability of (30) has nothing to do with NR.)
Insensitivity to NR suspension

Faced with examples like (32), one is tempted to say...

\[
\begin{align*}
\text{NEG} & \quad \text{(LocAcc)} \quad \text{bel}_a p \lor \text{bel}_a \neg p \quad \text{bel}_a p \lor \text{bel}_a \neg p \quad \Rightarrow \quad \text{TRUE} \quad \Rightarrow \quad *
\end{align*}
\]

- It suffices for a structure to contain an L-analytical constituent for the sentence to be ungrammatical.
- While local accommodation may get rid of presuppositions, it would kick in too late to save think wh-.
More on pspss: Local accommodation vs. non-triggering

There are two ways of getting rid of presuppositions.

- **‘Know’** usually presupposes the truth of its complement.

  (33) Mike does(n’t) know that Samson’s safe.
      \[ \sim \text{Samson’s safe.} \]

- **Local accommodation**

  (34) Mike wants to know that Samson’s safe.
      a. \[ \not\sim \text{Samson’s safe.} \]
      b. \[ \rightarrow \text{Mike wants Samson to be safe and...} \]

- **No triggering**

  (35) I don’t know that Samson’s safe.
      a. \[ \not\sim \text{Samson’s safe.} \]
      b. \[ \not\not \text{It’s not the case that Samson is safe and...} \]
No triggering won’t help

If the offending element is the excluded middle presupposition,

- instead of saying always triggered, sometimes accommodated,

- let’s say: sometimes not triggered.

(17) $[[\text{believe}]]^w$

$$= \lambda P_{(st,t)} \lambda x. \exists p \in P : (\text{dox}_x \subseteq p) \lor \exists p \in \neg P : (\text{dox}_x \subseteq p). \exists p \in P : (\text{dox}_x \subseteq p)$$
No triggering won’t help

If the offending element is the excluded middle presupposition,
▶ instead of saying always triggered, sometimes accommodated,
▶ let’s say: sometimes not triggered.

▶ Question embedding no longer ungrammatical. . . but expected to mean:

\[(36) \ [\text{Alice thinks } \neg_{EM} \text{ whether it’s raining}] = 1 \text{ iff Alice thinks that it’s raining or Alice thinks that it isn’t raining.}\]
Glaube nicht alles, was du denkst.
Consequences for the theory

To maintain similar theories of “NR/EM ⇒ neg-raising” one option is to say that *think* has multiple senses:

- one is NR and anti-rogative
- the other is non-NR and responsive

This is a possibility that Zuber anticipates:

*I*t may happen that in some languages one can find, in some construction, *to think whether or its equivalent. *In this case, the meaning of the verb will be different from the one stipulated by the properties here discussed.*

One result is that the Zuber/Theiler et al./Mayr is a constraint on possible attitude verb meanings: A verb cannot both be neg-raising and have a certain (independently motivated) semantics with embedded questions.
Consequences for the descriptive generalization
Analytical options

One of two things could be true:

➤ Either *think wh-* falsifies the “NR ⇒ anti-rogative” generalization,
➤ Or, it doesn’t.

To *show* things either way…

➤ We need to determine if the “think” in *think wh-* is neg-raising or triggers the excluded middle presupposition.
➤ This can only be done indirectly. The NR inference can’t be detected with embedded interrogatives.
White (2021): “Think wh- falsifies the NR generalization”

Strategy:

A. Take an acceptable instance of think wh-.

(37) I was thinking whether there was a way to help more than one person.

B. Modify the sentence ‘minimally’ and check for the NR inference.

(38) I wasn’t thinking there was a way to help more than one person (at a time) until Jo got back from lunch.  [✓NR]

C. Because (38) is NR, we are dealing with NR think in (37).

Problem: We’ll never be sure whether the think in (38) is the same think as in (37).
Özyıldız (2021): “Think wh- doesn’t falsify the NR generalization”

Strategy:

A. *Think wh-* is necessarily dynamic.

(39) Alice #thinks/is thinking whether p

B. Appeal to an auxiliary generalization.

(40) **Neg-raising ⇒ stative**

a. If a predicate is neg-raising, it is stative.

b. If a predicate is dynamic, it is not neg-raising.

C. Because the *think* in (39) is dynamic, it is not neg-raising.
Empirical arguments in favor of “Neg-raising $\Rightarrow$ stative”

- B and B’ are not synonymous
  
  (41)  
  A: What’s going on over there?  
  B  #Alice isn’t thinking that she should invite Tom.  
  B’  Alice is thinking that she shouldn’t invite Tom.  

- Strict NPIs are not licensed
  
  (42)  
  *When the barking dog startled him, the farmer wasn’t thinking that the tree had fallen until late last night.  
  Bervoets (2014)

  Can’t mean:  
  . . . the farmer was thinking that the tree hadn’t fallen until late last night.

- Disclaimer: The data here is also tricky.
Disclaimer: Showing this is tricky

No one-to-one mapping between stativity/dynamicity and, e.g., the progressive.

- White does the same exercise as us and reaches a different conclusion:

  (43) I wasn’t thinking there was a way to help more than one person (at a time) until Jo got back from lunch.

- Similar examples are attested elsewhere

  (44) Coach Pete DeBoer says he’s not thinking that the playoff dreams are over.

  “I don’t feel that way […]”

Suggestion: These are instances of stative progressives.
The resulting picture (programmatic)

Rather than:

Excluded Middle

causes

neg-raising

rather than:

question embedding

Better:

stativity

compatible with

neg-raising

incompatible with

question embedding
Towards a positive proposal
To account for...

A. The kind of eventuality description introduced by ‘think’ depends, in part, on the type of its sentential complement:

- ‘Think that’ may describe a state or an event.
- ‘Think wh-’ must describe an event.

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B. That stative *think that* may be neg-raising.
To account for...

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B. That stative *think that* may be neg-raising.
‘Think’ denotes an eventive predicate:

\[
\text{think} = \lambda Q. \lambda x. \lambda e. \text{think}'(e, x, Q)
\]

- Q ranges over declarative & interrogative denotations.
- think’ is a black box:
  - It describes what we intuitively mean by “dynamic thinking.”
  - We can, but need not formalize it further.
- This immediately derives dynamic think that and think wh-.
A gap: Stative *think that*

If *think* is originally eventive and responsive…

- *Think wh-* is not the interesting case.
  - This runs counter to our ‘historical’ intuition, which makes *think wh-* the unexpected case.
  - But it doesn’t mean that *think wh-* is entirely unrestricted. We still need to account for *a thought wh-*, etc.

- We need to derive stative *think that*, without accidentally deriving stative *think wh-*.

- And plant the seed for neg-raising.
An intuition: Dispositional thought reports

Stative thought reports feel like they have the following truth conditions:

(46) Alice thinks that it’s raining.
≈ If you were to ask Alice her opinion about the weather, she would eventually think that it’s raining.

They might derive from an eventive core.
An intuition: Dispositional thought reports

Similar eventive $\sim$ stative doublets are known:

\[(47) \quad \begin{align*}
a. & \quad \text{Alice is speaking French.} \\
b. & \quad \text{Alice speaks French.} \\
& \quad \approx \text{Alice is able to (eventively) speak French.}
\end{align*}\]

\[(48) \quad \begin{align*}
\text{This machine crushes oranges.} \\
& \quad \approx \text{This machine is designed to (eventively) crush oranges.}
\end{align*}\]

The stative member of these pairs is derived via the application of a vP level operator: GEN/HAB/DISP.

But, making an off-the-shelf proposal work for *think* is difficult.

- The operators apply after composition with the complement, and possibly predict unattested stative readings for *think* *wh*-
  - There is a specific problem with quoted declarative complements.
A custom fix

Assume a function $\text{DISP}$ that...

- combines with an eventive attitude predicate,
- to return a stative attitude predicate,
- with that predicate’s observed truth conditions.
Defining $\text{DISP}$ (very first pass)

\[
(49) \quad [\text{DISP}] = \lambda V. \lambda Q. \lambda x. \lambda s. \exists e : V(e, x, Q) \land \text{dox}(s, x) \in Q
\]
Defining DISP (very first pass)

(49) \([\text{DISP}] = \lambda V. \lambda Q. \lambda x. \lambda s. \exists e : V(e, x, Q) \land \text{dox}(s, x) \in Q\)

(50) \([\text{DISP}([\text{think}])] = \lambda Q. \lambda x. \lambda s. \exists e : \text{think}(e, x, Q) \land \text{dox}(s, x) \in Q\)
Defining \textit{DISP} (very first pass)

\begin{align*}
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& \quad \lambda Q. \lambda x. \lambda s. \exists e : \text{think}(e, x, Q) \land \text{dox}(s, x) \in Q \\
(51) \quad & [\text{DISP}]([[\text{think}]])([[\text{that it's raining}]]) = \\
& \quad \lambda x. \lambda s. \exists e : \text{think}(e, x, \{\text{rain}\} \downarrow) \land \text{dox}(s, x) \in \{\text{rain}\} \downarrow
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Defining $\text{DISP}$ (very first pass)

(49) $\llbracket \text{DISP} \rrbracket = \lambda V. \lambda Q. \lambda x. \lambda s. \exists e : V(e, x, Q) \land \text{dox}(s, x) \in Q$

(50) $\llbracket \text{DISP} \rrbracket(\llbracket \text{think} \rrbracket) =$

$\lambda Q. \lambda x. \lambda s. \exists e : \text{think}(e, x, Q) \land \text{dox}(s, x) \in Q$

(51) $\llbracket \text{DISP} \rrbracket(\llbracket \text{think} \rrbracket)(\llbracket \text{that it's raining} \rrbracket) =$

$\lambda x. \lambda s. \exists e : \text{think}(e, x, \{\text{rain}\} \downarrow) \land \text{dox}(s, x) \in \{\text{rain}\} \downarrow$

(52) $\llbracket \text{DISP} \rrbracket(\llbracket \text{think} \rrbracket)(\llbracket \text{that it's raining} \rrbracket) =$

$\lambda x. \lambda s. \exists e : \text{think}(e, x, \{\text{rain}\} \downarrow) \land \text{dox}(s, x) \subseteq \text{rain}$

$\{\text{rain}\} \downarrow$ is a downward closed set, containing $\{w: \text{rain}(w)\}$ and all of its subsets (Ciardelli et al. 2019)
Elucidating these truth conditions

(53) \[ \text{[DISP]}([\text{think}])([\text{that it’s raining}]) = \lambda x. \lambda s. \exists e : \text{think}(e, x, \{\text{rain}\} \downarrow) \land \text{dox}(s, x) \subseteq \text{rain} \]

This will assert that

- there is an event of “x thinking that it’s raining”
  Assume that this is what allows us to ascribe to x that opinion in the first place. (To be appropriately located in time and world.)

- there is a state of x believing that it’s raining.
  This corresponds to the fact that stative \text{think that} ascribes belief.
Defining DISP (a better approximation)

Currently, DISP-think can combine with questions as well.

(54) \([\text{DISP}][[\text{think}]]([[\text{whether it’s raining}]])) = \lambda x.\lambda s. \exists e : \text{think}(e, x, \{\text{rain}, \neg\text{rain}\}) \land \text{dox}(s, x) \in \{\text{rain}, \neg\text{rain}\}

But this is exactly the problem that we would like to avoid. . .

We can redefine DISP as follows:

(55) \([\text{DISP}][[\text{think}]] = \lambda Q : |\text{Alts}(Q) = 1| . \lambda x.\lambda s. \exists e : \text{think}(e, x, Q) \land \text{dox}(s, x) \in Q

Then,

- When DISP(think) gets a question complement, we get #.
- Declarative complements are generally ✓.
Popping back out

In relating stative and dynamic *think that*, we have two options:

- Derive dynamic *think* from stative *think*.
- Derive stative *think* from dynamic *dynamic*.

The stative to dynamic hypothesis is independently motivated for certain attitude predicates:

(56) Aspectual coercion

?She was suddenly knowing all of the answers.

Given that there is stative *think*, coercion might even apply to it. But is one argument in favor of dynamic to stative.
Meaning neutralization

Many eventive verbs have stative counterparts whose at issue component is just “believe.”

(57) Alice {imagines, supposes, agrees, remembers, . . . } that it’s raining.

- It is easy to efface layers of meaning in a unified way. Currently, DISP promises to take any such verb to derive a belief report.
- It is harder to generate layers of meaning in a unified way. It is unclear what stative ‘imagine’ would mean: (58)?

(58) \[ \lambda Q. \lambda x. \lambda s. \text{dox}(s, x) \in Q \]

Operators OCC that would derive occurrent attitudes from, e.g., (58), would be defined on a case by case basis.

(59) \[ [\text{OCC}_{\text{imagine}}] = \lambda V. \lambda Q. \lambda x. \lambda e. \exists s : V(Q)(x)(s) \land \text{imagine}'(e, x, Q) \]
What about neg-raising?

Neg-raising can be derived without appealing to the excluded middle presupposition and in a way that is aware of lexical aspect. (To be adapted to the current proposal.)

Why neg-raising requires stativity*

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In Proceedings of the Amsterdam Colloquium 2022
Key takeaways
Two kinds of meaning driven combinatorial restrictions?

Key results from the literature

▶ Trivial meanings arise as soon as the verb and its complement compose.

TP ➞ unacceptable from here on?

Alice λx.TURE ➞ unacceptable from here on?

believes wh-

▶ Unacceptability calculated immediately, or ‘higher up’?
  ▶ If immediately, no way of rescuing ‘*believe wh-’
  ▶ If higher up, ‘believe wh-’ has a chance to shine

(60) Luis can’t believe who won the race.
Two kinds of meaning driven combinatorial restrictions?

The emerging view

- No constituent with a trivial meaning in here:
  - Alice
  - VP
  - think
  - wh-

- But a constituent with a *picky* meaning, which doesn’t shine through all of the time.

- Restrictions don’t bear on the distribution of embedded questions. But on VPs that contain embedded questions.

- Challenges: *thought wh-*?
  Possibly meaning in change?