Modal Repair
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Overview: the addition of a modal unexpectedly repairs an otherwise ungrammatical English sentence in two disparate environments (I-to-C movement and epistemic adverbs, and Beck’s (1996)/Pesetsky’s (2000) negative intervention effects). This leads us to conclude that the original violations are not due to a syntactic constraint on movement, as has been previously suggested. An explanation is proposed in which modals are ambiguous between quantificational and non-quantificational variants.

1. MODAL REPAIR PUZZLES

1.1 Puzzle #1: epistemic adverbs in I-to-C environments

Previously noted facts
- Epistemic adverbs are bad in questions (Katz & Postal 1964, Ross 1967, Jackendoff 1972, Bellert 1977, among others).

(1) a. * Did John probably hurt himself?
   b. * Is she possibly the best in the competition?
   c. * Did John probably check this before we sent it out?
   d. * Is it probably raining?

(2) a. John probably hurt himself.
   b. She is possibly the best in the competition.
   c. John probably checked this before we sent it out.
   d. It’s probably raining.

- Jackendoff (1972) points out that the correct characterization of the environment is not questions, but I-to-C movement.

(3) a. John probably hurt himself, didn’t he?
   b. She is possibly the best in the competition, isn’t she?
   c. John probably checked this before we sent it out, didn’t he?
   d. It’s probably raining, isn’t it?

(4) a. * Never has John probably hurt himself.
   b. * Never has she possibly been the best in the competition.
   c. * So carefully did John probably check this that there are no mistakes at all.
   d. * So hard is it probably raining that the water will be up to the windows.

Previous analyses
- Bellert (1977): semantic type mismatch, due to the fact that probably and possibly take the truth value of the CP they occur in as an argument, and questions do not return truth values.
• McDowell (1987): epistemic adverbs are sentential operators that move to COMP at LF. This movement is blocked when this COMP is already filled by something else.

⇒ **Problematic new fact:** The addition of a modal repairs the sentences in (1) and (4).

(5)  
- a. Would John probably hurt himself?  
- b. Could she possibly be the best in the competition?  
- c. Should John probably check this before we send it out?  
- d. Will it probably rain tomorrow?

(6)  
- b. Never could she have possibly been the best in the competition.  
- c. So carefully would John probably check this that there would be no mistakes.  
- d. So hard will it probably rain tomorrow that the water will be up to the windows.

**Puzzle #1:**
Epistemic adverbs can’t appear in I-to-C environments, unless the expression moving to C is a modal.

1.2 **Puzzle #2: Negative intervention effects**

**Previously noted facts**
• Pesetsky (2000) analyzes the following multiple wh-questions as English examples of Beck’s (1996) Negative intervention effect: the wh-in situ expression in English anti-Superiority sentences is ungrammatical in the scope of Negation.¹²

(7)  
- a. Which book did which author write?  
- b. Which form did which person sign?  
- c. Which question did he ask at which interview?  
- d. Which movie did you see in which city?

(8)  
- a. * Which book didn’t which author write?  
- b. * Which form didn’t which person sign?  
- c. * Which question didn’t he ask at which interview?  
- d. * Which movie didn’t you see in which city?

**Previous analyses**
• Pesetsky (2000) analyzes these sentences as involving overt feature movement from the wh-in situ expressions. The result at LF is a quantifier separated from its restriction, ruled out by the following locality constraint.

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¹ Pesetsky notes that sentences like (8) are ungrammatical only on the pair-list reading. Some speakers find such sentences grammatical on the single-pair reading, where it is presupposed that there is a single \( (x,y) \) pair that satisfies the question. As I am apparently not one of these speakers, I will mark these sentences with an asterisk, with the understanding that for some people this judgment applies only to the pair-list reading.
² According to Pesetsky, sentences like (8) are good if \( T \) moves to C without \( not \), as in *Which book did which author not write*. This is presumably because \( not \) here is too low to intervene.
(9)  *\[… Qx \ldots [Q/Neg\ldots [… x’s restriction \ldots ]]]*

(10)  *\[\text{CP [which book]} [\text{C'} \text{wh-x C'}^0 \text{didn’t [ which author-x [write t]]}]\] (8)

\[\text{Problematic new fact: the addition of a modal repairs the sentences in (8)}\]

(11)  a. Which book wouldn’t which author write?
     b. Which form couldn’t which person sign?
     c. Which question shouldn’t he ask at which interview?
     d. Which movie can’t you see in which city?

Puzzle #2
Wh-in situ expressions in anti-Superiority sentences can’t be in the scope of Negation, unless they are also in the scope of a modal. This means that the ungrammaticality of (8) can’t be due to the wh-in situ being separated from its operator – if anything, adding a modal to the sentence should separate the operator and variable even further.\(^3\)

2. PROPOSAL: MODALS HAVE NON-QUANTIFICATIONAL VARIANTS

Each puzzle requires an individual explanation, but there is one core feature of both proposals: modals are ambiguous between quantificational and non-quantification expressions. Non-quantificational modals can serve as restrictors for quantifiers elsewhere in the sentence, accounting for their ability to repair in environments where there is an unrestricted quantifier.

2.1 Puzzle #1: non-quantificational modals restrict the quantifier of epistemic adverbs

New proposal for (1-4):
1. Epistemic adverbs are quantifiers that do not come with their own restriction (13). This restriction must be provided from elsewhere in the sentence.
2. One such restriction is a phonologically null operator (EPISTEMIC), which may be generated in C.
3. The question operator competes for position with EPISTEMIC in C.

(13)  a. probably: \(\forall w \in W^4\)
     b. possibly: \(\exists w \in W\)

\(^3\) The modal repair data is problematic for Beck’s original (1996) analysis of the intervention effect as well. If the intervention effect arises because the in situ expression is illicitly crossing a barrier at LF, as Beck proposed, it is not clear why adding a modal would somehow make the barrier inactive.

\(^4\) W is the set of accessible worlds. W’ is the set of accessible worlds which are sufficiently close to the stereotypical ideal in an ordering on W. See Lewis (1973) and Kratzer (1981) for details on the possible world semantics of probability.
(14) \[
\text{CP \_ EPISTEMIC \_ [ip John \_ possibly \_ [vp checked this]]]}
\]
\text{John probably checked this.}

(15) a. *\[
\text{CP \_ C \_ question OP-did \_ [ip John \_ probably \_ [vp check this]]]}
\]
b. *\[
\text{CP \_ C \_ EPISTEMIC \_ did \_ [ip John \_ possibly \_ [vp check this]]]}
\]
c. *\[
\text{CP \_ C \_ EPISTEMIC \_ question OP-did \_ [ip John \_ probably \_ [vp check this]]]}
\]
*Did John probably check this?

Proposal for modal repair in (5-6):
Modals are lexically ambiguous between quantificational and non-quantificational variants.\(^{5}\)
The restriction of a non-quantificational modal may provide the restriction for the adverb.

(16) a. can\text{quantificational}: \ \exists w \in W \ [w \text{ is consistent with ___}]

b. can\text{non-quantificational}: \ [w \text{ is consistent with ___}]

(17) \[
\text{CP \_ C \_ question OP-should \_ [ip John \_ probably \_ [vp check this]]]}
\]
\text{Should John probably check this?}

2.2 Puzzle #2: non-quantificational modals restrict the quantifier of existential closure

Assume the following
1. The Pesetsky (2000) LF representation of wh-in situ and split constructions is correct (contra Beck 1996), i.e. these involve a quantifier separated from its restriction at LF.
2. When a free variable appears in the scope of Negation, Existential Closure obligatorily applies.
3. Variables are distinguished; individual and world variables are of different kinds. Quantifiers by default bind individual variables. They can bind other kinds of variables only if they combine with a restriction that ranges over that kind.

Proposal for intervention effect sentences in (8):
Existential Closure applies because Negation has a free variable in its domain. This Quantifier then combines with the in situ restriction. Ungrammaticality results because the wh-operator is left unrestricted and quantifies vacuously.

(18) *\[
\text{CP [which book] \_ C \_ wh-x \ C^0 \ \exists x_k \text{ didn’t [which author-x}_k \text{ [write } t_j]]]}
\]
(8)

(19) *WHy[y a book] WHx \sim \exists z[z an author] z write y

Proposal for modal repair in (12):
As above, modals are ambiguous between quantificational and non-quantificational expressions. The modal repair sentences are good because a non-quantificational version of a modal can restrict the existential quantifier of Existential Closure to world-quantification, freeing up the in situ restriction and wh variable.

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(20) \([c_p \text{[which book]}]_i \ [c' \text{wh-}x_k \ C^0 \exists x_l \text{ wouldn’t [which author-}x_k \text{ world-}x_l \text{ [write } t_i]]}\) \hspace{1cm} (12)

(21) \(\text{WH}_x[x \text{ a book}] \ \text{WH}_y[y \text{ an author}] \sim \exists w[w \text{ a world consistent with will} y \text{ write x in w}]\)

(22) \([\ldots Qx \ldots [Qy\ldots*(y's \text{ restriction)} \ldots [\ldots x's \text{ restriction } \ldots]]]\)

**Summary of analyses:**
- In both cases, a non-quantificational modal is able to serve as restrictor for an unrestricted quantifier.
- In the I-to-C adverb cases, the modal provides the restriction needed by the epistemic adverb, obviating the need for the EPISTEMIC operator in C and allowing the adverb to occur in I-to-C environments.
- In the Negative intervention cases, the modal restricts the existential quantifier of Existential Closure to world quantification, preventing it from binding any individual variables and obviating the intervention effect.

3. FURTHER DETAILS: MATCHING QUANTIFICATIONAL FORCE

**Table 1: Non-quantificational modals and what they repair**

<table>
<thead>
<tr>
<th>Modals:</th>
<th>Necessity ((\forall))</th>
<th>Possibility ((\exists))</th>
</tr>
</thead>
<tbody>
<tr>
<td>deontic</td>
<td>must(^6)</td>
<td>may, can, could</td>
</tr>
<tr>
<td>epistemic</td>
<td>must</td>
<td>may, might</td>
</tr>
<tr>
<td>other</td>
<td>should, will, would</td>
<td>can, could</td>
</tr>
</tbody>
</table>

**Repairs:**
- I-to-C with *probably*, negative intervention
- I-to-C with *possibly*, negative intervention

**3.1 Match required: I-to-C/adverb repair**

- **Necessity** modals *(should, will, would)* repair questions with *probably*, but not *possibly*.

(23) *should*:\
It’s 4:00…
   a. He should be at work still.
b. He should probably/*possibly be at work still.
c. ?? Is he probably/possibly at work still?
d. Should he probably/*possibly be at work still?

\(^{6}\) *Must* does not repair, whether deontic or epistemic: *Must they probably/possibly say a prayer?* On the present analysis this implies that it is “strong,” in other words lacks a non-quantificational variant.
(24) **should:**
If that shutter is broken…
  a. We should try to fix it.
  b. We should probably/*possibly try to fix it.
  c. *Do we probably/possibly try to fix it?
  d. Should we probably/*possibly try to fix it?

(25) **will:**
  a. We will find out tomorrow.
  b. We will probably/?possibly find out tomorrow.
  c. *Do we probably/possibly find out tomorrow?
  d. Will we probably/*possibly find out tomorrow?

(26) **would:**
  a. She would like eggplant.
  b. She would probably/*possibly like eggplant.
  c. *Does she probably/possibly like eggplant?
  d. Would she probably/*possibly like eggplant?

- **Possibility** modals (*may, might, can, could*) repair questions with *possibly*, but not *probably*.

(27) **Epistemic may:**
I heard a noise coming from that room…
  a. Somebody may be in there.
  b. Somebody may possibly/*probably be in there.
  c. ?? Is somebody possibly/probably in there?
  d. May somebody possibly/*probably be in there?

(28) **Epistemic might:**
There’s a car pulled over on the side of the road…
  a. They might have had an accident.
  b. They might possibly/*probably have had an accident.
  c. ?? Have they possibly/probably had an accident?
  d. Might they possibly/*probably have had an accident?

(29) **Ability can:**
  a. John can lift this rock.
  b. John can possibly/probably lift this rock.
  c. *Did John possibly/probably lift this rock?
  d. Can John possibly/*probably lift this rock?

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7 Note that *can* matches existential *possibly*, but not universal *probably*, patterned with the existential modals.
(30)  *could:*
   a.  We could settle down here.
   b.  We could possibly/probably settle down here.
   c.    *Do/did we possibly/probably settle down here?
   d.    Could we possibly/*probably settle down here?

(31)  *Deontic may:*
   A teacher gives a child permission:
   a.  You may go to the lunchroom.
   b.  You possibly/probably may go to the lunchroom.
   c.    *Did he possibly/probably go to the lunchroom?
   d.    May I possibly/*probably go to the lunchroom?

(32)  *Deontic can:*
   A teacher gives a child permission:
   a.  You can go to the lunchroom.
   b.  You possibly/probably can go to the lunchroom.
   c.    *Do I possibly/probably go to the lunchroom?
   d.    Can I possibly/*probably go to the lunchroom?

3.2 Match not required: Negative intervention repair

- Both possibility and necessity modals repair negative intervention effects (the examples in (12) are repeated here as (33)).
  
  This indicates that the quantifier of Existential Closure differs in some significant respect from lexical existential quantifiers.

(33)  a.  Which book wouldn’t which author write?
   b.  Which form couldn’t which person sign?
   c.  Which question shouldn’t he ask at which interview?
   d.  Which movie can’t you see in which city?

4. Conclusion and further implications

Modal repair tells us:
- The ungrammaticality in the two phenomena discussed above is not in fact due to syntactic movement, or to strict syntactic intervention, as has been previously assumed. Rather, it seems to arise from the (presumably semantic) requirement for all quantifiers to be restricted and to bind variables, and from the manner in which restrictions are applied to quantifiers.

My proposal:
- Modals in English (excluding *must*) are lexically ambiguous between quantificational and non-quantificational variants. The non-quantificational version can restrict a quantifier elsewhere in the sentence.

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8 For deontic modals, the epistemic adverb needs to precede the modal on my judgment.
9 The environment for Negative intervention cannot be created with the epistemic modals *may* and *might*, as they do not allow *n’t cliticization. (*mayn’t, *mightn’t*).
Some further implications and questions

1. The intervention effect does not need a dedicated stipulation to rule it out. It follows from an extension of Pesetsky’s (1982) Path Containment Condition to quantifier restriction, and the (independently necessary) ban on vacuous and/or unrestricted quantification in human language.

2. Cross-linguistic status of modals: do modals repair intervention effects in other languages, such as German and Korean? Do other languages disallow epistemic adverbs in I-to-C (and other operator) environments, and if so, do modals repair these cases?

3. Timing of indexing and operator movement: Contra Heim (1982), it must not be the case that when an operator separates from its restriction it takes the restrictor’s index with it. Indexing must apply after movement, in order to allow intervention to happen.

4. Scope of existential closure: If a quantifier must c-command its restriction at LF, then we can conclude that the minimal scope for the existential closure of negation is the highest non-epistemic ModalP.

Bibliography