Sensitivity to false answers in interpreting questions under attitudes

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Earlier works noticed two forms of exhaustivity involved in interpreting indirect questions: weak exhaustivity and strong exhaustivity.


Compared with WE, IE is sensitive to false answers (FAs): FA-sensitivity

(1) John knows who came.

- **Weakly exhaustive (WE):**
  \[ \forall x \left[ x \text{ came } \rightarrow J \text{ bels } x \text{ came} \right] \]

- **Intermediately exhaustive (IE):**
  \[ \forall x \left[ x \text{ came } \rightarrow J \text{ bels } x \text{ came} \right] \land \forall x \left[ x \text{ didn’t come } \rightarrow \text{ not } \left[ J \text{ bels } x \text{ came} \right] \right] \]

- **Strongly exhaustive (SE):**
  \[ \forall x \left[ x \text{ came } \rightarrow J \text{ bels } x \text{ came} \right] \land \forall x \left[ x \text{ didn’t come } \rightarrow J \text{ bels } x \text{ didn’t come} \right] \]
**Mention-all (MA) questions**

(2) Who went to the party?

\[ w: \text{only John and Mary went to the party.} \]

a. John and Mary.
b. John did .../ \[ \sim \text{I don’t know who else did.} \]
b’. # John did./ \[ \sim \text{Only John did.} \]

**Mention-some (MS) questions: questions admitting MS answers.**

(3) Where can we get gas?

\[ w: \text{there are only two accessible gas stations: Station A and B.} \]

a. Station A.\[ MS \text{ answer} \]
b. Station A and/or Station B.\[ MA \text{ answer} \]
In parallel to the IE readings of indirect MA questions, indirect MS questions also have readings sensitive to false answers. (George 2011, 2013)

<table>
<thead>
<tr>
<th>Italian newspapers are available at ...</th>
<th>Newstopia?</th>
<th>PaperWorld?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facts</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>John’s belief</td>
<td>✓</td>
<td>?</td>
</tr>
<tr>
<td>Mary’s belief</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

(4) a. **John** knows where we can buy an Italian newspaper. [TRUE]

b. **Mary** knows where we can buy an Italian newspaper. [FALSE]
To be theory neutral, for both MA-questions and MS-questions, I call the readings that are sensitive to false answers “FA-sensitive readings”.

**The goal of this talk:** To characterize the conditions of FA-sensitive readings

### Conditions of FA-sensitive readings

(5) John knows Q.

- a. John knows a complete true answer of Q. **Completeness**
- b. John has no false belief about Q. **FA-sensitivity**
2. Completeness

(A simplified version)
In the traditional view, only exhaustive answers can be complete. This view leaves no space for MS.

### Completeness = Max-informativity

(Fox 2013)

Any **maximally informative (MaxI)** true answer counts as a complete true answer. A true answer is MaxI iff it isn’t asymmetrically entailed by any of the true answers.

\[
\text{ANS(}Q\text{)}(w) = \{ p : w \in p \in Q \land \forall q \in Q \rightarrow q \not\subset p \}
\]

A question takes MS iff it can have multiple MaxI true answers:

1. **Who came?**
   \[
   Q_w = \{\text{\textasciitilde came}'(a), \text{\textasciitilde came}'(b), \text{\textasciitilde came}'(a \oplus b)\}
   \]

2. **Who can chair the committee?**
   \[
   Q_w = \{\text{\textasciitilde\textasciitilde chair}'(a), \text{\textasciitilde\textasciitilde chair}'(b)\}
   \]

This view allows: non-exhaustive answers to be good answers, a question to take multiple good answers.
... But, (9b) is predicted to be a partial answer.

(9) Who can serve on the committee?
   a. Gennaro+Danny+Jim can serve. \(\Diamond \text{serve}'(g \oplus d \oplus j)\)
   b. Gennaro+Danny can serve. \(\Rightarrow \Diamond \text{serve}'(g \oplus d)\)

Intuitively, (9b) means: \textit{it is possible to have only }g \oplus d\text{ serve on the committee.}

\textbf{Solution:} the \(\Diamond\)-modal embeds a covert \textbf{exhaustivity operator} \(O\) associated with the \textit{wh}-trace. (Xiang 2016)

(10) \(O(p) = p \land \forall q \in \text{Alt}(p) [p \not\subseteq q \rightarrow \neg q]\) \hspace{1cm} (Chierchia et al. 2012)

\((p\text{ is true, any alternative of } p\text{ that is not entailed by } p\text{ is false.})\)

Local exhaustification provides a \textbf{non-monotonic} environment w.r.t. the \textit{wh}-trace, preventing (9b) from being entailed by (9a):

(11) \(\Diamond O[\text{serve}'(g \oplus d \oplus j)] \nleftrightarrow \Diamond O[\text{serve}'(g \oplus d)]\)
**Completeness**

**Who came?**

\[
f(a \oplus b \oplus c) \quad \rightarrow \text{MaxI}
\]

\[
f(a \oplus b) \quad \rightarrow \text{Not MaxI}
\]

\[
f(a) \quad \rightarrow \text{Not MaxI}
\]

**Who can chair the committee?**

[See Xiang 2016: sec. 2.6.1 for full picture.]

\[
\Diamond O[f(a \oplus b \oplus c)] \quad \rightarrow \text{MaxI}
\]

\[
\Diamond O[f(a \oplus b)] \quad \Diamond O[f(a \oplus c)] \quad \Diamond O[f(b \oplus c)] \quad \rightarrow \text{MaxI}
\]

\[
\Diamond O[f(a)] \quad \Diamond O[f(b)] \quad \Diamond O[f(c)] \quad \rightarrow \text{MaxI}
\]

(12) **Completeness Condition** of “John knows Q”:

\[\lambda w. \exists \phi \in \text{ANS } (\llbracket Q \rrbracket ) (w) [\text{know}'_w (j, \phi)]\]

(John knows a MaxI true answer of Q.)
Other issues involved in Completeness and mention-some:

1. Nominal short answers and free relatives.
   \(John\) went to where he could get help.

2. Questions with collective predicates:
   Which boys formed a team?

3. Mention-all readings of \(\Diamond\)-questions.
   Who all/alles can chair the committee?

4. Uniqueness requirement of singular-marked questions:
   Which professor can chair the committee?

5. ...

3. Sensitivity to false answers

Plan

1. Observation: Partial answers are involved in FA-sensitivity.
2. The exhaustification-based approach and its problems
3. My proposal
3.1 Partial answers in FA-sensitivity

FA-sensitivity is concerned with all types of false answers, not just those that can be complete.
Answers that are always partial:

(13) Who came?
    a. Andy or Billy. \( \phi_a \lor \phi_b \) Disjunctive partial
    b. Andy didn’t. \( \neg \phi_a \) Negative partial

**FA-sensitivity is concerned with false disjunctives: \( \phi_b \lor \phi_c \)**

(14) John knows [who came]. [Judgment: FALSE]
    Fact: \( a \) came, but \( bc \) didn’t come.
    John’s belief: \( a \) and someone else came, **who might be** \( b \) or \( c \).

(15) John knows [where we can get gas]. [Judgment: FALSE]
    Fact: \( a \) sells gas, but \( bc \) do not.
    John’s belief: \( a \) and somewhere else sell gas, **which might be** \( b \) or \( c \).
Partial answers in FA-sensitivity

<table>
<thead>
<tr>
<th>Italian papers are available at...</th>
<th>A?</th>
<th>B?</th>
<th>C?</th>
<th>FA-type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facts</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Mary’s belief</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>over-affirming (OA)</td>
</tr>
<tr>
<td>Sue’s belief</td>
<td>✓</td>
<td>?</td>
<td>×</td>
<td>over-denying (OD)</td>
</tr>
</tbody>
</table>

(16) Sue knows where one can buy an Italian newspaper. True/False?

From MA questions, we cannot tell whether the requirement of avoiding OD is part of FA-sensitivity or simply an entailment of Completeness.

(17) John knows who came.

a. \( \forall x \ [x \text{ came} \rightarrow \text{John believes that } x \text{ came}] \)  
    \[ \Rightarrow \forall x \ [x \text{ came} \rightarrow \text{not [John believes that } x \text{ didn’t come]]}. \] Completeness  
    Avoiding OD

b. \( \forall x \ [x \text{ didn’t come} \rightarrow \text{not [John believes that } x \text{ came}]] \)  
    Avoiding OA
Klinedinst & Rothschild (2011)

abcd trying out for the swimming team: ad made the team, but bc didn’t. For each set of predictions (A1-A4), identify whether it correctly predicted who made the swimming team.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>b</th>
<th>c</th>
<th>D</th>
<th>SE</th>
<th>IE</th>
<th>WE</th>
<th>Ans-type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>✗</td>
<td>?</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>OD</td>
</tr>
<tr>
<td>A2</td>
<td>?</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>MS</td>
</tr>
<tr>
<td>A3</td>
<td>✓</td>
<td>?</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>MA</td>
</tr>
<tr>
<td>A4</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
<td>OA</td>
</tr>
</tbody>
</table>

I reanalyzed K&R’s (2011) raw data and excluded ...

1. non-native speakers;
2. subjects rejected by MTurk;
3. subjects with missing responses.

Subjects were not chosen based on their responses.
Four places \((abcd)\) at Central Square selling alcohol, among which only \(ad\) sold red wine. Susan asked her local friends \textbf{where she could buy a bottle of red wine at Central Square}. Identify whether an answer (A1 to A4) correctly answered Susan’s question.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>b</th>
<th>c</th>
<th>D</th>
<th>Ans-type</th>
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</thead>
<tbody>
<tr>
<td>A1</td>
<td>✗</td>
<td>?</td>
<td>✗</td>
<td>✓</td>
<td>OD</td>
</tr>
<tr>
<td>A2</td>
<td>?</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
<td>MS</td>
</tr>
<tr>
<td>A3</td>
<td>✓</td>
<td>?</td>
<td>✗</td>
<td>✓</td>
<td>MA</td>
</tr>
<tr>
<td>A4</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>OA</td>
</tr>
</tbody>
</table>
In each experiment, each two answers were fit with a logistic mixed effect model. All the models, except the one for MS-MA in Exp-MS, reported a significant effect.

1. **OD/OA < MS/MA in Exp-MS**
   - Both **OA** and **OD** are involved in FA-sensitivity.

2. **OD < OA in Exp-MA; OD > OA in Exp-MS**
   - FA-sensitivity exhibits an asymmetry varying by Q-type.
3.2 Against the exhaustification-based approach
The exhaustification-based approach

(Klinedinst & Rothschild 2011, Uegaki 2015)

1. The ordinary value of an indirect question is its **Completeness** Condition.
2. FA-sensitivity is derived by **exhaustifying** Completeness.

\((w: \text{ab came, but c didn't.})\)

\((18)\) \(O [\text{John knows [Q who came ]}]\)

\(\text{a. } [S] = \lambda w. \exists \phi \in \text{ANS}(\llbracket Q \rrbracket)(w)[\text{know}'_w(j, \phi)] = \text{know}'(j, \phi\text{ab})\)

(John knows a **true** complete answer of Q)

\(\text{b. } \text{Alt}(S) = \{\lambda w. \exists \phi \in \text{ANS}(\llbracket Q \rrbracket)(w')[\text{bel}'_w(j, \phi)] | w' \in W\} = \{\text{bel}'(j, \phi\text{a}), \text{bel}'(j, \phi\text{ab}), \text{bel}'(j, \phi\text{abc})\}

({John believes \(\phi\): \(\phi\) is a **possible** complete answer of Q})

\(\text{c. } [O(S)] = \text{know}'(j, \phi\text{ab}) \land \neg \text{bel}'(j, \phi\text{c})\)

(John **only** believes the **TRUE** complete answer of Q.)

\(\boxed{\text{FA-sensitivity is a **scalar implicature** of Completeness.}}\)
(19) John knows $\left[ Q \text{ where we can get gas} \right]$.  

(\textit{w: among the considered places abc, only ab sell gas.})

a. $\exists \phi \ [\phi \text{ is a true MS answer of } Q] \ [O \ [\text{John knows } \phi]]$ \hspace{1cm} \textbf{Local exh}

b. $O \ [\exists \phi \ [\phi \text{ is a true MS answer of } Q] \ [\text{John knows } \phi]]$ \hspace{1cm} \textbf{Global exh}

\textbf{Local exhaustification}

The truth conditions yielded by local exhaustification are too strong:

1. John knows a true MS answer as to \textit{where we can get gas};
2. John doesn’t believe any answer that is not entailed by this MS answer.

If what John believes is \textit{we can get gas at a and somewhere else}, (19) would be predicted to be false, contra the fact.
Global exhaustification

Using innocent exclusion (Fox 2007), global exhaustification derives an inference close to FA-sensitivity. (D. Fox and A. Cremers p.c. independently)

\[(20) \quad O_{IE} [S \text{ John knows } [Q \text{ where we can get gas}]] \quad (w: ab \text{ sell gas, but } c \text{ doesn’t.})\]

\[
a. \quad [S] = \lambda w. \exists \phi \in \text{ANS([Q](w))[\text{know'}(j, \phi)] = } \text{know'}(j, \phi_a) \lor \text{know'}(j, \phi_b) \\

b. \quad \text{Alt}(S) = \{ \lambda w. \exists \phi \in \text{ANS([Q](w')[\text{bel'}(j, \phi)] | w' \in W \}
  = \{ \text{bel'}(j, \phi_a), \quad \text{bel'}(j, \phi_a) \lor \text{bel'}(j, \phi_b), \quad ...} \\
  \quad \text{bel'}(j, \phi_b), \quad \text{bel'}(j, \phi_b) \lor \text{bel'}(j, \phi_c), \\
  \quad \text{bel'}(j, \phi_c), \quad \text{bel'}(j, \phi_c) \lor \text{bel'}(j, \phi_c), \}

\]

\[
c. \quad [O_{IE}(S)] = [\text{know'}(j, \phi_a) \lor \text{know'}(j, \phi_b)] \land \neg \text{bel'}(j, \phi_c)\]

Innocent exclusion

Innocent exclusion negates only innocently excludable alternatives.

\[(21) \quad O_{IE}(p) = p \land \forall q \in \text{IExcl}(p)[\neg q] \]

\[
\text{IExcl}(p) = \bigcap\{A : A \text{ is a maximal subset of } \text{ALT}(p) \text{ s.t. } A \setminus \{p\} \text{ is consistent}\}
\text{where } A^{-} = \{\neg q : q \in A\}
First, **FA-sensitivity is concerned with all types of false answers**, not just those that can be complete.

To obtain the desired FA-sensitivity, exhaustification needs to operate on a special alternative set:

\[(22) \quad O_{IE} [S \text{ John knows } [Q \text{ where we can get gas}]]\]

(Context: *ab sell gas, but cd do not.*)

a. \( \llbracket S \rrbracket = \text{know}'(j, \phi_a) \lor \text{know}'(j, \phi_b) \)
   \[
   \begin{aligned}
   &\text{bel}'(j, \phi_c), \text{bel}'(j, \phi_d), \ldots \quad \text{OA} \\
   &\text{bel}'(j, \neg \phi_a), \text{bel}'(j, \neg \phi_b), \ldots \quad \text{OD}
   \end{aligned}
   \]

b. \( \text{Alt}(S) = \left\{ \begin{aligned}
   &\text{bel}'(j, \phi_c \lor \phi_d), \ldots \quad \text{Disj} \\
   &\ldots \\
   &\text{bel}'(j, \phi_a \land \phi_b)\ldots \quad \text{MA/MI}
   \end{aligned} \right\} \)
Problems with the exhaustification-based approach

Second, FA-sensitivity inferences do not behave like scalar implicatures.

1. FA-sensitivity inferences are not cancelable.

(23)  a. Did Mary invite some of the speakers to the dinner?
      b. Yes. Actually she invited all of them.

(24)  (Context: *Only Billy and Cindy presented this morning.*)
      a. Does Mary know which speakers presented this morning?
      b. Yes. #Actually she believes that Andy, Billy, and Cindy all did.

2. FA-sensitivity inferences are easily generated in downward-entailing contexts.

(25)  If M invited some of the speakers to the dinner, I will buy her a coffee.
      ∇ If Mary invited some but not all speakers to the dinner, I will...

(26)  If M knows which speakers presented this morning, I will ...
      ⊢ If [M believes B+C did] ∧ not [M believes A did], I will...
Problems with the exhaustification-based approach

3. FA-sensitivity inferences are not “mandatory” scalar implicatures: (27b) evokes an indirect scalar implicature, while (28b) doesn’t.

(27) a. Mary only invited the FEMALE$_F$ speakers to the dinner. 
   $\sim \Rightarrow$ Mary did not invite the male speakers to the dinner. 
   $\sim \Rightarrow \neg \phi_{\text{male}}$

   b. Mary only did not invite the FEMALE$_F$ speakers to the dinner. 
   $\sim \Rightarrow$ Mary invited the male speakers to the dinner. 
   $\sim \Rightarrow \phi_{\text{male}}$

b’. $O \neg \phi_{\text{female}} = \neg \phi_{\text{female}} \land \neg \neg \phi_{\text{male}} = \neg \phi_{\text{female}} \land \phi_{\text{male}}$

(28) a. Mary knows which speakers presented this morning. 
   $\sim \Rightarrow$ not [Mary believes that A presented this morning] 
   $\sim \Rightarrow \neg \text{bel}'(m, \phi_a)$

b. Mary does not know which speakers presented this morning. 
   $\not \Rightarrow$ Mary believes that A presented this morning 
   $\not \Rightarrow \text{bel}'(m, \phi_a)$

b’. $O \neg [\text{Mary knows which speakers presented this morning}]$
3.3 My analysis of FA-sensitivity
1. Characterizing FA-sensitivity

**My view**

1. FA-sensitivity is an **independent** condition mandatorily involved in interpreting indirect questions.

2. FA-sensitivity is concerned with all **Q-relevant** propositions, not just those that can be complete answers of Q.

**Formalizations**

(29) John knows Q.

a. $\lambda w. \exists \phi \in \text{ANS}([Q])(w)[\text{know}'_w(j, \phi)]$

   (John knows a MaxI true answer of Q.)

b. $\lambda w. \forall \phi \in \text{REL}([Q])[w \not\in \phi \rightarrow \neg \text{believe}'_w(j, \phi)]$

   (John has no **Q-relevant** false belief.)

Completeness

FA-sensitivity

If the Hamblin set $Q = \{p, q\}$, then $\text{REL}([Q]) = \{p, q, \neg p, p \lor q, p \land q, \ldots\}$
1. Characterizing FA-sensitivity

### Q-relevance

\( \phi \) is **Q-relevant** iff \( \phi \) is a union of some partition cells of \( Q \).

\[(30) \quad \text{REL}(\llbracket Q \rrbracket) = \{ \bigcup X : X \subseteq \text{Part}(\llbracket Q \rrbracket) \} \]

\[(31) \quad \text{Defining partition:} \]

a. Based on the *true* answers:

\[\text{Part}(\llbracket Q \rrbracket) = \{ \lambda w[Q_w = Q'_{w}] : w' \in W \} \]

b. Based on the *complete true* answers:

\[\text{Part}(\llbracket Q \rrbracket) = \{ \lambda w[\text{ANS}(\llbracket Q \rrbracket)(w) = \text{ANS}(\llbracket Q \rrbracket)(w')] : w' \in W \} \]

### Example:

\[(32) \quad \text{Who came?} \]

a. \( \phi_a \lor \phi_b = c_1 \cup c_2 \cup c_3 \)

b. \( \neg \phi_a = c_3 \cup c_4 \)

<table>
<thead>
<tr>
<th>( w )</th>
<th>( Q_w = {\phi_a, \phi_b, \phi_{ab}} )</th>
<th>( c_1 )</th>
<th>( w: \text{only } ab \text{ came} )</th>
<th>( c_1 )</th>
<th>( w: \text{only } ab \text{ came} )</th>
<th>( c_1 )</th>
<th>( w: \text{only } ab \text{ came} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( w )</td>
<td>( Q_w = {\phi_a} )</td>
<td>( c_2 )</td>
<td>( w: \text{only } a \text{ came} )</td>
<td>( c_2 )</td>
<td>( w: \text{only } a \text{ came} )</td>
<td>( c_2 )</td>
<td>( w: \text{only } a \text{ came} )</td>
</tr>
<tr>
<td>( w )</td>
<td>( Q_w = {\phi_b} )</td>
<td>( c_3 )</td>
<td>( w: \text{only } b \text{ came} )</td>
<td>( c_3 )</td>
<td>( w: \text{only } b \text{ came} )</td>
<td>( c_3 )</td>
<td>( w: \text{only } b \text{ came} )</td>
</tr>
<tr>
<td>( w )</td>
<td>( Q_w = \emptyset )</td>
<td>( c_4 )</td>
<td>( w: \text{nobody came} )</td>
<td>( c_4 )</td>
<td>( w: \text{nobody came} )</td>
<td>( c_4 )</td>
<td>( w: \text{nobody came} )</td>
</tr>
</tbody>
</table>

| \( w \) | \( \text{ANS}(\llbracket Q \rrbracket)(w) = \{\phi_{ab}\} \) | \( w \) | \( \text{ANS}(\llbracket Q \rrbracket)(w) = \{\phi_{a}\} \) | \( w \) | \( \text{ANS}(\llbracket Q \rrbracket)(w) = \{\phi_{b}\} \) | \( w \) | \( \text{ANS}(\llbracket Q \rrbracket)(w) = \emptyset \) |
1. Characterizing FA-sensitivity

- Embedded questions must be defined in a way that can retrieve the partitions, and furthermore all the relevant propositional answers.
- Hence, the embedded question shall NOT be reduced to a true propositional answer of this question.

(33)  

a. √ John knows \([\text{partition who came}]\)

b. √ John knows \([\text{Hamblin set who came}]\)

c. √ John knows \([\text{Topical Property who came}]\)

d. × John knows \([\text{ANS}_w [Q who came]]\)

e. √ John knows \([\lambda w [\text{ANS}_w [Q who came]]]\)
2. FA-sensitivity and factivity

The typology of interrogative-embedding predicates: (Adapted from Lahiri (2002), Spector & Egré (2015), and Uegaki (2015))

- Rogative
  - Non-veridical
  - Veridical
    - Non-factive
    - Factive
- Responsive
  - Non-veridical
  - Veridical

Types of factives

1. Emotive factives: *be surprised, be pleased*, ...
2. Cognitive factives: *know, remember, discover*, ...
3. Communication verbs: *tell[+fac], predict[+fac]*, ...
1. In paraphrasing FA-sensitivity, *know* is replaced with its non-factive counterpart *believe*. (Spector & Egré 2015) Why?

(34) (Context: *ab came, but c didn’t.*)  
John *knows* who came.  
\[ \approx \text{know}'(j, \phi_a \land \phi_b) \land \neg \text{believe}'(j, \phi_c) \]

**Explanation:** Presupposition accommodation makes the FA-sensitivity Condition suffer a presupposition failure or be tautologous.

(35) a. Global accommodation  
\[ \lambda w. \forall \phi \in \text{REL}([Q])[w \not\in \phi \rightarrow \neg \text{believe}'_w(j, \phi) \land w \in \phi] \]  
Contradiction

b. Local accommodation  
\[ \lambda w. \forall \phi \in \text{REL}([Q])[w \not\in \phi \rightarrow \neg[\text{believe}'_w(j, \phi) \land w \in \phi]] \]  
Tautology

Hence, in paraphrasing FA-sensitivity, the factive presupposition of *know* needs to be “deactivated”.
2. FA-sensitivity and factivity

2. Seemingly, emotive factives do not license FA-sensitive readings. Why?

(36) John is surprised at who came.

(Context: ab came, but c didn’t.)

a. \( \sim \) John is surprised that \( ab \) came. \[ \text{surprise}'(j, \phi_a \land \phi_b) \]

b. \( \not\sim \) John isn’t surprised that \( c \) came. \[ \text{\neg surprise}'(j, \phi_c) \phi_c \]

c. \( \sim \not\) Not that John is surprised that \( c \) came. \[ \neg \text{[surprise}'(j, \phi_c) \land \phi_c] \]

Explanation: FA-sensitivity collapses under factivity, due to local accommodation of the factive presupposition.

(37) John is surprised at \( Q \).

\[ \lambda w. \forall \phi \in \text{REL}(\llbracket Q \rrbracket) [w \notin \phi \rightarrow \neg \text{[surprise}'(j, \phi) \land w \in \phi]] \]

Tautology

(For any \( Q \)-relevant \( \phi \), if \( \phi \) is false, then it is not the case that [John is surprised at \( \phi \) and \( \phi \) is true])
3. The factive presupposition of *surprise* isn’t deactivated, (but instead locally accommodated), why?

**Explanation:** Factive presuppositions of emotive factives are strong and indefeasible, unlike those of cognitive factives. (Karttunen 1971; Stalnaker 1977)

(38) a. If someone **regrets** that I was mistaken, I will admit that I was wrong. 
\[ \sim \rightarrow \text{The speaker was mistaken.} \]

b. If someone **discovers** that I was mistaken, I will admit that I was wrong. 
\[ \sim \not\rightarrow \text{The speaker was mistaken.} \]

As weak factives, **communication verbs** pattern like cognitive factives.

(39) John **told** Mary Q:
\[ \lambda w. \forall \phi \in \text{REL}([Q])(w \not\in \phi \rightarrow \neg \text{told}'[-\text{ver}], w(j, m, \phi))] \]
4. Asymmetry of FA-sensitivity
The unacceptability of false answers varies:

- In MA-Qs, **OA** is more tolerated than **OD**. ($\hat{\beta} = 1.0952$, $p < .001$)
- In MS-Qs, **OD** is more tolerated than **OA**. ($\hat{\beta} = -0.7324$, $p < .005$)
What causes these asymmetries?

- **An appealing idea**: OD is less tolerated than OA in MA-Qs because OD even doesn’t satisfy Completeness.

- **This idea predicts**: if a participant was tolerant of incompleteness, then his/her responses would not show any asymmetry w.r.t FA-sensitivity.

- **Assessing this idea**: ×
  Subjects in Exp-MA tolerated of incompleteness (viz. who accepted MS&MA) also rejected OD significantly more than OA (binomial test: 89%, \( p < .05 \))

<table>
<thead>
<tr>
<th></th>
<th>OD</th>
<th>MS</th>
<th>MA</th>
<th>OA</th>
<th>( N )</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>√</td>
<td>√</td>
<td>×</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>√</td>
<td>√</td>
<td>√</td>
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<td></td>
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</tr>
<tr>
<td>×</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

⇒ Regardless of whether Completeness was considered, the subjects in Exp-MA consistently rejected OD more than OA.
**Asymmetry of FA-sensitivity**

**My view**: A false answer is tolerated if it is “not misleading”.

<table>
<thead>
<tr>
<th>Could we get gas at ...?</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fact</strong></td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>OA</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td>OD</td>
<td>✓</td>
<td>✗</td>
<td>?</td>
</tr>
</tbody>
</table>

When accepting a response $\phi$, the questioner would:

1. update the answer space: **removing the incompatible answers** and **adding the entailed answers**.

2. take any **MaxI answer of the new answer space** as a resolution and make decisions accordingly.

If none of these MaxI answers leads to an “improper decision”, $\phi$ could be tolerated.
**Principle of Tolerance**

An answer $\phi$ is tolerated iff accepting $\phi$ yields an answer space s.t. every MaxI member of this answer space entails a MaxI true answer.

**MA-Q: OD is worse than OA**

In MA-Qs, **OD** violates the Principle of Tolerance:

- Let all the answers be true. MaxI true answer: $f(a \oplus b \oplus c)$.
- Overly denying $f(a)$ rules out all the shaded answers. MaxI member in the updated answer space: $f(b \oplus c)$.
- $f(b \oplus c) \not\Rightarrow f(a \oplus b \oplus c)$
**Principle of Tolerance**

An answer $\phi$ is tolerated iff accepting $\phi$ yields an answer space s.t. every MaxI member of this answer space entails a MaxI true answer.

**MA-Q: OD is worse than OA**

In MA-Qs, **OA does not violate the Principle of Tolerance:**

- Only let the unshaded answers be true. MaxI true answer: $f(b \oplus c)$.
- Overly affirming $f(a)$ rules in all the shaded answers.
  The MaxI member in the updated answer space: $f(a \oplus b \oplus c)$.
- $f(a \oplus b \oplus c) \Rightarrow f(b \oplus c)$.
**Principle of Tolerance**

An answer $\phi$ is tolerated iff accepting $\phi$ yields an answer space s.t. every MaxI member of this answer space entails a MaxI true answer.

**MS-Q: OA is worse than OD**

\[\Diamond O[f(b \oplus c)]\]

\[\Diamond O[f(a)]\]  \[\Diamond O[f(b)]\]  \[\Diamond O[f(c)]\]

In MS-Qs, **OD** does not violate the Principle of Tolerance:

- Let all the answers be true. All of them are MaxI true answers.
- Overly denying $\Diamond O[f(a)]$ only rules out $\Diamond O[f(a)]$ itself.
  MaxI members in the updated space: all the unshaded answers.
- Each of the remaining answers entails a MaxI true answer (i.e., itself).
**Principle of Tolerance**

An answer $\phi$ is tolerated iff accepting $\phi$ yields an answer space s.t. every MaxI member of this answer space entails a MaxI true answer.

**MS-Q: OA is worse than OD**

In MS-Qs, **OA** violates the Principle of Tolerance:

- Only let the unshaded answers be true. All unshaded answers are MaxI true.
- Overly affirming $\Diamond O[f(a)]$ only rules in $\Diamond O[f(a)]$ itself. MaxI members in the updated answer space: all the present answers.
- $\Diamond O[f(a)]$ does not entail any of the unshaded answers.
Completeness

Any MaxI true answer counts as a complete true answer.

(40) “John knows Q”:
\[ \lambda w. \exists \phi \in \text{ANS}([Q])(w)[\text{know}'_w(j, \phi)] \]
(John knows a MaxI true answer of Q.)

FA-sensitivity

1. FA-sensitivity is concerned with all types of false answers.
2. FA-sensitivity is not derived by exhaustifications.
3. Factivity in paraphrasing FA-sensitivity:
   - Weak factivity is deactivated.
     (41) “John knows Q”:
     \[ \lambda w. \forall \phi \in \text{REL}([Q])[w \notin \phi \rightarrow \neg \text{believe}'_w(j, \phi)] \]
   - Strong factivity is locally accommodated, yielding a tautology.
     (42) “John is surprised at Q”:
     \[ \lambda w. \forall \phi \in \text{REL}([Q])[w \notin \phi \rightarrow \neg [\text{surprise}'(j, \phi) \land w \in \phi]] \]
Asymmetries of FA-sensitivity

1. The observations:
   - In MA-Qs, OA is more tolerated than OD.
   - In MS-Qs, OD is more tolerated than OA.

2. Principle of Tolerance
   An answer $\phi$ is tolerated iff accepting $\phi$ yields an answer space s.t. every MaxI member of this answer space entails a MaxI true answer.
Against the pragmatic view of mention-some

The pragmatic view: the distribution of MS is purely restricted by pragmatics.

- **Pragmatic approaches**: (Groenendijk & Stokhof 1984; van Rooij 2004; a.o.)
  Complete answers must be exhaustive. MS answers are partial answers that are sufficient for the conversational goal behind the question.

- **Post-structural approaches**: (Beck & Rullmann 1999; George 2011: ch 2)
  MS is semantically licensed but pragmatically restricted. MS and MA are two independent readings derived via different operations on question roots.

mention-some = mention-one: each MS answer specifies only one option

- Unlike MS answers, **mention-intermediate (MI) answers** (viz. non-exhaustive answers that specify multiple choices) must be ignorance-marked.

  (43) Who can chair the committee?
  
  *(w: only Andy, Billy, and Cindy can chair; single-chair only.)*

  a. Andy.
  
  b. Andy and Billy...

  b’.#Andy and Billy.  \(\leadsto\) Only John and Mary can chair.

  c. Andy, Billy, and Cindy.
Indirect ♦-questions admit mention-one and MA readings, but not MI readings. While a conversational goal can be, e.g., “mention-3”.

(44) (The dean wants to discuss plans for the committee with 3 chair candidates)
    John knows who can chair the committee.
    a. ∃x [x can chair ∧ John knows that x can chair]  (✓)
    b. ∀x [x can chair → John knows that x can chair.]  (✓)
    c. ∃xyz [xyz each can chair ∧ John knows that xyz each can chair.]  (#)
(45) John **agrees with** Mary on who came.

a. $\forall x [\text{Mary believes that } x \text{ came} \rightarrow \text{John believes that } x \text{ came}]$

b. $\forall x [[\text{Mary believes that } x \text{ did not came}] \rightarrow \neg \text{ [John believes that } x \text{ came}]]$

<table>
<thead>
<tr>
<th>Did ... came?</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary’s belief</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>?</td>
</tr>
<tr>
<td>John’s belief can be</td>
<td>✓</td>
<td>✓</td>
<td>✗/?</td>
<td>✓/?</td>
</tr>
</tbody>
</table>

(46) $\mathcal{B}_w^m(Q) = \{ p : p \in Q \land \text{believe}'_w(m, p) \}$

(The set of possible answers that Mary believes in $w$)

(47) John **agrees with** Mary on $Q$.

a. $\lambda w. \exists \phi \in \text{MaxI}(\mathcal{B}_w^m(Q))[\text{believe}'_w(j, \phi)]$  **Completeness**
   
   ($\lambda w. \text{John believes}_w$ a MaxI member of $\mathcal{B}_w^m(Q)$)

b. $\lambda w. \forall \phi \in \text{REL}([Q])[\text{believe}'_w(m, \neg \phi) \rightarrow \neg \text{believe}'_w(j, \phi)]$  **FA-sensitivity**
   
   (John doesn’t believe anything $Q$-relevant that contradicts Mary’s belief.)
Puzzle: ♦-questions embedded under *agree* do not admit MS readings.

(48) John **agrees with** Mary on [who can chair the committee].

a. $\forall x [\text{Mary believes that } x \text{ can } \rightarrow \text{John believes that } x \text{ can}]$

a'. $\exists x [\text{Mary believes that } x \text{ can } \land \text{John believes that } x \text{ can}]$ (too weak)

b. $\forall x [[\text{Mary believes that } x \text{ can’t}] \rightarrow \text{not [John believes that } x \text{ can}]]$

<table>
<thead>
<tr>
<th>Can ... chair?</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary’s belief</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>?</td>
</tr>
<tr>
<td>John’s belief</td>
<td>Yes</td>
<td>No/?</td>
<td>No</td>
<td>?</td>
</tr>
</tbody>
</table>

Judgement: FALSE

Explanation: Indirect questions with *agree* evoke an **Opinionatedness Condition**

(49) **Opinionatedness & FA-sensitivity** $\Rightarrow$ MA

a. $\lambda w. \forall \phi \in \text{MaxI}(B^m_w(Q)) [\text{bel}_w^j(\phi) \lor \text{bel}_w^j(\neg \phi)]$ **Opinionatedness**

(John is opinionated about every MaxI belief of Mary on Q.)

b. $\lambda w. \forall \phi \in \text{MaxI}(B^m_w(Q)) [\neg \text{bel}_w^j(\neg \phi)]$ $\Leftarrow$ **FA-sensitivity**

c. $a \& b \Rightarrow \lambda w. \forall \phi \in \text{MaxI}(B^m_w(Q)) [\text{bel}_w^j(\phi)]$


Fox, D. 2013. Mention-some readings of questions, class notes, MIT seminars.


