Sensitivity to False Answers in Indirect Questions

Yimei Xiang

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Harvard University
yxiang@fas.harvard.edu

Attitudes and Questions, Carnegie Mellon University
1. Introduction
Exhaustivity and FA-sensitivity

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

- Recent works start to consider the **intermediate** form of exhaustivity. (Klinedinst & Rothschild 2011, Spector & Egré 2015, Uegaki 2015, Cremers & Chemla 2016, Xiang 2016, Theiler et al. 2016)

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

(1) John knows who came.

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

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

- **Strongly exhaustive (SE):**
  \[ \forall x \ [ x \text{ came } \rightarrow J \text{ bels } x \text{ came}] \land \forall x \ [ x \text{ didn’t come } \rightarrow J \text{ bels } x \text{ didn’t came}] \]
Mention-all vs. mention-some

**Mention-all (MA) questions**

(2) Who went to the party?

(w: only John and Mary went to the party.)

a. John and Mary.

b. John did .../ \(\leadsto I\) don’t know who else did.

b’. # John did.\(\leadsto Only\) John did.

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

(3) Where can we get gas?

(w: there are only two accessible gas stations: Station A and B.)

a. Station A.\(\leadsto MS\) answer

b. Station A and/or Station B.\(\leadsto MA\) answer
George (2011, 2013): in parallel to the IE readings of indirect MA questions, indirect MS questions also have readings sensitive to false answers.

<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
In the traditional view, only exhaustive answers can be complete. This view leaves no space for MS.

**Completeness = Max-informativity**

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.

\[
\text{Ans}(Q)(w) = \{ p : w \in p \in Q \land \forall q[w \in q \in Q \rightarrow q \not\subset p] \} \\
(\{ p : p \text{ is a MaxI true member of } Q \text{ in } w \})
\]

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

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

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: it is possible to have only \( g \oplus d \) serve on the committee.

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

(10) \( O(p) = p \land \forall q \in \text{Alt}(p)[p \not\subseteq q \rightarrow \neg q] \)  
     \hspace{1cm} (Chierchia et al. 2013)
     \hspace{1cm} (\( p \) is true, any alternative of \( p \) that is not entailed by \( p \) is false.)

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

(11) \( \Diamond O[\text{serve}'(g \oplus d \oplus j)] \nRightarrow \Diamond O[\text{serve}'(g \oplus d)] \)
(12) **Completeness Condition** of *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*)
Completeness

▶ Other issues involved in Completeness and mention-some:

1. Nominal short answers and free relatives.
   
   \textit{John went to where he could get help}.

2. Questions with collective predicates:

   \textit{Which boys formed a team?}

3. Mention-all readings of \diamondsuit-questions.

   \textit{Who all/alles can chair the committee?}

4. Uniqueness requirement of singular-marked questions:

   \textit{Which professor can chair the committee?}

5. ...

3. Sensitivity to false answers

Plan

1. An 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; $bc$ 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; $bc$ do not.
    John’s belief: $a$ and somewhere else sell gas, which might be $b$ or $c$. 
## Partial answers in FA-sensitivity

**FA-sensitivity is concerned with false denials**

<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</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(OA)</td>
</tr>
<tr>
<td>Sue’s belief</td>
<td>✓</td>
<td>?</td>
<td>✗</td>
<td>over-denying</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(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.

\[
\forall x \ [x \text{ came } \rightarrow \text{ John believes that } x \text{ came}]
\]

\[
\Rightarrow \forall x \ [x \text{ came } \rightarrow \text{ not } \{\text{John believes that } x \text{ didn’t come]\}].
\]

**Completeness**  
**Avoiding OD**

b. \[
\forall x \ [x \text{ didn’t come } \rightarrow \text{ not } \{\text{John believes that } x \text{ came}\}]
\]

**Avoiding OA**

Yimei Xiang  
Sensitivity to false answers: Partial answers in FA-sensitivity  
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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 \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>
</tr>
</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>
Experiments: Results

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.

(18) \( O[p \text{ John knows } [Q \text{ who came }]] \) \( (w: \text{ ab came, but c didn’t.}) \)

   a. \( p = \lambda w. \exists \phi \in \text{Ans}(Q)(w)[\text{know}'_w(j, \phi)] = \text{know}'(j, \phi_a \land \phi_b) \)
      (John knows a **true** complete answer of Q)

   b. \( \text{Alt}(p) = \{ \lambda w. \exists \phi \in \alpha[\text{bel}'_w(j, \phi)] \mid \exists w'[\alpha = \text{Ans}(Q)(w')]) \}
      = \{ \lambda w. \exists \phi \in \text{Ans}(Q)(w')[\text{bel}'_w(j, \phi)] \mid w' \in W \}
      = \{ \text{bel}'(j, \phi_a), \text{bel}'(j, \phi_b), \text{bel}'(j, \phi_c), \}
      \begin{cases} \text{bel}'(j, \phi_a \land \phi_b), \text{bel}'(j, \phi_c), \ldots, \text{bel}'(j, \phi_a \land \phi_b \land \phi_c) \end{cases}
      (John believes \( \phi \), where \( \phi \) is a **possible** complete answer of Q)

   c. \( O(p) = \text{know}'(j, \phi_a \land \phi_b) \land \lnot \text{bel}'(j, \phi_c) \)
      (John **only** believes the **TRUE** complete answer of Q.)

\( \blacksquare \) FA-sensitivity is a **scalar implicature** of Completeness.
The exhaustification-based approach: Extending to MS-questions

(19) John knows $[Q$ where we can get gas].
    ($w$: among the considered places abc, only ab sell gas.)

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

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

Local exhaustification

The truth conditions yielded by local exhaustification are too strong:

1. John knows a true MS answer as to 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 “we could 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) $O_{IE}[p \text{ John knows } [Q \text{ where we can get gas}]] \quad (w: ab \text{ sell gas, but } c \text{ doesn’t.})$

a. $p = \lambda w. \exists \phi \in \text{Ans}(Q)(w)[\text{know}'_w(j, \phi)] = \text{know}'(j, \phi_a) \lor \text{know}'(j, \phi_b)$

b. $\text{Alt}(p) = \{ \lambda w. \exists \phi \in \alpha[\text{bel'}_w(j, \phi)] \mid \exists w'[\alpha = \text{Ans}(Q)(w')])$

$$= \{ \text{bel'}(j, \phi_a), \text{bel'}(j, \phi_a) \lor \text{bel'}(j, \phi_b), ... \}$$

$$= \{ \text{bel'}(j, \phi_b), \text{bel'}(j, \phi_a) \lor \text{bel'}(j, \phi_c), \}$$

$$= \{ \text{bel'}(j, \phi_c), \text{bel'}(j, \phi_b) \lor \text{bel'}(j, \phi_c), ... \}$$

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

Innocent exclusion

Innocent exclusion negates only innocently excludable alternatives.

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

b. $\text{IExcl}(p) = \{ q : q \in \text{Alt}(p) \land \neg \exists q' \in \text{Excl}(p)[p \land \neg q \rightarrow q'] \}$

where $\text{Excl}(p) = \{ q : q \in \text{Alt}(p) \land p \not\subseteq q \}$
Problems with the exhaustification-based approach

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:

\( O_{IE} \) \[ p \text{ John knows } [Q \text{ where we can get gas}] \]
\( (w: \text{ab sell gas, but cd do not.}) \)

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

b. \( \text{Alt}(p) = \begin{cases} 
   \text{bel}'(j, \phi_c \lor \phi_d), \ldots \quad \text{Disj} \\
   \ldots \\
   \text{bel}'(j, \phi_a \land \phi_b), \ldots \quad \text{MA/MI}
\end{cases} \)
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) a. Does Mary know which speakers presented this morning?  
   b. Yes. #Actually she believes that Alexandre, B, and Carlotta 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.  
   \( \neg \rightarrow \) If Mary invited some but **not all** speakers to the dinner, I will...

   (26) If M knows which speakers presented this morning, I will ...  
   \( \neg \sim \) If [M believes B+C did] \( \wedge \) **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.
\[\neg\phi_{\text{male}}\]
\[\neg\phi_{\text{female}} \land \neg\phi_{\text{male}} = \neg\phi_{\text{female}} \land \phi_{\text{male}}\]

b. Mary only did not invite the FEMALE\(_F\) speakers to the dinner.
\[\phi_{\text{male}}\]

b'. O \[\neg\phi_{\text{female}} = \neg\phi_{\text{female}} \land \neg\phi_{\text{male}} = \neg\phi_{\text{female}} \land \phi_{\text{male}}\]

(28)  a. Mary knows which speakers presented this morning.
\[\neg \text{bel}^\prime(m, \phi_a)\]

b. Mary does not know which speakers presented this morning.
\[\text{bel}^\prime(m, \phi_a)\]

b'. O not [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. \( \lambda w. \forall \phi \in \text{Rel}(Q)[w \notin \phi \rightarrow \neg \text{believe}'_w(j, \phi)] \)
   (John has no **Q-relevant** false belief.)

If \( Q = \{p, q\} \), 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) \( \text{Rel}(Q) = \{ \bigcup X : X \subseteq \text{Part}(Q) \} \)

(31) Defining **partition**:

a. Based on the **true** answers

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

b. Based on the **MaxI true** answers

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

**Example:**

(32) 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 ): ( Q_w )</th>
<th>( c_1 )</th>
<th>( w ): only ( ab ) came</th>
<th>( w ): Ans(( Q ))(( w )) = {( \phi_{ab} )}</th>
</tr>
</thead>
<tbody>
<tr>
<td>( { \phi_a, \phi_b, \phi_{ab} } )</td>
<td>( c_2 )</td>
<td>( w ): only ( a ) came</td>
<td>( w ): Ans(( Q ))(( w )) = {( \phi_a )}</td>
</tr>
<tr>
<td>( { \phi_a } )</td>
<td>( c_3 )</td>
<td>( w ): only ( b ) came</td>
<td>( w ): Ans(( Q ))(( w )) = {( \phi_b )}</td>
</tr>
<tr>
<td>( { \phi_b } )</td>
<td>( c_4 )</td>
<td>( w ): nobody came</td>
<td>( w ): Ans(( Q ))(( w )) = ( \emptyset )</td>
</tr>
</tbody>
</table>
The typology of interrogative-embedding predicates: (Adapted from Lahiri (2002), Spector & Egré (2015), and Uegaki (2015))

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

- Responsive

- Types of factives
  1. Emotive factives: *be surprised, be pleased, ...
  2. Cognitive factives: *know, remember, discover, ...
  3. Communication verbs: *tell[+fac], predict[+fac], ...
2. FA-sensitivity and factivity

1. In paraphrasing FA-sensitivity, *know* is replaced with its non-factive counterpart *believe*. (Spector & Egré 2015) Why?

\[(33) \quad (w: \text{ ab came, but c didn’t.})\]
\[
\text{John knows who came.} \quad \approx \text{know}'(j, \phi_a \land \phi_b) \land \neg\text{believe}'(j, \phi_c)
\]

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

\[(34) \quad \begin{align*}
\text{a. Global accommodation} & \quad \text{Presupposition failure} \\
& \quad \lambda w. \forall \phi \in \text{Rel}(Q)[w \notin \phi \rightarrow [\neg\text{believe}'_w(j, \phi) \land w \in p]]
\end{align*}
\]

\[
\quad \text{b. Local accommodation} \quad \text{Tautology} \\
& \quad \lambda w. \forall \phi \in \text{Rel}(Q)[w \notin \phi \rightarrow \neg[\text{believe}'_w(j, \phi) \land w \in p]]
\]

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?

(35) John is surprised at who came.
\((w: ab \text{ came, but } c \text{ didn’t.})\)

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

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

c. \(\sim \rightarrow \) 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.

(36) John is surprised at \(Q\).
\(\lambda w. \forall p \in \text{Rel}(Q)[w \notin p \rightarrow \neg [\text{surprise}'(j, p) \land w \in p]] = \text{Tautology}\)

(For any \(Q\)-relevant \(p\), if \(p\) is false, then it is not the case that [John is surprised at \(p\) and \(p\) 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)

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

b. If someone *discovers* that I was mistaken, I will admit that I was wrong.  
\[\nleftrightarrow \text{The speaker was mistaken.}\]

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

(38) *(w: ab came, but c didn’t.)*  
John *told* Mary who came.  
\[\approx \text{told}^+[\text{+fac}](j, m, \phi_a \land \phi_b) \land \neg \text{told}^-[\text{+fac}](j, m, \phi_c)\]
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>
<td>×</td>
<td>√</td>
<td>1</td>
</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**.
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>Fact</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 $p$, 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”, $p$ could be tolerated.
Asymmetry of FA-sensitivity

### Principle of Tolerance

An answer $p$ is tolerated iff accepting $p$ 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 $p$ is tolerated iff accepting $p$ 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 $p$ is tolerated iff accepting $p$ 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 $p$ is tolerated iff accepting $p$ 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.
**Conclusions**

**Completeness**

Any MaxI true answer counts as a complete true answer.

(39) “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.
     (40) “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.
     (41) “John is surprised at Q”:
     \[ \lambda w. \forall p \in \text{Rel}(Q)[w \notin p \rightarrow \neg [\text{surprise}'(j, p) \land w \in p]] \]
Conclusions

Asymmetries of FA-sensitivity

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

Principle of Tolerance
An answer $p$ is tolerated iff accepting $p$ 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.

(42) Who can chair the committee?

\[ (w: \text{only Andy, Billy, and Cindy can chair; single-chair only.}) \]

a. Andy.

b. Andy and Billy.../

b'.#Andy and Billy. \[ \implies \text{Only John and Mary can chair.} \]

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”.

(43) *(The dean wants to discuss plans for the committee with 3 chair candidates)*

John knows who can chair the committee.

a. $\exists x [x \text{ can chair} \land \text{John knows that } x \text{ can chair}]$  $(\checkmark)$

b. $\forall x [x \text{ can chair} \rightarrow \text{John knows that } x \text{ can chair.}]$  $(\checkmark)$

c. $\exists xyz [xyz \text{ each can chair} \land \text{John knows that } xyz \text{ each can chair.}]$  $(\#)$
(44) 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. \( \forall x [[\text{Mary believes that } x \text{ did not came}] \rightarrow \text{not} [\text{John believes that } x \text{ came}]] \)

<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>

(45) \( \mathcal{B}_w^m(Q) = \{ p : p \in Q \land \text{believe}'_w(m, p) \} \)
    (The set of possible answers that Mary believes in \( w \))

(46) 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
       (\( \lambda w. \) 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.

(47) John agrees with Mary on [who can chair the committee].
a. \( \forall x \) [Mary believes that \( x \) can \( \rightarrow \) John believes that \( x \) can]
a'. \( \exists x \) [Mary believes that \( x \) can \( \land \) John believes that \( x \) can] (too weak)
b. \( \forall x \) [[Mary believes that \( x \) can\(\text{'t} \) \( \rightarrow \) not [John believes that \( x \) can]]

Explanation: Indirect questions with agree evoke an Opinionatedness Condition

(48) Opinionatedness & FA-sensitivity \( \Rightarrow \) MA
a. \( \lambda w. \forall \phi \in \text{MaxI}(B_w^m(Q)) [\text{bel}'_w(j, \phi) \lor \text{bel}'_w(j, \neg \phi)] \) Opinionatedness
   (John is opinionated about every MaxI belief of Mary on Q.)
b. \( \lambda w. \forall \phi \in \text{MaxI}(B_w^m(Q)) [\neg \text{bel}'_w(j, \neg \phi)] \) \( \Leftarrow \) FA-sensitivity
c. a&b \( \Rightarrow \lambda w. \forall \phi \in \text{MaxI}(B_w^m(Q)) [\text{bel}'_w(j, \phi)] \)


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


