# Sensitivity to False Answers in Indirect Questions

**Yimei Xiang**

June 10-11, 2016

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)*:
  $\forall x$ [$x$ came $\rightarrow$ J bels $x$ came]
- *Intermediately exhaustive (IE)*:
  $\forall x$ [$x$ came $\rightarrow$ J bels $x$ came] & **$\forall x$ [$x$ didn't come $\rightarrow$ not [J bels $x$ came]]**
- *Strongly exhaustive (SE)*:
  $\forall x$ [$x$ came $\rightarrow$ J bels $x$ came] & **$\forall x$ [$x$ didn't come $\rightarrow$ J bels $x$ didn't come]**

# 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 .../ $\rightsquigarrow$ *I don't know who else did.*

b′. # John did.\ $\rightsquigarrow$ *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.\ MS answer

b. Station A and/or Station B.\ MA answer

# FA-sensitivity in mention-some

George (2011, 2013): in parallel to the IE readings of indirect MA questions, indirect MS questions also have readings sensitive to false answers.

| *Italian newspapers are available at ...* | *Newstopia?* | *PaperWorld?* |
|---|---|---|
| *Facts* | ✔ | ✘ |
| John's belief | ✔ | ? |
| Mary's belief | ✔ | ✔ |

(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

# Completeness

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.

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

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

(7) Who came?
$Q_w = \{\hat{}\text{came}'(a), \hat{}\text{came}'(b), \hat{}\text{came}'(\boldsymbol{a \oplus b})\}$

(8) Who can chair the committee?
$Q_w = \{\hat{}\Diamond\text{chair}'(\boldsymbol{a}), \hat{}\Diamond\text{chair}'(\boldsymbol{b})\}$

☞ 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 *wh*-trace. (Xiang 2016a, 2016b)

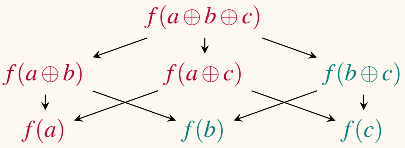
(10) $\boldsymbol{O}(p) = p \wedge \forall q \in \text{Alt}(p)[p \not\subseteq q \rightarrow \neg q]$ (Chierchia et al. 2013)

($p$ 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 *wh*-trace, preventing (9b) from being entailed by (9a):

(11) $\Diamond \boldsymbol{O}[\text{serve}'(g \oplus d \oplus j)] \not\Rightarrow \Diamond \boldsymbol{O}[\text{serve}'(g \oplus d)]$

### *Who came?*




$\rightarrow$ MaxI

$\rightarrow$ Not MaxI

$\rightarrow$ Not MaxI

### *Who can chair the committee?*

| | | | |
|---|---|---|---|
| | $\Diamond O[f(a \oplus b \oplus c)]$ | | $\rightarrow$ MaxI |
| $\Diamond O[f(a \oplus b)]$ | $\Diamond O[f(a \oplus c)]$ | $\Diamond O[f(b \oplus c)]$ | $\rightarrow$ MaxI |
| $\Diamond O[f(a)]$ | $\Diamond O[f(b)]$ | $\Diamond O[f(c)]$ | $\rightarrow$ MaxI |

(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.

     *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. ...

- More fully fledged accounts based on max-informativity: Fox (2013), Xiang (2016b, to appear).

# 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.

# Partial answers in FA-sensitivity

Answers that are always partial:

(13) Who came?

a. Andy or Billy. $\phi_a \vee \phi_b$ Disjunctive partial

b. Andy didn't. $\neg\phi_a$ Negative partial

**FA-sensitivity is concerned with false disjunctives: $\phi_b \vee \phi_c$**

(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**

| *Italian papers are available at ...* | *A?* | *B?* | *C?* | FA-type |
|---|---|---|---|---|
| Facts | ✔ | ✘ | ✔ | |
| Mary's belief | ✔ | ✔ | ? | **over-affirming (OA)** |
| Sue's belief | ✔ | ? | ✘ | **over-denying (OD)** |

(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. $\forall x$ [$x$ came $\rightarrow$ John believes that $x$ came] **Completeness**

$\Rightarrow$ $\forall x$ [$x$ came $\rightarrow$ **not** [John believes that $x$ did**n't** come]]. **Avoiding OD**

b. $\forall x$ [$x$ did**n't** come $\rightarrow$ **not** [John believes that $x$ came]] **Avoiding OA**

# Experiments: Exp-MA

**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**.

| | *A* | *b* | *c* | *D* | SE | IE | WE | Ans-type |
|---|---|---|---|---|---|---|---|---|
| A1 | ✘ | ? | ✘ | ✔ | × | × | × | **OD** |
| A2 | ? | ✘ | ✘ | ✔ | × | × | × | MS |
| A3 | ✔ | ? | ✘ | ✔ | × | √ | √ | MA |
| A4 | ✔ | ✔ | ? | ✔ | × | × | √ | **OA** |

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.

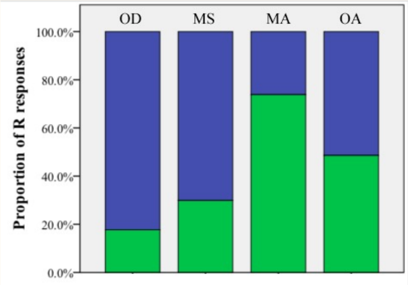
# Experiments: Exp-MS

Four places (*abcd*) at Central Square selling alcohol, among which only *ad* sold red wine. Susan asked **where she could buy a bottle of red wine at Central Square**. Identify whether an answer (A1 to A4) correctly answered Susan's question.

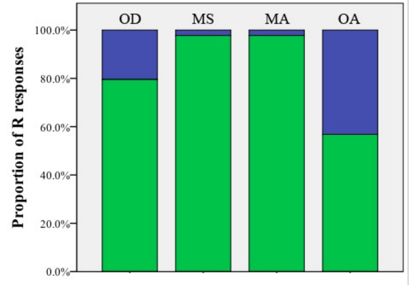
| | *A* | *b* | *c* | *D* | Ans-type |
|---|---|---|---|---|---|
| A1 | ✘ | ? | ✘ | ✔ | **OD** |
| A2 | ? | ✘ | ✘ | ✔ | MS |
| A3 | ✔ | ? | ✘ | ✔ | MA |
| A4 | ✔ | ✔ | ? | ✔ | **OA** |

# Experiments: Results

**By Answer: Exp-MA** **N = 107**




**By Answer: Exp-MS** **N = 88**




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

**The exh-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) $\boldsymbol{O}$ [$_p$ John knows [$_Q$ who came ]] (*w: ab came, but c didn't.*)

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

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

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

☞ 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] [$\boldsymbol{O}$ [John knows $\phi$]] **Local exh**

b. $\boldsymbol{O}$ [$\exists\phi$ [$\phi$ is a true MS answer of Q] [John knows $\phi$]] **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) $\boldsymbol{O}_{\text{IE}}$ $[_p$ John knows $[_Q$ where we can get gas$]]$ (*w: ab sell gas, but c doesn't.*)

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

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

$$= \left\{ \begin{array}{lll} \text{bel}'(j,\phi_a), & \text{bel}'(j,\phi_a) \vee \text{bel}'(j,\phi_b), & \ldots \\ \text{bel}'(j,\phi_b), & \text{bel}'(j,\phi_a) \vee \text{bel}'(j,\phi_c), & \\ \textbf{bel}'(j,\phi_c), & \text{bel}'(j,\phi_b) \vee \text{bel}'(j,\phi_c), & \end{array} \right\}$$

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

### Innocent exclusion

Innocent exclusion negates only innocently excludable alternatives.

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

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

where $\text{Excl}(p) = \{q : q \in \text{Alt}(p) \wedge p \not\subseteq q\}$

# 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:

(22) $\boldsymbol{O}_{\text{IE}}$ [$_p$ John knows [$_{\text{Q}}$ where we can get gas]]
($w$ : *ab sell gas, but cd do not.*)

a. $p = \text{know}'(j, \phi_a) \vee \text{know}'(j, \phi_b)$

b. $$\text{Alt}(p) = \left\{ \begin{array}{lr} \text{bel}'(j, \phi_c), \text{bel}'(j, \phi_d), ... & \text{OA} \\ \text{bel}'(j, \neg\phi_a), \text{bel}'(j, \neg\phi_b), ... & \text{OD} \\ \text{bel}'(j, \phi_c \vee \phi_d), ... & \text{Disj} \\ ... & \\ \sout{\text{bel}'(j, \phi_a \wedge \phi_b)}... & \sout{\text{MA/MI}} \end{array} \right\}$$

# 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) 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.
$\not\rightsquigarrow$ If Mary invited some but **not all** speakers to the dinner, I will...

(26) If M knows which speakers presented this morning, I will ...
$\rightsquigarrow$ 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.
$\rightsquigarrow$ Mary did not invite the male speakers to the dinner. $\neg\phi_{\text{male}}$
b. Mary **only** did **not** invite the FEMALE$_F$ speakers to the dinner.
$\rightsquigarrow$ Mary invited the male speakers to the dinner. $\phi_{\text{male}}$
b′. $\boldsymbol{O}\ \neg\phi_{\text{female}} = \neg\phi_{\text{female}} \wedge \neg\neg\phi_{\text{male}} = \neg\phi_{\text{female}} \wedge \phi_{\text{male}}$

(28) a. Mary knows which speakers presented this morning.
$\rightsquigarrow$ not [Mary believes that A presented this morning] $\neg\text{bel}'(m, \phi_a)$
b. Mary does **not** know which speakers presented this morning.
$\not\rightsquigarrow$ Mary believes that A presented this morning $\text{bel}'(m, \phi_a)$
b′. ***O*** **not** [Mary knows which speakers presented this morning ]

# 3.3 My analysis of 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. $\lambda w.\exists\phi \in \text{Ans}(Q)(w)[\text{know}'_w(j,\phi)]$ **Completeness**
(John knows a MaxI true answer of Q.)

b. $\lambda w.\forall\phi \in \text{Rel}(Q)[w \notin \phi \rightarrow \neg\text{believe}'_w(j,\phi)]$ **FA-sensitivity**
(John has no **Q-relevant** false belief.)

If Q= $\{p,q\}$, then Rel(Q) $= \{p,q,\neg p, p\vee q, p\wedge q, ...\}$

## 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. $\phi_a \vee \phi_b = c_1 \cup c_2 \cup c_3$

b. $\neg\phi_a = c_3 \cup c_4$

| |
|---|
| $w$: $Q_w = \{\phi_a, \phi_b, \phi_{ab}\}$ |
| $w$: $Q_w = \{\phi_a\}$ |
| $w$: $Q_w = \{\phi_b\}$ |
| $w$: $Q_w = \varnothing$ |

=

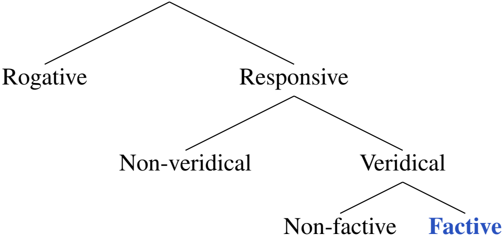
| | |
|---|---|
| $c_1$ | $w$: only *ab* came$_w$ |
| $c_2$ | $w$: only *a* came$_w$ |
| $c_3$ | $w$: only *b* came$_w$ |
| $c_4$ | $w$: nobody came$_w$ |

=

| |
|---|
| $w$: $\text{Ans}(Q)(w) = \{\phi_{ab}\}$ |
| $w$: $\text{Ans}(Q)(w) = \{\phi_a\}$ |
| $w$: $\text{Ans}(Q)(w) = \{\phi_b\}$ |
| $w$: $\text{Ans}(Q)(w) = \varnothing$ |

# 2. FA-sensitivity and factivity

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




- **Types of factives**
  1. Emotive factives: *be surprised*, *be pleased*, ...
  2. Cognitive factives: *know*, *remember*, *discover*, ...
  3. Communication verbs: $\textit{tell}_{[+\text{fac}]}$, $\textit{predict}_{[+\text{fac}]}$, ...

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

(33) (*w: ab came, but c didn't.*)
John **knows** who came. $\approx \text{know}'(j, \phi_a \wedge \phi_b) \wedge \neg \textbf{believe}'(j, \phi_c)$

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

(34) a. Global accommodation ☞ **Presupposition failure**
$\lambda w.\forall \phi \in \text{Rel(Q)}[w \notin \phi \rightarrow [\neg \text{believe}'_w(j, \phi) \wedge \boldsymbol{w \in p}]]$

b. Local accommodation ☞ **Tautology**
$\lambda w.\forall \phi \in \text{Rel(Q)}[w \notin \phi \rightarrow \neg[\text{believe}'_w(j, \phi) \wedge \boldsymbol{w \in p}]]$

Hence, in paraphrasing FA-sensitivity, the factive presupposition of *know* needs to be **"deactivated"**.

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

(35) John **is surprised at** who came.
(*w: ab came, but c didn't.*)

a. $\rightsquigarrow$ John is surprised that *ab* came. $\text{surprise}'(j, \phi_a \wedge \phi_b)$

b. $\not\rightsquigarrow$ John isn't surprised that *c* came. $\neg\text{surprise}'(j, \phi_c)_{\phi_c}$

c. $\rightsquigarrow$ Not that John is surprised that *c* came. $\neg[\text{surprise}'(j, \phi_c) \wedge \phi_c]$

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

(36) John **is surprised at** Q.
$\lambda w.\forall p \in \text{Rel}(Q)[w \notin p \rightarrow \neg[\text{surprise}'(j, p) \wedge \boldsymbol{w \in p}]]$ **= 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.
$\rightsquigarrow$ The speaker was mistaken.
b. If someone **discovers** that I was mistaken, I will admit that I was wrong.
$\not\rightsquigarrow$ The speaker was mistaken.

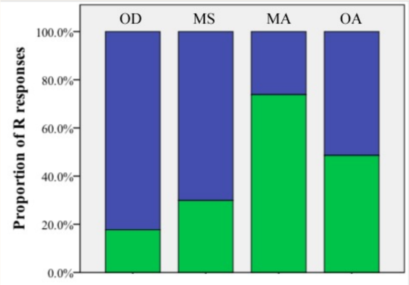
As weak factives, **communication verbs** pattern like cognitive factives.

(38) (*w: ab came, but c didn't.*)
John **told** Mary who came.
$\approx \text{told}'_{[+\text{fac}]}(j, m, \phi_a \wedge \phi_b) \wedge \neg \textbf{told}_{[-\text{fac}]}{}'(j, m, \phi_c)$

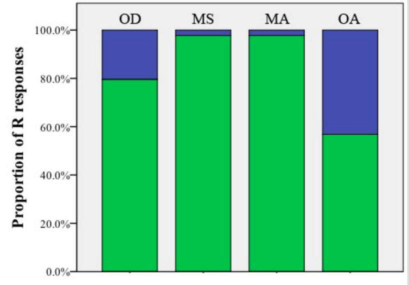
# 4. Asymmetry of FA-sensitivity

# Asymmetry of FA-sensitivity

**By Answer: Exp-MA** **N = 107**




**By Answer: Exp-MS** **N = 88**




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

| | OD | MS | MA | OA | *N* |
|---|---|---|---|---|---|
| | $\times$ | $\surd$ | $\surd$ | $\times$ | 11 |
| | $\surd$ | $\surd$ | $\surd$ | $\times$ | 1 |
| | $\times$ | $\surd$ | $\surd$ | $\surd$ | 8 |
| | $\surd$ | $\surd$ | $\surd$ | $\surd$ | 8 |

$\Rightarrow$ **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”.

| *Could we get gas at...?* | *A* | *B* | *C* |
|---|---|---|---|
| *Fact* | ✔ | ✔ | ✖ |
| OA | ✔ | ? | ✔ |
| OD | ✔ | ✖ | ? |

When accepting a response *p*, the questioner would:

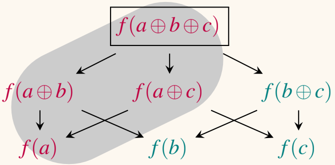
1. update the answer space: **removing the incompatible answers** and **adding the entailed answers**.
2. take any **MaxI answer of the new answer space** as a resolution and make decisions accordingly.

If none of these MaxI answers leads to an “improper decision”, *p* could be tolerated.

### 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



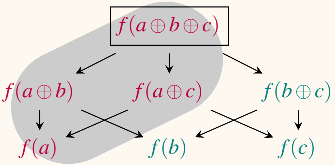

**In MA-Qs, OD violates the Principle of Tolerance:**

- 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

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

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

**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.

(39) "John knows Q":
$\lambda w.\exists \phi \in \text{Ans}(\text{Q})(w)[\text{know}'_w(j, \phi)]$
(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":
      $\lambda w.\forall \phi \in \text{Rel}(\text{Q})[w \notin \phi \rightarrow \neg \text{believe}'_w(j, \phi)]$

    - Strong factivity is locally accommodated, yielding a tautology.

      (41) "John is **surprised** at Q":
      $\lambda w.\forall p \in \text{Rel}(\text{Q})[w \notin p \rightarrow \neg[\text{surprise}'(j, p) \wedge \boldsymbol{w \in p}]]$

# Conclusions

## 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 $p$ 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: only Andy, Billy, and Cindy can chair; single-chair only.*)

a. Andy.\

b. Andy and Billy.../

b′.#Andy and Billy.\ $\rightsquigarrow$ *Only John and Mary can chair.*

c. Andy, Billy, and Cindy.\

**mention-some = mention-one (cont.)**

- Indirect $\Diamond$-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. $\exists x$ [$x$ can chair $\wedge$ John knows that $x$ can chair] ($\surd$)
b. $\forall x$ [$x$ can chair $\rightarrow$ John knows that $x$ can chair.] ($\surd$)
c. $\exists xyz$ [$xyz$ each can chair $\wedge$ John knows that $xyz$ each can chair.] (#)

(44) John **agrees with** Mary on who came.

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

b. $\forall x$ [[Mary believes that $x$ did **not** came] $\rightarrow$ **not** [John believes that $x$ came]]

| *Did ... came?* | A | B | C | D |
|---|---|---|---|---|
| Mary's belief | ✔ | ✔ | ✘ | ? |
| John's belief can be | ✔ | ✔ | ✘/? | ✔/✘/? |

(45) $\mathscr{B}_w^m(\mathrm{Q}) = \{p : p \in \mathrm{Q} \wedge \mathrm{believe}'_w(m,p)\}$
(The set of possible answers that Mary believes in $w$)

(46) John **agrees with** Mary on Q.

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

b. $\lambda w.\forall\phi \in \mathrm{Rel}(\mathrm{Q})[\mathrm{believe}'_w(m,\neg\phi) \rightarrow \neg\mathrm{believe}'_w(j,\phi)]$ **FA-sensitivity**
(John doesn't believe anything Q-relevant that contradicts Mary's belief.)

**Puzzle: $\Diamond$-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 $\wedge$ John believes that $x$ can]~~ (too weak)

b. $\forall x$ [[Mary believes that $x$ can**n't**] $\rightarrow$ **not** [John believes that $x$ can]]

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

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

a. $\lambda w.\forall \phi \in \text{MaxI}(\mathscr{B}^m_w(\text{Q}))[\text{bel}'_w(j,\phi) \vee \text{bel}'_w(j,\neg\phi)]$ **Opinionatedness**
(John is opinionated about every MaxI belief of Mary on Q.)

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

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

# References


- Beck, S. and H. Rullmann. 1999. A flexible approach to exhaustivity in questions. *Natural Language Semantics* 7:249–298.
- Chierchia, G., D. Fox, and B. Spector. 2013. The grammatical view of scalar implicatures and the relationship between semantics and pragmatics. In *Semantics: An International Handbook of Natural Language Meaning volume 3*, ed. Claudia Maienborn, Klaus von Heusinger, and Paul Portner. Berlin: Mouton de Gruyter.
- Cremers, A. and E. Chemla. 2016. A psycholinguistic study of the different readings for embedded questions. *Journal of Semantics.*
- Spector, B. and P. Egré. 2015. A uniform semantics for embedded interrogatives: *an* answer, not necessarily *the* answer. *Synthese* 92:1729–1784.
- Stainaker, R. C. 1977. Pragmatic presuppositions. *Semantics and philosophy* 197–213.
- Fox, D. 2007. Free choice and the theory of scalar implicatures. *Presupposition and implicature in compositional semantics*, ed. P. Stateva and U. Sauerland. Palgrave-Macmillan.
- Fox, D. 2013. Mention-some readings of questions, class notes, MIT seminars.
- George, B. R. 2011. *Question embedding and the semantics of answers*. Doctoral Dissertation, UCLA.
- George, B. R., 2013. Knowing-*wh*, mention-some readings, and non-reducibility. *Thought: A Journal of Philosophy*.

# References


- Groenendijk, J. and M. Stokhof. 1984. *Studies in the semantics of questions and the pragmatics of answers*. Amsterdam: University of Amsterdam dissertation.
- Karttunen, L. 1971. Some observations on factivity. *Research on Language & Social Interaction* 4:55–69.
- Karttunen, L. 1977. Syntax and semantics of questions. *L&P* 1:3-44.
- Klinedinst, N. and D. Rothschild. 2011. Exhaustivity in questions with non-factives. *Semantics and Pragmatics* 4:1-23.
- Theiler, N., F. Roelofsen, and M. Aloni. 2016. A truthful resolution semantics for declarative and interrogative complements. Unpublished manuscript.
- Uegaki, W. 2015. *Interpreting questions under attitudes*. Doctoral dissertation. MIT.
- Xiang, Y. 2016a. Complete and true: A uniform analysis for mention-some and mention-all questions. *Proceedings of SuB 20.*
- Xiang, Y. 2016b. *Interpreting questions with non-exhaustive answers.* Doctoral dissertation. Harvard.
- Xiang, Y. To appear. Solving the dilemma between uniqueness and mention-some. *Proceedings of NELS 46*.
- van Rooij, R. 2004. Questioning to Resolve Decision Problems. *Linguistics and Philosophy* 26: 727-763.