Sensitivity to false answers in interpreting questions under attitudes

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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

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

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

(A simplified version)

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) $\textsc{Ans}([\![\text{Q}]\!])(w) = \{p : w \in p \in Q \wedge \forall q[w \in q \in Q \rightarrow q \not\subset p]\}$
($\{p : p$ 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.

Completeness

- ... 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 2016)

(10) $\boldsymbol{O}(p) = p \wedge \forall q \in \text{Alt}(p)[p \not\subseteq q \rightarrow \neg q]$ (Chierchia et al. 2012)

(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?

$f(a \oplus b \oplus c)$ $\rightarrow$ MaxI

$f(a \oplus b)$ $f(a \oplus c)$ $f(b \oplus c)$ $\rightarrow$ Not MaxI

$f(a)$ $f(b)$ $f(c)$ $\rightarrow$ Not MaxI

Who can chair the committee? [See Xiang 2016: sec. 2.6.1 for full picture.]

$\Diamond O[f(a \oplus b \oplus c)]$ $\rightarrow$ 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":
$\lambda w.\exists \phi \in \textsc{Ans}([\![Q]\!])(w)[\text{know}'_w(j, \phi)]$
(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: Fox (2013, 2015), Xiang (2016: ch. 2-3).

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.

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, 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

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.

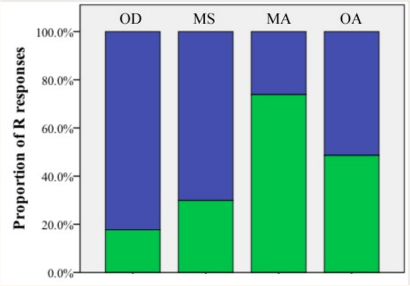
Experiments: Exp-MS

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

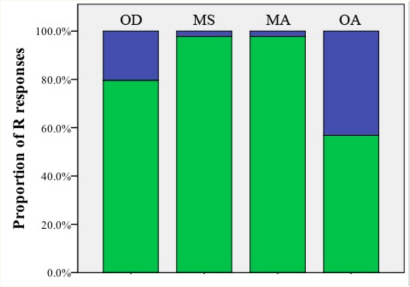
	A	*b*	*c*	*D*	Ans-type
A1	✘	?	✘	✔	**OD**
A2	?	✘	✘	✔	MS
A3	✔	?	✘	✔	MA
A4	✔	✔	?	✔	**OA**

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) ***O*** $[_S$ John knows $[_Q$ who came $]]$ (*w: ab came, but c didn't.*)

a. $[\![\mathrm{S}]\!] = \lambda w.\exists\phi \in \textsc{Ans}([\![\mathrm{Q}]\!])(w)[\mathrm{know}'_w(j,\phi)] = \mathbf{know}'(j,\phi_{ab})$
(John knows a **true** complete answer of Q)

b. $\mathrm{Alt(S)} = \{\lambda w.\exists\phi \in \textsc{Ans}([\![\mathrm{Q}]\!])(\boldsymbol{w'})[\mathrm{bel}'_w(j,\phi)] \mid w' \in W\}$
$$= \left\{ \begin{array}{lll} \mathrm{bel}'(j,\phi_a) & \mathrm{bel}'(j,\phi_{ab}) & \mathrm{bel}'(j,\phi_{abc}) \\ \mathrm{bel}'(j,\phi_b\} & \mathrm{bel}'(j,\phi_{bc}\} & \\ \mathrm{bel}'(j,\phi_c) & \mathrm{bel}'(j,\phi_{ac}) & \end{array} \right\}$$
({John believes ϕ: ϕ is a **possible** complete answer of Q})

c. $[\![O(\mathrm{S})]\!] = \mathbf{know}'(j,\phi_{ab}) \wedge \neg\mathbf{bel}'(j,\phi_c)$
(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. $\exists\phi$ [ϕ is a true MS answer of Q] [$\boldsymbol{O}$ [John knows ϕ]] **Local exh**

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

a. $[\![\text{S}]\!] = \lambda w.\exists \phi \in \text{A}\textsc{ns}([\![\text{Q}]\!])(w)[\text{know}'_w(j,\phi)] = \textbf{know}'(j,\phi_a) \vee \textbf{know}'(j,\phi_b)$

b. $\text{Alt(S)} = \{\lambda w.\exists \phi \in \text{A}\textsc{ns}([\![\text{Q}]\!])(\boldsymbol{w'})[\text{bel}'_w(j,\phi)] \mid w' \in W\}$

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

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

Innocent exclusion

Innocent exclusion negates only innocently excludable alternatives.

(21) $O_{\text{IE}}(p) = p \wedge \forall q \in \text{IExcl}(p)[\neg q]$
$\text{IExcl}(p) = \bigcap\{A : A \text{ is a maximal subset of } \text{A}\textsc{lt}(p) \text{ s.t. } A^{\neg} \cup \{p\} \text{ is consistent}\}$
where $A^{\neg} = \{\neg q : q \in A\}$

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

a. $[\![\text{S}]\!] = \text{know}'(j,\phi_a) \vee \text{know}'(j,\phi_b)$

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

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) (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.
$\not\rightsquigarrow$ 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. ϕ_{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′. $\boldsymbol{O}$ **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. $\lambda w.\exists \phi \in \textsc{Ans}(\llbracket Q \rrbracket)(w)[\text{know}'_w(j,\phi)]$ **Completeness**
(John knows a MaxI true answer of Q.)

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

If the Hamblin set $Q = \{p,q\}$, then $\textsc{Rel}(\llbracket Q \rrbracket) = \{p,q,\neg p, p \vee q, p \wedge q, ...\}$

Q-relevance

ϕ is **Q-relevant** iff ϕ is a union of some partition cells of Q.

(30) $\textsc{Rel}([\![Q]\!]) = \{\bigcup X : X \subseteq \text{Part}([\![Q]\!])\}$

(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 **complete true** answers:
$\text{Part}([\![Q]\!]) = \{\lambda w[\textsc{Ans}([\![Q]\!])(w) = \textsc{Ans}([\![Q]\!])(w')] : w' \in W\}$

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$_w$

=

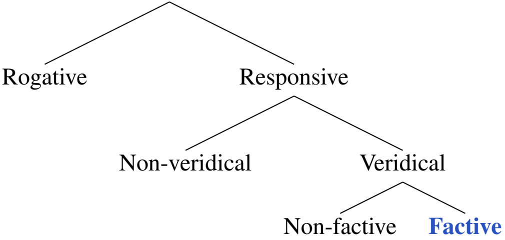
w: $\textsc{Ans}([\![Q]\!])(w) = \{\phi_{ab}\}$
w: $\textsc{Ans}([\![Q]\!])(w) = \{\phi_a\}$
w: $\textsc{Ans}([\![Q]\!])(w) = \{\phi_b\}$
w: $\textsc{Ans}([\![Q]\!])(w) = \varnothing$

- 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. $\surd$ John knows [$_{\text{partition}}$ who came]
b. $\surd$ John knows [$_{\text{Hamblin set}}$ who came]
c. $\surd$ John knows [$_{\text{Topical Property}}$ who came]
d. $\times$ John knows [ANS_w [$_{\text{Q}}$ who came]]
e. $\surd$ John knows [λw [ANS_w [$_{\text{Q}}$ who came]]]

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?**

(34) (Context: *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.

(35) a. Global accommodation
$\lambda w.\forall\phi \in \text{REL}([\![Q]\!])[w \notin \phi \rightarrow \neg\text{believe}'_w(j, \phi) \wedge \boldsymbol{w \in \phi}]$ **Contradiction**

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

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?

(36) John **is surprised at** who came.
(Context: *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.

(37) John **is surprised at** Q.
$\lambda w.\forall\phi \in \text{REL}([\![Q]\!])[w \notin \phi \rightarrow \neg[\text{surprise}'(j, \phi) \wedge \boldsymbol{w \in \phi}]]$ **Tautology**
(For any Q-relevant ϕ, if ϕ is false, then it is not the case that [John is surprised at ϕ and **ϕ 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.
$\rightsquigarrow$ 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.

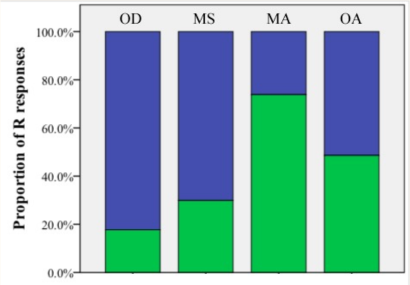
As weak factives, **communication verbs** pattern like cognitive factives.

(39) John $\textbf{told}_{\textbf{[+ver]}}$ Mary Q:
$\lambda w.\forall \phi \in \text{R}{\small\text{EL}}(⟦\text{Q}⟧)[w \notin \phi \rightarrow \neg \textbf{told}'_{[-\text{ver}],w}(j,m,\phi)]$

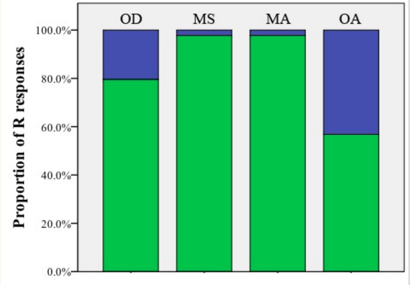
4. Asymmetry of FA-sensitivity

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 ϕ, 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.

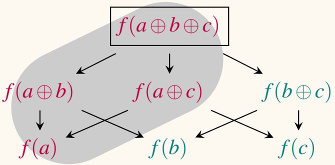
If none of these MaxI answers leads to an "improper decision", ϕ could be tolerated.

Asymmetry of FA-sensitivity

Principle of Tolerance

An answer ϕ is tolerated iff accepting ϕ 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: $f(b \oplus c)$.
- $f(b \oplus c) \not\Rightarrow f(a \oplus b \oplus c)$

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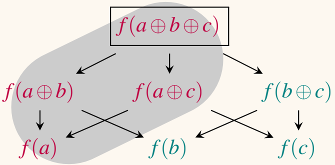

In MA-Qs, OA does not violate the Principle of Tolerance:

- 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 ϕ is tolerated iff accepting ϕ 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).

Asymmetry of FA-sensitivity

Principle of Tolerance

An answer ϕ is tolerated iff accepting ϕ 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.

Conclusions

Completeness

Any MaxI true answer counts as a complete true answer.

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

   - Strong factivity is locally accommodated, yielding a tautology.

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

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 ϕ is tolerated iff accepting ϕ 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.\ $\rightsquigarrow$ *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".

(44) (*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.] (#)

(45) 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	✔	✔	✘/?	✔/✘/?

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

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

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

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

Puzzle: $\Diamond$-questions embedded under *agree* do not admit MS readings.

(48) 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]]

Can ... chair?	*a*	*b*	*c*	*d*
Mary's belief	Yes	Yes	No	?
John's belief	Yes	**No/?**	No	?

Judgement: FALSE

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

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

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

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

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

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