Complete and True!
A uniform analysis of mention-some and mention-all questions

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Forms of Exhaustivity

- Groenendijk & Stokhof (1982, 1984): indirect questions have two forms of exhaustivity, i.e., weakly exhaustive and strongly exhaustive.

(1) John knows who came.

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

- Strongly exhaustive (SE):
  \[ \forall x \ [x \text{ came} \rightarrow J \text{ bels} \ x \text{ came}] \ \& \ \forall x \ [x \text{ didn’t come} \rightarrow J \text{ bels} \ x \text{ didn’t come}] \]
Forms of Exhaustivity

- Groenendijk & Stokhof (1982, 1984): indirect questions have two forms of exhaustivity, i.e., *weakly* exhaustive and *strongly* exhaustive.

- Klinedinst & Rothschild (2011) discuss an *intermediate* form of exhaustivity. Compared with WE, IE is sensitive to false answers.

(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)*:
  \[ \forall x \ [x \text{ came} \rightarrow J \text{ bels } x \text{ came}] \land \forall x \ [x \text{ didn’t come} \rightarrow J \text{ bels } x \text{ didn’t come}] \]
Forms of Exhaustivity

- Groenendijk & Stokhof (1982, 1984): indirect questions have two forms of exhaustivity, i.e., \textit{weakly} exhaustive and \textit{strongly} exhaustive.

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- \textit{Weakly exhaustive (WE)}:
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- IE readings are available to most indirect questions, except those embedded under \textit{emotive factives}: \textit{surprise, be pleased}. (Cremers & Chemla 2014)
Mention-all (MA) questions:

(2) Who came to the party yesterday?

(\textit{w: only John and Mary came})

a. John and Mary did. Complete (MA)

b. John did. But I’m not sure if anyone else did. Partial

c. JOHN did ... Partial

\text{L H* L-H%}

Mention-some (MS) questions:

(3) Where can we get gas?

(\textit{w: there are only two accessible stations, A and B.})

a. You can go to station A. MS

b. You can go to station A and/or B. MA
• **Mention-all (MA) questions:**

(2) Who came to the party yesterday?

\[ w: \text{only John and Mary came} \]

a. John and Mary did. **Complete (MA)**

b. John did. But I’m not sure if anyone else did. **Partial**

c. **JOHN** did ... **Partial**

L H* L-H%

• **Mention-some (MS) questions:**

(3) Where can we get gas?

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

a. You can go to station A. **MS**

b. You can go to station A and/or B. **MA**

• **MS answers:** Non-exhaustive answers that are not ignorance-marked.
Indirect MS questions also have readings sensitive to false answers. (George 2013)

<table>
<thead>
<tr>
<th></th>
<th>Newstopia?</th>
<th>PaperWorld?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facts</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
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<td>Yes</td>
<td>?</td>
</tr>
<tr>
<td>Mary’s belief</td>
<td>Yes</td>
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</table>

(4)  

a. *John knows where one can buy an Italian newspaper.* True  

b. *Mary knows where one can buy an Italian newspaper.* False
Indirect MS questions also have readings sensitive to false answers. (George 2013)

<table>
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(4)  

a. *John knows where one can buy an Italian newspaper.*  
   True

b. *Mary knows where one can buy an Italian newspaper.*  
   False

“FA-sensitive readings”: Readings that are sensitive to false answers (FAs).
Goal for today

Characterize the truth conditions of FA-sensitive readings.
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Characterize the truth conditions of FA-sensitive readings.

A skeleton for FA-sensitivity readings

(5) *John knows Q.*

a. John believes a complete true answer of *Q.*  
Compleness

b. John doesn’t believe any false answers of *Q.*  
FA-sensitivity
1. Completeness


Fox (2013)

A maximally informative (MaxI) true answer is a complete true answer.

MaxI members of $\alpha_{stt}$: $\{p : p \in \alpha \land \forall q \in \alpha [q \not\subseteq p]\}$

(Members of $\alpha$ that are not asymmetrically entailed by any members of $\alpha$.)

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(6) **Who made the swimming team?**

\{
\text{a made the team, d made the team, a + d made the team}
\}

(7) **Where can Sue get a bottle of red wine?**

\{\text{◊(Sue get one from a)}, \text{◊(Sue get one from d)}\}
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(6) *Who made the swimming team?*

\{a made the team, d made the team, $a + d$ made the team\}

(7) *Where can Sue get a bottle of red wine?*

\{\lozenge(Sue get one from a), \lozenge(Sue get one from d)\}

Fox’s analysis (cf. Dayal 1996)

1. allows non-exhaustive answers to be good answers;
2. allows a question to have multiple good answers.
(8b) is predicted to be a bad answer, since it is asymmetrically entailed by (8a).

(8) Who can serve on the committee?
   a. Gennaro+Danny+Jim can serve. \( \Diamond f(g + d + j) \)
   b. \( \Rightarrow \) Gennaro+Danny can serve. \( \Rightarrow \Diamond f(g + d) \)
But ...

(8b) is predicted to be a bad answer, since it is asymmetrically entailed by (8a).

(8) Who can serve on the committee?
   a. Gennaro+Danny+Jim can serve. \[ \Diamond f(g + d + j) \]
   b. \[ \Rightarrow \text{Gennaro+Danny can serve.} \] \[ \Rightarrow \Diamond f(g + d) \]

**Proposal:** the weak modal in a \[\Diamond\]-question embeds an exhaustivity operator \(O\) associated with the \(wh\)-trace.

(9) \[ O(p) = \lambda w. p(w) \land \forall q \in Alt(p) [p \not\subseteq q \rightarrow \neg q(w)] \]
   (\(p\) is true, any alternatives of \(p\) that are not entailed by \(p\) are false.)

(Chierchia et al. 2013)

Local exhaustification provides a non-monotonic environment for the \(wh\)-item, prevent (8b) from being entailed by (8a):

\[ \Diamond O[f(g + d + j)] \not\Rightarrow \Diamond O[f(g + d)] \]
Who does $f$?

$f: \text{distributive predicate}$

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

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

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

Who can do $f$?

$f: \text{distributive predicate}$

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

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

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

Completeness Condition

John knows $w$:

\[
\exists p \left[ p \text{ is a MaxI true answer of } Q \text{ in } w \right] \quad \text{DOX} \quad j \subseteq p
\]

John believes a MaxI true answer of $Q$ in $w$.
Who does $f$? $f$: distributive predicate

$f(a + b + c) \quad \rightarrow \text{MaxI}$

\[
\begin{aligned}
&f(a + b) \quad f(a + c) \quad f(b + c) \\
&f(a) \quad f(b) \quad f(c)
\end{aligned}
\]

\[\rightarrow \text{Not MaxI}\]

Who can do $f$? $f$: distributive predicate

\[
\begin{aligned}
&\Diamond O[f(a + b + c)] \\
&\Diamond O[f(a + b)] \quad \Diamond O[f(a + c)] \quad \Diamond O[f(b + c)] \\
&\Diamond O[f(a)] \quad \Diamond O[f(b)] \quad \Diamond O[f(c)]
\end{aligned}
\]

\[\rightarrow \text{MaxI}\]

(10) **Completeness Condition** of $John knows_w Q$:

\[\exists p \ [p \text{ is a MaxI true answer of } Q \text{ in } w] \ [\text{DOX}^j_w \subseteq p]\]

(John believes a MaxI true answer of $Q$ in $w$)
Other issues involved in **Completeness**:

1. Uniqueness requirements of singular-marked questions:
   
   \[ \text{Which professor can chair the committee?} \]

2. Questions with a collective predicate:

   \[ \text{Which boys are in the same team?} \]

3. MA readings of ◇-questions.

   \[ \text{Who all/alles/dou can chair the committee?} \]
   
   *(Southern English/ German/ Mandarin)*

4. ...

...
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More fully fledged semantic analyses based on Max-informativity:

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More fully fledged semantic analyses based on Max-informativity:


2. FA-sensitivity
What types of false answers are involved in FA-sensitivity?
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- **MS-questions:**

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<th>Italian paper available at ...</th>
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<th>B?</th>
<th>C?</th>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
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<td>Yes</td>
<td>Yes</td>
<td>?</td>
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</tr>
<tr>
<td>Sue’s belief</td>
<td>Yes</td>
<td>?</td>
<td>No</td>
<td>over-denying (OD)</td>
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(11) *Sue knows where one can buy an Italian newspaper.*  True or False?
What types of false answers are involved in FA-sensitivity?

- **MS-questions:**

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  (11)  *Sue knows where one can buy an Italian newspaper.*  True or False?

- **MA-questions:**

  (12)  *John knows who came.*

  a.  if $x$ came, John believes that $x$ came.

  $\Rightarrow (\text{if } x \text{ came, } \neg [\text{John believes that } x \text{ didn’t come}].)$  Avoid OD

  b.  if $x$ didn’t come, $\neg [\text{John believes that } x \text{ came}]$

  Avoid OA

  Is *avoiding OD* a part of **FA-sensitivity** or just an entailment of **Completeness**?
2.1. Experiments
MA-Q: Klinedinst & Rothschild (2011)

There are four individuals (abcd) trying out for the swimming team. Only ad made the team. For each set of predictions (A1 to 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>No</td>
<td>?</td>
<td>No</td>
<td>Yes</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>OD</td>
</tr>
<tr>
<td>A2</td>
<td>?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>MS</td>
</tr>
<tr>
<td>A3</td>
<td>Yes</td>
<td>?</td>
<td>No</td>
<td>Yes</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>MA</td>
</tr>
<tr>
<td>A4</td>
<td>Yes</td>
<td>Yes</td>
<td>?</td>
<td>Yes</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>OA</td>
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### MA-Q: Klinedinst & Rothschild (2011)

There are four individuals \((abcd)\) trying out for the swimming team. Only \(ad\) made the team. For each set of predictions (A1 to A4), identify whether it correctly predicted **who made the swimming team**.

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<th>Ans-type</th>
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<tbody>
<tr>
<td>A1</td>
<td>No</td>
<td>?</td>
<td>No</td>
<td>Yes</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>OD</td>
</tr>
<tr>
<td>A2</td>
<td>?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>×</td>
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<td>Yes</td>
<td>?</td>
<td>No</td>
<td>Yes</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>MA</td>
</tr>
<tr>
<td>A4</td>
<td>Yes</td>
<td>Yes</td>
<td>?</td>
<td>Yes</td>
<td>×</td>
<td>×</td>
<td>√</td>
<td>OA</td>
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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.
There are four places \((abcd)\) at Central Square selling alcohol. Only \(ad\) sold red wine. Susan asked her friend **where she could buy a bottle of red wine at Central Square.** Identify whether a response (A1 to A4) correctly answered Susan’s question.

<table>
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<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
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</table>

**Example:**

**A1:** Bob told Susan that she could buy one from \(d\), but not from \(a\) or \(c\).

*Did Bob tell Susan where to buy a bottle of red wine at Central Square?*

- [ ] Yes
- [ ] No
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. OA/OD < MS/MA in Exp-MS $^{\hat{\beta}} = 1.0952, p < .001$.

OD > OA in Exp-MS $^{\hat{\beta}} = -0.7324, p < .005$.

The unacceptability of OD/OA varies: In MA-Qs, OD is worse than OA. In MS-Qs, OA is worse than OD.
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- OA/OD < MS/MA in Exp-MS

Both OA and OD are involved in FA-sensitivity.
By Answer: Exp-MA  
\[ N = 107 \]

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- \( \text{OA/OD} < \text{MS/MA} \) in Exp-MS

Both OA and OD are involved in FA-sensitivity.

By Answer: Exp-MS  
\[ N = 88 \]

- OD < OA in Exp-MA  
  \[ \hat{\beta} = 1.0952, \ p < .001 \]

- OD > OA in Exp-MS  
  \[ \hat{\beta} = -0.7324, \ p < .005 \]

The unacceptability of OD/OA varies:

- In MA-Qs, OD is worse than OA.
- In MS-Qs, OA is worse than OD.
In Exp-MA, subjects who accepted both MS-MA ($N = 28$) rejected OD significantly more than OA.

<table>
<thead>
<tr>
<th>Group</th>
<th>OD</th>
<th>MS</th>
<th>MA</th>
<th>OA</th>
<th>$N(\hat{N})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>×OAOD</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>×</td>
<td>11 (4.05)</td>
</tr>
<tr>
<td>×OA</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>×</td>
<td>1 (2.16)</td>
</tr>
<tr>
<td>×OD</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>8 (9.44)</td>
</tr>
<tr>
<td>×None</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>8 (2.03)</td>
</tr>
</tbody>
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$N(\times OD) > N(\times OA)$  

binomial test: $89\%, p < .05$
In Exp-MA, subjects who accepted both MS-MA \((N = 28)\) rejected OD significantly more than OA.

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<tr>
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<th>(N(\hat{N}))</th>
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<tr>
<td>×OD×OA</td>
<td>×</td>
<td>√</td>
<td>√</td>
<td>×</td>
<td>11 (4.05)</td>
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<td>√</td>
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</tbody>
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\(N(×OD) > N(×OA)\)  
binomial test: 89%, \(p < .05\)

⇒ **Regardless of whether Completeness was considered**, the subjects in Exp-MA consistently rejected OD more than OA.
In Exp-MA, subjects who accepted both MS-MA \((N = 28)\) rejected OD significantly more than OA.

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<td>√</td>
<td>√</td>
<td>8 (9.44)</td>
</tr>
<tr>
<td>×None</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>8 (2.03)</td>
</tr>
</tbody>
</table>

\[N(×OD) > N(×OA)\]  
binomial test: 89\%, \(p < .05\)

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

⇒ The asymmetry of FA-sensitivity comes from the question-type.
Summary

The FA-sensitivity condition considers both OA and OD.

The asymmetry of FA-sensitivity:

In MA-questions, OD is more unacceptable than OA.

In MS-questions, OA is more unacceptable than OD.

In MA-questions, OD is consistently more unacceptable than OA, regardless of whether the Completeness Condition is satisfied.

Theoretical issues

1. Explain the asymmetry of FA-sensitivity
2. Derive the FA-sensitivity Condition
The FA-sensitivity condition considers both OA and OD.
Summary

1. The FA-sensitivity condition considers both OA and OD.

2. The asymmetry of FA-sensitivity:
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Theoretical issues
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Theoretical issues

4. Explain the asymmetry of FA-sensitivity
Summary

1. The FA-sensitivity condition considers both OA and OD.

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   - In MA-questions, OD is more unacceptable than OA.
   - In MS-questions, OA is more unacceptable than OD.

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Theoretical issues

1. Explain the asymmetry of FA-sensitivity

2. Derive the FA-sensitivity Condition
2.2. Asymmetry of FA-sensitivity

- In MA-Qs, OD is worse than OA.
- In MS-Qs, OA is worse than OD.
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

\[
\begin{align*}
  f(a + b + c) & \rightarrow f(a + b) \\
  & \rightarrow f(a) \\
  f(a + c) & \rightarrow f(a + b) \\
  & \rightarrow f(b) \\
  f(b + c) & \rightarrow f(a + c) \\
  & \rightarrow f(c)
\end{align*}
\]
**FA-Principle**

Every MaxI answer in the updated space must entail a complete true answer.

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

In MA-Qs, **OD** violates the FA-Principle: .
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

In MA-Qs, **OD** violates the FA-Principle: .

- Let all the answers be true. Complete true answer:
  \[ \{f(a + b + c)\} \]
**FA-Principle**

Every MaxI answer in the updated space must entail a complete true answer.

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

In MA-Qs, **OD violates the FA-Principle**: .

- Let all the answers be true. Complete true answer: \( \{f(a + b + c)\} \)

- Overly denying \( f(a) \) rules out all the shaded answers. MaxI member in the updated answer space: \( \{f(b + c)\} \)
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

In MA-Qs, OD violates the FA-Principle:

- Let all the answers be true. Complete true answer:
  \[ \{f(a+b+c)\} \]

- Overly denying \( f(a) \) rules out all the shaded answers. MaxI member in the updated answer space:
  \[ \{f(b+c)\} \]

\[ f(b+c) \not\Rightarrow f(a+b+c) \] (\( f \): distributive predicate)
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

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

Only let the unshaded answers be true. Complete true answer:

\[
\{ f(b+c) \}
\]

Overly affirming rules in all the shaded answers.

MaxI member in the updated answer space:

\[
\{ f(a+b+c) \}
\]

\[
f(a+b+c) \Rightarrow f(b+c)
\]
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

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

Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

In MA-Qs, OA does not violate the FA-Principle:
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Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

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

- Only let the unshaded answers be true. Complete true answer:
  \[ \{ f(b + c) \} \]

- Overly affirming \( f(a) \) rules in all the shaded answers.
  MaxI member in the updated answer space:
  \[ \{ f(a + b + c) \} \]
Every MaxI answer in the updated space must entail a complete true answer.

MA-Q: OD is worse than OA

In MA-Qs, **OA does not violate the FA-Principle:**
- Only let the unshaded answers be true. Complete true answer: \{f(b + c)\}
- Overly affirming $f(a)$ rules in all the shaded answers. MaxI member in the updated answer space: \{f(a + b + c)\}
- $f(a + b + c) \Rightarrow f(b + c)$.

(f: distributive predicate)
**FA-Principle**

Every MaxI answer in the updated space must entail a complete true answer.

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

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

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

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

\[ \Diamond O[f(c)] \]
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

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

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

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

Every MaxI answer in the updated space must entail a complete true answer.

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

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

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

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

- Let all the present answers be true. Complete true answers:
  \[ \{ p : p \text{ is a present answer} \} \]
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

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

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

In MS-Qs, OD does not violate the FA-Principle:

- Let all the present answers be true. Complete true answers:
  \[\{p : p \text{ is a present answer}\}\]

- Overly denying \(\Diamond O[f(a)]\) only rules out \(\Diamond O[f(a)]\) itself.
  MaxI members in the updated space:
  \[\{p : p \text{ is an unshaded answer}\}\]
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

\[ \diamond O[f(b + c)] \]

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

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

- Let all the present answers be true. Complete true answers:
  \[ \{ p : p \text{ is a present answer} \} \]
- Overly denying \( \diamond O[f(a)] \) only rules out \( \diamond O[f(a)] \) itself.
  MaxI members in the updated space:
  \[ \{ p : p \text{ is an unshaded answer} \} \]
- Each unshaded answer entails a complete true answer (i.e., itself).
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

\[ \Diamond O[f(a)] \]
\[ \Diamond O[f(b)] \]
\[ \Diamond O[f(c)] \]
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

In MS-Qs, OA violates the FA-Principle:
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

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

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

In MS-Qs, OA violates the FA-Principle:
- Only let the unshaded answers be true. Complete true answers:
**FA-Principle**

Every MaxI answer in the updated space must entail a complete true answer.

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

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

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

In MS-Qs, **OA violates the FA-Principle:**

- Only let the unshaded answers be true. Complete true answers:
  \[ \{p : p \text{ is an unshaded answer}\} \]
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

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

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

In MS-Qs, **OA violates the FA-Principle**:  
- Only let the unshaded answers be true. Complete true answers:  
  \[ \{p : p \text{ is an unshaded answer}\} \]
- Overly affirming \( \Diamond O[f(a)] \) only rules in \( \Diamond O[f(a)] \) itself.  
  MaxI members in the updated answer space:  
  \[ \{p : p \text{ is a present answer}\} \]
FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.

MS-Q: OA is worse than OD

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

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

In MS-Qs, OA violates the FA-Principle:

- Only let the unshaded answers be true. Complete true answers:
  \[ \{ p : p \text{ is an unshaded answer} \} \]
- Overly affirming \( \Diamond O[f(a)] \) only rules in \( \Diamond O[f(a)] \) itself. MaxI members in the updated answer space:
  \[ \{ p : p \text{ is a present answer} \} \]
- \( \Diamond O[f(a)] \) does not entail any of the unshaded answers.
3.3. FA-sensitivity Condition
1. The ordinary value of an indirect question is its **Completeness** Condition.

2. **FA-sensitivity** is derived by exhaustifying **Completeness**.

(13) *John told Mary who came.*

   a. If \( x \) came, John told Mary that \( x \) came.  
   
   b. If \( x \) didn’t come, John didn’t say to Mary that \( x \) came.  

**Completeness**  

**FA-sensitivity**
Klinedinst & Rothschild (2011): An exhaustification-based approach

1. The ordinary value of an indirect question is its **Completeness** Condition.
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(13) *John told Mary who came.*
   a. If \(x\) came, John told Mary that \(x\) came. **Completeness**
   b. If \(x\) didn’t come, John didn’t say to Mary that \(x\) came. **FA-sensitivity**

(14) \[ O \ [_p \text{John told Mary who came}] \]
\[ = \lambda w.p(w) \land \forall q \in \text{ALT}(p)[p \not\subseteq q \rightarrow \neg q(w)] \]
   a. \([\text{who came}] = \lambda w.\lambda w'.\forall x[\text{came}_w(x) \rightarrow \text{came}_{w'}(x)]\]
   b. \([p] = \lambda w.\text{told}_w(j, m, \lambda w'.\forall x[\text{came}_w(x) \rightarrow \text{came}_{w'}(x)])\]
   c. \(\text{ALT} \ (p)\)
\[ = \{q \mid \exists w''\ [q = \lambda w.\text{told}_w(j, m, \lambda w'.\forall x[\text{came}_{w''}(x) \rightarrow \text{came}_{w'}(x)])]\}\]
\[ = \{q \mid \exists w''\ [q = J \text{ told M the MA answer as to who came in } w'']\}\]
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1. The ordinary value of an indirect question is its **Completeness** Condition.
2. **FA-sensitivity** is derived by exhaustifying **Completeness**.

(13) *John told Mary who came.*

   a. If *x* came, John told Mary that *x* came. \[\text{Completeness}\]
   b. If *x* didn’t come, John didn’t say to Mary that *x* came. \[\text{FA-sensitivity}\]

(14) \[O [p \text{ John told Mary who came}]]

   \[= \lambda w.p(w) \land \forall q \in \text{ALT}(p)[p \not\subseteq q \rightarrow \neg q(w)]\]

   a. \[\llbracket \text{who came} \rrbracket = \lambda w.\lambda w'.\forall x[\text{came}_w(x) \rightarrow \text{came}_{w'}(x)]\]
   b. \[\llbracket p \rrbracket = \lambda w.\text{told}_w(j, m, \lambda w'.\forall x[\text{came}_w(x) \rightarrow \text{came}_{w'}(x)]]\]
   c. \[\text{ALT} (p)\]

   \[= \{q | \exists w''[q = \lambda w.\text{told}_w(j, m, \lambda w'.\forall x[\text{came}_{w''}(x) \rightarrow \text{came}_{w'}(x)]]]\}\]

   \[= \{q | \exists w''[q = J \text{ told M the MA answer as to who came in } w'']\}\]

\[\Rightarrow \text{FA-sensitivity inferences are scalar implicatures.} \]
Empirical problems with the exhaustification-based approach

- FA-sensitivity inferences are not cancelable.

(15) a. Did Mary invite some of her classmates?
    b. Yes. Actually she invited all of them.

(16) a. Does Mary know which speakers went to the dinner?
    (w: only Uli and Irene went to the dinner.)
    b. Yes. #Actually she believes that Uli, Irene, and Pabara all did.
Empirical problems with the exhaustification-based approach

- FA-sensitivity inferences are not cancelable.

  (15)  
  a. Did Mary invite some of her classmates? 
  b. Yes. Actually she invited all of them.

  (16)  
  a. Does Mary know which speakers went to the dinner? 
    (w: only Uli and Irene went to the dinner.) 
  b. Yes. Actually she believes that Uli, Irene, and Pabara all did.

- FA-sensitivity is robust even in downward-entailing contexts.

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

  (18) If M knows which speakers went to the dinner, I will buy her a coffee. 
     \( \rightarrow \) If [M believes U+I did] \& not [M believes B/... did], I will...
Theoretical problems with the exhaustification-based approach

- It is hard to find a uniformed exhaustification-based approach to capture the distributional pattern of FA-sensitivity inferences.

1. FA-sensitive readings are available for both MA-Qs and MS-Qs.
2. FA-sensitive readings are unavailable for questions embedded under emotive factives.

(19)  *John is surprised at who came.*

(w: only a came.)

a.  → John is surprised that *a* came.
b.  \( \not\rightarrow \) John isn’t surprised that *b* came.
c.  \( \not\rightarrow \) John isn’t surprised that *a + b* came.
Option 1: Local exhaustification

(20) John told us where we could get gas.
    \( \exists p \ [p \text{ is a true MS answer}] \ [O \ [\text{John told us } p]] \)
Option 1: Local exhaustification

(20) John told us where we could get gas.
\[ \exists p \ [p \text{ is a true MS answer}] \ [O \ [\text{John told us } p]] \]

- Too strong!

It denies all propositions of the form *John told q*, where *q* is a non-weaker alternative of *p*.

If what John said was “we could get gas at *a* and somewhere else”, a local exhaustification-based approach would incorrectly predict (20) to be false.
Option 2: Global exhaustification

(21)  \( O [\exists p \ [p \text{ is a true MS answer}] \ [\text{John told us } p]] \)
Option 2: Global exhaustification

(21) \( O [\exists p [p \text{ is a true MS answer}] \text{ [John told us } p]] \)

- Innocent exclusion (Fox 2007) derives an inference close to FA-sensitivity (p.c. from Danny Fox and Alexandre Cremers independently).

  (22) a. Ordinary value: \( \text{told}(j, p) \lor \text{told}(j, q) \)

      b. ALT: \( \{ \text{told}(j, p), \text{told}(j, q), \text{told}(j, r), \ldots, \text{told}(j, p) \lor \text{told}(j, r), \ldots \} \)

      c. IE-ALT: \( \{ \text{told}(j, r) \} \)

      d. \( \lbrack (21) \rbrack = [\text{told}(j, p) \lor \text{told}(j, q)] \land \neg \text{told}(j, r) \)
Option 2: Global exhaustification

(21) $O \exists p \ [p \text{ is a true MS answer}] \ [\text{John told us } p]]$

- Innocent exclusion (Fox 2007) derives an inference close to FA-sensitivity (p.c. from Danny Fox and Alexandre Cremers independently).

(22)  
  a. Ordinary value: $\text{told}(j,p) \lor \text{told}(j,q)$
  b. ALT: $\{\text{told}(j,p), \text{told}(j,q), \text{told}(j,r), \ldots, \text{told}(j,p) \lor \text{told}(j,r), \ldots\}$
  c. IE-ALT: $\{\text{told}(j,r)\}$
  d. $\textbf{[(21)]} = [\text{told}(j,p) \lor \text{told}(j,q)] \land \neg\text{told}(j,r)$

- But, to get the desired FA-sensitivity, a global-exhaustification theory requires the $O$-operator to operate on a special set of alternatives.

(23) $\text{ALT} (\text{told}(j,p) \lor \text{told}(j,q))$
    $= \{\ldots, \text{told}(j,\neg p), \text{told}(j,\neg q), \ldots, \text{told}(j,p \land q), \text{told}(j,p) \land \text{told}(j,q)\}$
Option 2: Global exhaustification

(21) \( O \ [\exists p \ [p \text{ is a true MS answer}] \ [\text{John told us } p]] \)

**Innocent exclusion (Fox 2007) derives an inference close to FA-sensitivity (p.c. from Danny Fox and Alexandre Cremers independently).**

(22) a. Ordinary value: \( \text{told}(j, p) \lor \text{told}(j, q) \)

    b. ALT: \{\text{told}(j, p), \text{told}(j, q), \text{told}(j, r), \ldots, \text{told}(j, p) \lor \text{told}(j, r), \ldots\}\n
    c. IE-ALT: \{\text{told}(j, r)\}\n
    d. \[\text{\text{[(21)]} = [\text{told}(j, p) \lor \text{told}(j, q)] \land \neg \text{told}(j, r)}\]

**But, to get the desired FA-sensitivity, a global-exhaustification theory requires the \( O \)-operator to operate on a special set of alternatives.**

(23) \( \text{ALT}(\text{told}(j, p) \lor \text{told}(j, q)) \)

\( = \{\ldots, \text{told}(j, \neg p), \text{told}(j, \neg q), \ldots, \text{told}(j, p \land q), \text{told}(j, p) \land \text{told}(j, q)\}\n
\( \text{it must include negative alternatives;} \)

(\text{otherwise this theory cannot derive the “avoiding OD” condition})
Option 2: Global exhaustification

(21)  \( O \ [\exists p \ [p \text{ is a true MS answer}] \ [\text{John told us } p]] \)

- Innocent exclusion (Fox 2007) derives an inference close to FA-sensitivity (p.c. from Danny Fox and Alexandre Cremers independently).

(22)  a. Ordinary value: \( \text{told}(j, p) \lor \text{told}(j, q) \)

b. ALT: \( \{\text{told}(j, p), \text{told}(j, q), \text{told}(j, r), \ldots, \text{told}(j, p) \lor \text{told}(j, r), \ldots\} \)

c. IE-ALT: \( \{\text{told}(j, r)\} \)

d. \( [(21)] = [\text{told}(j, p) \lor \text{told}(j, q)] \land \neg \text{told}(j, r) \)

- But, to get the desired FA-sensitivity, a global-exhaustification theory requires the \( O \)-operator to operate on a special set of alternatives.

(23)  \( \text{ALT}(\text{told}(j, p) \lor \text{told}(j, q)) \)

\( = \{\ldots, \text{told}(j, \neg p), \text{told}(j, \neg q), \ldots, \text{told}(j, p \land q), \text{told}(j, p) \land \text{told}(j, q)\} \)

1. it must include negative alternatives;
   (otherwise this theory cannot derive the “avoiding OD” condition)

2. it must exclude stronger true alternatives.
   (otherwise (21) would be false if John told us multiple true MS answers)
Innocent exclusion cannot extend to the case of emotive factives.
Innocent exclusion cannot extend to the case of emotive factives.

Uegaki (2014):

1. Emotive factives are non-monotonic.
2. Exhaustifications over indirect-questions negate only stronger alternatives.

\[(24) \quad \text{John is surprised at who came.} \]
\[(w: \text{only a came.})\]
\[\begin{align*}
\text{a.} & \quad \rightarrow \text{John is surprised that } a \text{ came.} \\
\text{b.} & \quad \not\rightarrow \text{John isn’t surprised that } b \text{ came.} \\
\text{c.} & \quad \not\rightarrow \text{John isn’t surprised that } a + b \text{ came.}
\end{align*}\]

But, in MS-questions, IE-alternatives are not stronger than the prejacent:

\[(25) \quad \text{IE-ALT} (\text{told}(j, p) \lor \text{told}(j, q)) = \{\text{told}(j, r)\}\]
My slogan

FA-sensitivity is just a matter of **Quality**: “only make true contributions.”
My slogan

FA-sensitivity is just a matter of **Quality**: “only make true contributions.”

(26) **FA-sensitivity Condition** of \emph{John knows}_w \emph{Q}:

\[ \forall p \in \text{REL}(Q)[\text{DOX}_w^j \subseteq p \rightarrow p(w)] \]

(Every \emph{Q}-relevant proposition that John believes in \emph{w} is true in \emph{w})

\text{REL}(Q): the proposition set derived from closing \emph{Q} under Boolean closure.

If \emph{Q} = \{\emph{p}, \emph{q}\}, then \text{REL}(Q) = \{-\emph{p}, -\emph{q}, \emph{p} \land \emph{q}, \emph{p} \lor \emph{q}, \emph{p} \land -\emph{q}, \ldots\}. 
Emotive factives again:

(27) *John is surprised at who came.*

(w: only a came).

a. $\rightarrow$ John is surprised that *a* came.

b. $\not\rightarrow$ John isn’t surprised that *b* came.

c. $\not\rightarrow$ John isn’t surprised that *a + b* came.
Emotive factives again:

(27) *John is surprised at who came.*

(*w: only a came*).

a. → John is surprised that *a* came.

b. ↔ John isn’t surprised that *b* came.

c. ↔ John isn’t surprised that *a + b* came.

FA-sensitive readings are

- unavailable for questions embedded under *surprise*, why?
Emotive factives again:

(27)  *John is surprised at who came.*
      (\textit{w: only a came}).
      
      a.  \implies John is surprised that \textit{a} came.
      
      b.  \notimplies John isn’t surprised that \textit{b} came.
      
      c.  \notimplies John isn’t surprised that \textit{a} + \textit{b} came.

FA-sensitive readings are

\begin{itemize}
  \item unavailable for questions embedded under *surprise*, why?
\end{itemize}

FA-sensitivity collapses under the \textit{strong} factive presupposition:

\begin{center}
*John is surprised at* \( p \models p \)
\end{center}
Emotive factives again:

(27)  *John is surprised at who came.*
     
     (w: only a came).
     
     a.  $\rightarrow$ John is surprised that $a$ came.
     b.  $\nrightarrow$ John isn’t surprised that $b$ came.
     c.  $\nrightarrow$ John isn’t surprised that $a + b$ came.

FA-sensitive readings are

1. unavailable for questions embedded under *surprise*, why?

   FA-sensitivity collapses under the strong factive presupposition:

   *John is surprised at $p \vDash p$*

2. available for questions embedded under *know*, why?
Emotive factives again:

(27)  *John is surprised at who came.*

    *(w: only a came).*

    a.  → John is surprised that *a* came.
    b.  ∨ John isn’t surprised that *b* came.
    c.  ∨ John isn’t surprised that *a + b* came.

FA-sensitive readings are

1. **unavailable for questions embedded under *surprise*, why?**

   FA-sensitivity collapses under the strong factive presupposition:

   *John is surprised at p ⊨ p*

2. **available for questions embedded under *know*, why?**

   The factive presupposition of *know* is weak and defeasible. (Karttunen 1971)
Conclusions

Truth conditions of FA-sensitive readings

(28) *John knows*_\textsubscript{w} *Q*

a. **Completeness Condition:**
\[ \exists p \ [p \text{ is an MaxI true answer of } Q \text{ in } w] \ [\text{DOX}_w^j \subseteq p] \]
(John believes a MaxI true answer of \(Q\) in \(w\).)

b. **FA-sensitivity Condition:**
\[ \forall p \in \text{REL}(Q)[\text{DOX}_w^j \subseteq p \rightarrow p(w)] \]
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Conclusions

Truth conditions of FA-sensitive readings

(28) *John knows$_w$ Q*

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Asymmetry of FA-sensitivity

- In MA-Qs, **OD** is worse than **OA**.
- In MS-Qs, **OA** is worse than **OD**.
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- In MA-Qs, \textbf{OD} is worse than \textbf{OA}.
- In MS-Qs, \textbf{OA} is worse than \textbf{OD}.

FA-Principle

Every MaxI answer in the updated space must entail a complete true answer.
THANK YOU!

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Appendix: Asymmetry of FA-sensitivity for declaratives

- Gettier (1963) provides scenarios like (29a) as counterexamples to the view that the possession of a justified true belief constitutes knowledge.

- Related to the asymmetry of FA-sensitivity, while both (29a-b) entail the false belief that *a came*, (29a) makes (29) **more** likely to be judged as false.

> (29)  *John knows that a or b came.*  *(w: Only b came.)*

  a. John believes that only *a* came.  
  b. John believes that *a + b* came.  
  c. John believes that *a or b* came, but he isn’t sure which one.
Appendix: Asymmetry of FA-sensitivity for declaratives

- Gettier (1963) provides scenarios like (29a) as counterexamples to the view that the possession of a justified true belief constitutes knowledge.
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\[(29) \quad \text{John knows that } a \text{ or } b \text{ came. (w: Only } b \text{ came.)}\]

a. John believes that only \( a \) came. \( \text{OA+OD} \)

b. John believes that \( a+b \) came. \( \text{OA} \)

c. John believes that \( a \) or \( b \) came, but he isn’t sure which one.

“FA”-Principle for [\( x \text{ knows } p \)]

Some MaxI domain (D)-alternative of \( p \) that \( x \) believes entails some true D-alt of \( p \).
Appendix: Asymmetry of FA-sensitivity for declaratives

- Gettier (1963) provides scenarios like (29a) as counterexamples to the view that the possession of a justified true belief constitutes knowledge.

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"FA"-Principle for \([x \text{ knows } p]\)

Some MaxI domain (D)-alternative of \(p\) that \(x\) believes entails some true D-alt of \(p\).

- True D-ALT: \( \{ \text{came}(a) \cup \text{came}(b), \text{came}(b) \} \)
- D-ALT under (29a): \( \{ \text{came}(a) \cup \text{came}(b), \framebox{came(a)} \} \)
  - under (29b): \( \{ \text{came}(a) \cup \text{came}(b), \framebox{came(a)}, \framebox{came(b)} \} \) \( \checkmark \)
  - under (29c): \( \{ \framebox{came(a) \cup came(b)} \} \) \( \checkmark \)
Introduction Completeness FA-sensitivity Conclusions


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


