Unless: an experimental approach

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Overview

- Introduction: a puzzle about compositionality

- *Unless* as an exceptive operator on quantifier domains

- Our experimental study
  - Universal quantifiers and some pragmatic puzzles
  - Follow-up work

- A new proposal for *unless*
  - The role of felicity conditions
  - Biconditionality

- Conclusions and questions

Is *unless* non-compositional?

Unless behaves differently in positive and negative contexts (originally due to Higginbotham 1986):

- ▶ Biconditional under positive quantifiers:
    - (1)a. Every student will succeed unless he goofs off.
      ⤳ *All students are such that they will succeed if they do not goof off and will not succeed if they do goof off.*

- ▶ One-directional under negative quantifiers:
    - (1)b. No student will succeed unless he works hard.
      ⤳ *No student is such that he will succeed without working hard.*

[One-directional *if not* also does not compose properly under the negative quantifier; Higginbotham]

Unless and exceptionality

The best available account treats *unless* as an exceptive operator (see also Geis 1973, Dancygier 1975). An *unless*-statement:

a) asserts a generalization
b) asserts the existence of an exception to that generalization

Proposal (von Fintel 1992):
Unless modifies a quantifier by subtracting from its domain, and asserts that the complement of the *unless*-clause is the unique smallest exception to the quantified statement.

Unless and exceptionality

$$Q[C]M \text{ \textbf{unless} } R :=$$

Q = the quantifier/quantificational adverb
C = quantifier restriction
M = nuclear scope
R = *unless*-complement/excepted set

Von Fintel $Q[C \wedge \neg R]M \wedge (\forall S \subseteq C : Q[C \wedge \neg S]M \rightarrow R \subseteq S)$

Leslie $Q[C \wedge \neg R]M \wedge Q[C \wedge M]\neg R$

(1)a. Every student will succeed unless he goofs off.
vF: *All but the goofing students succeed and any set of unsuccessful students contains all the goofing ones.*
L: *All but the goofing students succeed and all successful students do not goof off.*

(1)b. No student will succeed unless he works hard.
vF: *None but the hardworking students succeed and any set of successful students contains all hardworking ones.*
L: *None but the hardworking students succeed and no successful students are not hardworking.*

Issues with the exceptive account: biconditionality

Natural data suggests semantic biconditionality is too strong (Nadathur 2014):

- Reinforceable
  - (2) Always be yourself, unless you are Fernando Torres. Then always be someone else.

- Questionable
  - (3) The answer is no unless you ask. If you do ask the answer might be no.

- Defeasible
  - (4) Mantou is always late unless she's already out before we meet, but she's often just less late then

This resembles conditional perfection (Geis & Zwicky 1971) and behaves like a "default" implicature.

Issues with the exceptive account: non-universal quantifiers

Natural data also shows that *unless* co-occurs with non-universal quantifiers:

(5)   a. Most livestock are fed GMO grains unless you buy pasture-raised animals.

      b. You cannot be certain how to pronounce some words unless you know their prehistory.

      c. Smoking kills half of smokers unless they quit.

(Leslie's) exceptive account makes odd predictions here:

(5c.) $\frac{1}{2}x[\text{smoker}(x) \wedge \neg\text{quit}(x)]\text{die}(x) \wedge \frac{1}{2}x[\text{smoker}(x) \wedge \text{die}(x)]\neg\text{quit}(x)$
= Half of smokers who do not quit die, and half of smokers who die do not quit
⤳ Half of smokers die, whether or not they quit.

Reasons to question the exceptive account

Both *if not* and *not if* directions are relevant, but they do not seem to have equal status.

Reason 1:
If not is entailed, but *not if* (biconditionality in positive contexts) behaves like an implicature.
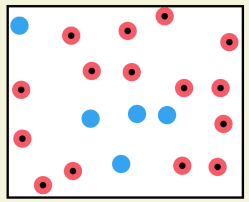
Reason 2:
Unless-statements appear subject to a condition rendering them false/bad when the generalization is true on the excepted set as well.
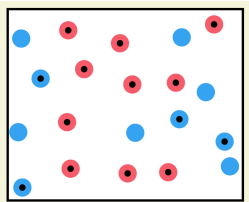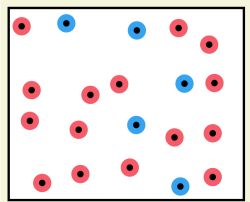
The exceptive accounts don't handle either of these intuitions.

Intuitions

Every marble has a dot unless it is blue.

True **True** **False**

Every marble has a dot.

False False True

Every marble has a dot if it is not blue
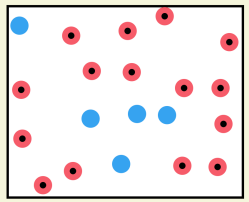
True True True

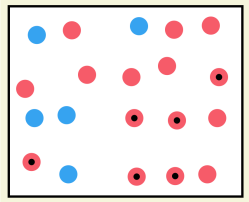# Intuitions
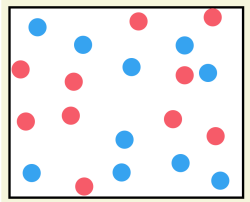
No marble has a dot unless it is red.

True   **True**   **False**

No marble has a dot.

False   False   True
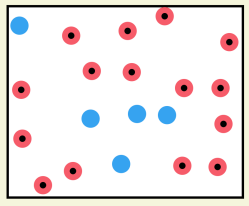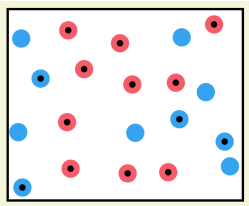
No marble has a dot if it is not red.

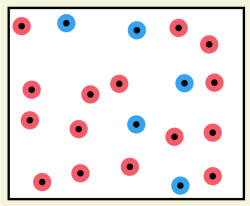True   True   True

Exceptive predictions

Every marble has a dot unless it is blue.

True	**True**	**False**

Von Fintel: *Every non-blue marble has a dot and every set of dotted marbles contains no blue ones.*

True	False	False

Leslie: *Every non-blue marble has a dot and every blue marble has no dot.*

True	False	False

Exceptive predictions

No marble has a dot unless it is red.
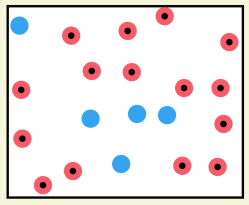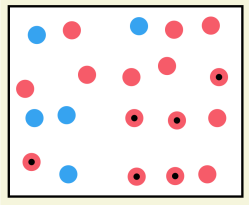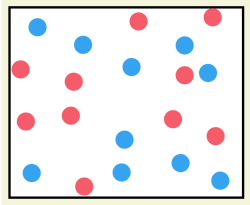
	True	**True**	**False**

Von Fintel: *No non-red marble has a dot and every set of non-dotted marbles contains no red ones.*

	True	False	False

Leslie: *No non-red marbles have dots.*

	True	True	True

Experiment design
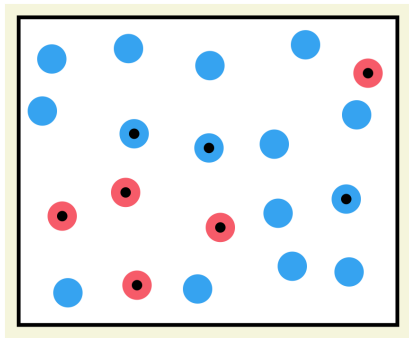
Is the following claim true or false?

**"Every marble has a dot unless it is blue."**

○ True ○ False

Continue

- ▶ Forced-choice T/F
- ▶ Critical trials: quantified *if not* and *unless* statements
- ▶ Parameters: target colour, red/blue marble ratios, proportion of target marbles with dots
- ▶ 155 participants, via Amazon's Mechanical Turk (filtered for native English status)
- ▶ 48 trials/participant: 24 test, 24 fillers (*if*-conditionals, single-clause quantified statements, existential statements)

Results

The results don't match either exceptive account, or intuitions!
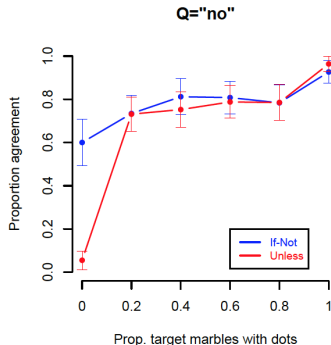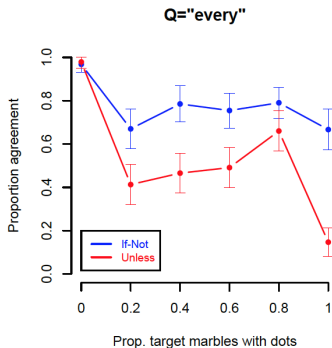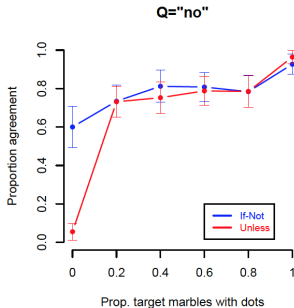

if not:

- ▶ *every*: reduced agreement (66.7-79.0%) on 0.2-1

- ▶ *no*: reduced on 0-0.8 (60.0-80.8%)

unless:

- ▶ *every*: true at 0, false at 1; uncertain else (41.3-66.0%)

- ▶ *no*: true at 1, false at 0; else matches *if not* (73.1-78.5%)

Results
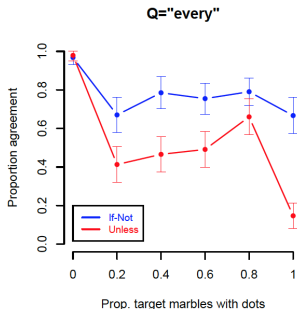
This leaves us with three puzzles:

(A) The categorical divergence of *if not* and *unless* in **across the board** conditions

(B) The degraded response to both conditionals in the middle range

(C) The reliable but non-categorical difference between *if not* and *unless* in the middle range, only under *every*

Interpretation

Claim: Our results falsify both exceptive accounts

Q="every"

Q="no"
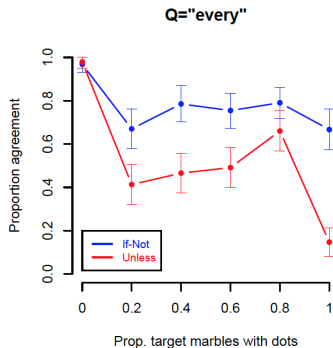
- *unless* degraded but **not categorically false** on 0.2-0.8

- contradicts biconditionality
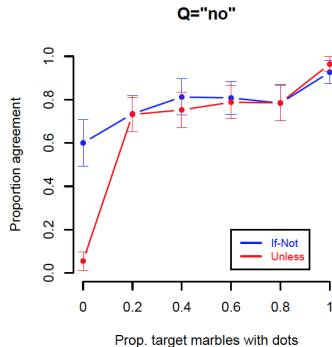
- *unless* and *if not* equivalent and **not false** on 0.2-1

- *unless* **false** at 0, but *if not* accepted

A solution for Puzzle A

(A) The categorical divergence of *if not* and *unless* in **across the board** conditions
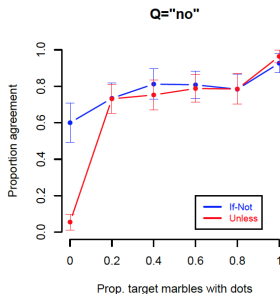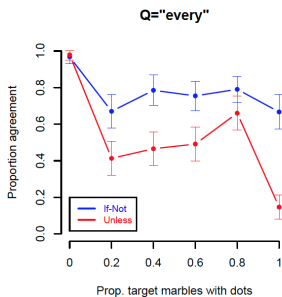
Proposal: $Q[C]M$ *unless* $R := Q[C \wedge \neg R]M \wedge \neg \mathbf{Q[C \wedge R]M}$

- compare $Q[C]M$ *if not* $R := Q[C \wedge \neg R]M$
- the purple clause captures divergence in ATB scenarios
- data are compatible with ATB clause as entailment or presupposition

A solution for Puzzle B

(B) The degraded response to both conditionals in the middle range
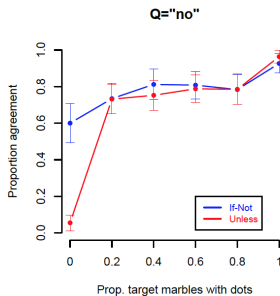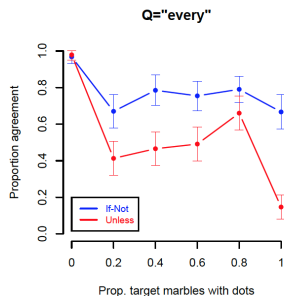
Proposal: Puzzle (B) is produced by biconditionality implicatures; e.g. conditional perfection

$$\left\{ \begin{array}{l} \text{Every marble has a dot if it is not blue} \\ \text{Every marble has a dot unless it is blue} \end{array} \right\} \rightsquigarrow \textit{No blue marbles have dots}$$

Puzzle C?

(C) The reliable but non-categorical difference between *if not* and *unless* in the middle range, only under *every*
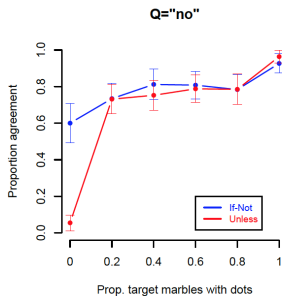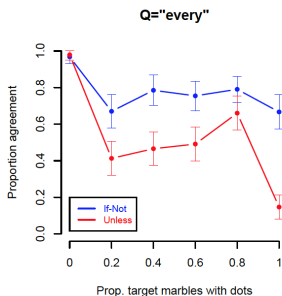
- ▶ Puzzle (C) is also about biconditionality
- ▶ Validates the intuition that *unless* is "less" biconditional under *no*
- ▶ The positive/negative difference is pragmatic, not semantic

Interim Summary

- Our results falsify both versions of the exceptive account
- *Unless* and *if not* categorically diverge iff the main generalization holds across the board
- Empirical differences captured by joint effect of ATB clause and a biconditionality implicature
- The positive/negative difference is due to pragmatics

$Q[C]M$ *unless* R :=

if not	$Q[C \wedge \neg R]M$
ATB condition	$\neg Q[C \wedge R]M$
perfection	$Q[C \wedge R]\neg M$

Moving forward: our intuition is that the ATB condition reflects a precondition or presupposition, rather than an entailment

Follow-up work

Follow-up study:

- ▶ 373 MTurk participants, similar design
- ▶ tested non-universal quantifiers (*most, some, few*)
- ▶ included controls for quantifier interpretation

Summary of results:

- ▶ data are consistent with ATB clause as a presupposition
- ▶ consistent with biconditionality implicature (additional support from control data with *if*-conditionals)
- ▶ biconditionality effects are stronger for *most*, weaker for *few* (weakening is in downward-entailing contexts)

A revised theoretical proposal

The experimental data here support (and refine) a theoretical proposal outlined in Nadathur (2014):

- both *if not* and *not if* directions matter for *unless*, but they do not have the same status
- where *if not* simply directs attention away from the excepted set, *unless* directs attention to the truth of the main generalization over the excepted set
- *if not* and *unless* share semantic content (Leslie's 2008 "modalized restrictor")
- key differences are located in two pragmatic considerations:
  - a felicity/appropriateness condition
  - a biconditionality implicature

Appropriateness conditions

Conditionals have felicity/appropriateness conditions (see also von Fintel 2001):

Conditional strengthening:
Given a conditional operator COND and two propositions p and q, the statement q COND p is best asserted when the speaker is unwilling/unable to assert the unqualified proposition q.

(6) Bill will go swimming if the weather is not bad.
   ⤳ The speaker is unwilling/unable to assert "Bill will go swimming."

(7) Bill will go swimming unless the weather is bad.
   ⤳ The speaker is unwilling/unable to assert "Bill will go swimming."

Conditional strengthening

Conditional strengthening is very difficult to cancel with *if*-conditionals (see Lauer 2013, "Need a Reason" implicatures), but is **even stronger** with *unless*:
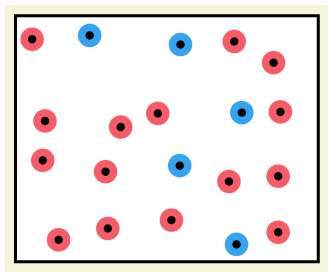
(8)a. Every marble has a dot if it is not blue.
        odd, but accepted

(8)b. Every marble has a dot unless it is blue.
        empirically rejected

Claim: This is the source of the ATB clause

$$Q[C]M \text{ unless } R := Q[C \wedge \neg R]M \wedge \neg \mathbf{Q[C \wedge R]M}$$

Biconditionality implicatures

Both types of conditionals are subject to biconditionality implicatures, e.g. **conditional perfection** (Geis & Zwicky 1971):

(9) I'll give you $10 if you mow the lawn.
   ↝ *And if you don't, I won't*

(10) I'll go for a run unless the weather is bad.
   ↝ *And if it is, I won't*

Questions:
- Why is biconditionality stronger for *unless*?
- ... but only in positive contexts?

Conditional perfection and biconditionality

Conditional perfection (mostly) accompanies a strong contextual motive to consider the truth of the consequent on the excepted set (e.g. threats, promises; Fillenbaum 1986, van Canegem-Ardigns & van Belle 2008):

(11) If you don't give me your money, I'll kill you!
How can the recipient avoid being killed?

Unless **always** draws attention to the value of the consequent on the excepted set:

(12) Every student will succeed unless he goofs off.
What happens to the ones who do?

So: the perfecting implicature is always available with *unless*, but contextually limited for *if not*

Conditional perfection and the positive/negative split

The joint effects of conditional strengthening and conditional perfection induce a scalar relationship between *unless* and *if not*:

- the items are alternatives (semantically)
- the choice of *unless* suggests a stronger commitment to unasserted biconditionality

This may explain Puzzle C (and the original problem!):

- Scalar implicatures are weaker in downward-entailing contexts (Horn 1989, Chierchia 2004)
- Experimental evidence from disjunctions (Schwarz et al. 2008) and numerals (Panizza et al. 2009)
- biconditionality is weaker under *no*, and other downward-entailing contexts (*few* in follow-up study)

Conclusions

- The two directions associated with *unless* do not share entailment status

- Experimental evidence goes against semantic biconditionality, suggests a role for pragmatics

- An account is needed that captures a) the similarity between *unless* and *if not*, b) the points of categorical difference, and c) explains their divergent pragmatics

- We have proposed:
  - *unless* and *if not* share asserted content
  - **conditional strengthening** is a precondition for *unless*, but an (NaR) implicature for *if not*
  - **conditional perfection** affects both conditionals, but with differing strength because they are scalar alternatives

Outlook and questions

- Is biconditionality with *unless* really the same inference as conditional perfection?
- What evidence is there for a scalar relationship?
- The data on non-universal quantifiers is compatible with our proposal but not exclusively so; further and more refined experiments would be extremely valuable
  - Better controls (quantifier variance, secondary implicatures)
- What is the difference between presupposition and implicature here?

  - Why should conditional strengthening be a precondition for *unless*?
  - Can other salient differences satisfy this precondition?
  - Other exceptive constructions might provide a good base for further investigation (see Garcia-Alvarez 2008)

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