

Negation and alternatives in counterfactual antecedents

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Inquisitive semantics seminar

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Alternatives in counterfactual antecedents

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Contemporary semantics of conditionals distinguish

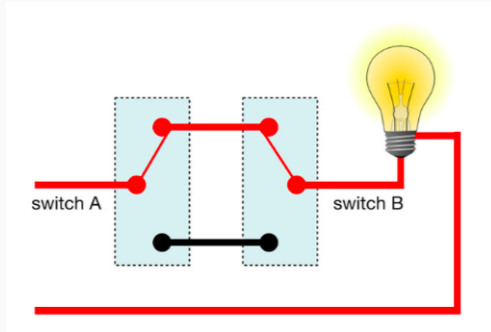
1. the alternatives raised by a conditional antecedent
 2. the mechanism used to hypothetically assume each alternative
- (3) Ciardelli (2016): $A > C$ is true at a state s just in case for every $p \geq \text{alt}(A)$ there is a $q \geq \text{alt}(C)$ such that $s \models p \vee q$

Recent work on conditional antecedents

Recent work on the semantics of conditionals

Ciardelli et al. (2018)	inquisitive semantics
Fine (2012)	truthmaker semantics
Santorio (2018)	truthmaker/alternative semantics
Willer (2018)	dynamic semantics
Schulz (2018)	novel semantics of negation

Each paper has a different semantic entry for negation



- (4)
- If switch A or switch B was down, the light would be off.
 - If switch A and switch B were not both up, the light would be off.

Contemporary semantics of conditionals

Willer (2018)

Dynamic semantics for conditionals

Validates De Morgan's law $\neg(A \wedge B) \equiv \neg A \vee \neg B$

We need to explain why [(4a)] and [(4b)] draw attention to different possibilities. One option is to revise the negative entry for conjunction. But another option is to keep the entry as it is and to explore the role of expressions like 'both' in generating alternatives over and above the ones predicted by the clause for negated conjunction. Further inquiry, including work at the empirical level, is needed to decide which of these options is more viable. (Willer, 2018, 390)

(5) *Schulz negation (n-ary version)*

- a. $L(\varphi) = fa : a$ is an atomic sentence appearing in φ
- b. $w \varphi v$ iff $w(a) = v(a)$ for every $a \in L(\varphi)$
- c. For any information state $p \subseteq W$,
 - (i) $p \not\models Q(\varphi)$ iff $w \varphi v$ for every $w, v \in p$
 - (ii) $p \text{?} \varphi$ iff $p \setminus \{j\varphi\}$ is empty
- d. For any proposition $P \subseteq \wp(W)$, $P \not\models : \varphi$ iff $p \not\models Q(\varphi)$ and $p \text{?} \varphi$ for every $p \in P$

Note $w(a)$ and $v(a)$ can take values beyond $[0, 1]$

Experiment on what negation does to alternatives

Experimental design

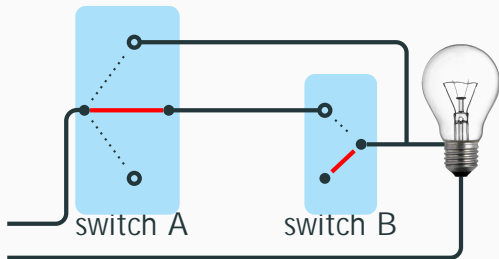


Figure 1: Scenario used in the experiment

Experimental design

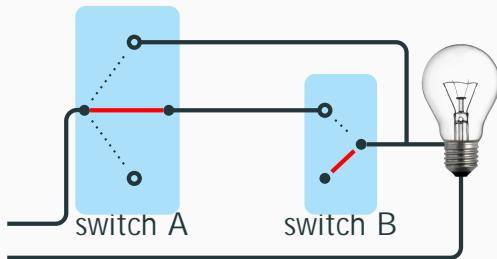


Figure 1: Scenario used in the experiment

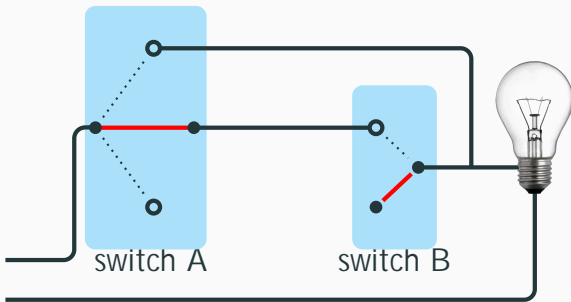
192 Mechanical Turk participants, excluding:

- 74 participants who responded 4 on the True filler;

- 3 participants who didn't report English as native language

Each participant only saw one of T1 and T2, in random order with the True and False filler and the Control item, T3 presented last

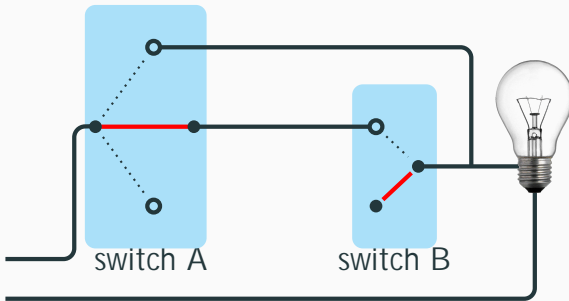
Fillers



False: Currently, switch A is in the middle and switch B is down. If that wasn't the case, the light would be on.

True: Currently, switch A is not up. If that was the case, the light would be on.

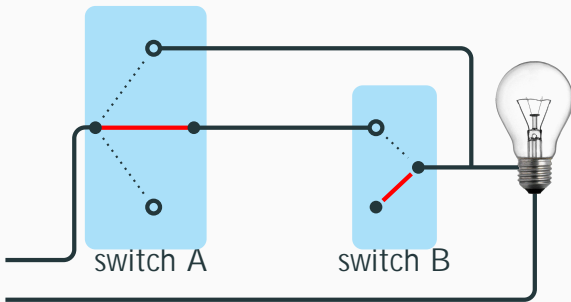
Control



Control: Currently, switch B is down. If that wasn't the case, the light would be on.

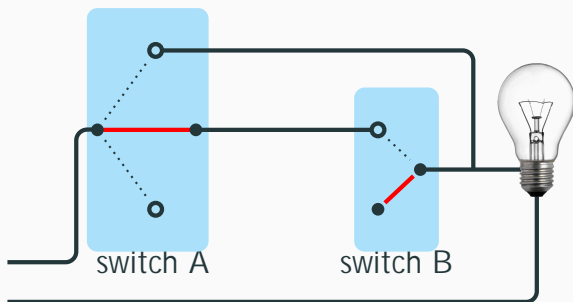
Tests how much the participant keeps fixed

Main test



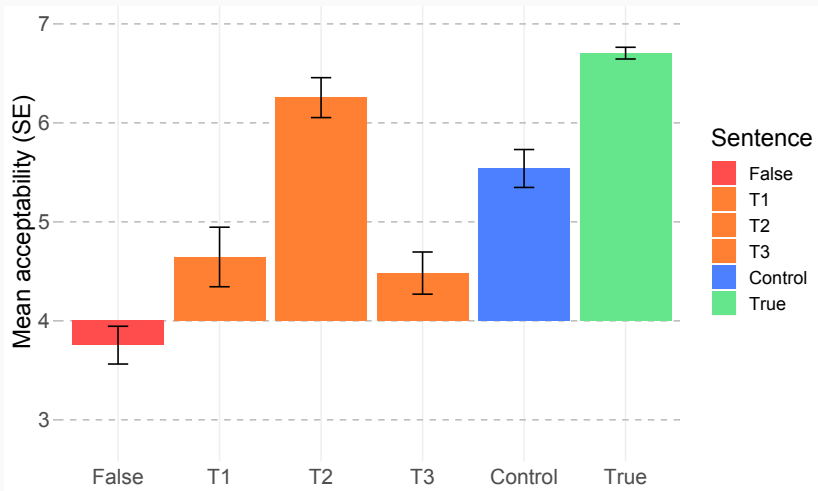
- T1:** Currently, neither switch is up. If that wasn't the case, the light would be on.
- T2:** Currently, switch A is in the middle and switch B is down. If switch A was up or switch B was up, the light would be on.

Final test



T3: If switch B was up but not switch A, the light would be on.

Results



F

T1

T2

T3

C

T

: (A ^ B #)

:: (A " _ B ")

A " _ B "

B " ^ : A "

: B #

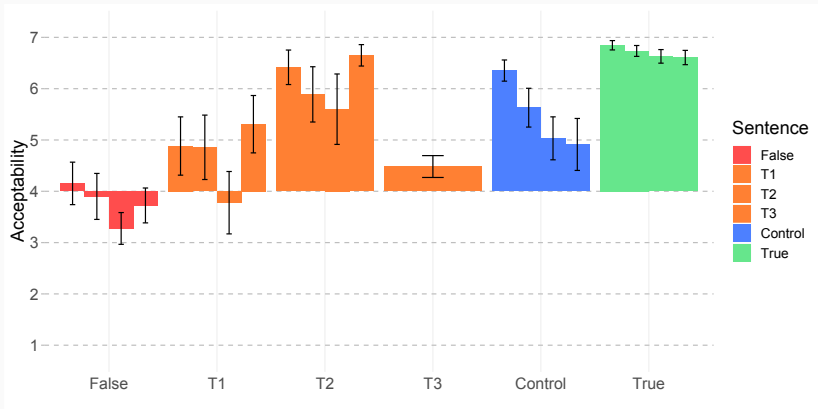
A "

Predictions

Theory / Antecedent	T1 : : (A''_B'')	T2 A''_B''	T3 B'' ^: A''
Alonso-Ovalle (2006)	X	✓	✓
Ciardelli et al. (2018)	X	✓	✓
Fine (2012)	✓	✓	X
Santorio (2018)	✓	✓	X
Willer (2018)	✓	✓	X
Schulz (2018)	X	✓	X
Our data (interpreted)	X	✓	X

Table 1: Overview of predictions

Order effects



F T1 T2 T3 C T
 : (A ^ B #) : : (A " _ B ") A " _ B " B " ^ : A " : B # A "

Hurford antecedents

Hurford's constraint

Hurford (1974): a disjunction in which one disjunct entails the other is generally infelicitous

- (6) a. #The ring is made of gold or metal.
- b. #John is here, or John is here and Mary is not.

Hurford's constraint also appears in conditional antecedents.

- (7) a. #If the ring is made of gold or metal, it will be heavy.
- b. #If John were here, or John were here but Mary not, he would come to.

Hurford Antecedents

Gazdar (1979): some Hurford disjunctions are acceptable

- (8)
- a. Alice ate some or all of the cookies.
 - b. John solved three or four of the problems.

Acceptability extends to conditional antecedents:

- (9)
- a. If switch B was up, or switches A and B were up, ...
 - b. $B _ (A \wedge B) > \dots$

$$\llbracket B _ (A \wedge B) \rrbracket = f_j B_j, j A \wedge B_j g^\# = f_j B_j g^\# = \llbracket B \rrbracket$$

where $P^\# = f s \quad W j s \quad t$ for some $t \geq P g$.

Exclusive disjunction

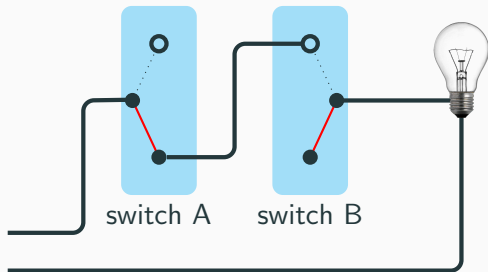


Figure 2: The light is on just in case A is down and B is up.

- (10) a. If switch B was up, the light would be on. B
- b. If switch B was up, or switches A and B were up, the light would be on. $B \vee (A \wedge B)$

Exhaustivity

Aloni and Ciardelli (2011):

$$s \not\models \text{exh}(\varphi) \quad , \quad s \models \text{exh}(\alpha, jRA(\varphi)j) \text{ for some } \alpha \in \text{Alt}(\varphi)$$

Where

$$jRA(\varphi)j = f\psi \mid \psi \in RA(\varphi)g$$

Roelofsen and van Gool (2010):

$$\text{exh}(\pi, \Pi) = \pi \quad \cup \{ \pi^0 \in \Pi \mid \pi \not\subseteq \pi^0 \}$$

$$\text{exh}(\Pi) = f\text{exh}(\pi, \Pi) \mid \pi \in \Pi g$$

$$RA(a) = fag \mid C_a$$

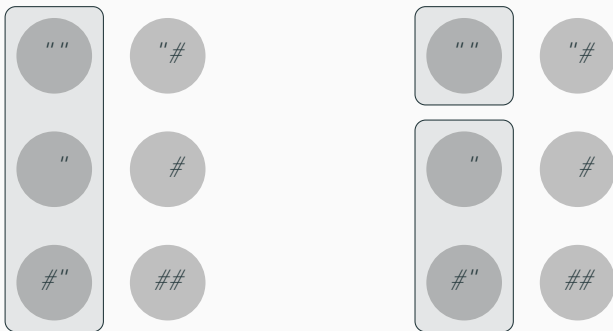
$$RA(\varphi _ \psi) = RA(\varphi) \mid RA(\psi)$$

$$RA(\varphi \wedge \psi) = RA(\varphi) \mid RA(\psi)$$

$$RA(: \psi) = f: \psi \mid \psi \in RA(\varphi)g$$

$$RA(\text{exh}(\varphi)) = f\text{exh}(\psi) \mid \psi \in RA(\varphi)g$$

where C_a is a set of contextually relevant alternatives to a .



(a) $B \text{ up} _ (A \text{ up} \wedge B \text{ up})$

(b) $\text{EXH}(B \text{ up}) _ \text{EXH}(A \text{ up} \wedge B \text{ up})$

Figure 3: Exclusification in inquisitive semantics

$$\text{EXH}(B) _ \text{EXH}(A \wedge B) \quad (B \wedge : A) _ (A \wedge B)$$

Exclusive interpretation

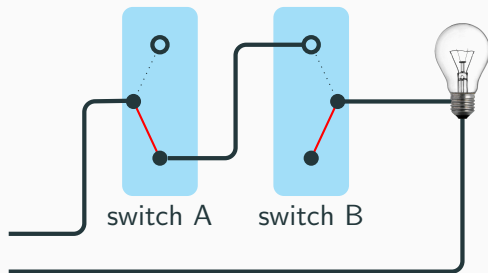


Figure 4: The light is on just in case A is down and B is up.

- (11) a. If switch B was up, the light would be on. B
- b. If switch B was up (and A not up), or switches A and B were up, the light would be on. $(B \wedge \neg A) \vee (A \wedge B)$

A three-valued switch

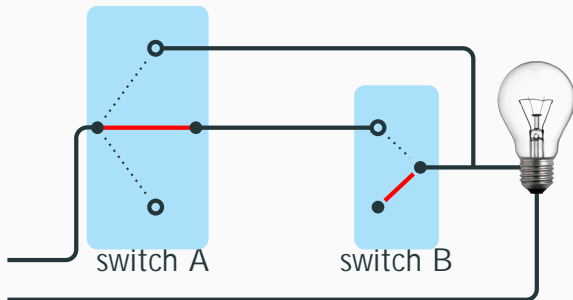


Figure 5: The light is on iff A is up, or A is in the middle and B is up

- (12)
- If B was up, the light would be on.
 - If B was up, or A and B were up, the light would be on.
 - If B was up and A not up, or A and B were up, the light would be on.

What negation does to alternatives

Observation

$B _ (A \wedge B)$ and $(B \wedge : A) _ (A \wedge B)$ seem to raise different hypothetical scenarios

When A is not mentioned, its position is kept fixed

When $: A$ is mentioned, its position is not kept fixed

In particular, $: A$ invites considering A being **down**

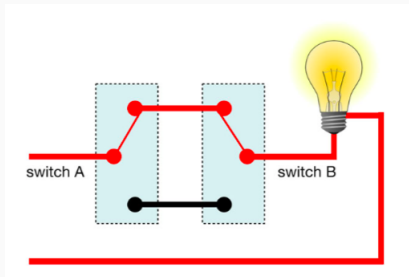
Overt versus covert negation

- (13) a. If **EXH**(B was up), or A and B were up, the light would be on.
- b. If B was up **and A not up**, or A and B were up, the light would be on.

Perhaps **EXH** should be sensitive to counterfactual alternatives

But this invites worries about compositionality

Perhaps overt negation has **extra-semantic** effects



- (4)
- If switch A or switch B was down, the light would be off.
 - If switch A and switch B were not both up, the light would be off.

Ciardelli et al. (2018) give a **semantic** explanation of their data via:

the difference in alternatives between $:(A \wedge B)$ and $:A _ : B$ together with their method of adopting hypothetical assumptions

Summary

Experimental evidence **against**

Alonso-Ovalle (2006)

alternative semantics

Ciardelli et al. (2018)

inquisitive semantics

Fine (2012)

truthmaker semantics

Santorio (2018)

truthmaker/alternative semantics

Waller (2018)

dynamic semantics

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Our results **can** be accounted for by adapting the semantic entry for negation

Schulz (2018) accounts for our data

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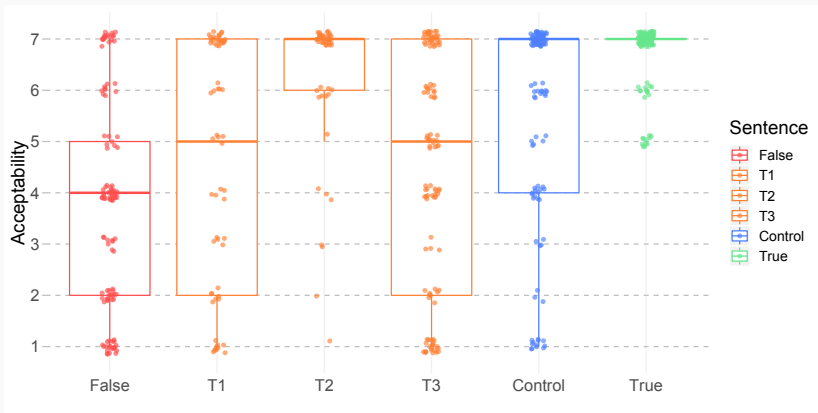
Schulz (2018) accounts for our data

But our results challenge the **semantic** explanation of the data in Ciardelli et al. (2018)

- Maria Aloni and Ivano Ciardelli. A semantics for imperatives, 2011.
- Luis Alonso-Ovalle. *Disjunction in alternative semantics*. PhD thesis, University of Massachusetts Amherst, 2006. URL <http://people.linguistics.mcgill.ca/~luis.alonso-ovalle/papers/alonso-ovalle-diss.pdf>.
- Ivano Ciardelli. Lifting conditionals to inquisitive semantics. In *Semantics and Linguistic Theory*, volume 26, pages 732–752, 2016. doi:10.3765/salt.v26i0.3811.
- Ivano Ciardelli, Linmin Zhang, and Lucas Champollion. Two switches in the theory of counterfactuals. *Linguistics and Philosophy*, 2018. doi:10.1007/s10988-018-9232-4.
- Kit Fine. Counterfactuals without possible worlds. *Journal of Philosophy*, 109(3): 221–246, 2012. doi:10.5840/jphil201210938.
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- Floris Roelofsen and Sam van Gool. Disjunctive questions, intonation, and highlighting. In Maria Aloni, Harald Bastiaanse, Tikitou de Jager, and Katrin Schulz, editors, *Logic, Language and Meaning*, pages 384–394, Berlin, Heidelberg, 2010. Springer. doi:10.1007/978-3-642-14287-1_39.
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- Katrin Schulz. The similarity approach strikes back: Negation in counterfactuals. In Uli Sauerland and Stephanie Solt, editors, *Proceedings of Sinn und Bedeutung 22*, volume 2 of *ZASPiL 61*, pages 343–360. Leibniz-Centre General Linguistics, Berlin, 2018. URL <https://semanticsarchive.net/sub2018/Schulz.pdf>.
- Malte Willer. Simplifying with free choice. *Topoi*, 37(3):379–392, Sep 2018. doi:10.1007/s11245-016-9437-5.

Box plot



F : (A ^ B #)
 T1 : : (A " _B ")
 T2 A " _B "
 T3 B " ^ : A "
 C : B #
 T A "

Schulz (2018)'s experiment

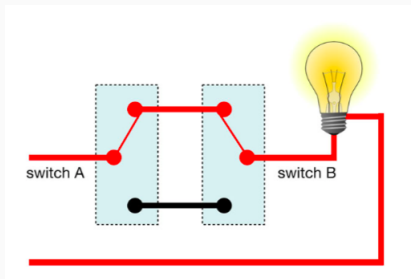


Figure 6: Scenario used in Ciardelli et al. (2018)'s experiment

- (14)
- If the electricity was working, then the light would be on.
 - If the electricity was working and switch A was up, then the light would be on.
 - If the electricity was working and switch A and switch B were not both up, then the light would (still) be off.

Results from Schulz (2018)'s experiment

sentences	true	%	false	%	indet.	%
$E \rightsquigarrow On$	8	16%	42	82%	1	2%
$(E \wedge A) \rightsquigarrow On$	43	84%	5	10%	2	4%
$[E \wedge \neg(A \wedge B)] \rightsquigarrow On$	14	27%	27	53%	8	16%
$[E \wedge \neg(A \wedge B)] \rightsquigarrow On^*$	9	26%	20	59%	5	15%

Figure 7: Results from Schulz (2018)'s experiment

Conclusion

The mechanism for making hypothetical assumptions in Ciardelli et al. (2018) keeps too much fixed