Counterfactuals (not) under discussion

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Overview

Overview

The focus

The focus: counterfactual sentences

(1) If ticket #37 had been bought, it would have won.

Two approaches[1]

- We focus on two approaches:

[1] Stalnaker 1968, 1981 for selectional; von Fintel 1998, Schlenker 2004, Kriz 2015 for homogeneity

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  - Selectional approach

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- We focus on two approaches:
  - Selectional approach
  - Homogeneity approach

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- It found support for the selectional approach
- But it did not control for relevance
- The results remain compatible with both approaches

Addressing the confound

- A novel experiment

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  - manipulating relevance

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  - enlarging the set of sentences

Addressing the confound

- A novel experiment
  - manipulating relevance
  - enlarging the set of sentences
- The results again support the selectional approach

Two other approaches[2]

- Focus is on the two approaches above

[2] Lewis 1973, Kratzer 2012 for Universal; Bar-Lev and Bassi 2016 for Implicature

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- We also discuss briefly two other approaches

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Two other approaches[2]

- Focus is on the two approaches above
- We also discuss briefly two other approaches
  - Universal approach
  - Implicature approach
- Neither is in line with our results

[2] Lewis 1973, Kratzer 2012 for Universal; Bar-Lev and Bassi 2016 for Implicature

Rest of today

- Background and the two approaches

Rest of today

- Background and the two approaches
- Previous study

Rest of today

- Background and the two approaches
- Previous study
- Potential confound

Rest of today

- Background and the two approaches
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- Potential confound
- Experiment

Rest of today

- Background and the two approaches
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- Potential confound
- Experiment
- Discussion and conclusion

Background

Background

The two approaches

The meaning of counterfactuals

(2) If ticket #37 had been bought, it would have won.

The two approaches[3]

- Selectional approach
- Homogeneity approach

[3] Stalnaker 1968, 1981 for selectional; von Fintel 1998, Schlenker 2004, Kriz 2015 for homogeneity

The two approaches

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- On both approaches, counterfactuals consider 'closest' antecedent-worlds
- They differ along two dimensions:
  - The quantificational force
  - How they handle undefinedness

The selectional approach[4]

(3) If ticket #37 had been bought, it would have won.

[4] Stalnaker 1968, 1981, 1984

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- TRUE iff the closest world where #37 is bought is a world in which it wins

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  - (SUPER)TRUE if true in all such worlds
  - (SUPER)FALSE if false in all of them
  - UNDEFINED otherwise

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The homogeneity approach[5]

- Inspired by the analogous approach to plural definites

  (4) The tickets that have been bought won.

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- TRUE iff all of the tickets that were bought won

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  (4) The tickets that have been bought won.

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  (4) The tickets that have been bought won.

- TRUE iff all of the tickets that were bought won
- FALSE iff all of the tickets that were bought didn't win
- UNDEFINED otherwise
- Homogeneity:
  $\rightsquigarrow$ *either all of the tickets that were bought won; or all of them didn't win*

[5] von Fintel 1997, Schlenker 2004, Kriz 2015

The homogeneity approach[6]

(5) If ticket #37 had been bought, it would have won.

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(5) If ticket #37 had been bought, it would have won.

- TRUE iff in all of the closest worlds where it is bought it wins
- FALSE iff in all of the closest worlds where it is bought it doesn't win

[6] von Fintel 1997, Schlenker 2004, Kriz 2015

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- Homogeneity:
  $\rightsquigarrow$ *either in all closest worlds where ticket #37 is bought, it wins; or in all of such worlds, it doesn't win*

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Divergent predictions

- Mixed lottery: all have a chance to win but none is guaranteed to win

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- Both approaches predict undefinedness in the simple positive case

  (6) If ticket #37 had been bought, it would have won.

- But differ in more complex cases

  (7) None of tickets would have won, if it had been bought

Selectional approach

- Mixed lottery all have a chance to win but none is guaranteed to win

  (8) If ticket #37 had been bought, it would have won.

Selectional approach

- Mixed lottery all have a chance to win but none is guaranteed to win

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  → in some candidate closest world #37 wins and in some it loses

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  ... (SUPER)FALSE

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  (8) If ticket #37 had been bought, it would have won. UNDEFINED

  → in some candidate closest world #37 wins and in some it loses

  (9) None of the tickets would have won, if it had been bought
  ... (SUPER)FALSE

  → In all candidate closest worlds some ticket or other always win

Homogeneity approach

- Mixed lottery: all have a chance to win but none is guaranteed to win

(10) If ticket #37 had been bought, it would have won. UNDEFINED
$\rightsquigarrow$ *if bought, ticket #37 is guaranteed to win or guaranteed to lose* $\times$

[7] Regardless of the strength of homogeneity projection through negative quantifiers

Homogeneity approach

- Mixed lottery: all have a chance to win but none is guaranteed to win

(10) If ticket #37 had been bought, it would have won. UNDEFINED
$\rightsquigarrow$ *if bought, ticket #37 is guaranteed to win or guaranteed to lose* ×

(11) None of the tickets would have won, if it had been bought
... UNDEFINED

[7] Regardless of the strength of homogeneity projection through negative quantifiers

Homogeneity approach

- Mixed lottery: all have a chance to win but none is guaranteed to win

(10) If ticket #37 had been bought, it would have won. UNDEFINED
⇝ *if bought, ticket #37 is guaranteed to win or guaranteed to lose* ×

(11) None of the tickets would have won, if it had been bought
UNDEFINED
⇝ *all/some of the tickets are guaranteed to win or guaranteed to lose, if bought*[7] ×

[7] Regardless of the strength of homogeneity projection through negative quantifiers

Summary

THEORY	positive	negative
Selectional	undefined	false
Homogeneity	undefined	undefined

Summary

THEORY	positive	negative
Selectional	undefined	false
Homogeneity	undefined	undefined

Background

The previous study

Previous study[8]

- Positive and negative cases in mixed lottery scenarios

[8] Marty, Romoli, and Santorio 2019

Previous study[8]

- Positive and negative cases in mixed lottery scenarios

  (12) If ticket #37 was bought, it would win.

  (13) None of the tickets would win, if it was bought.

[8] Marty, Romoli, and Santorio 2019

Previous study[8]

- Positive and negative cases in mixed lottery scenarios

  (12) If ticket #37 was bought, it would win.

  (13) None of the tickets would win, if it was bought.

- We used futureless vivid conditionals in this study

[8] Marty, Romoli, and Santorio 2019

Previous study[9]

- Control cases as baselines for falsity

[9] Marty, Romoli, and Santorio 2019

Previous study[9]

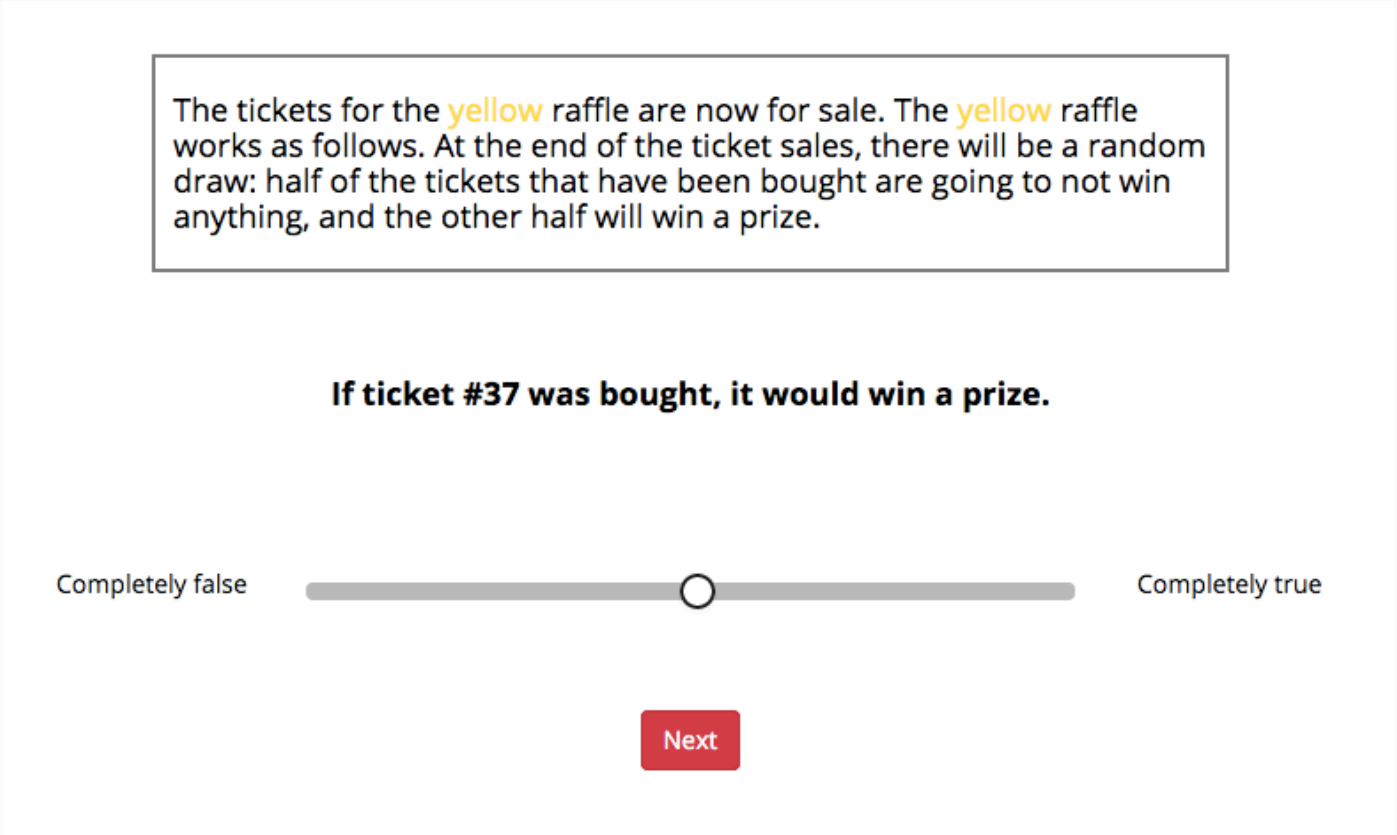
- Control cases as baselines for falsity

  (14) If ticket #37 was bought, necessarily, it would win.

  (15) None of the tickets could win, if it was bought.

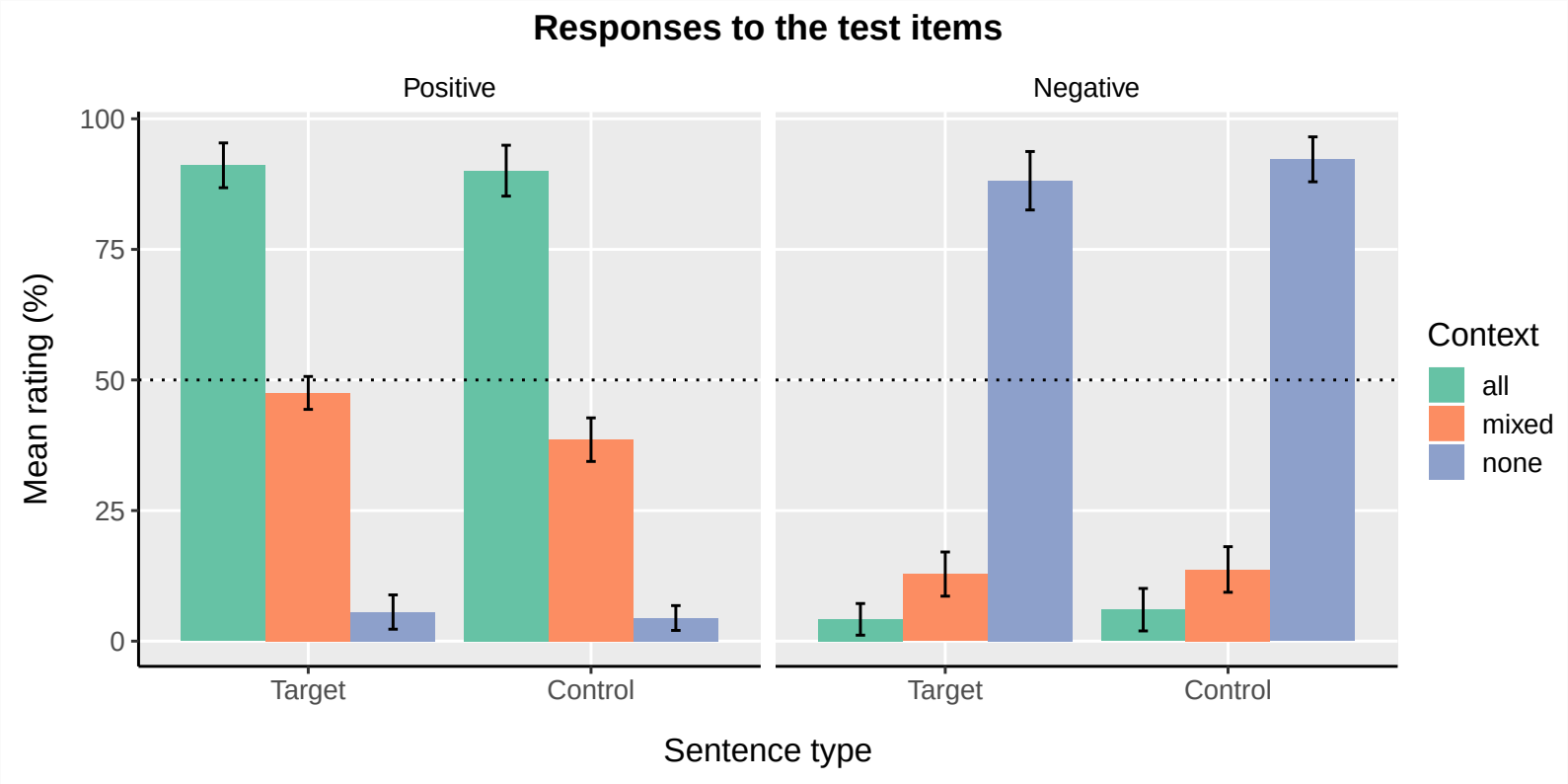
[9] Marty, Romoli, and Santorio 2019

Previous study[10]



[10] Marty, Romoli, and Santorio 2019

Previous study[11]



[11] Marty, Romoli, and Santorio 2019

Previous study

- Participants gave intermediate values to positive cases

Previous study

- Participants gave intermediate values to positive cases
- Their response to the negative was as low as false controls

Previous study

- Participants gave intermediate values to positive cases
- Their response to the negative was as low as false controls
- In line with the selectional approach

Previous study

- Participants gave intermediate values to positive cases
- Their response to the negative was as low as false controls
- In line with the selectional approach
- Challenging for the homogeneity approach

Background

The potential confound

Relevance

- The homogeneity approach supplemented with relevance sensitivity

Illustrating with plural definites

(16) The tickets that have been bought won.

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TRUE iff all of the tickets that were bought won $\forall$

Illustrating with plural definites

(16) The tickets that have been bought won.

TRUE iff all of the tickets that were bought won $\forall$

FALSE iff all of the tickets that were bought didn't win $\neg\exists$

Illustrating with plural definites

(16) The tickets that have been bought won.

TRUE iff all of the tickets that were bought won	$\forall$
FALSE iff all of the tickets that were bought didn't win	$\neg\exists$
UNDEFINED otherwise	$\exists \wedge \neg\forall$

Illustrating with plural definites

- In a mixed lottery scenario where some tickets won and some lost

Illustrating with plural definites

- In a mixed lottery scenario where some tickets won and some lost

  (17) The tickets that have been bought won. UNDEFINED

Illustrating with plural definites

- In a mixed lottery scenario where some tickets won and some lost

  (17) The tickets that have been bought won. UNDEFINED

- But what is relevant can make the undefined case indistinguishable from the true/false one

Reinterpreting undefinedness

- A pragmatic mechanism for contextual modulation based on relevance

Reinterpreting undefinedness

- A pragmatic mechanism for contextual modulation based on relevance
- Relevance modelled as the QuD or current issue in the context

Existential QuDs

- Whether any tickets that was bought won

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- Whether any tickets that was bought won $\{\{\exists\}, \{\neg\exists\}\}$

Existential QuDs

- Whether any tickets that was bought won $\{\{\exists\}, \{\neg\exists\}\}$

(18) a. $\forall$ and $\exists \wedge \neg\forall$ $\Rightarrow \{\exists\}$

Existential QuDs

- Whether any tickets that was bought won $\{\{\exists\}, \{\neg\exists\}\}$

(18) a. $\forall$ and $\exists \wedge \neg\forall$ $\Rightarrow \{\exists\}$

b. $\neg\exists$ $\Rightarrow \{\neg\exists\}$

Effectively true

- Whether any tickets that was bought won

(19) The tickets that have been bought won.

Effectively true

- Whether any tickets that was bought won

(19) The tickets that have been bought won. $\approx$ *true*

Universal QuDs

- Whether all tickets that were bought won

Universal QuDs

- Whether all tickets that were bought won $\{\{\forall\}, \{\neg\forall\}\}$

Universal QuDs

- Whether all tickets that were bought won $\{\{\forall\}, \{\neg\forall\}\}$

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Universal QuDs

- Whether all tickets that were bought won $\{\{\forall\}, \{\neg\forall\}\}$

(20) a. $\forall$ $\Rightarrow \{\forall\}$

b. $\neg\exists$ and $\exists \wedge \neg\forall$ $\Rightarrow \{\neg\forall\}$

Effectively false

- Whether all tickets that were bought won

(21) The tickets that have been bought won.

Effectively false

- Whether all tickets that were bought won

(21) The tickets that have been bought won. $\approx$ *false*

Same for counterfactuals

(22) If ticket #37 was bought, it would win

Same for counterfactuals

(22) If ticket #37 was bought, it would win

TRUE iff in all closest worlds were it is bought it wins □

Same for counterfactuals

(22) If ticket #37 was bought, it would win

TRUE iff in all closest worlds were it is bought it wins $\Box$

FALSE iff in all closest worlds were it is bought it doesn't win $\neg\Diamond$

Same for counterfactuals

(22) If ticket #37 was bought, it would win

TRUE iff in all closest worlds were it is bought it wins $\Box$

FALSE iff in all closest worlds were it is bought it doesn't win $\neg\Diamond$

UNDEFINED otherwise $\Diamond \wedge \neg\Box$

Existential QuDs

- Whether it has a chance to win $\{\{\Diamond\}, \{\neg\Diamond\}\}$

Existential QuDs

- Whether it has a chance to win $\{\{\Diamond\}, \{\neg\Diamond\}\}$

(23) a. $\Box$ and $\Diamond \wedge \neg\Box$ $\Rightarrow \{\Diamond\}$

b. $\neg\Diamond$ $\Rightarrow \{\neg\Diamond\}$

Effectively true

- Whether it has a chance to win

(24) If ticket #37 was bought, it would win. $\approx$ *true*

Universal QuDs

- Whether it is guaranteed to win $\{\{\Box\}, \{\neg\Box\}\}$

Universal QuDs

- Whether it is guaranteed to win $\{\{\Box\}, \{\neg\Box\}\}$

Universal QuDs

- Whether it is guaranteed to win $\{\{\Box\}, \{\neg\Box\}\}$

(25) a. $\Box$ $\Rightarrow \{\Box\}$

b. $\Diamond \wedge \neg\Box$ and $\neg\Diamond$ $\Rightarrow \{\neg\Box\}$

Effectively false

- Whether it is guaranteed to win

(26) If ticket #37 was bought, it would win. $\approx$ *false*

The opposite for the negative case

- For each ticket, whether it is guaranteed to win

  (27) None of the tickets would win, if it was bought

The opposite for the negative case

- For each ticket, whether it is guaranteed to win

  (27) None of the tickets would win, if it was bought $\approx$ *true*

The opposite for the negative case

- For each ticket, whether it is guaranteed to win

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- For each ticket, whether it has a chance to win

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The opposite for the negative case

- For each ticket, whether it is guaranteed to win

  (27) None of the tickets would win, if it was bought $\approx$ *true*

- For each ticket, whether it has a chance to win

  (28) None of the tickets would win, if it was bought $\approx$ *false*

Summary

QuDs	simple	negative
Existential	true	false
Universal	false	true

The confound in a gist

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- Participants might have accommodated existential QuDs

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- Participants might have accommodated existential QuDs
- Reinterpreting undefinedness to effectively true in the simple case
- Effectively false in the negative case

The confound in a gist

- The results remain compatible with a homogeneity approach when supplemented with a relevance-sensitive reinterpretation of undefinedness

Experiment

Experiment

Motivation

Addressing the confound

- We manipulated what was relevant in the context

Addressing the confound

- We manipulated what was relevant in the context
  - Whether each ticket had a chance to win Ex-QuD

Addressing the confound

- We manipulated what was relevant in the context
  - Whether each ticket had a chance to win — Ex-QuD
  - Whether each ticket was guaranteed to win — U-QuD

Other changes

- We also moved to genuine counterfactuals

  (29) None of these tickets would have won if it had been bought.

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  - POS-STRONG
    Every one of these tickets would have won if it had been bought.

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  - POS-STRONG
    Every one of these tickets would have won if it had been bought.
  - NEG-WEAK
    Not every one of these tickets would have won if it had been bought.

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	SELECTIONAL			
	every	**some**	**none**	**not every**
Universal	FALSE	TRUE	FALSE	TRUE
Existential	FALSE	TRUE	FALSE	TRUE

Predictions: The homogeneity approach

- Concerning the truth value of counterfactuals

Predictions: The homogeneity approach

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  - all of them to be undefined

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    - all of them to be undefined
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Predictions: The homogeneity approach

- Concerning the truth value of counterfactuals
  - all of them to be undefined
- Concerning QuDs
  - depending on the QuD, some of the counterfactuals can be judged effectively true

	HOMOGENEITY			
	every	**some**	**none**	**not every**
Universal	FALSE	FALSE	TRUE	TRUE
Existential	TRUE	TRUE	FALSE	FALSE

Predictions: summary

	SELECTIONAL			
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Predictions: summary

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Experiment

Design

Experiment overview

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- two tasks:

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Experiment overview

- 87 participants in the final sample
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- 2 between-subject QUD conditions ($N = 43$ in existential QUD)
- 12 target sentences and 12 fillers

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  - Polarity (negative, positive)

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  - Polarity (negative, positive)
  - Quantifier strength (weak, strong)

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- counterfactuals embedded under quantifiers
  - $2 \times 2 \times 3$ within-subject factors
  - Polarity (negative, positive)
  - Quantifier strength (weak, strong)
  - Lottery scenario (all, mixed, none)

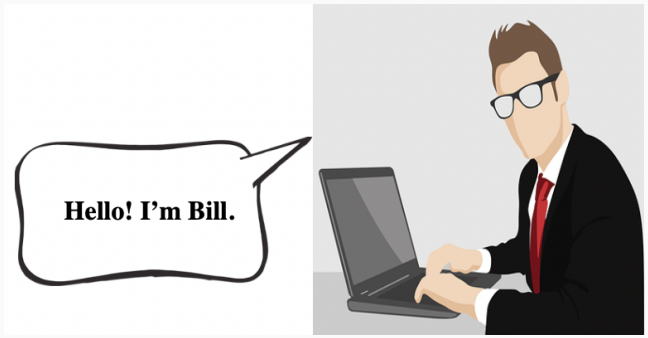
QUD manipulation

Ex-qud

I want to have
a shot at winning.

Question whether:
each ticket `has a chance` to win

U-qud



I care about winning
each and every single time.

Question whether:
each ticket `is guaranteed` to win

Three lottery contexts

All

At the end of the ticket sales, every ticket that has been bought win a prize.

Three lottery contexts

All

At the end of the ticket sales, every ticket that has been bought win a prize.

Mixed

At the end of the sales, only some of the tickets that have been bought win a prize.

Three lottery contexts

All

At the end of the ticket sales, every ticket that has been bought win a prize.

Mixed

At the end of the sales, only some of the tickets that have been bought win a prize.

None

At the end of the ticket sales, none of the tickets that have been bought win a prize.

Target sentences

- POS-STRONG

  Every one of these tickets would have won if it had been bought.

- NEG-WEAK

  Not every one of these tickets would have won if it had been bought.

- POS-WEAK

  Some of these tickets would have won if they had been bought.

- NEG-STRONG

  None of these tickets would have won if it had been bought.

QUD check task

The orange raffle works as follows. The organizers want all participants to be content: at the end of the ticket sales, **every ticket that has been bought win a prize**.

Do you think that the person with John's investor profile, would invest in the orange raffle this year?

○ **No** ○ **Yes**

Figure 1: Ex-qud, All lottery context.

Graded TVJ task

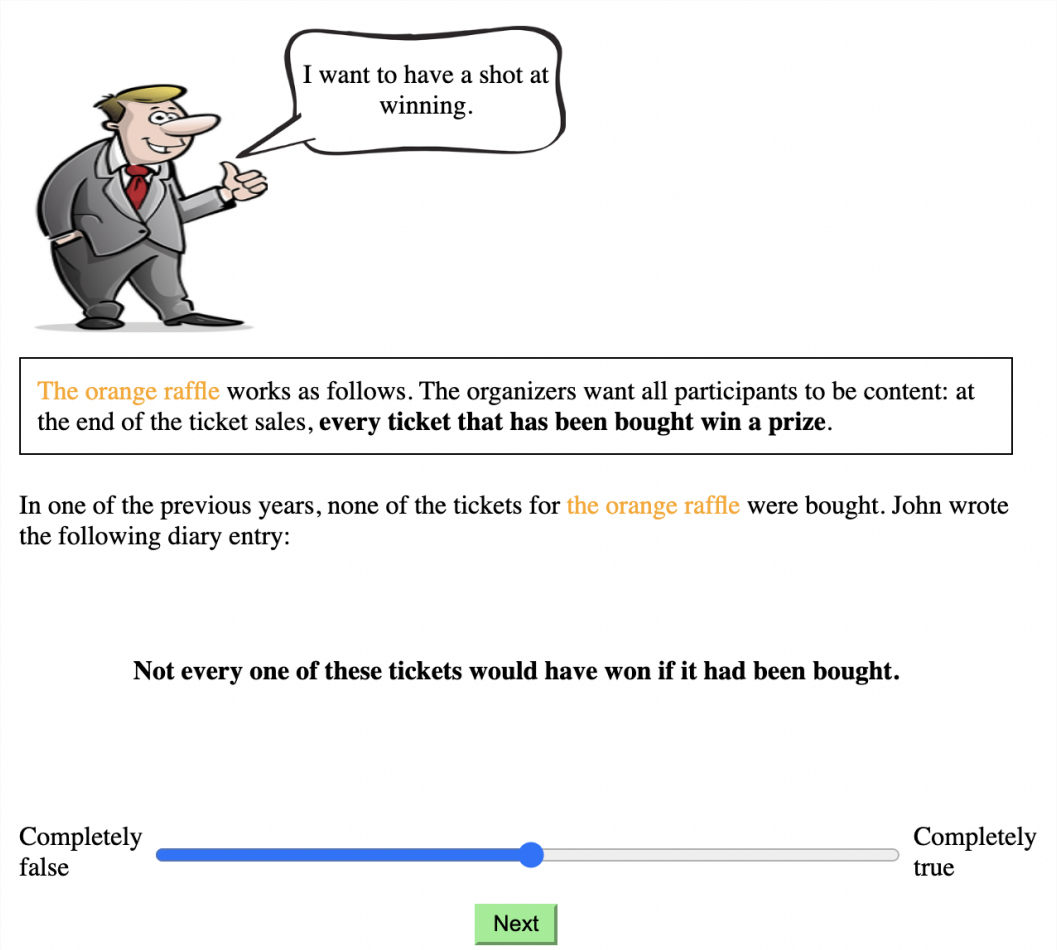
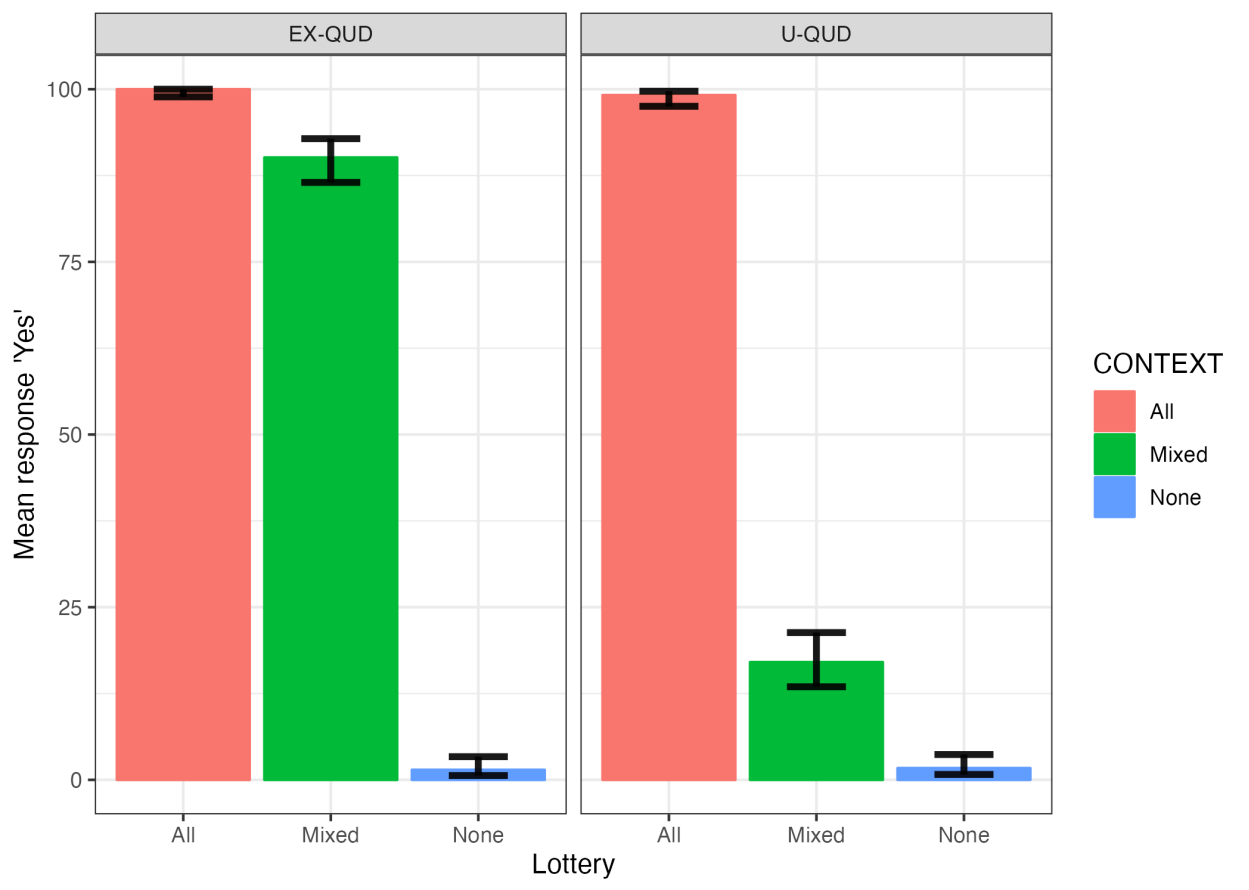


Figure 2: Ex-qud, All lottery context × Neg × Weak.

Experiment

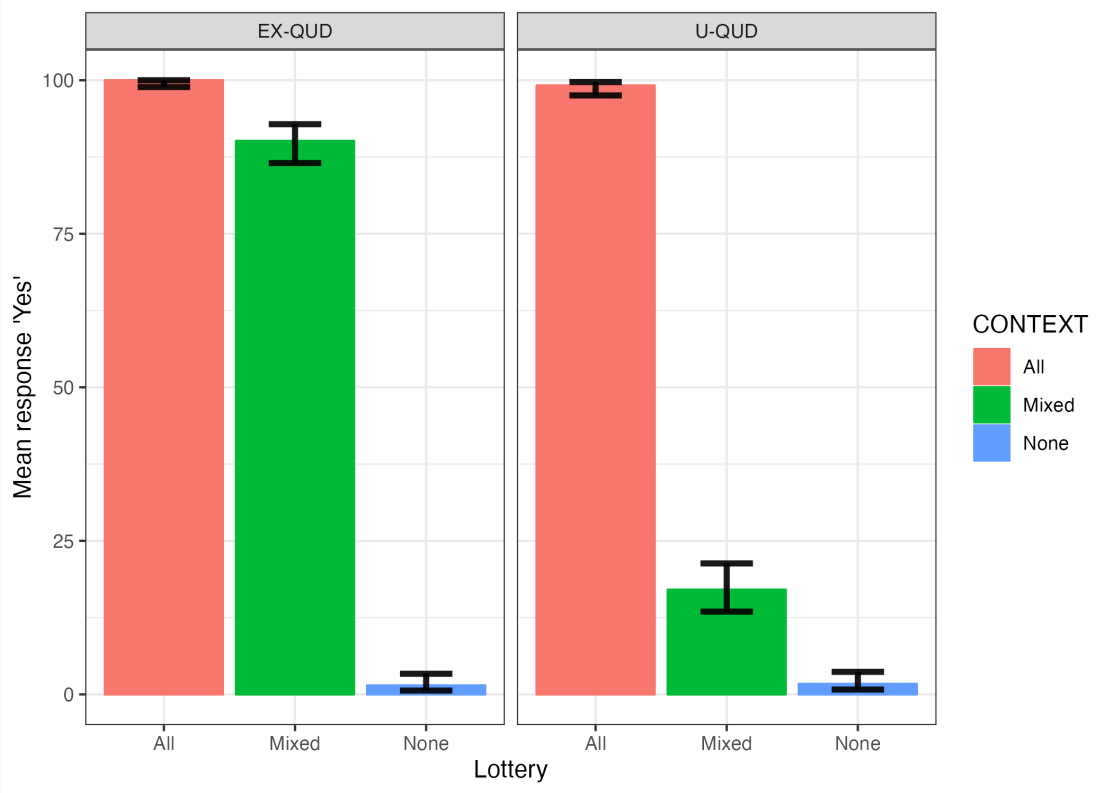
Results

QUD check task



Ceiling and floor effects in ALL and NONE lotteries.

QUD check task



Significantly higher 'Yes' response rate in MIXED context under EX-QUD.

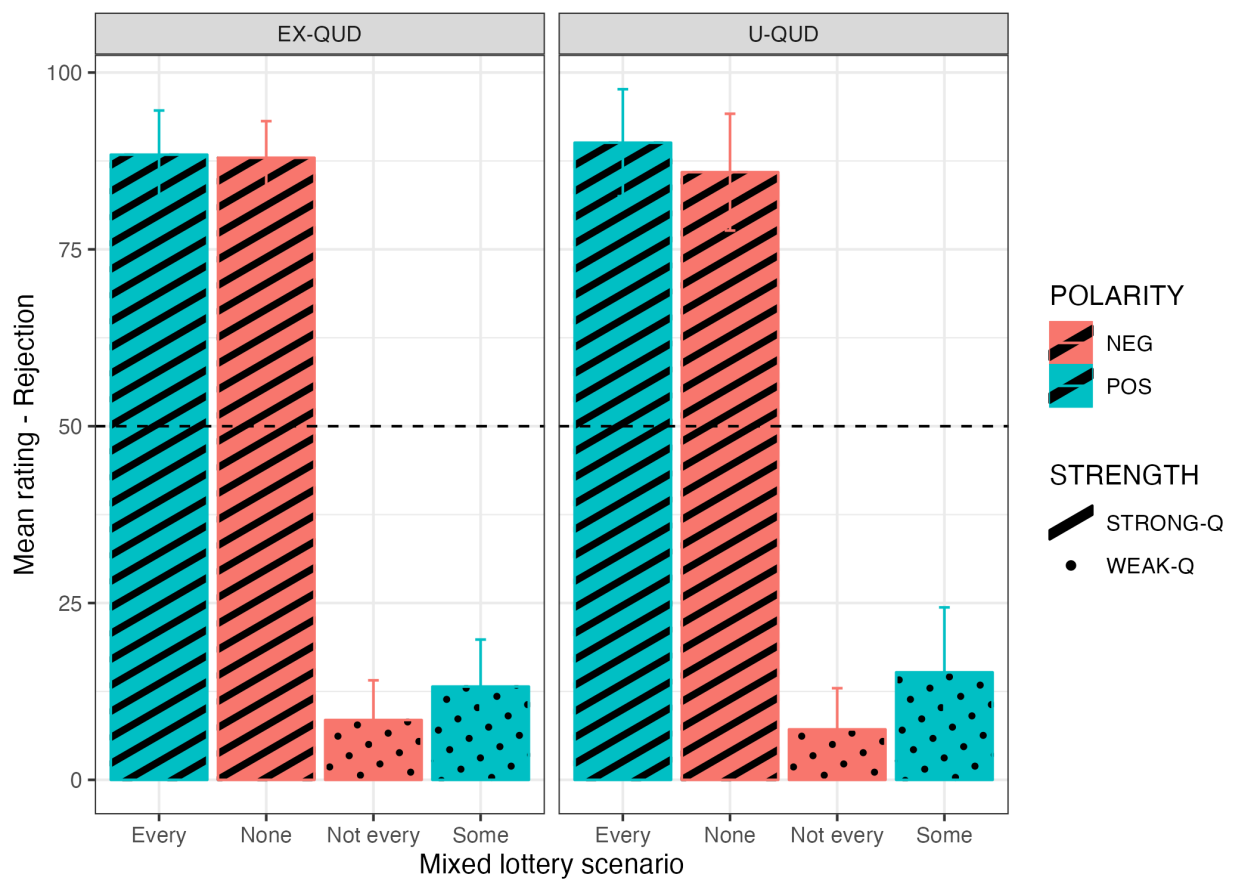
QUD check task - summary

- Successful QUD manipulation.

QUD check task - summary

- Successful QUD manipulation.
- Responses incorrect with regard to QUD manipulation were excluded from further analysis
  (in MIXED context responses: 'Yes' for U-QUD and 'No' for E-QUD).

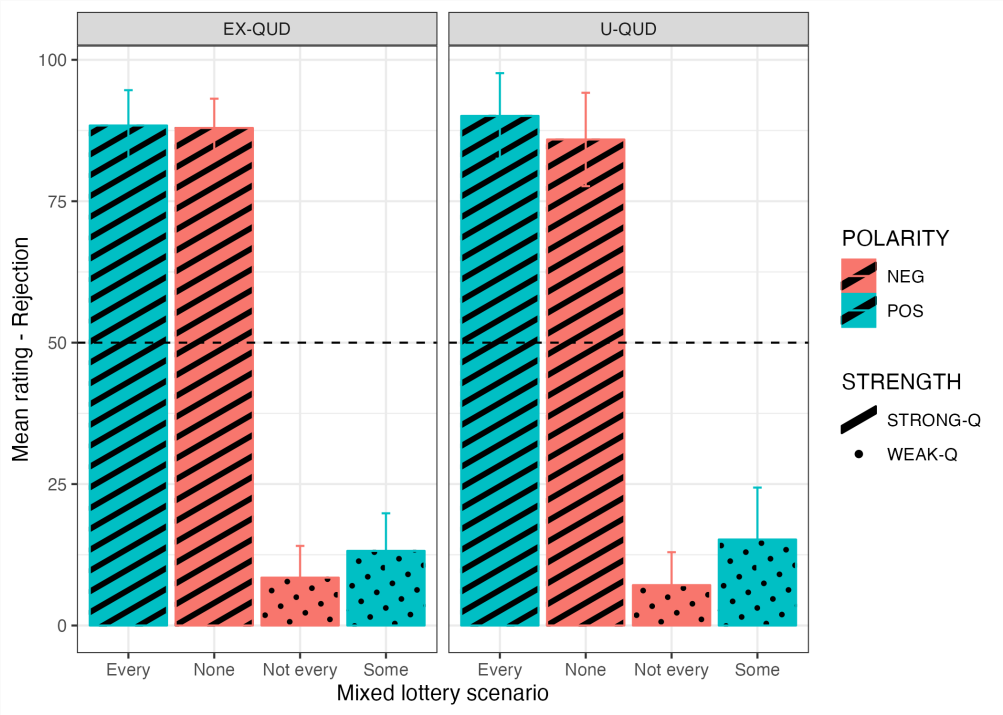
Graded TVJ task



Mean rejection rate for each quantifier.

Homogeneity approach

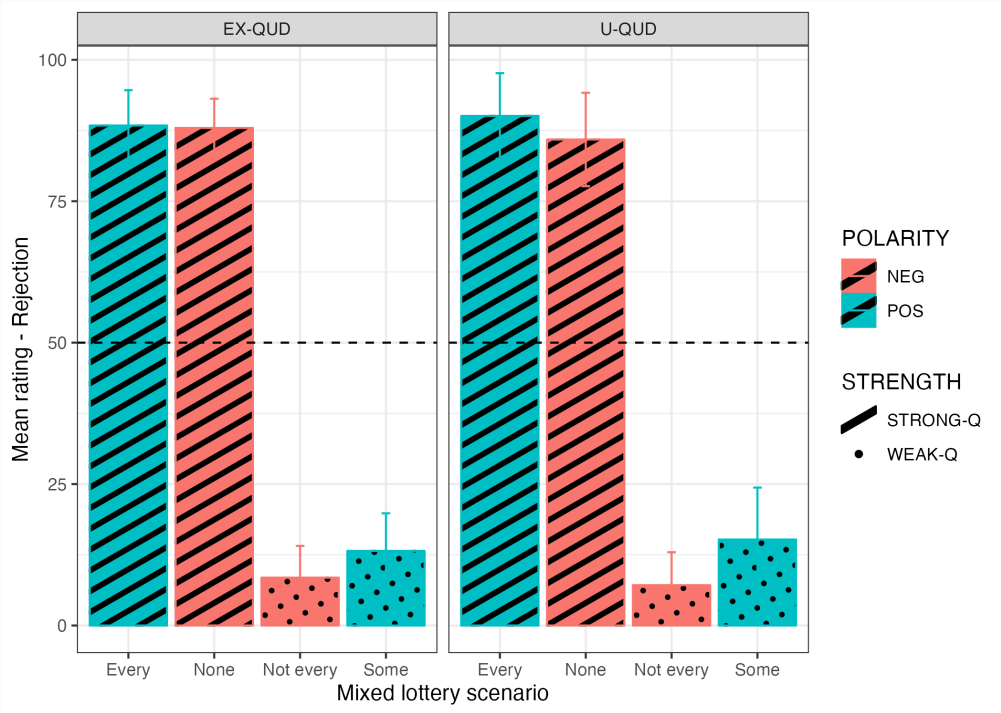
	HOMOGENEITY			
	every	**some**	**none**	**not every**
Universal	FALSE	FALSE	TRUE	TRUE
Existential	TRUE	TRUE	FALSE	FALSE



No effect of QuD and QuD × Polarity interaction.

Selectional approach

	SELECTIONAL			
	every	**some**	**none**	**not every**
Universal	FALSE	TRUE	FALSE	TRUE
Existential	FALSE	TRUE	FALSE	TRUE



Only significant effect of quantifier strength.

Discussion

Discussion

The main result

Our contribution

- We addressed the confound of the previous study

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- by manipulating QuDs and expanding the embedding environments

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- but no effect of QuD

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- We addressed the confound of the previous study
- by manipulating QuDs and expanding the embedding environments
- we find an effect of quantifier strength
- but no effect of QuD
- or interaction of QuD and Polarity

The main result

- The results are in line with the selectional approach

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- challenging for the homogeneity approach

The main result

- The results are in line with the selectional approach
- challenging for the homogeneity approach
- even if supplemented with QuD-sensitive reinterpretation of undefinedness

Discussion

Other approaches

Two other approaches

- What about the two other approaches?
  - Universal approach
  - Implicature approach

Two other approaches

- What about the two other approaches?
  - Universal approach
  - Implicature approach
- Neither in line with our results

Predictions: universal approach[12]

- In this experiment we tested real counterfactuals

[12] Lewis 1973, Kratzer 2012

Predictions: universal approach[12]

- In this experiment we tested real counterfactuals
- Regardless of the QuD: the effect of Polarity

[12] Lewis 1973, Kratzer 2012

Predictions: universal approach[12]

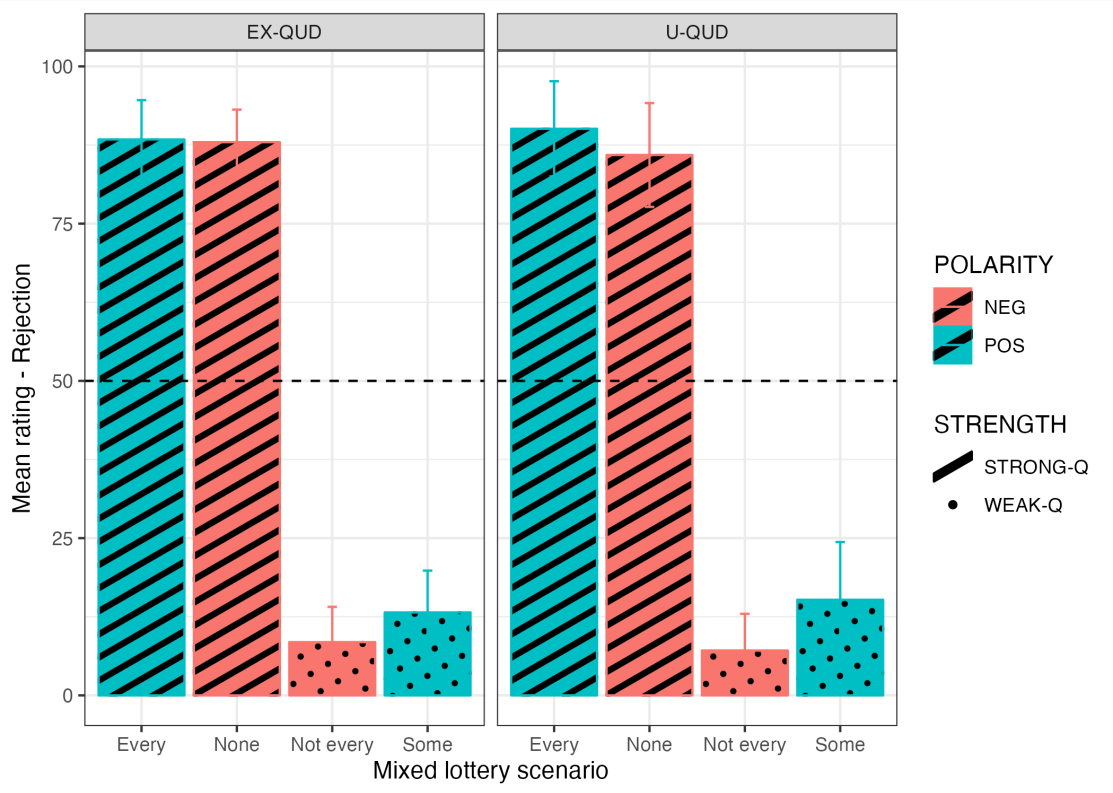
- In this experiment we tested real counterfactuals
- Regardless of the QuD: the effect of Polarity

	UNIVERSAL			
	every	**some**	**none**	**not every**
Universal	FALSE	FALSE	TRUE	TRUE
Existential	FALSE	FALSE	TRUE	TRUE

[12] Lewis 1973, Kratzer 2012

Predictions: universal approach

	UNIVERSAL VS. OUR RESULTS			
QUD	**every**	**some**	**none**	**not every**
EX-/ U-	FALSE	FALSE	TRUE	TRUE



Predictions: implicature approach[13]

- Implicatures are sensitive to relevance

[13] Bassi and Bar-Lev 2016

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Predictions: implicature approach[13]

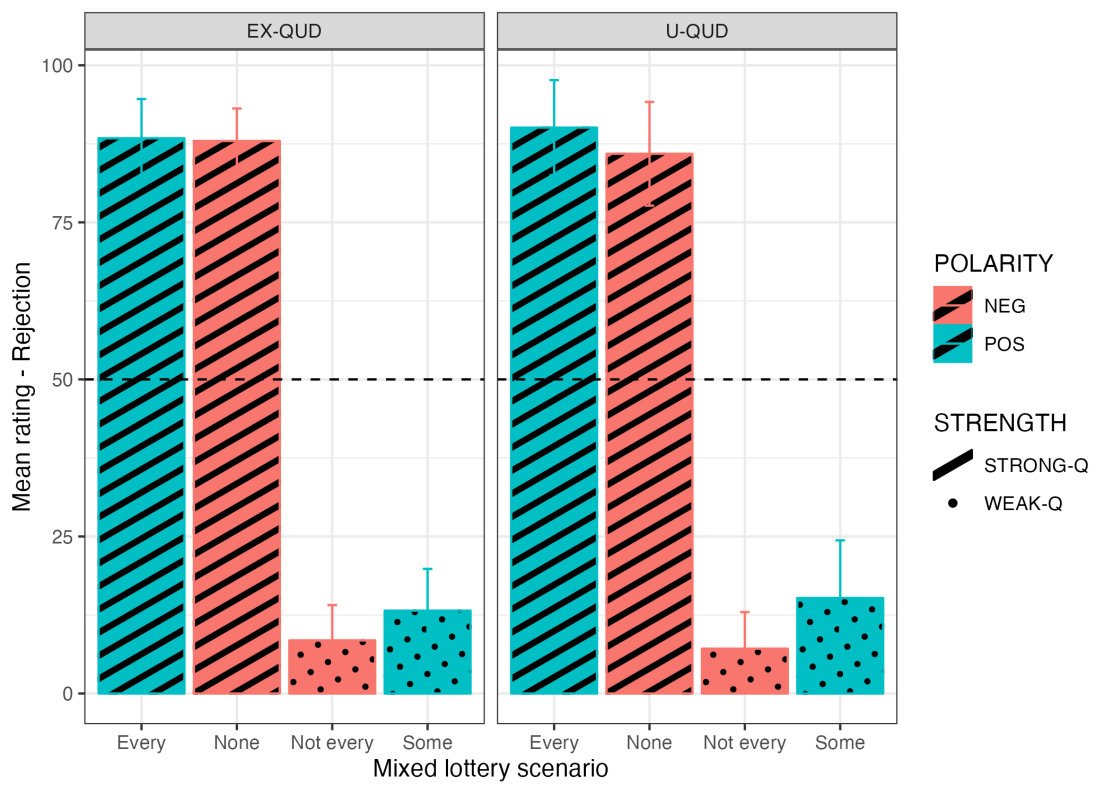
- Implicatures are sensitive to relevance
- It predicts relevance sensitivity where implicatures are involved.
- Effect of QuD only for every and some

	IMPLICATURE			
	every	**some**	**none**	**not every**
Universal	FALSE IMP	FALSE IMP	FLASE	FALSE
Existential	TRUE	TRUE	FALSE	FALSE

[13] Bassi and Bar-Lev 2016

Predictions: implicature approach

	IMPLICATURE VS. OUR RESULTS			
	every	**some**	**none**	**not every**
Universal	FALSE IMP	FALSE IMP	FLASE	FALSE
Existential	TRUE	TRUE	FALSE	FALSE



In sum

- Neither of the two alternative approach is compatible with our results

Discussion

Connection to other phenomena

Extensions

- Controlling for what is relevant in the context

[14] Augurzky et al 2022
[15] Chao and Breheny 2019

Extensions

- Controlling for what is relevant in the context
- To investigate a similar debate with other phenomena:

[14] Augurzky et al 2022
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Extensions

- Controlling for what is relevant in the context
- To investigate a similar debate with other phenomena:
  - Plural definites[14]

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Extensions

- Controlling for what is relevant in the context
- To investigate a similar debate with other phenomena:
  - Plural definites[14]
  - Donkey anaphora[15]
  - ...

[14] Augurzky et al 2022
[15] Chao and Breheny 2019

Extensions

- Controlling for what is relevant in the context
- To investigate a similar debate with other phenomena:
  - Plural definites[14]
  - Donkey anaphora[15]
  - ...
- For these cases, we find the effect of QUDs

[14] Augurzky et al 2022
[15] Chao and Breheny 2019

Extensions

- This type of experimental investigations allows us to distinguish between these cases

Extensions

- This type of experimental investigations allows us to distinguish between these cases
- on the face of it, they look very similar and have been given similar analyses

Thanks!