Homogeneity in (non)monotonic contexts

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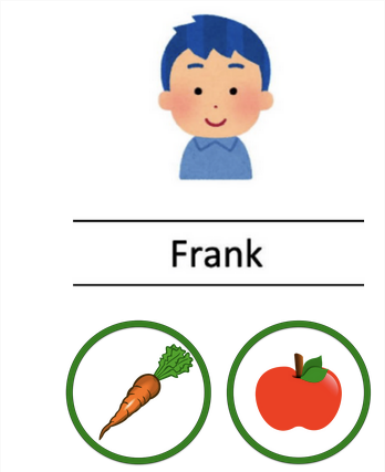
Overview

The focus: plural definites

Frank ate the items in front of him.



Homogeneity

(1) Frank ate the items.
≈ Frank ate all of the items.

Homogeneity

(1) Frank ate the items.
≈ Frank ate all of the items.

(2) Frank didn't eat the items.
≠ Frank didn't eat all of the items.

Homogeneity

(1) Frank ate the items.
≈ Frank ate all of the items.

(2) Frank didn't eat the items.
≠ Frank didn't eat all of the items.
≈ Frank didn't eat any of the items.

Three main approaches

- Implicature approach Magri 2017, Bar-Lev 2021

Three main approaches

- Implicature approach — Magri 2017, Bar-Lev 2021
- Cognitive biases approach — Sbardolini 2023; also Aloni 2022

Three main approaches

- Implicature approach — Magri 2017, Bar-Lev 2021
- Cognitive biases approach — Sbardolini 2023; also Aloni 2022
- Gappy approach — Kriz 2015, Kriz & Spector 2021, Guerrini & Wehbe 2024

Homogeneity in quantificational contexts

- We look at plural definites in quantificational contexts.

Homogeneity in quantificational contexts

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- Varying the monotonicity of the quantifiers.

Homogeneity in quantificational contexts

- We look at plural definites in quantificational contexts.
- Varying the monotonicity of the quantifiers.
    - Positive or negative

Homogeneity in quantificational contexts

- We look at plural definites in quantificational contexts.
- Varying the monotonicity of the quantifiers.
    - Positive or negative
    - Monotonic or non-monotonic

Homogeneity in quantificational contexts

(3) a. Each boy ate the items in front of him.
b. Exactly/Only one boy ate the items in front of him.

Homogeneity in quantificational contexts

(3) a. Each boy ate the items in front of him.
b. Exactly/Only one boy ate the items in front of him.

(4) a. No boy ate the items in front of him.
b. Exactly/Only one boy didn't eat the items in front of him.

Homogeneity in non-monotonic contexts

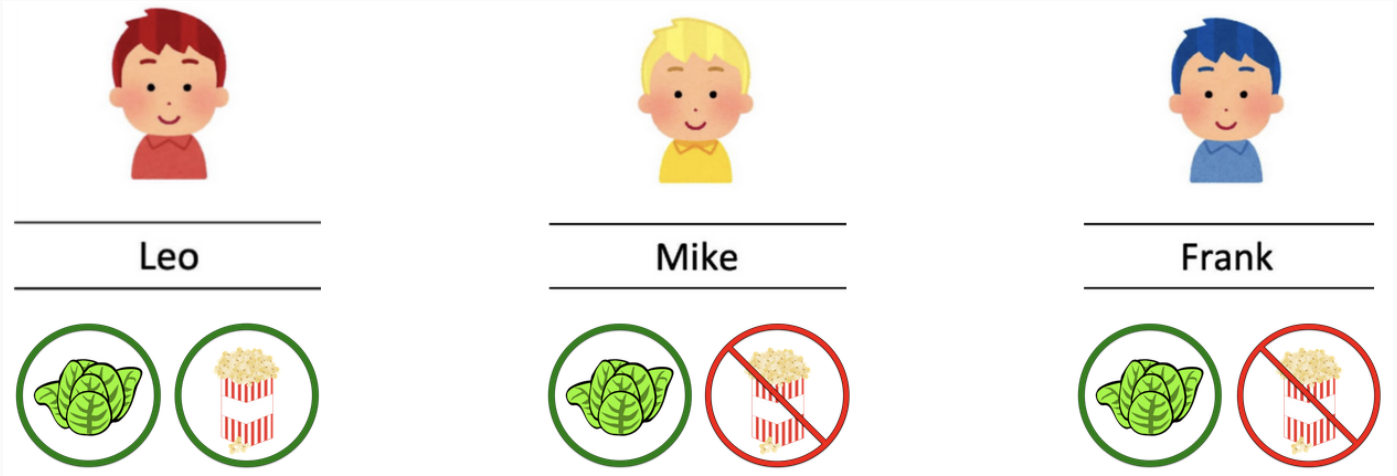
Exactly/Only one boy ate the items in front of him.

Homogeneity in non-monotonic contexts

Exactly/Only one boy ate the items in front of him.

Homogeneity in non-monotonic contexts

Exactly/Only one boy ate the items in front of him.



- Divergent predictions for the three approaches in those contexts

Today

- Background

Today

- Background
- The three main approaches and their predictions

Today

- Background
- The three main approaches and their predictions
- Previous studies

Today

- Background
- The three main approaches and their predictions
- Previous studies
- Two experiments

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- Background
- The three main approaches and their predictions
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- Discussion

Today

- Background
- The three main approaches and their predictions
- Previous studies
- Two experiments
- Discussion
- Conclusion and extensions

Introduction

Introduction

Plural definites

Homogeneity

(5) Frank ate the items.
≈ Frank ate all of the items.

(6) Frank didn't eat the items.
≈ Frank didn't eat any of the items.

Non-maximality

(7) Frank opened his presents
≈ *Frank opened all of his presents*

Non-maximality

(7) Frank opened his presents
≈ *Frank opened all of his presents*

Context: Whether Frank opened any of his presents.

Non-maximality

(7) Frank opened his presents
≈ *Frank opened all of his presents*

Context: Whether Frank opened any of his presents.

(8) Frank opened his presents

Non-maximality

(7) Frank opened his presents
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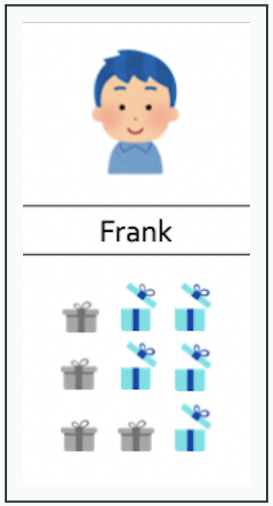
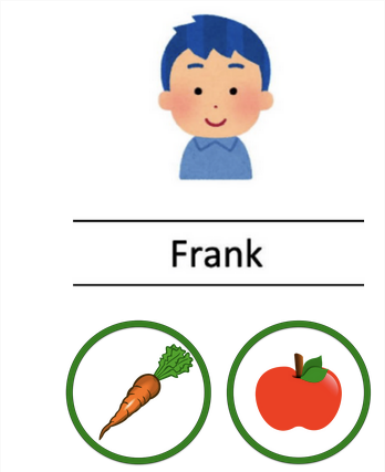
Context: Whether Frank opened any of his presents.

(8) Frank opened his presents



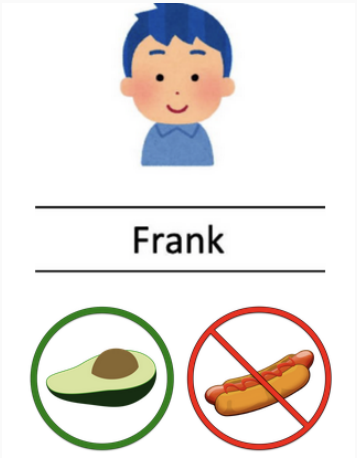
Controlling for non-maximality

Frank ate the items in front of him.



Controlling for non-maximality

Frank ate the items in front of him.



Inspired by conjoined nominals

Frank ate the avocado and the hotdog.

Non-maximality

- Putting non-maximality aside for now

Non-maximality

- Putting non-maximality aside for now
- We come back to it below

Homogeneity in non-monotonic contexts[1]

(9) Exactly one boy ate the items in front of him.

[1] Kriz and Chemla 2016, Magri 2017, Romoli et al. 2023; see also Gotzner, Romoli, and Santorio 2018

Homogeneity in non-monotonic contexts[1]

(9) Exactly one boy ate the items in front of him.

(10) Exactly one boy didn't eat the items in front of him.

[1] Kriz and Chemla 2016, Magri 2017, Romoli et al. 2023; see also Gotzner, Romoli, and Santorio 2018

Two possible readings

(11) Exactly one boy ate the items in front of him.

Two possible readings

(11) Exactly one boy ate the items in front of him.

a. One boy ate both and all others didn't eat either STRONG

Two possible readings

(11) Exactly one boy ate the items in front of him.

a. One boy ate both and all others didn't eat either — STRONG

b. One boy ate both and all others didn't eat both — WEAK

Two possible readings

(12) Exactly one boy ate the items in front of him.

a. One boy ate both and all others didn't eat either STRONG

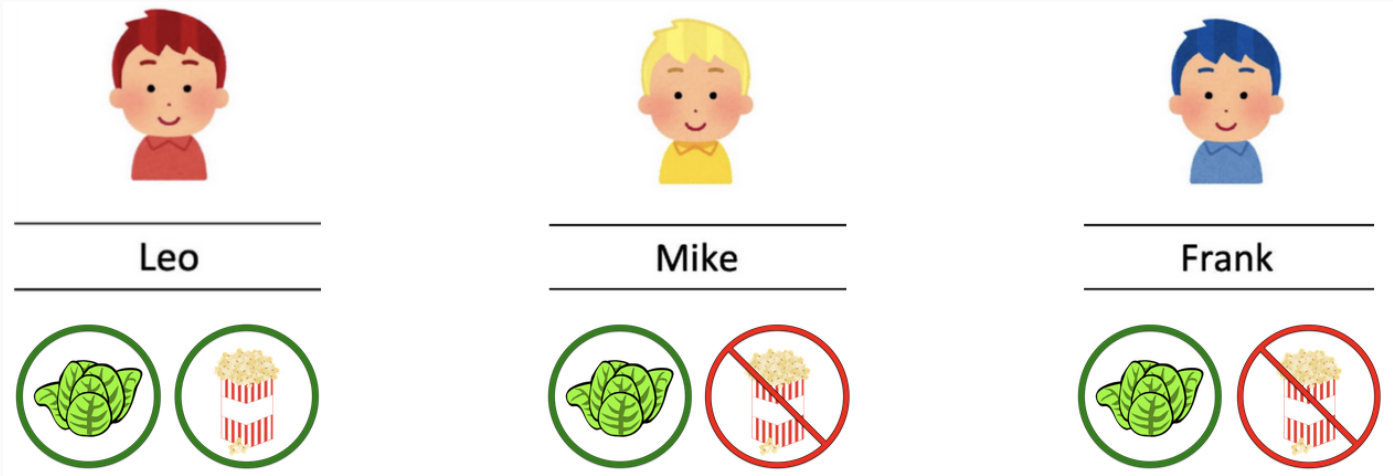
b. One boy ate both and all others didn't eat both WEAK

Two possible readings

(13) Exactly one boy ate the items in front of him.

a. One boy ate both and all others didn't eat either STRONG

b. One boy ate both and all others didn't eat both WEAK



Two possible readings

(14) Exactly one boy didn't eat the items.

Two possible readings

(14) Exactly one boy didn't eat the items.

a. One boy didn't eat either and all others ate both STRONG

Two possible readings

(14) Exactly one boy didn't eat the items.

a. One boy didn't eat either and all others ate both — STRONG

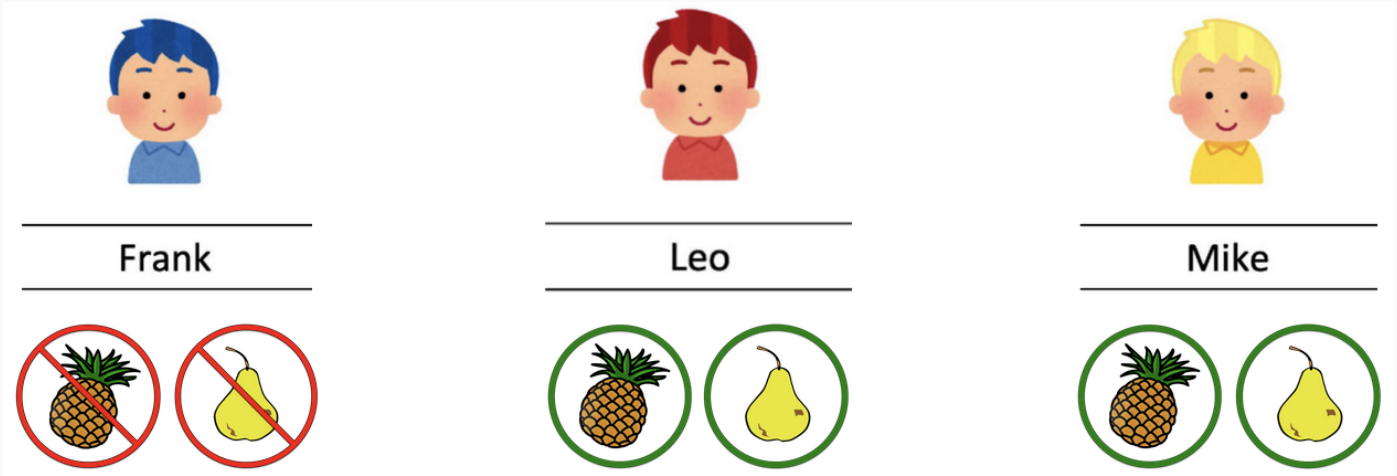
b. One boy didn't eat either and all others ate either — WEAK

Two possible readings

(15) Exactly one boy didn't eat the items.

a. One boy didn't eat either and all others ate both — STRONG

b. One boy didn't eat either and all others ate either — WEAK



Two possible readings

(16) Exactly one boy didn't eat the items.

a. One boy didn't eat either and all others ate both — STRONG

b. One boy didn't eat either and all others ate either — WEAK

Positive and negative monotonic cases

(17) Each boy ate the items in front of him.

Positive and negative monotonic cases

(17) Each boy ate the items in front of him.

a. Each boy ate both STRONG

Positive and negative monotonic cases

(17) Each boy ate the items in front of him.

a. Each boy ate both — STRONG

b. Each boy ate either — WEAK

Positive and negative monotonic cases

(17) Each boy ate the items in front of him.

a. Each boy ate both — STRONG

b. Each boy ate either — WEAK

(18) No boy ate the items in front of him.

Positive and negative monotonic cases

(17) Each boy ate the items in front of him.

a. Each boy ate both — STRONG

b. Each boy ate either — WEAK

(18) No boy ate the items in front of him.

a. No boy ate either — STRONG

Positive and negative monotonic cases

(17) Each boy ate the items in front of him.

a. Each boy ate both — STRONG

b. Each boy ate either — WEAK

(18) No boy ate the items in front of him.

a. No boy ate either — STRONG

b. Each boy ate both — WEAK

- The different readings in-non monotonic contexts

- The different readings in-non monotonic contexts
- And the comparison with the monotonic cases

- The different readings in-non monotonic contexts
- And the comparison with the monotonic cases
- Distinguishing among the three approaches

Theoretical background

- We consider three ‘basic’ versions of the three approaches

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- We go back to consider additional assumptions for each

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- We go back to consider additional assumptions for each
- We put aside non-maximality for now

Theoretical background

The implicature approach

The implicature approach[2]

- The strong reading under negation is part of the literal meaning

[2] Bar-Lev 2021; see also Chierchia et al 2009, Spector and Fox 2018, Magri 2009, 2017

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- The strong reading under negation is part of the literal meaning
- The maximal reading in the positive case is an (obligatory) implicature

[2] Bar-Lev 2021; see also Chierchia et al 2009, Spector and Fox 2018, Magri 2009, 2017

The implicature approach[2]

- The strong reading under negation is part of the literal meaning
- The maximal reading in the positive case is an (obligatory) implicature
- Implicatures are blocked if vacuous or lead to weaker meanings

[2] Bar-Lev 2021; see also Chierchia et al 2009, Spector and Fox 2018, Magri 2009, 2017

Homogeneity

(19) Frank ate the items in front of him

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items*

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items*

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

(21) EXH[Frank ate the items in front of him]

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

(21) EXH[Frank ate the items in front of him]
= *Frank ate both of the items*

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

(21) EXH[Frank ate the items in front of him]
= *Frank ate both of the items* $a \wedge b$

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

(21) EXH[Frank ate the items in front of him]
= *Frank ate both of the items* $a \wedge b$

(22) not[EXH[Frank ate the items in front of him]]

Homogeneity

(19) Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(20) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

(21) EXH[Frank ate the items in front of him]
= *Frank ate both of the items* $a \wedge b$

(22) not[EXH[Frank ate the items in front of him]]
= *Frank didn't eat both of the items* $\neg(a \wedge b)$

Obligatory exhaustification[3]

- At least one occurrence of EXH is obligatory (modulo non-weakening).

[3] Magri 2009, Bar-Lev 2021

Obligatory exhaustification[3]

- At least one occurrence of EXH is obligatory (modulo non-weakening).

(23) *Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

[3] Magri 2009, Bar-Lev 2021

Non-weakening constraint[4]

(24) **Don't weaken!**: do not insert EXH in *S* if the resulting meaning of *S* with EXH is equivalent or weaker than *S* without

[4] Chierchia et al 2009, Fox and Spector 2018 a.o.

Non-weakening constraint[4]

(24) **Don't weaken!**: do not insert EXH in S if the resulting meaning of S with EXH is equivalent or weaker than S without

(25) *not[EXH[Frank ate the items in front of him]]
$\rightsquigarrow$ *Frank didn't eat both of the items* $\neg(a \wedge b)$

[4] Chierchia et al 2009, Fox and Spector 2018 a.o.

Homogeneity

(26) *Frank ate the items in front of him
= *Frank ate one or more of the items* $a \vee b$

(27) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

(28) EXH[Frank ate the items in front of him]
= *Frank ate both of the items* $a \wedge b$

(29) *not[EXH[Frank ate the items in front of him]]
= *Frank didn't eat both of the items* $\neg(a \wedge b)$

Homogeneity

(30) Frank didn't eat the items in front of him
= *Frank didn't eat either of the items* $\neg(a \vee b)$

(31) EXH[Frank ate the items in front of him]
= *Frank ate both of the items* $a \wedge b$

Back to the non-monotonic contexts: positive

(32) Exactly one boy ate the items in front of him.

a. One boy ate both and all others didn't eat either — STRONG

b. One boy ate both and all others didn't eat either — WEAK

Predictions

(33) EXH[Exactly one boy ate the items in front of him].

Predictions

(33) EXH[Exactly one boy ate the items in front of him].
⇝ One boy ate both and all others didn't eat either — STRONG

(34) Exactly one boy EXH[ate the items in front of him]
⇝ One boy ate both and all others didn't eat both — WEAK

Back the the non-monotonic contexts: negative

(35) Exactly one boy didn't eat the items in front of him.

a. One boy didn't eat either and all others ate both — STRONG
b. One boy didn't eat either and all others ate one — WEAK

Predictions

(36) EXH[Exactly one boy didn't eat the items in front of him]
⇝ One boy didn't eat either and more than one didn't eat one and more than one didn't eat the other

Predictions

(36) EXH[Exactly one boy didn't eat the items in front of him]
⇝ One boy didn't eat either and more than one didn't eat one and more than one didn't eat the other

(37) Exactly one boy not[EXH[ate the items in front of him]]
⇝ One boy didn't eat both and all others ate both

Predictions

(36) EXH[Exactly one boy didn't eat the items in front of him]
⇝ One boy didn't eat either and more than one didn't eat one and more than one didn't eat the other

(37) Exactly one boy not[EXH[ate the items in front of him]]
⇝ One boy didn't eat both and all others ate both

- neither the STRONG nor the WEAK readings

Predictions

(36) EXH[Exactly one boy didn't eat the items in front of him]
⇝ One boy didn't eat either and more than one didn't eat one and more than one didn't eat the other

(37) Exactly one boy not[EXH[ate the items in front of him]]
⇝ One boy didn't eat both and all others ate both

- neither the STRONG nor the WEAK readings
- But both incompatible with a WEAK situation

Predictions

(36) EXH[Exactly one boy didn't eat the items in front of him]
⇝ One boy didn't eat either and more than one didn't eat one and more than one didn't eat the other

(37) Exactly one boy not[EXH[ate the items in front of him]]
⇝ One boy didn't eat both and all others ate both

- neither the STRONG nor the WEAK readings
- But both incompatible with a WEAK situation

Predictions

- In the positive case, both the STRONG and WEAK readings predicted[5]

[5] but the prediction of the strong reading doesn't scale to exactly *n* where *n* is larger than one

Predictions

- In the positive case, both the STRONG and WEAK readings predicted[5]
- In the negative case, neither the STRONG nor the WEAK readings

[5] but the prediction of the strong reading doesn't scale to exactly *n* where *n* is larger than one

Predictions

- In the positive case, both the STRONG and WEAK readings predicted[5]
- In the negative case, neither the STRONG nor the WEAK readings
- But the readings predicted are incompatible with a WEAK situation

[5] but the prediction of the strong reading doesn't scale to exactly *n* where *n* is larger than one

Positive and negative monotonic cases

(38) Each boy ate the items in front of him.

Positive and negative monotonic cases

(38) Each boy ate the items in front of him.

(39) No boy ate the items in front of him.

Predictions

(40) EXH[Each boy ate the items in front of him].
⇝ Each boy ate both STRONG

Predictions

(40) EXH[Each boy ate the items in front of him].
⇝ Each boy ate both STRONG

(41) Each boy EXH[ate the items in front of him].
⇝ Each boy ate both STRONG

Predictions

(40) EXH[Each boy ate the items in front of him].
⇝ Each boy ate both — STRONG

(41) Each boy EXH[ate the items in front of him].
⇝ Each boy ate both — STRONG

(42) No boy ate the items in front of him.
⇝ No boy ate either — LITERAL/STRONG

Predictions

(40) EXH[Each boy ate the items in front of him].
⇝ Each boy ate both — STRONG

(41) Each boy EXH[ate the items in front of him].
⇝ Each boy ate both — STRONG

(42) No boy ate the items in front of him.
⇝ No boy ate either — LITERAL/STRONG

(43) *No boy EXH[ate the items in front of him].
⇝ No boy ate both — WEAK

Summary

- The positive non-monotonic case: both the weak and strong readings.

Summary

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- The negative non-monotonic case: only readings (close to) the strong reading.

Summary

- The positive non-monotonic case: both the weak and strong readings.
- The negative non-monotonic case: only readings (close to) the strong reading.
- It also predicts only strong readings for the positive and negative monotonic cases.

Theoretical background

Cognitive biases approach

The approach[6]

- Homogeneity arises as a by-product of a cognitive bias

[6] Sbardolini 2023

The approach[6]

- Homogeneity arises as a by-product of a cognitive bias
- Ignoring zero models which would vacuously satisfy a formula

[6] Sbardolini 2023

The approach[6]

- Homogeneity arises as a by-product of a cognitive bias
- Ignoring zero models which would vacuously satisfy a formula
- The meaning of negation and non-monotonic quantifiers

[6] Sbardolini 2023

Homogeneity

(44) Frank ate the items in front of him

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items*

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items* $a \wedge b$

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items* $a \wedge b$

(45) Frank didn't eat the items in front of him

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items* $a \wedge b$

(45) Frank didn't eat the items in front of him
= *Frank didn't eat both of the items*

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items* $a \wedge b$

(45) Frank didn't eat the items in front of him
= *Frank didn't eat both of the items* $\neg(a \wedge b)$

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items* $a \wedge b$

(45) Frank didn't eat the items in front of him
= *Frank didn't eat both of the items* $\neg(a \wedge b)$

(46) [Frank didn't eat the items in front of him]*

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items* $a \wedge b$

(45) Frank didn't eat the items in front of him
= *Frank didn't eat both of the items* $\neg(a \wedge b)$

(46) [Frank didn't eat the items in front of him]*
$\rightsquigarrow$ *Frank didn't eat either of the items*

Homogeneity

(44) Frank ate the items in front of him
= *Frank ate both of the items* $a \wedge b$

(45) Frank didn't eat the items in front of him
= *Frank didn't eat both of the items* $\neg(a \wedge b)$

(46) [Frank didn't eat the items in front of him]*
$\rightsquigarrow$ *Frank didn't eat either of the items* $\neg(a \vee b)$

The meaning of negation and non-monotonic quantifiers[7]

- State-based semantics with a notion of support and rejection of an assertion

[7] Aloni 2022, Sbardolini 2023

The meaning of negation and non-monotonic quantifiers[7]

- State-based semantics with a notion of support and rejection of an assertion
- Negation corresponds to rejecting an assertion (false in every world of the state)

[7] Aloni 2022, Sbardolini 2023

The meaning of negation and non-monotonic quantifiers[7]

- State-based semantics with a notion of support and rejection of an assertion
- Negation corresponds to rejecting an assertion (false in every world of the state)
- Non-monotonic quantifiers are defined with that negation

(47) $[\![\text{Exactly one boy}]\!](P) =$
$\exists x(P(x)) \wedge \forall y((y \neq x) \rightarrow \neg(P(y))$

[7] Aloni 2022, Sbardolini 2023

Back the the non-monotonic contexts: positive

(48) Exactly one boy ate the items in front of him.

a. One boy ate both and all others didn't eat either — STRONG

b. One boy ate both and all others didn't eat either — WEAK

Predictions

(49) Exactly one boy ate the items in front of him.
⇝ One boy ate both and all others didn't eat both WEAK

Predictions

(49) Exactly one boy ate the items in front of him.
⇝ One boy ate both and all others didn't eat both WEAK

(50) [Exactly one boy ate the items in front of him]*
⇝ One boy ate both and all others didn't eat either STRONG

Back the the non-monotonic contexts: negative

(51) Exactly one boy didn't eat the items in front of him.

a. One boy ate neither and all others ate both — STRONG

b. One boy ate neither and all others ate either — WEAK

Predictions

(52) Exactly one boy didn't eat the items in front of him.
⇝ One boy didn't eat both and all others ate both

Predictions

(52) Exactly one boy didn't eat the items in front of him.
⇝ One boy didn't eat both and all others ate both

(53) [Exactly one boy didn't eat the items in front of him]*
⇝ One boy didn't eat either and all others ate both STRONG

Predictions

(52) Exactly one boy didn't eat the items in front of him.
⇝ One boy didn't eat both and all others ate both

(53) [Exactly one boy didn't eat the items in front of him]*
⇝ One boy didn't eat either and all others ate both STRONG

- Both readings incompatible with a WEAK situation

Predictions

(52) Exactly one boy didn't eat the items in front of him.
⇝ One boy didn't eat both and all others ate both

(53) [Exactly one boy didn't eat the items in front of him]*
⇝ One boy didn't eat either and all others ate both STRONG

- Both readings incompatible with a WEAK situation

Positive and negative monotonic cases

(54) Each boy ate the items in front of him.

Positive and negative monotonic cases

(54) Each boy ate the items in front of him.

(55) No boy ate the items in front of him.

Predictions

(56) Each boy ate the items in front of him.
⇝ Each boy ate both LITERAL/STRONG

Predictions

(56) Each boy ate the items in front of him.
⇝ Each boy ate both — LITERAL/STRONG

(57) [Each boy ate the items in front of him]*
⇝ Each boy ate both — STRONG

Predictions

(56) Each boy ate the items in front of him.
⇝ Each boy ate both — LITERAL/STRONG

(57) [Each boy ate the items in front of him]*
⇝ Each boy ate both — STRONG

(58) No boy ate the items in front of him.
⇝ No boy ate both — LITERAL/WEAK

Predictions

(56) Each boy ate the items in front of him.
⇝ Each boy ate both — LITERAL/STRONG

(57) [Each boy ate the items in front of him]*
⇝ Each boy ate both — STRONG

(58) No boy ate the items in front of him.
⇝ No boy ate both — LITERAL/WEAK

(59) [No boy ate the items in front of him]*.
⇝ No boy ate either — STRONG

Summary

- The positive targets: both the weak and strong readings.

Summary

- The positive targets: both the weak and strong readings.
- The negative targets: only the strong reading (or close to that).

Summary

- The positive targets: both the weak and strong readings.
- The negative targets: only the strong reading (or close to that).
- It also predicts only strong readings for the positive monotonic case.

Summary

- The positive targets: both the weak and strong readings.
- The negative targets: only the strong reading (or close to that).
- It also predicts only strong readings for the positive monotonic case.
- Both the weak and strong of the negative monotonic case.

Theoretical background

Gappy approach

The approach[8]

- Either trivalent semantics or a supervaluation mechanism

[8] Križ 2015, 2016, Križ and Spector 2021, Guerrini and Wehbe 2024 a.o.

The approach[8]

- Either trivalent semantics or a supervaluation mechanism
- Trivalency either introduced lexically or by an operator

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The approach[8]

- Either trivalent semantics or a supervaluation mechanism
- Trivalency either introduced lexically or by an operator
- Homogeneity arises as byproduct of that

[8] Križ 2015, 2016, Križ and Spector 2021, Guerrini and Wehbe 2024 a.o.

The approach[8]

- Either trivalent semantics or a supervaluation mechanism
- Trivalency either introduced lexically or by an operator
- Homogeneity arises as byproduct of that
- A theory of homogeneity projection

[8] Križ 2015, 2016, Križ and Spector 2021, Guerrini and Wehbe 2024 a.o.

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.
Frank ate all of the items TRUE

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

Frank ate all of the items	TRUE
Frank didn't eat any of the items	FALSE

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

Frank ate all of the items	TRUE
Frank didn't eat any of the items	FALSE
otherwise	UNDEFINED

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

Frank ate all of the items	TRUE
Frank didn't eat any of the items	FALSE
otherwise	UNDEFINED

(61) Frank didn't eat the items in front of him.

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

Frank ate all of the items	TRUE
Frank didn't eat any of the items	FALSE
otherwise	UNDEFINED

(61) Frank didn't eat the items in front of him.

Frank didn't eat any of the items	TRUE

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

Frank ate all of the items	TRUE
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otherwise	UNDEFINED

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Frank didn't eat any of the items	TRUE
Frank ate all of the items	FALSE

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

Frank ate all of the items	TRUE
Frank didn't eat any of the items	FALSE
otherwise	UNDEFINED

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Frank didn't eat any of the items	TRUE
Frank ate all of the items	FALSE
otherwise	UNDEFINED

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One main implementation: Trivalent semantics[9]

(60) Frank ate the items in front of him.

Frank ate all of the items	TRUE
Frank didn't eat any of the items	FALSE
otherwise	UNDEFINED

(61) Frank didn't eat the items in front of him.

Frank didn't eat any of the items	TRUE
Frank ate all of the items	FALSE
otherwise	UNDEFINED

- Both cases only DEFINED when Frank ate all or none of the items in front of him

[9] Križ 2015, 2016, Guerrini and Wehbe 2024

Homogeneity projection from the scope of quantifiers

- How homogeneity projects through quantifiers

[10] see Spector 2019, Kriz and Spector 2021; Del Pinal et al 2023
[11] Guerrini and Wehbe 2024

Homogeneity projection from the scope of quantifiers

- How homogeneity projects through quantifiers
- Let's start assuming a universal projection through quantifiers[10]

[10] see Spector 2019, Kriz and Spector 2021; Del Pinal et al 2023
[11] Guerrini and Wehbe 2024

Homogeneity projection from the scope of quantifiers

- How homogeneity projects through quantifiers
- Let's start assuming a universal projection through quantifiers[10]
- Assume also a mechanism of local accommodation or similar suspension of homogeneity - call it *A*[11]

[10] see Spector 2019, Kriz and Spector 2021; Del Pinal et al 2023
[11] Guerrini and Wehbe 2024

Back the the non-monotonic contexts: positive

(62) Exactly one boy ate the items in front of him.

a. One boy ate both and all others didn't eat either — STRONG

b. One boy ate both and all others didn't eat either — WEAK

Predictions

(63) Exactly one boy ate the items in front of him.
$\rightsquigarrow$ One boy ate both and all others didn't eat either STRONG

Predictions

(63) Exactly one boy ate the items in front of him.
⇝ One boy ate both and all others didn't eat either STRONG

(64) Exactly one boy *A*[ate the items in front of him].
⇝ One boy ate both and all others either didn't eat both WEAK

Back the the non-monotonic contexts: negative

(65) Exactly one boy didn't eat the items in front of him.

a. One boy ate neither and all others ate both — STRONG

b. One boy ate neither and all others ate either — WEAK

Predictions

(66) Exactly one boy didn't eat the items in front of him.
⇝ One boy didn't eat either and all others ate both STRONG

Predictions

(66) Exactly one boy didn't eat the items in front of him.
⇝ One boy didn't eat either and all others ate both STRONG

(67) Exactly one boy *A*[not[eat the items in front of him]]
⇝ One boy ate neither and all others ate either WEAK

Positive and negative monotonic cases

(68) Each boy ate the items in front of him.

(69) No boy ate the items in front of him.

Predictions

(70) Each boy ate the items in front of him.
⇝ Each boy ate both STRONG

Predictions

(70) Each boy ate the items in front of him.
⇝ Each boy ate both — STRONG

(71) No boy ate the items in front of him.
⇝ No boy ate either — STRONG

Predictions

(70) Each boy ate the items in front of him.
⇝ Each boy ate both — STRONG

(71) No boy ate the items in front of him.
⇝ No boy ate either — STRONG

(72) No boy *A*[ate the items in front of him].
= No boy ate both — WEAK

Summary

- The positive targets: both the strong and the weak reading.

Summary

- The positive targets: both the strong and the weak reading.
- The negative targets: both the strong and the weak reading.

Summary

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Summary

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- Both the weak and strong of the negative monotonic case.

Previous studies and motivation

- Two studies in particular investigating quantificational contexts

- Two studies in particular investigating quantificational contexts
- Clear evidence for the strong readings across positive and negative contexts

- Two studies in particular investigating quantificational contexts
- Clear evidence for the strong readings across positive and negative contexts
- Some evidence for the weak readings

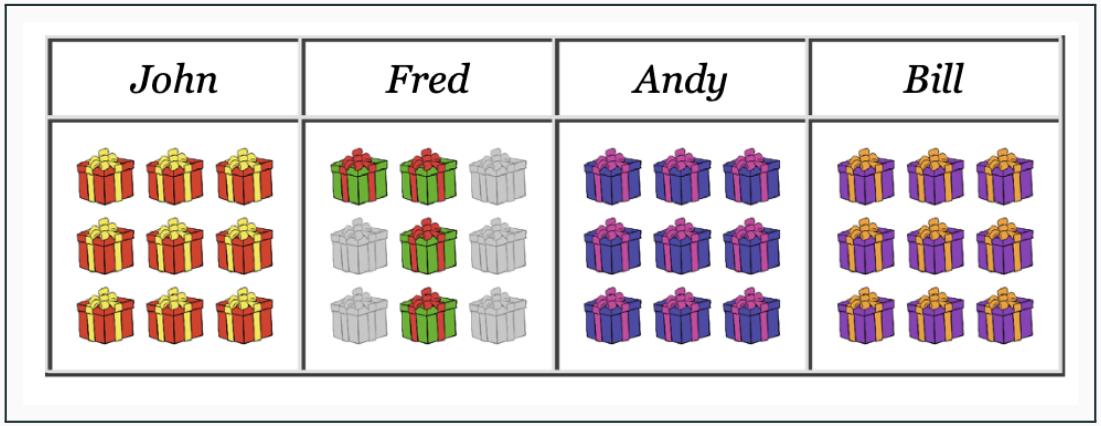
Nat Lang Semantics (2015) 23:205–248
DOI 10.1007/s11050-015-9114-z

CrossMark

Two methods to find truth-value gaps and their application to the projection problem of homogeneity

Manuel Križ · Emmanuel Chemla

Exactly 2 of the 4 boys found their presents.



- Some evidence for the strong and weak readings

- Some evidence for the strong and weak readings
- They did not control for non-maximality

- Some evidence for the strong and weak readings
- They did not control for non-maximality
- No extension to the negative non-monotonic case

Putting plural definites into context*

Jacopo Romoli
Heinrich Heine Universität Düsseldorf

Yasutada Sudo
University College London

Petra Augurzky
Goethe-Universität Frankfurt

Marion Bonnet
Georg-August-Universität Göttingen

Richard Breheny
University College London

Alexandre Cremers
Vilniaus Universitetas

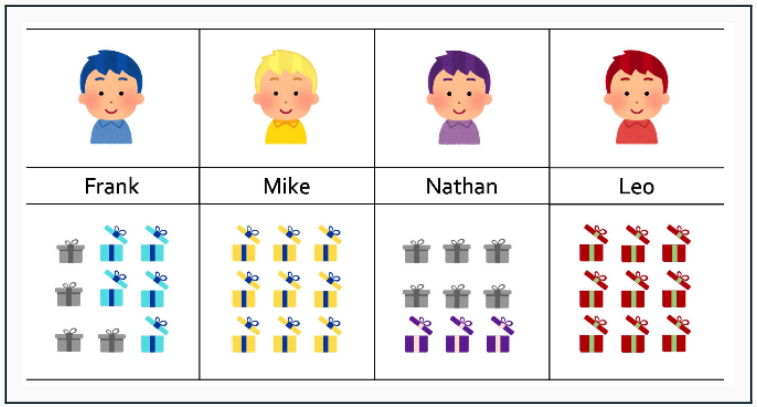
Cornelia Ebert
Goethe-Universität Frankfurt

Kurt Erbach
Goethe-Universität Frankfurt

Markus Steinbach
Georg-August-Universität Göttingen

Clemens Mayr
Georg-August-Universität Göttingen

Exactly two boys opened their presents.



- Weak and strong readings of the positive non-monotonic cases

- Weak and strong readings of the positive non-monotonic cases
- manipulate relevance directly finding a small effect of it

- Weak and strong readings of the positive non-monotonic cases
- manipulate relevance directly finding a small effect of it
    - clear evidence for the strong reading
    - marginal evidence for the weak reading
- no extension to the negative non-monotonic case

- Building on the insights and methods of both studies

- Building on the insights and methods of both studies
- More systematic investigation of the possible readings

- Building on the insights and methods of both studies
- More systematic investigation of the possible readings
- Adding the negative non-monotonic case

- Building on the insights and methods of both studies
- More systematic investigation of the possible readings
- Adding the negative non-monotonic case
- controlling for non-maximality in a novel way

Experiments

Theoretical background

	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions			
Interpretative options	We consider three `basic' versions of the approaches Variants and additional assumptions will be discussed		
Predictions Each Exactly No Exactly NEG			

	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions	• Existential semantics for plural DPs • Obligatory insertion of an EXH-operator • Don't Weaken!		
Interpretative options	1. **EXH** [QP Verb DP] 2. QP **EXH** [Verb DP]		
Predictions Each Exactly No Exactly NEG			

Each

Each boy ate the items

1. **EXH** [each boy ate the items]

   Each boy ate both FALSE

2. each boy **EXH** [ate the items]

   Each boy ate both FALSE

No

No boy ate the items

1. ***EXH** [No boy ate the items] *vacuous*
2. *No boy **EXH** [ate the items] *weakening*
3. No boy ate the items

   No boy ate either FALSE

Exactly

Exactly one boy ate the items

1. **EXH** [exactly one boy ate the items]

One boy ate both and <u>all others didn't eat either</u> FALSE

2. exactly one boy **EXH** [ate the items]

One boy ate both and <u>all others didn't eat both</u> TRUE

Exactly NEG

Exactly one boy didn’t eat the items

1. **EXH** [exactly one boy didn’t eat the items]

One boy didn’t eat either and more than one didn’t eat one and more than one didn’t eat the other FALSE

2. exactly one boy NEG **EXH** [ate the items]

One boy didn’t eat both and all others ate both FALSE

3. *exactly one boy **EXH** NEG [ate the items] *vacuous*

	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions	• Existential semantics for plural DPs • Obligatory insertion of an EXH-operator • Don't Weaken!		
Interpretative options	1. **EXH** [QP Verb DP] 2. QP **EXH** [Verb DP]		
Predictions Each Exactly No Exactly NEG	**FALSE** **AMBIGUOUS** **FALSE** **FALSE**		

	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions	• Existential semantics for plural DPs • Obligatory insertion of an EXH-operator • Don't Weaken!	• Universal semantics for plural DPs • Bias to ignore `zero' models [.]★ • Meaning of NEG/QP	
Interpretative options	1. **EXH** [QP Verb DP] 2. QP **EXH** [Verb DP]	1. [QP Verb DP] 2. [QP Verb DP]★	
Predictions Each Exactly No Exactly NEG	**FALSE** **AMBIGUOUS** **FALSE** **FALSE**		

Each

Each boy ate the items

1. [each boy ate the items]

   Each boy ate both FALSE

2. [each boy ate the items]*

   Each boy ate both FALSE

No

No boy ate the items

1. [No boy ate the items]

   No boy ate both — TRUE

2. [No boy ate the items]*

   No boy ate either — FALSE

Exactly

Exactly one boy ate the items

1. [exactly one boy ate the items]

One boy ate both and all others didn't eat both TRUE

2. [exactly one boy ate the items]*

One boy ate both and all others didn't eat either FALSE

Exactly NEG

Exactly one boy didn’t eat the items

1. [exactly one boy didn’t eat the items]

One boy didn’t eat both and all others ate both FALSE

2. [exactly one boy didn’t eat the items]*

One boy didn’t eat either and all others ate both FALSE

	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions	• Existential semantics for plural DPs • Obligatory insertion of an EXH-operator • Don't Weaken!	• Universal semantics for plural DPs • Bias to ignore `zero' models [.]★ • Meaning of NEG/QP	
Interpretative options	1. **EXH** [QP Verb DP] 2. QP **EXH** [Verb DP]	1. [QP Verb DP] 2. [QP Verb DP]★	
Predictions Each Exactly No Exactly NEG	**FALSE** **AMBIGUOUS** **FALSE** **FALSE**	**FALSE** **AMBIGUOUS** **AMBIGUOUS** **FALSE**	

	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions	• Existential semantics for plural DPs • Obligatory insertion of an EXH-operator • Don't Weaken!	• Universal semantics for plural DPs • Bias to ignore `zero' models [.]★ • Meaning of NEG/QP	• Trivalent semantics • Universal projection through quantifiers • Accommodation
Interpretative options	1. **EXH** [QP Verb DP] 2. QP **EXH** [Verb DP]	1. [QP Verb DP] 2. [QP Verb DP]★	1. [QP Verb DP] 2. QP **ACC** [Verb DP]
Predictions Each Exactly No Exactly NEG	**FALSE** **AMBIGUOUS** **FALSE** **FALSE**	**FALSE** **AMBIGUOUS** **AMBIGUOUS** **FALSE**	

Each

Each boy ate the items

1. each boy ate the items

   Each boy ate both FALSE

2. each boy **ACC** [ate the items]

   Each boy ate both FALSE

No

No boy ate the items

1. no boy ate the items

   No boy ate either FALSE

2. no boy **ACC** [ate the items]

   No boy ate both TRUE

Exactly

Exactly one boy ate the items

1. exactly one boy ate the items

One boy ate both and all others didn't eat either FALSE

2. exactly one boy **ACC** [ate the items]

One boy ate both and all others didn't eat both TRUE

Exactly NEG

Exactly one boy didn’t eat the items

1. exactly one boy didn’t eat the items

One boy didn’t eat either and all others ate both FALSE

2. exactly one boy **ACC** [NEG eat the items]

One boy ate neither and all others ate one TRUE

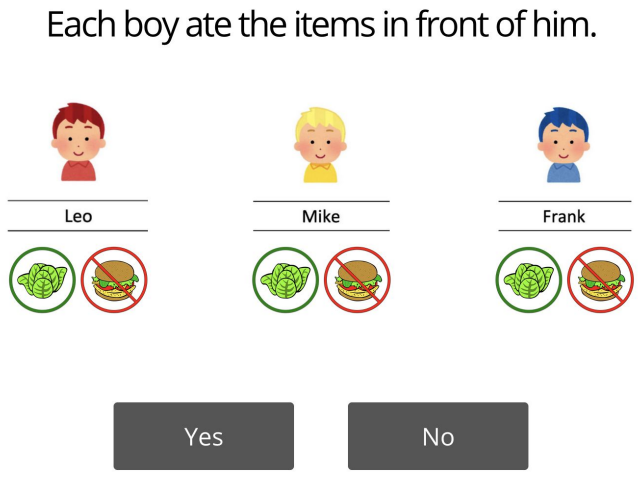
	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions	• Existential semantics for plural DPs • Obligatory insertion of an EXH-operator • Don't Weaken!	• Universal semantics for plural DPs • Bias to ignore `zero' models [.]★ • Meaning of NEG/QP	• Trivalent semantics or supervaluation • Universal projection through quantifiers • Accommodation
Interpretative options	1. **EXH** [QP Verb DP] 2. QP **EXH** [Verb DP]	1. [QP Verb DP] 2. [QP Verb DP]★	1. [QP Verb DP] 2. QP **ACC** [Verb DP]
Predictions Each Exactly No Exactly NEG	**FALSE** **AMBIGUOUS** **FALSE** **FALSE**	**FALSE** **AMBIGUOUS** **AMBIGUOUS** **FALSE**	**FALSE** **AMBIGUOUS** **AMBIGUOUS** **AMBIGUOUS**

	IMPLICATURE	COGNITIVE BIAS	TRUTH-VALUE GAP
General assumptions	• Existential semantics for plural DPs • Obligatory insertion of an EXH-operator • Don't Weaken!	• Universal semantics for plural DPs • Bias to ignore `zero' models [.]★ • Meaning of NEG/QP	• Trivalent semantics or supervaluation • Universal projection through quantifiers • Accommodation
Interpretative options	1. **EXH** [QP Verb DP] 2. QP **EXH** [Verb DP]	1. [QP Verb DP] 2. [QP Verb DP]★	1. [QP Verb DP] 2. QP **ACC** [Verb DP]
Predictions			
Each	**FALSE**	**FALSE**	**FALSE**
Exactly	**AMBIGUOUS**	**AMBIGUOUS**	**AMBIGUOUS**
No	**FALSE**	**AMBIGUOUS**	**AMBIGUOUS**
Exactly NEG	**FALSE**	**FALSE**	**AMBIGUOUS**

Experiments

Overview of the experiments

- Two experiments using the same TVJT



Note: domain of plural definites reduced to 2 individuals to prevent non-maximality effects

Overview of the experiments

- Two experiments using the same TVJT
- Test sentences

POSITIVE

Each boy ate the items in front of him.

Exactly/Only one boy ate the items in front of him.

NEGATIVE

No boy ate the items in front of him.

Exactly/Only one one boy didn't eat the items [...]

Note: "exactly" tested in Exp.1 and "only" in Exp.2

Overview of the experiments

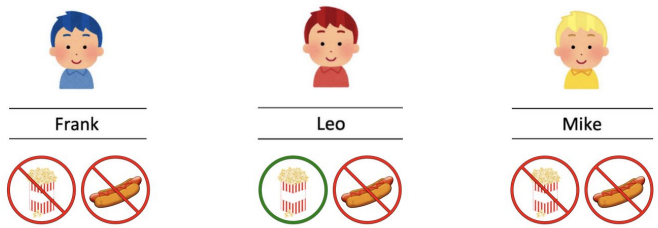
- Two experiments using the same TVJT
- Test sentences
- True, false and weak pictures

Condition	Sentence predicted to be…
TRUE	true on all theories
FALSE	false on all theories
WEAK	false or ambiguous depending on the sentence and theory

Overview of the experiments

- Two experiments using the same TVJT
- Test sentences
- True, false and weak pictures
- Comprehension checks using the same sentence frames with a singular DP

Exactly one boy ate the popcorn in front of him.



Inclusion criterion: accuracy > 80%

Overview of the experiments

- Two experiments using the same TVJT
- Test sentences
- True, false and weak pictures
- Comprehension checks using the same sentence frames with a singular DP
- Instructions with a cover story followed by a short training and the task

Participants	Recruited	Included	Med age	Male/Female
Exp.1	76	75	44	39/36
Exp.2	76	75	41	38/37

Predictions for Weak conditions (recap)

	IMPLICATURE (IMP)	COGNITIVE BIAS (NZ)	TRUTH-VALUE GAP (TVG)
Predictions	WEAK	WEAK	WEAK
Each	FALSE	FALSE	FALSE
Exactly	AMBIGUOUS	AMBIGUOUS	AMBIGUOUS
No	FALSE	AMBIGUOUS	AMBIGUOUS
Exactly NEG	FALSE	FALSE	AMBIGUOUS

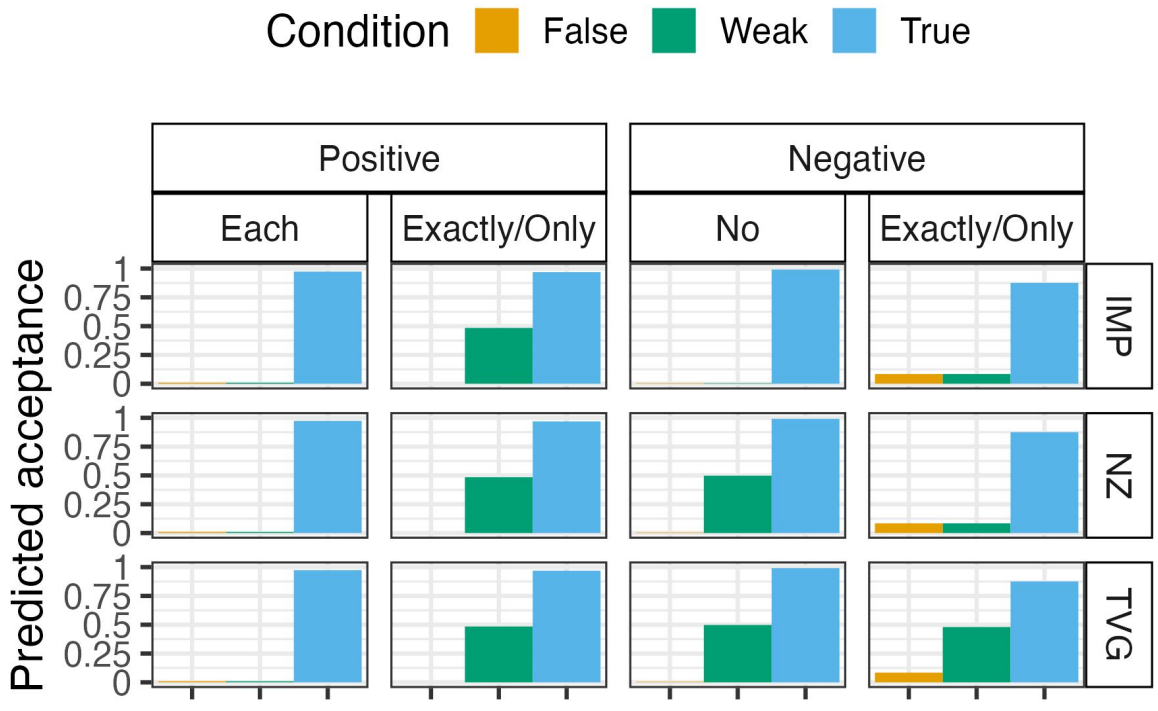
Predictions for all conditions

	IMPLICATURE (IMP)			COGNITIVE BIAS (NZ)			TRUTH-VALUE GAP (TVG)		
Predictions	FALSE	WEAK	TRUE	FALSE	WEAK	TRUE	FALSE	WEAK	TRUE
Each	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE
Exactly	FALSE	AMB	TRUE	FALSE	AMB	TRUE	FALSE	AMB	TRUE
No	FALSE	FALSE	TRUE	FALSE	AMB	TRUE	FALSE	AMB	TRUE
Exactly NEG	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	AMB	TRUE

Visualizing the predictions

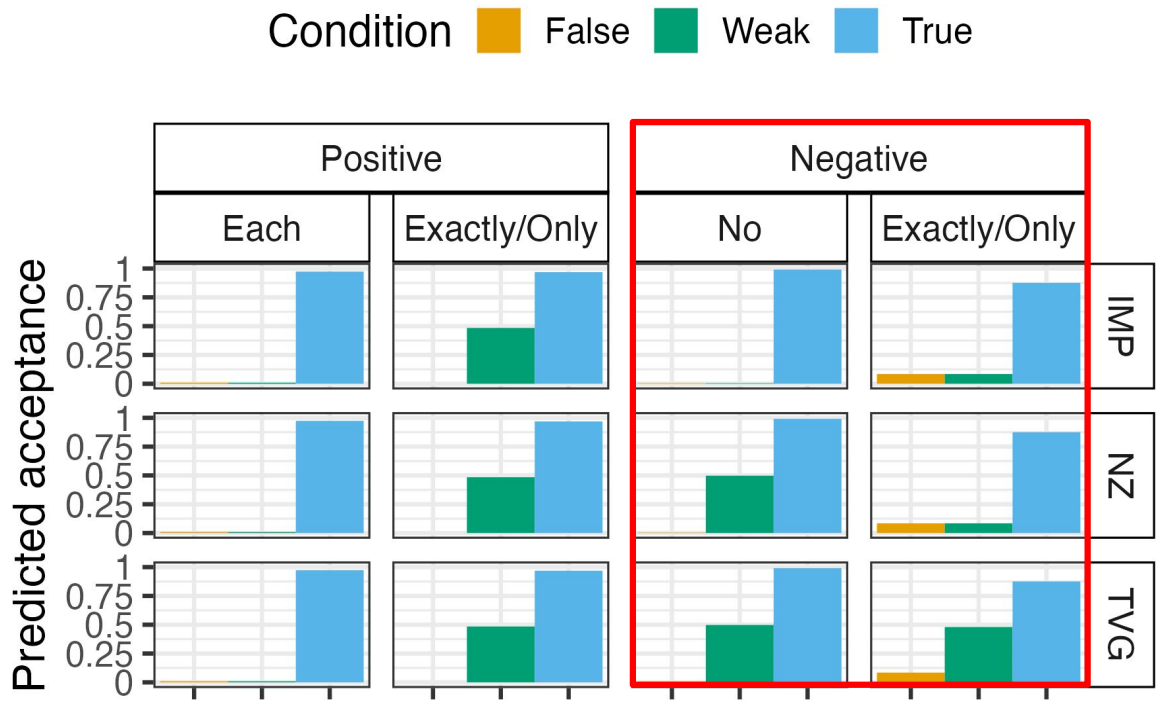
- Response error rates estimated from comprehension checks
- Ambiguity represented by the average of the min/max values
- No non-maximality effects, e.g., predictions for *Each-Weak*

(these values are only used for illustrating the predicted patterns)



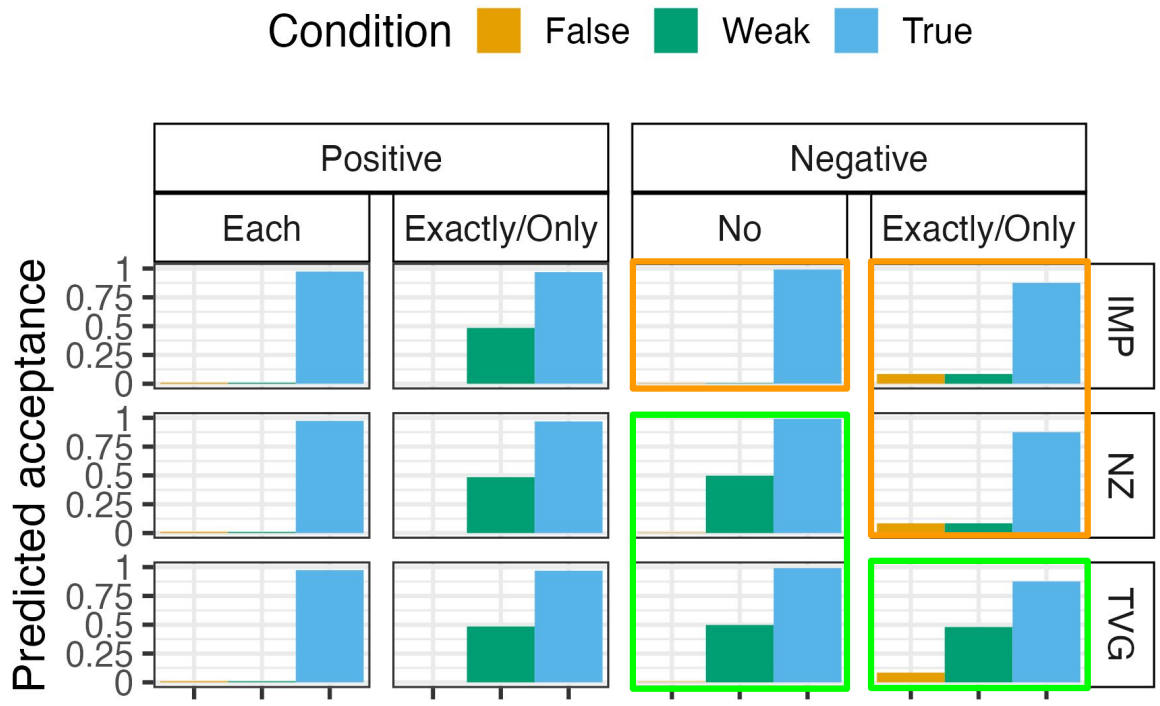
Testing the predictions

- Focus on the test cases where predictions critically differ?



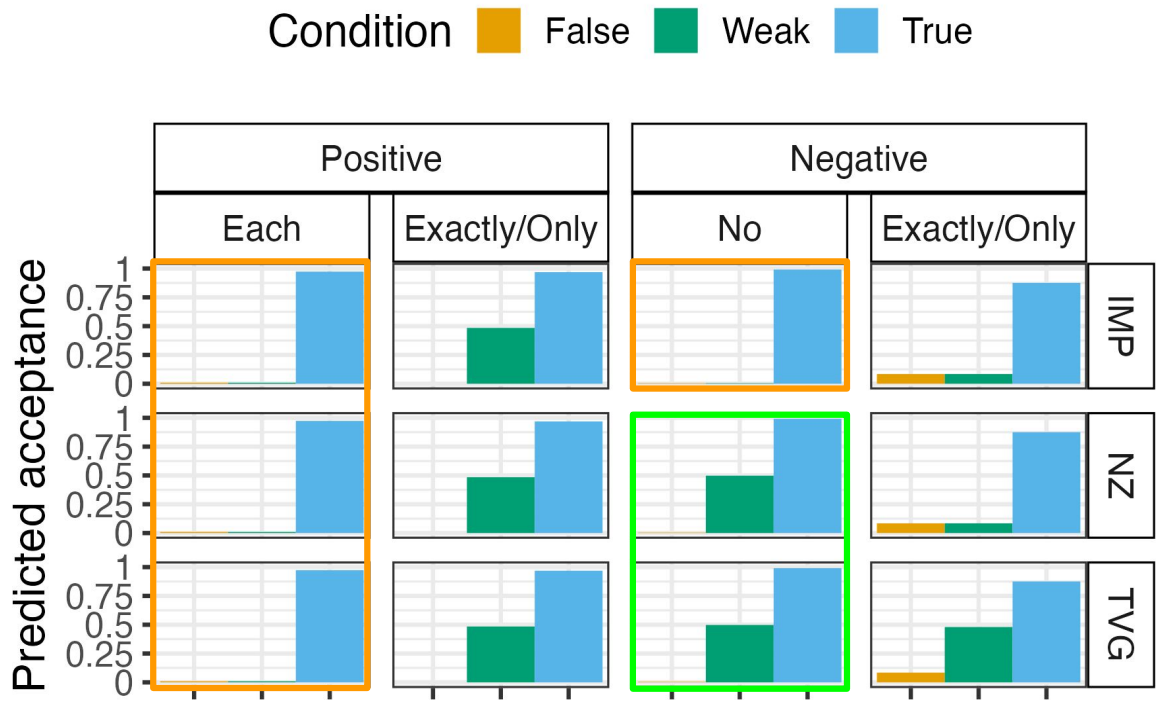
Testing the predictions

- Focus on the test cases where predictions critically differ?



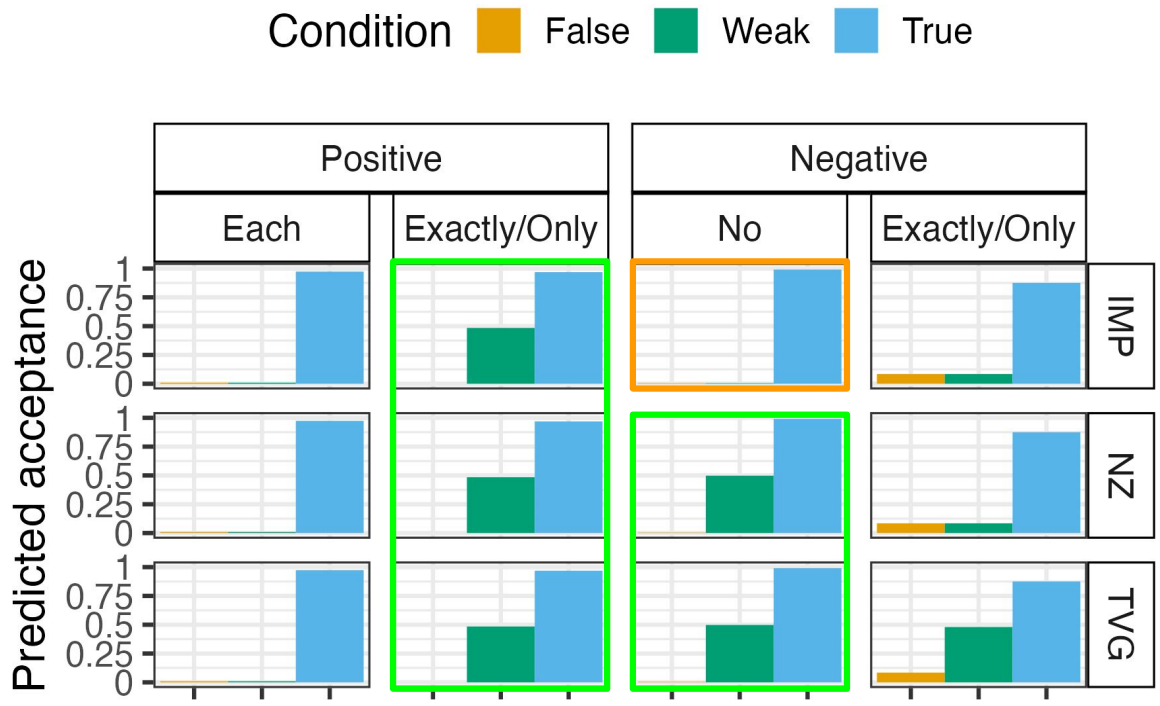
Testing the predictions

- Focus on the test cases where predictions critically differ?
- There are many such contrasts which are just as relevant



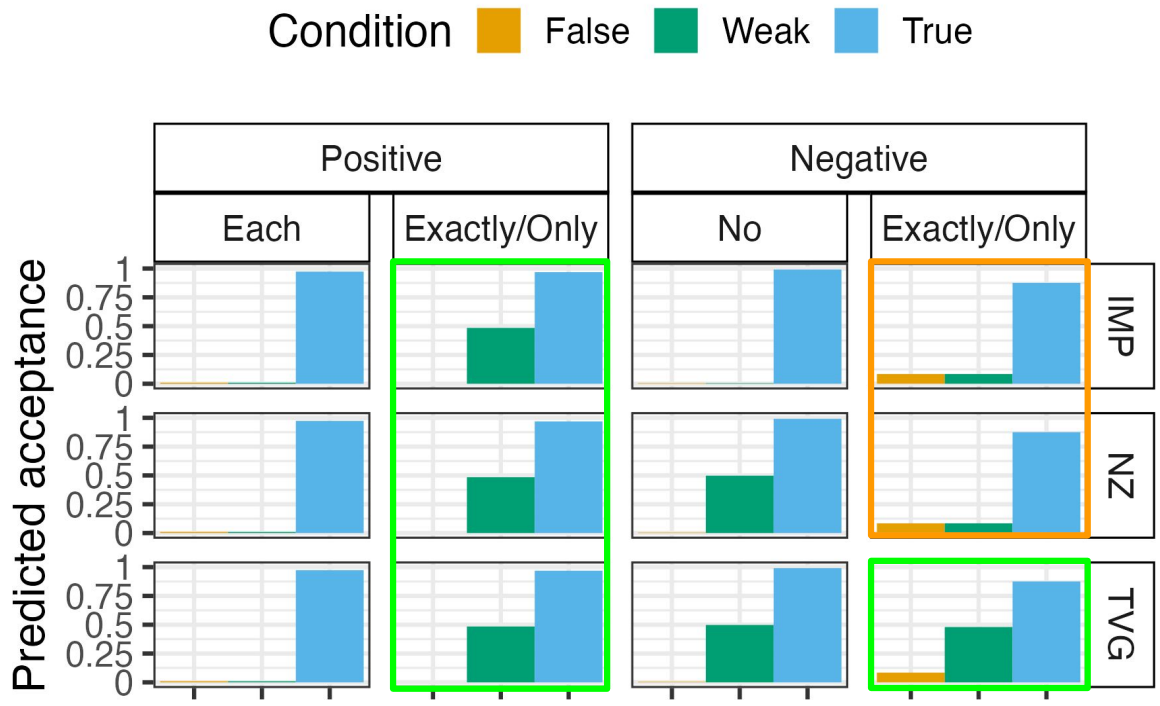
Testing the predictions

- Focus on the test cases where predictions critically differ?
- There are many such contrasts which are just as relevant



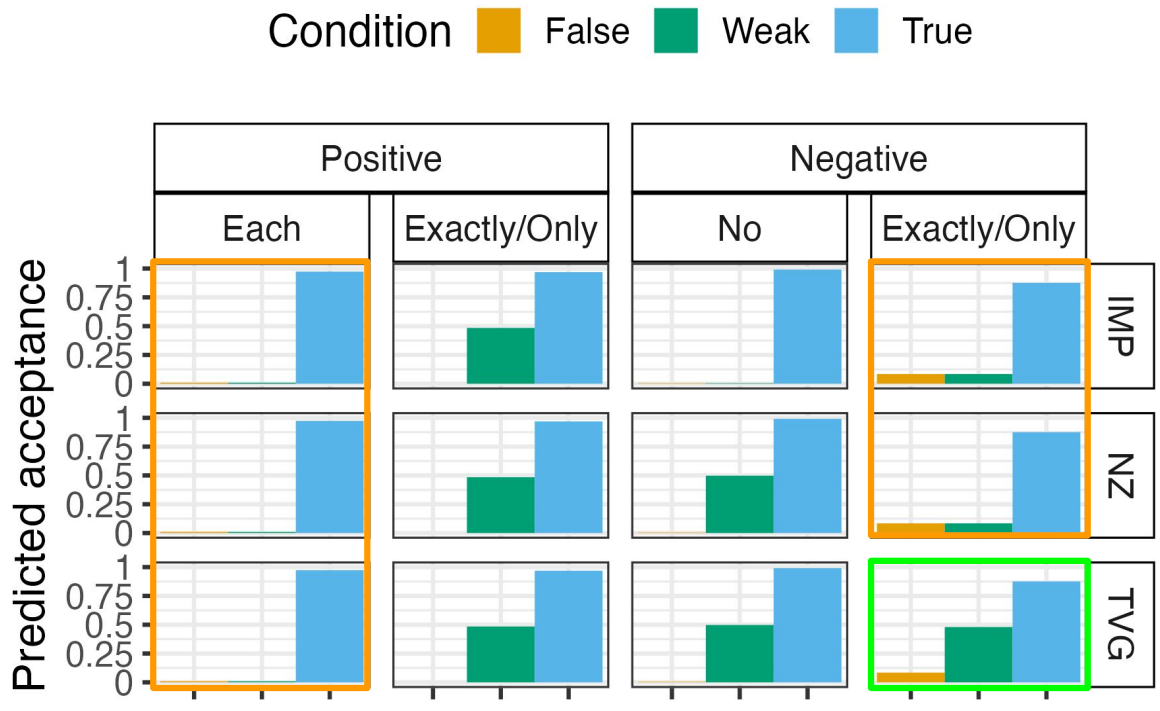
Testing the predictions

- Focus on the test cases where predictions critically differ?
- There are many such contrasts which are just as relevant



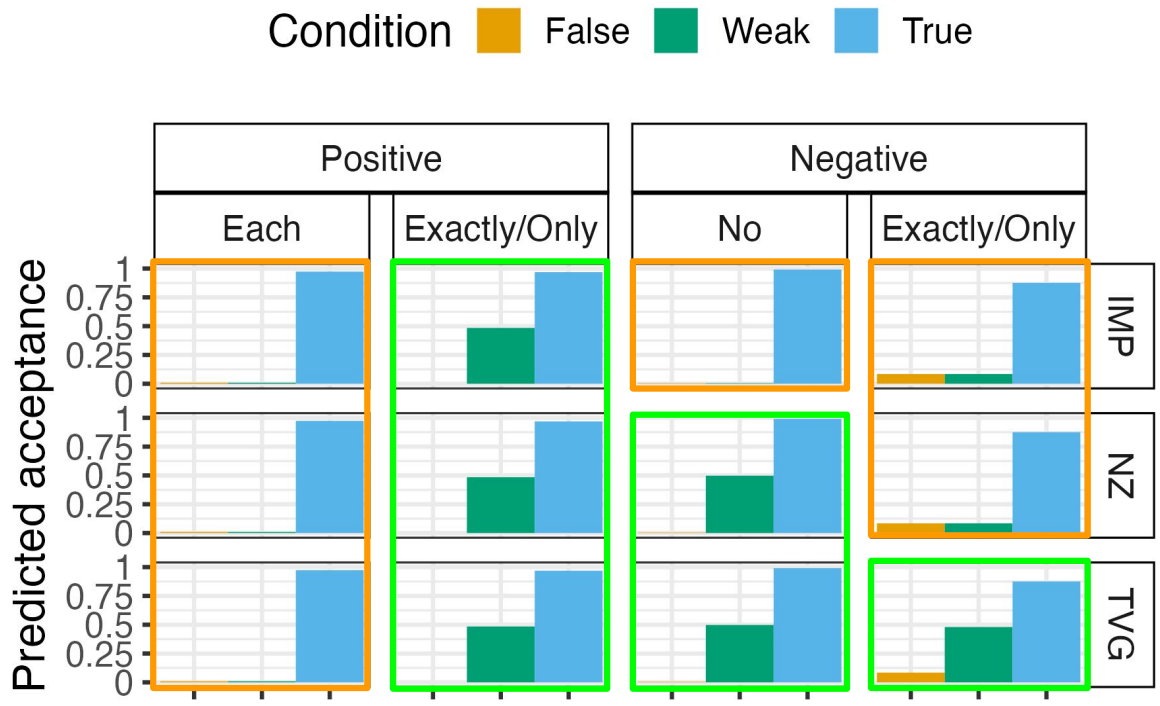
Testing the predictions

- Focus on the test cases where predictions critically differ?
- There are many such contrasts which are just as relevant



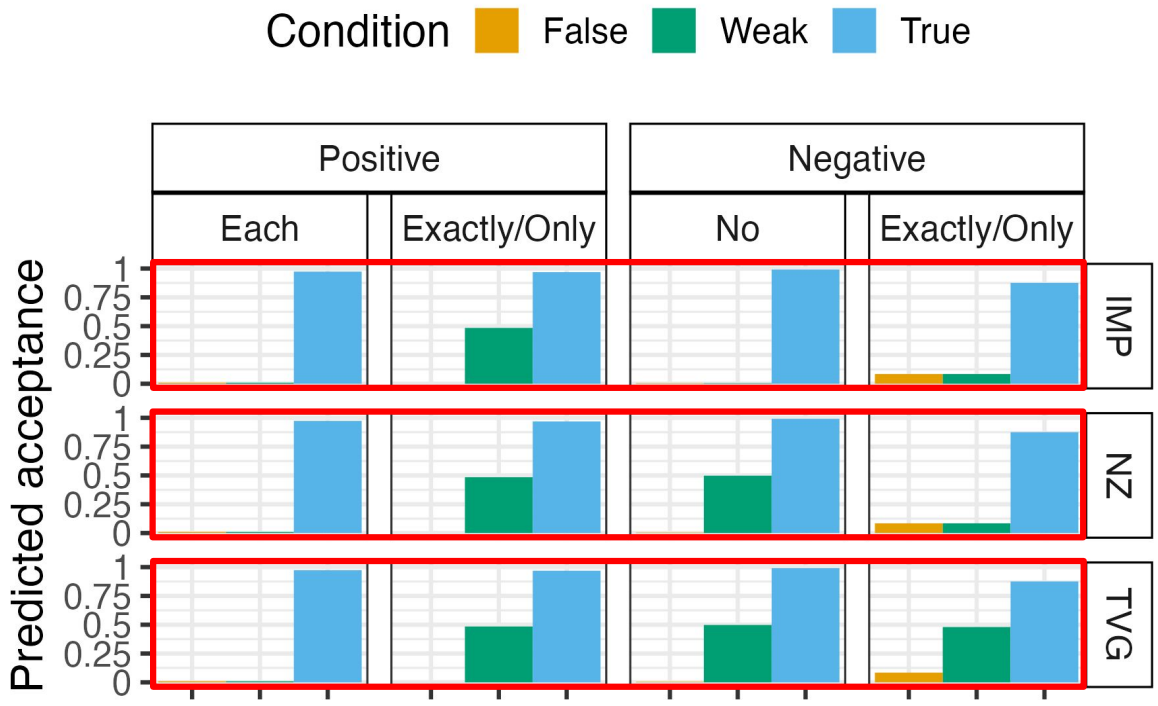
Testing the predictions

- Focus on the test cases where predictions critically differ?
- There are many such contrasts which are just as relevant
  - arbitrary decisions
  - data subsetting
  - multiple comparisons
  - loss of information
  - ...



Testing the predictions

- Focus on the test cases where predictions critically differ?
- There are many such contrasts which are just as relevant
- Devise theory-driven models considering all predictions and see how well they fit our data



Theory-driven models

1. Each theory comes with general assumptions but predicts acceptance/rejection in our task based on the interplay of 2 key variables.

Theory	**V1**	**V2**
IMP	Global EXH(S)	Local (..EXH(S'))
NZ	Literal [S]	Enrichment [S]*
TVG	$\forall$-projection	Accommodation

Theory-driven models

1. Each theory comes with general assumptions but predicts acceptance/rejection in our task based on the interplay of 2 key variables.
2. Every theory is linked to the data by formulating a model predicting responses based on these predictors.

```
### R pseudo-code

# Theory-specific predictors

V1   = if_else(Condition %in% c(...), 1, 0)

V2  =  if_else(Condition %in% c(...), 1, 0)

# GLMM

formula = response~V1+V2+(0+V1+V2|Subject)

model <- glmer(formula,

                    family = binomial(link=logit),

                    control=...)
```

Theory-driven models

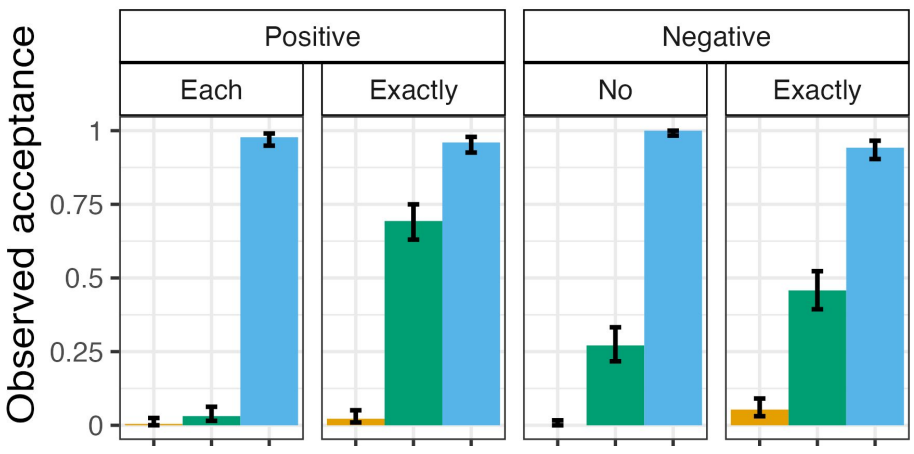
1. Each theory comes with general assumptions but predicts acceptance/rejection in our task based on the interplay of 2 key variables.
2. Every theory is linked to the data by formulating a model predicting responses based on these predictors.
3. We compute and compare indices of model performance for each model to determine which one is the best for our data.

Indices of model performance

- AIC, AIC_c, AIC weight
- BIC, BIC_c, BIC weight
- Marginal R^2 (fixed effects only)
- Conditional R^2 (total model)
- RMSE
- ...

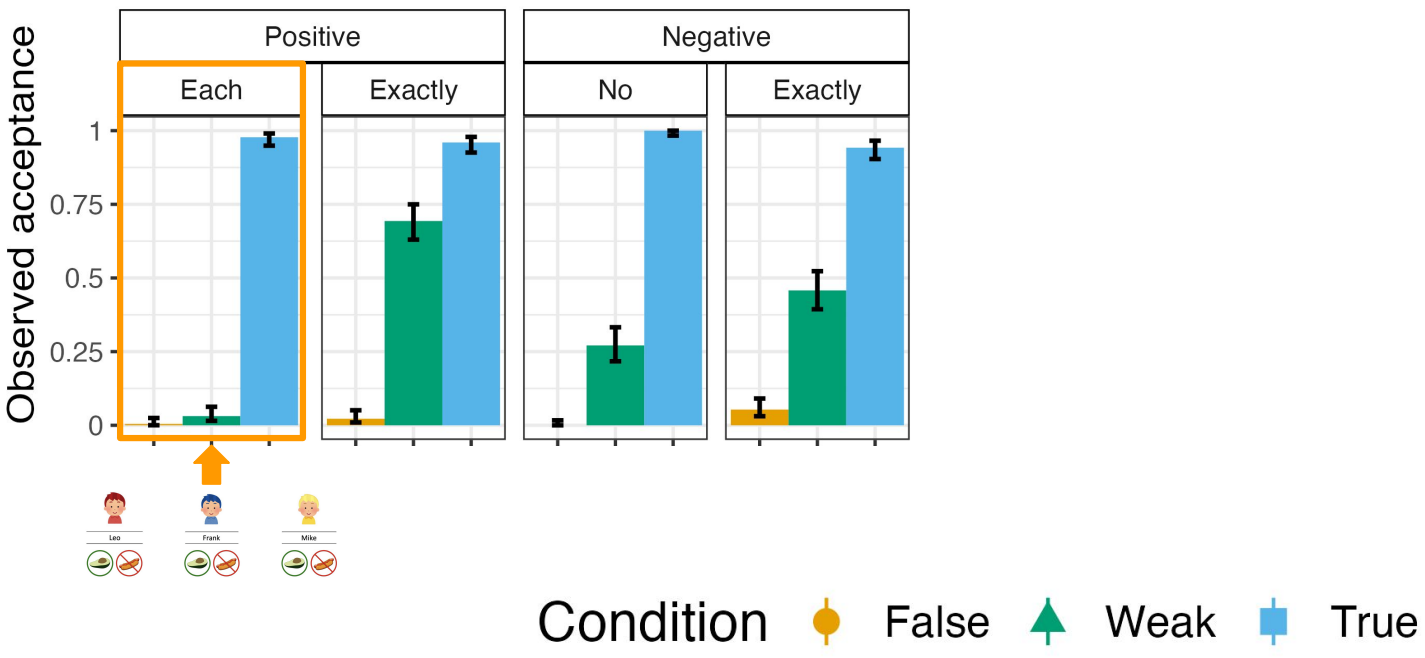
Results

Exp.1 – Exactly



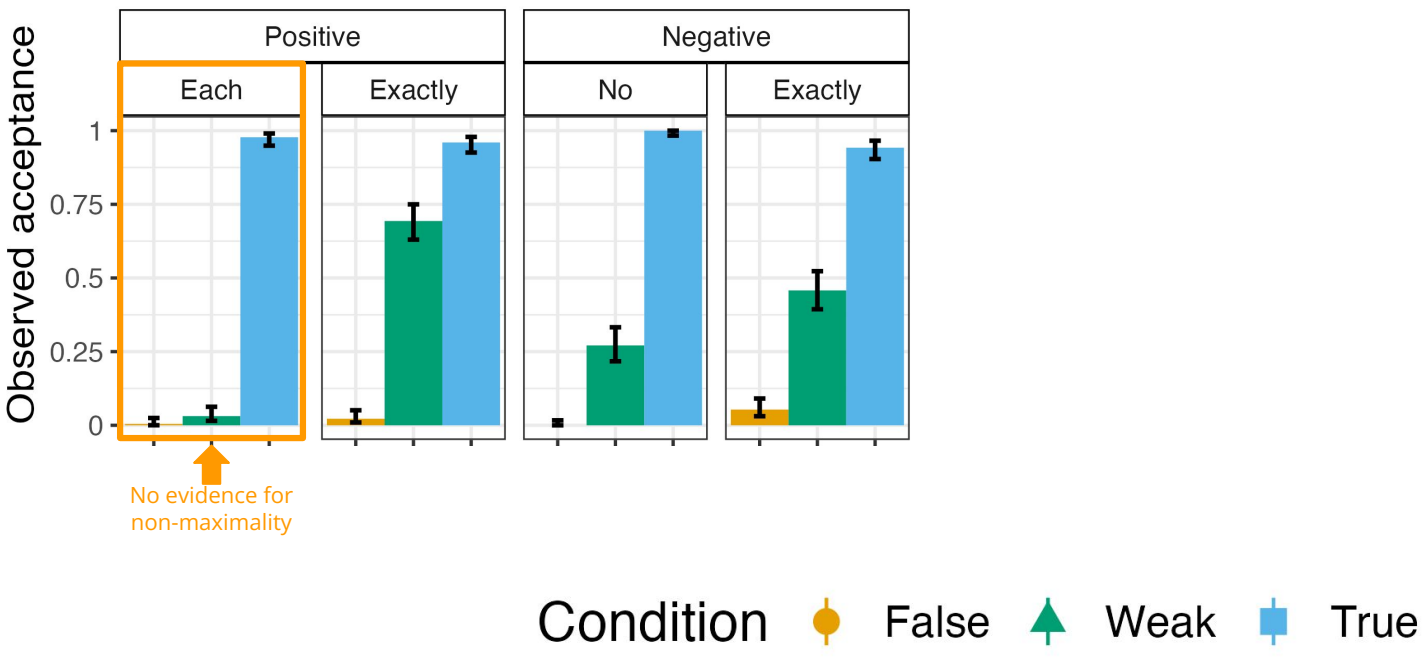
Results

Exp.1 – Exactly



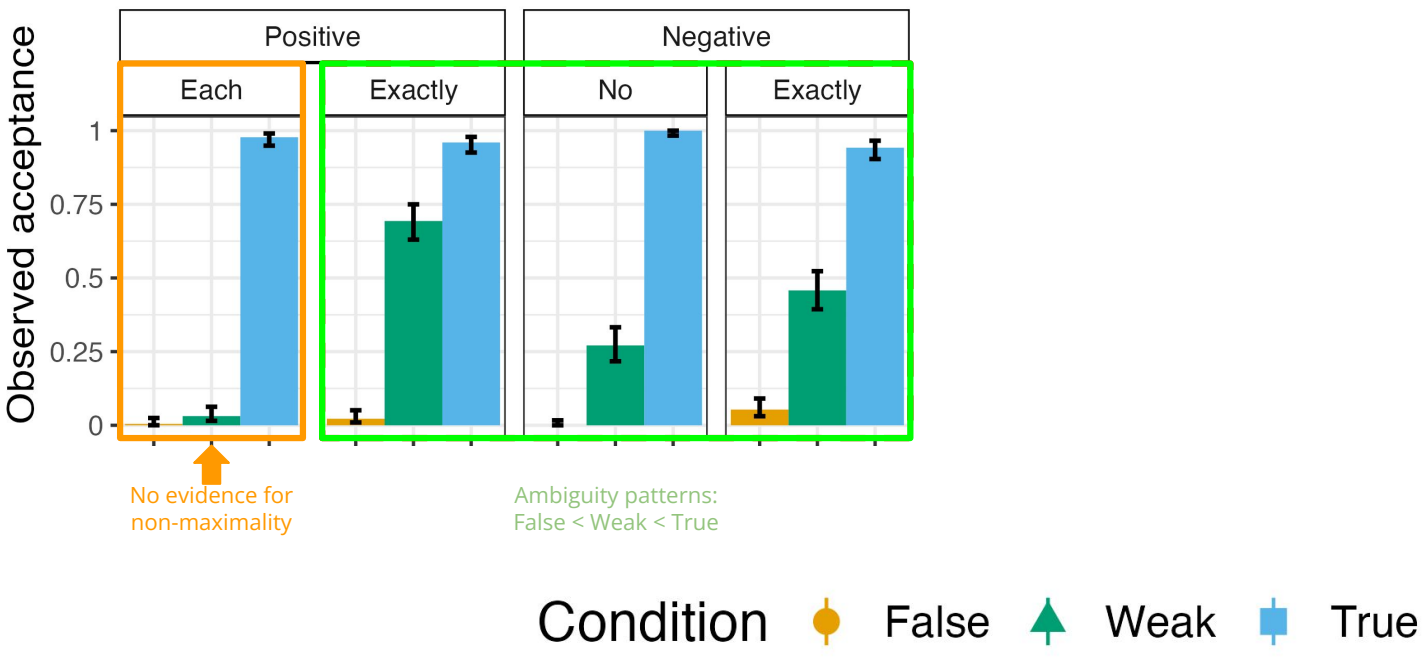
Results

Exp.1 – Exactly



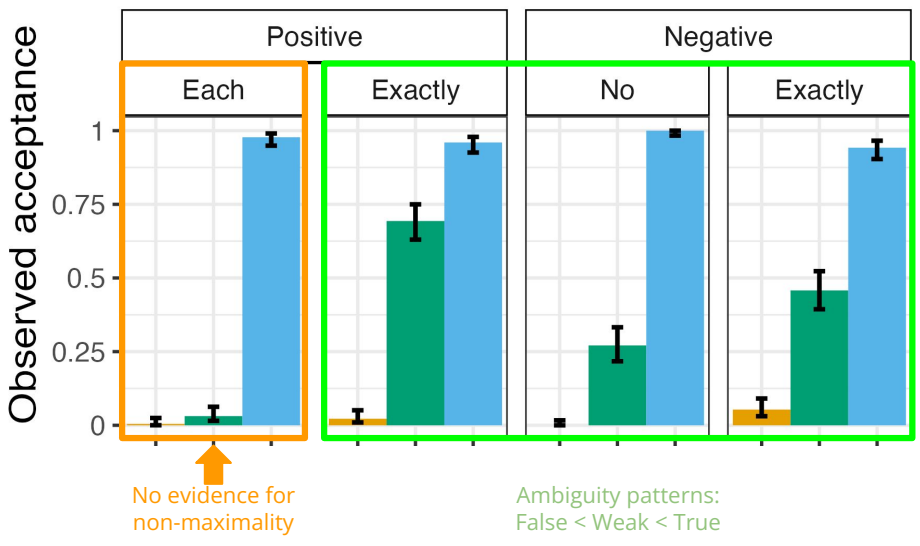
Results

Exp.1 – Exactly

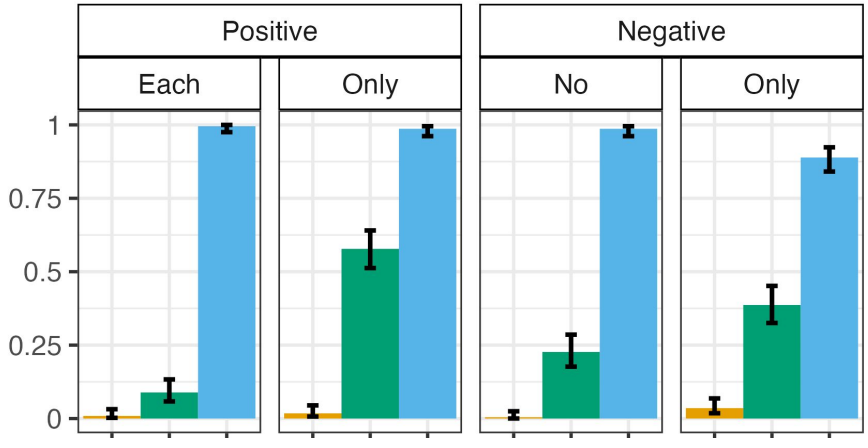


Results

Exp.1 – Exactly

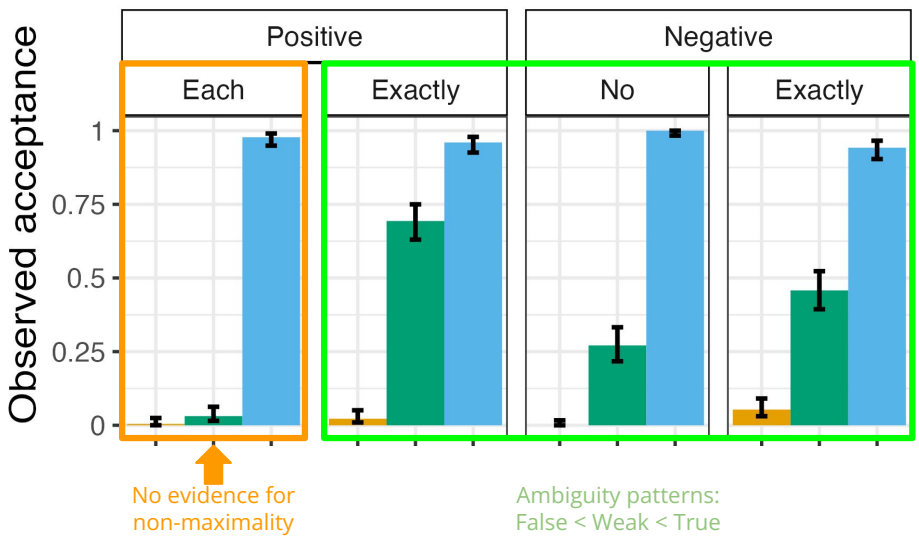


Exp.2 – Only

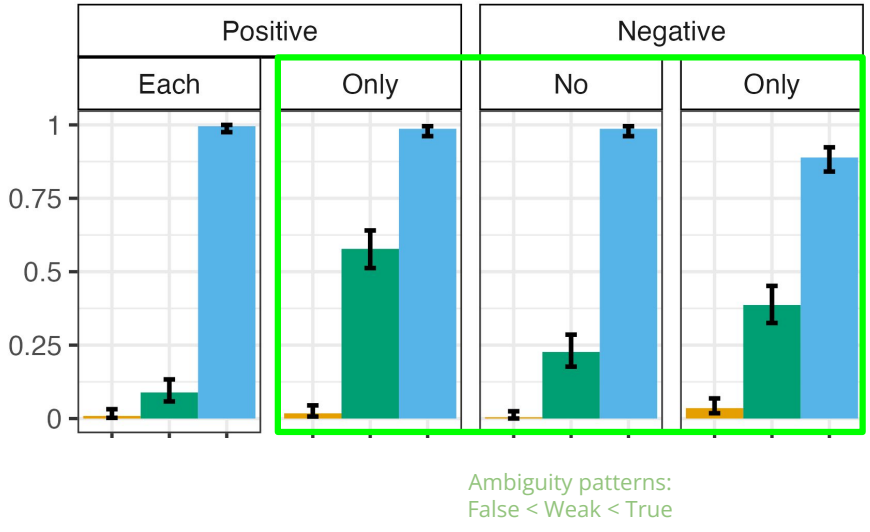


Results

Exp.1 – Exactly

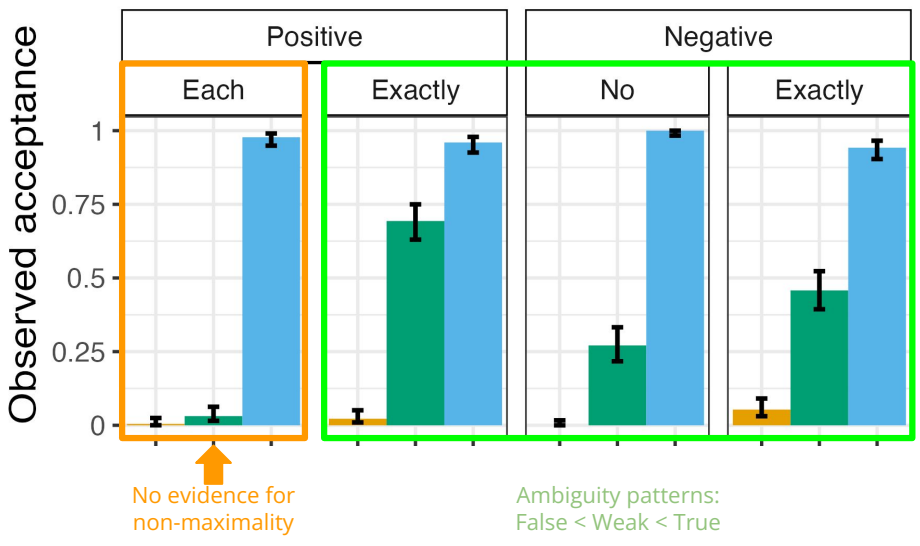


Exp.2 – Only

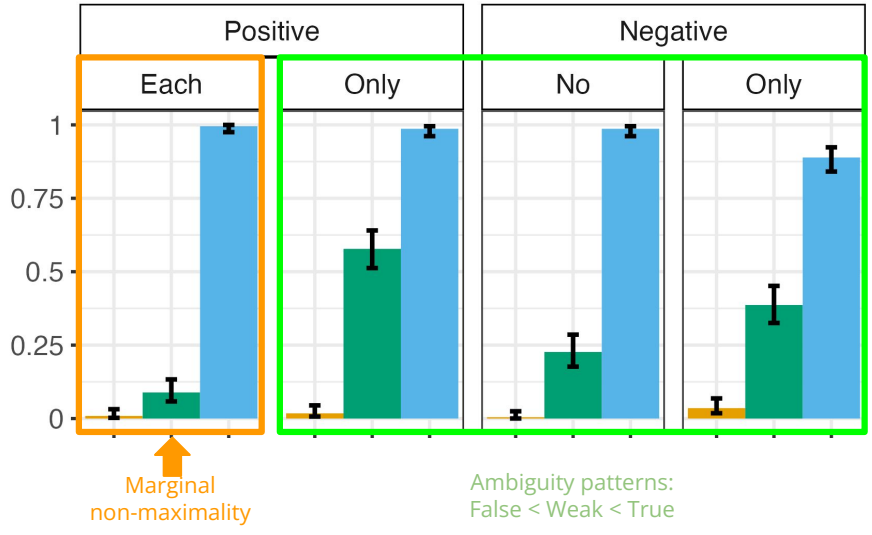


Results

Exp.1 – Exactly

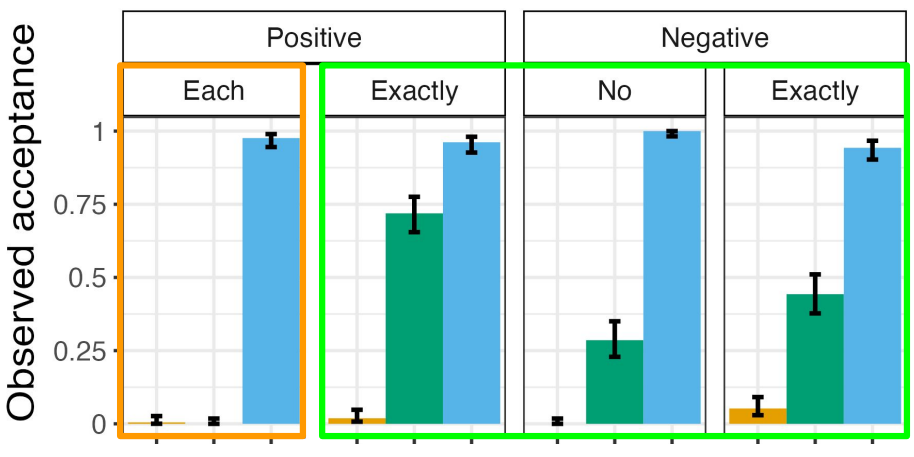


Exp.2 – Only



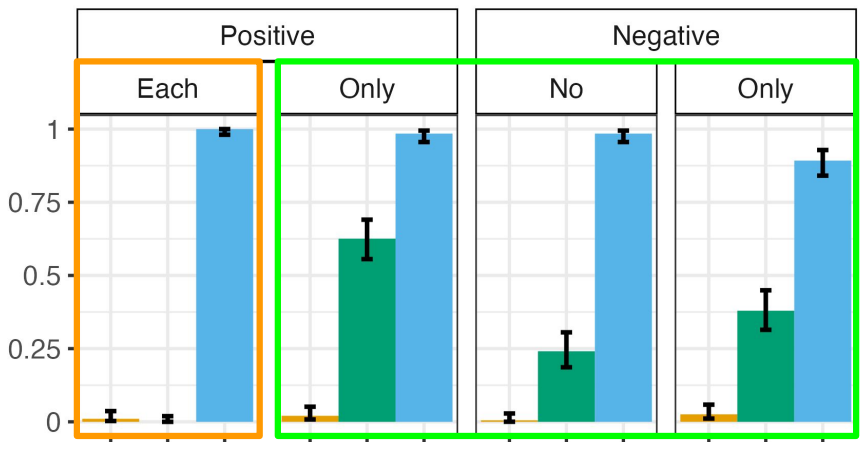
Results: removing all potential non-maximal responders

Exp.1 – Exactly



5 excluded, n=70

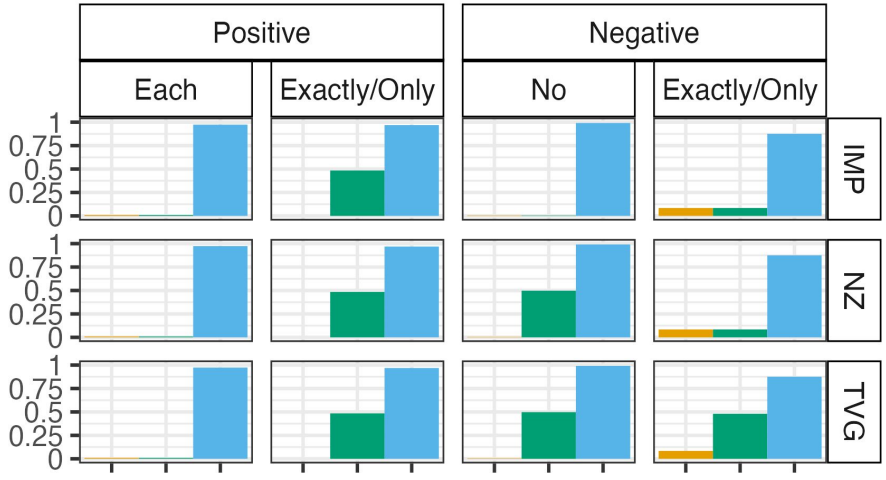
Exp.2 – Only

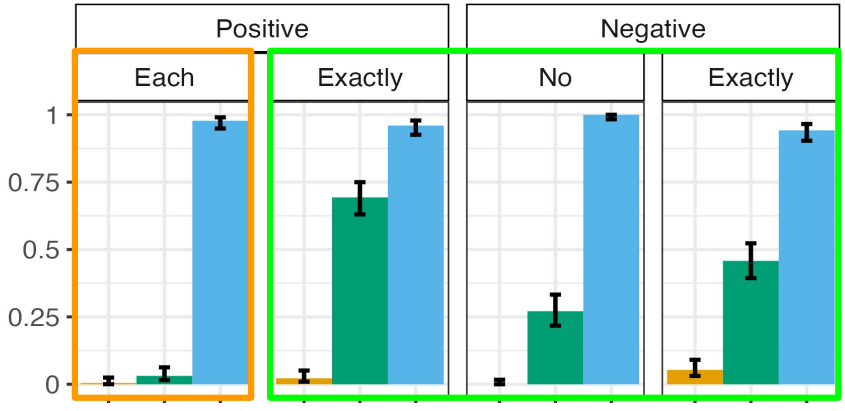


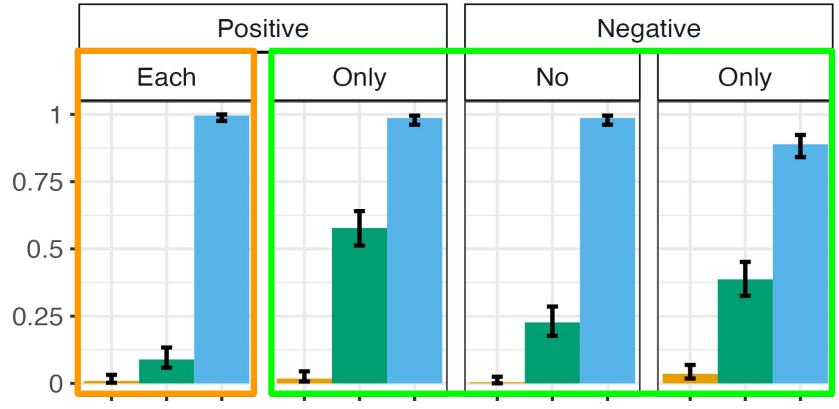
10 excluded, n=65

Condition False Weak True

Predicted
vs. observed







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Model performance

Exp.1 – Exactly

	AIC	BIC	R2_m	R2_c
Model_IMP	1663	1686	0.66	0.71
Model_NZ	1663	1698	0.64	0.69
Model_TVG	1379	1415	0.73	0.76

Exp.2 – Only

AIC	BIC	R2_m	R2_c
1646	1669	0.66	0.72
1629	1664	0.63	0.70
1451	1486	0.70	0.74

```
Models:
model_IMP: Binary ~ global.IMP + local.IMP + (0 + local.IMP | Subject)
model_NZ: Binary ~ lit.NZ + enriched.NZ + (0 + lit.NZ + enriched.NZ | Subject)
model_TVG: Binary ~ lit.TVG + accommodate.TVG + (0 + lit.TVG + accommodate.TVG | Subject)
```

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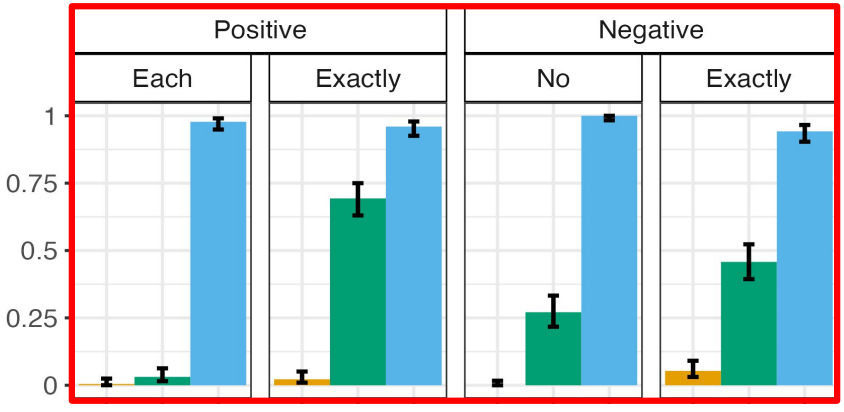
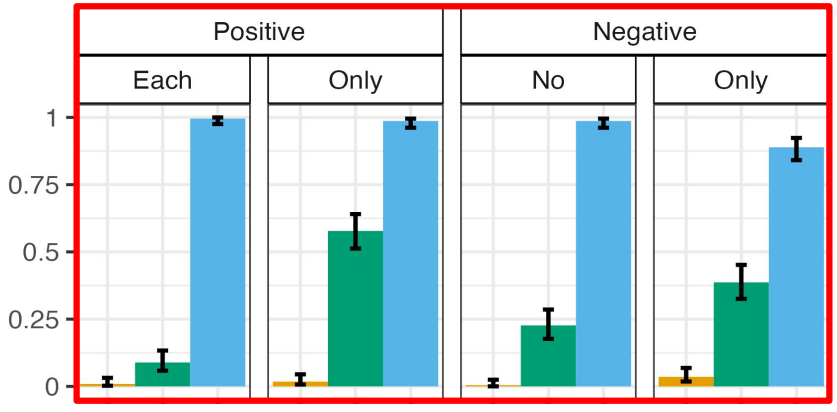
The TVG model outperforms the IMP and NZ models

Note: AIC/BIC estimates the amount of information lost by a model: the lower, the better; R^2 is the proportion of the variation in responses predictable from V1 and V2: the higher, the better

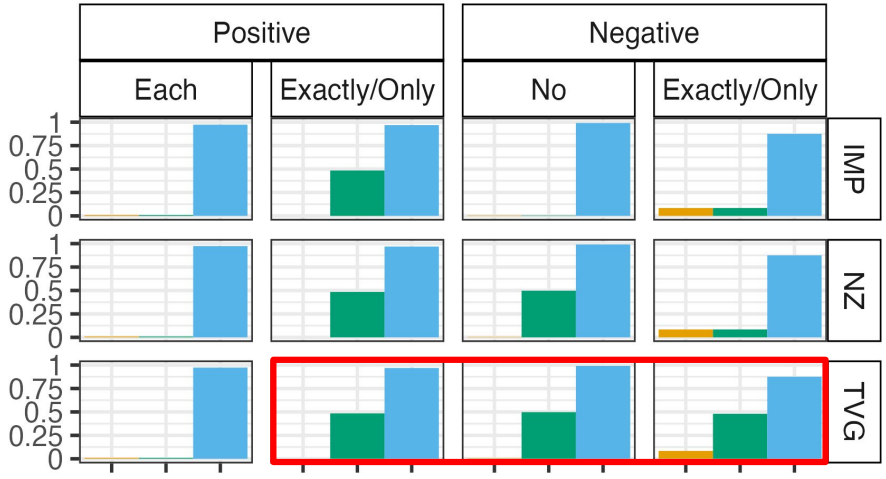
TVG fits the data better

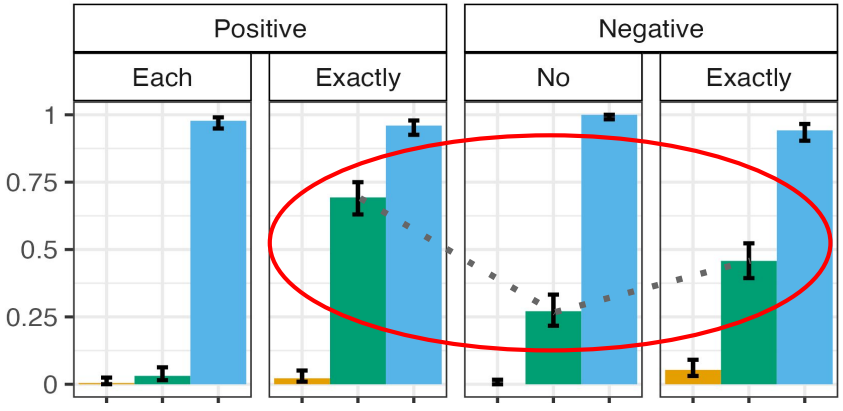


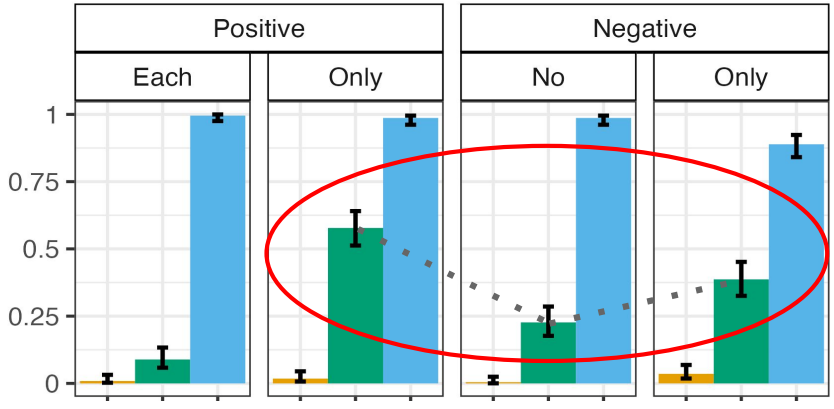


Condition False Weak True

Unexplained variations







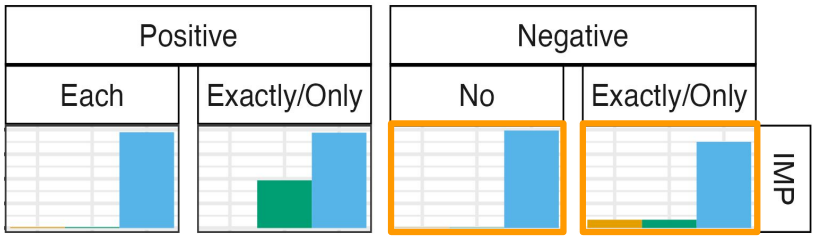
Similarity in non-uniformity pointing to other factors

Summary

- Two experiments testing the predictions of IMP, NZ and TVG for the interpretation of plural DPs in quantificational sentences
- Evidence for the existence of weak readings in the negative environments in the (quasi)absence of non-maximality effects
- The Gappy approach is the most compatible with our results and the TVG model the one that best fits the data

Implications, prospects and extensions

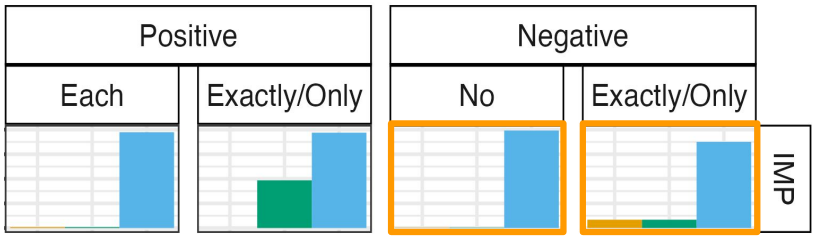
The Implicature approach



Issue: no weak readings in the negative cases due to the combination of

1. Obligatory exhaustification, and
2. Non-weakening constraint

The Implicature approach



Issue: no weak readings in the negative cases due to the combination of

1. Obligatory exhaustification, and
2. Non-weakening constraint

- Dropping obligatoriness?

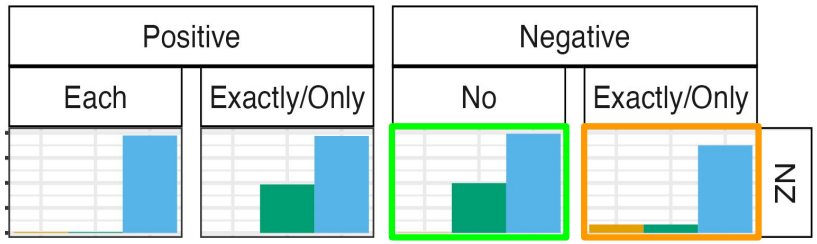
  ...and losing good predictions

- Relaxing non-weakening?

  No student ate an apple or a banana
  ↛ *every student ate neither or both*

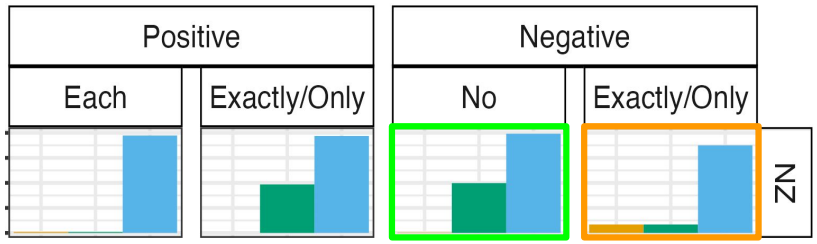
- Moving to another constraint?
  cf. Enguehard and Chemla (2018)

The Cognitive bias approach



Issue: only predicts strong readings in the non-monotonic cases.

The Cognitive bias approach

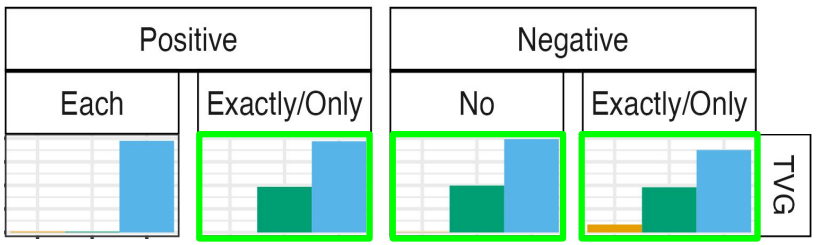


Issue: only predicts strong readings in the non-monotonic cases.

- Ambiguity of negation with *exactly/only*?*
  - negation as rejection
  - negation as failure to assert
- This would allow the weak readings to emerge but also raise some questions:
  - evidence for this negation?
  - explanatoriness: lexicalizing ambiguity in the meaning of Qs?

* Giorgio Sbardolini and Maria Aloni, p.c.

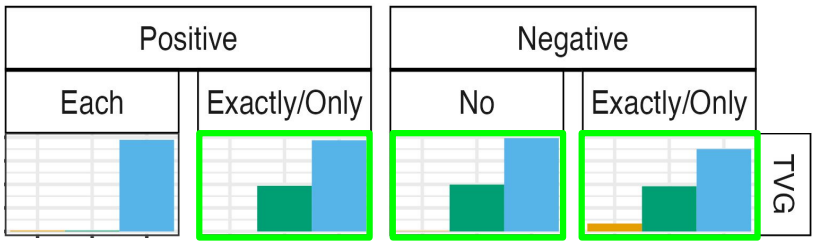
The Gappy approach



Ambiguity in the NM cases and the negative monotonic cases as a result of

1. ∀-projection and
2. Accommodation (or ∃-projection)

The Gappy approach



Ambiguity in the NM cases and the negative monotonic cases as a result of

1. ∀-projection and
2. Accommodation (or ∃-projection)

- Presupposition or other projective meaning?
- Cost of accommodation as an explanation for the variations observed?
- **Next:** comparison with presupposition

Exactly one boy finished/didn't finish eating the apple in front of him.

Extension: conjunction

- Unfocused conjunction also gives rise to homogeneity inferences

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- All theories above have been or can be extended to conjunction

Exactly one boy didn't eat the cupcake and the pear

Strong:	*… all other boys ate both*	FALSE
Weak:	*…all other boys ate one*	TRUE

Extension: conjunction

- Unfocused conjunction also gives rise to homogeneity inferences
- All theories above have been or can be extended to conjunction
- We tested these constructions using the same task, materials and design

POSITIVE

Each boy ate `<item1>` and `<item2>`...

Exactly one boy ate `<item1>` and `<item2>`...

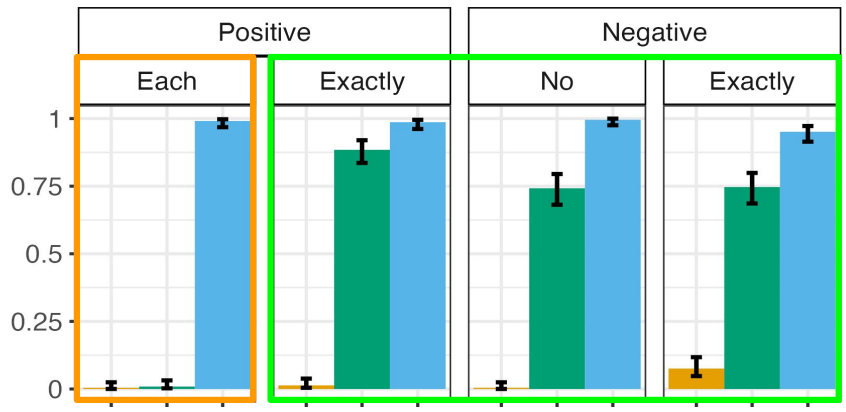
NEGATIVE

No boy ate `<item1>` and `<item2>`...

Exactly one one boy didn't eat `<item1>` and `<item2>`...

Extension: conjunction

- Unfocused conjunction also gives rise to homogeneity inferences
- All theories above have been or can be extended to conjunction
- We tested these constructions using the same task, materials and design
- We found similar patterns of responses



Weak readings readily available

Extension: free choice

- All three approaches to homogeneity extend to FC (or started with FC)

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Extension: free choice

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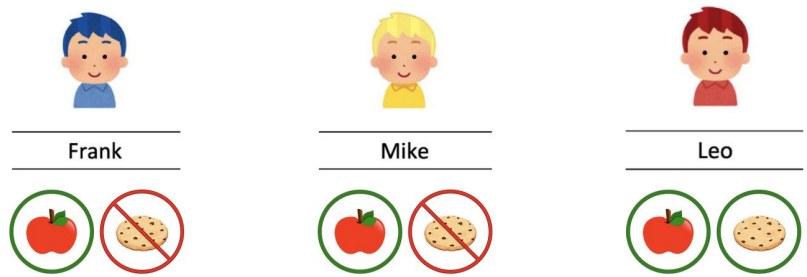
- Test the plausibility of unified approaches to homogeneity and FC
- Same ambiguity in NM contexts? Distinct predictions there too.*

Exactly one boy can buy the apple or the cookie.



Strong:	*… all other boys cannot buy either*	FALSE
Weak:	*…all other boys can't choose*	TRUE

* See Gotzner, Romoli & Santorio (2020) for discussion

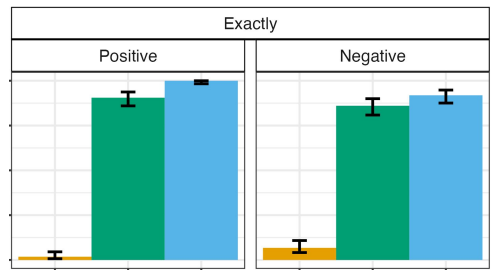
Extension: free choice

- All three approaches to homogeneity extend to FC (or started with FC)
- Test the plausibility of unified approaches to homogeneity and FC
- Same ambiguity in NM contexts? Distinct predictions there too.*

PILOT STUDIES

Exactly one boy can buy `<item1>` or `<item2>`...

Exactly one boy cannot buy `<item1>` or `<item2>`...



Weak readings readily available

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Conclusion

A systematic comparison across quantificational contexts with different monotonic properties allows us to

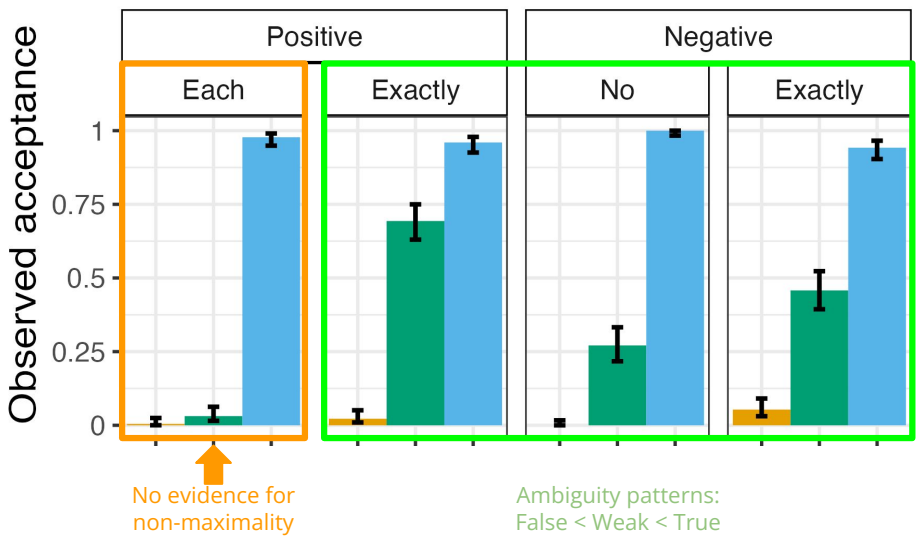
- test diverging predictions and distinguish among different approaches
- investigate the prospects of a unified analysis of these phenomena

Thanks!

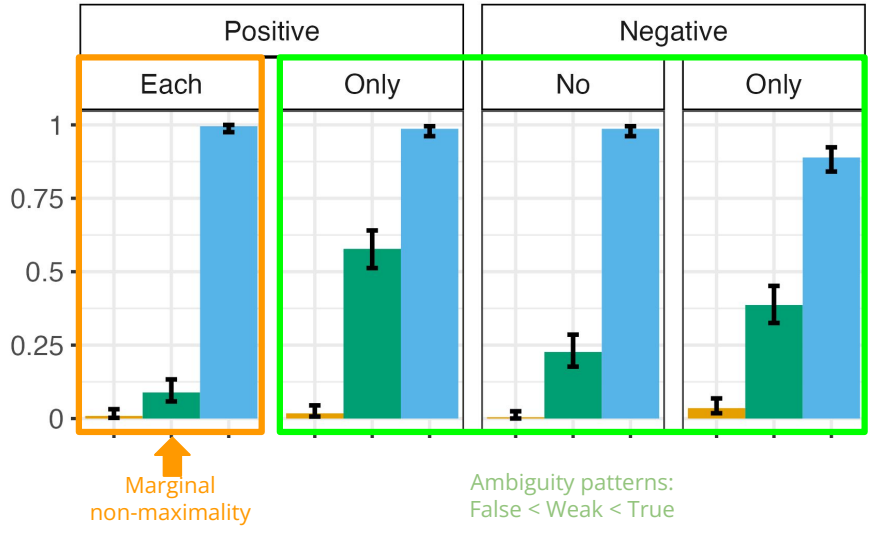
Appendix

Results

Exp.1 – Exactly

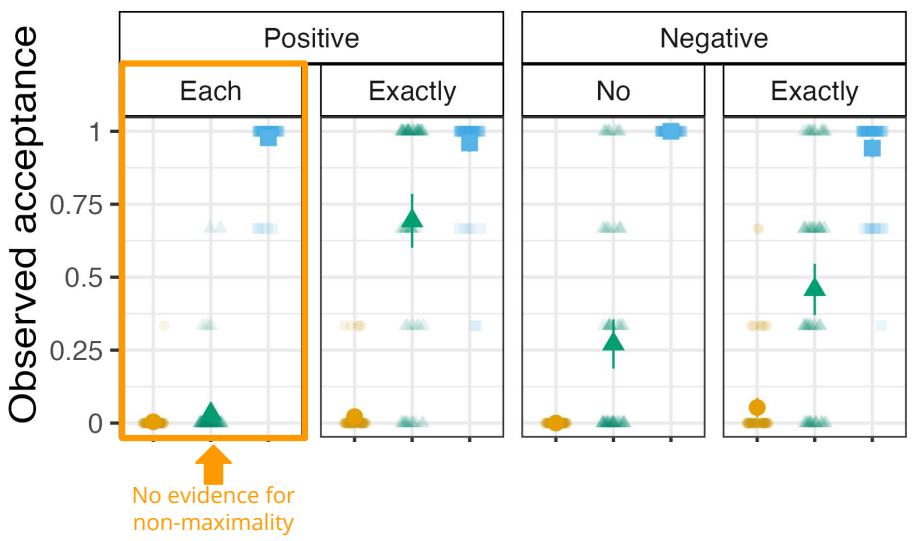


Exp.2 – Only



Zooming in

Exp.1 – Exactly



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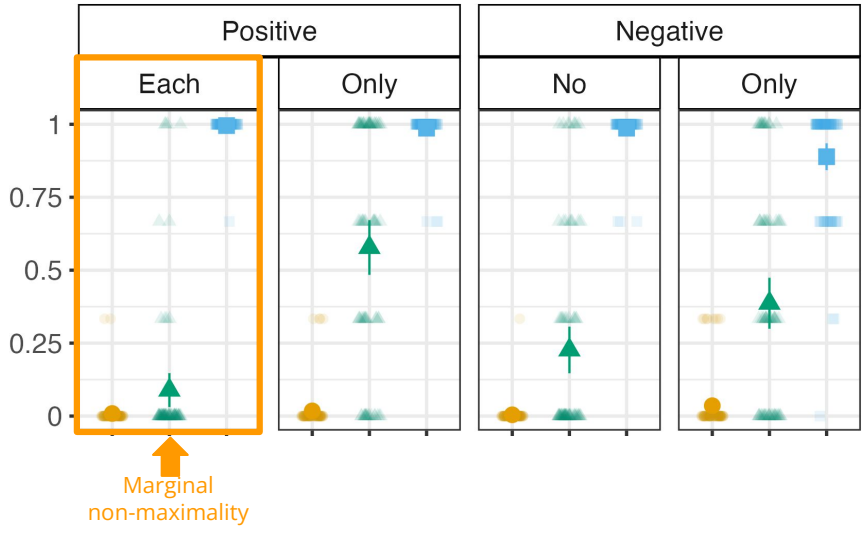

Model performance

Exp.1 – Exactly

	npar	AIC	BIC	R2_m	R2_c
Model_IMP	4	1663	1686	0.66	0.71
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Exp.2 – Only

npar	AIC	BIC	R2_m	R2_c
4	1646	1669	0.66	0.72
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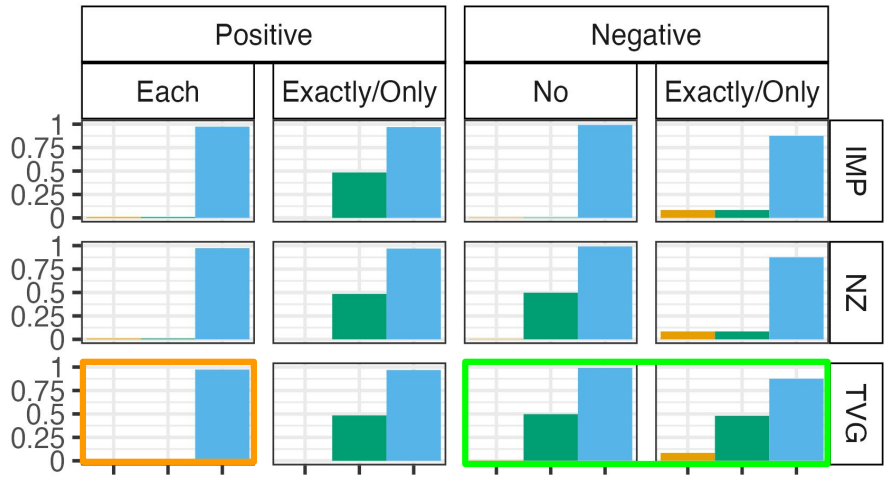
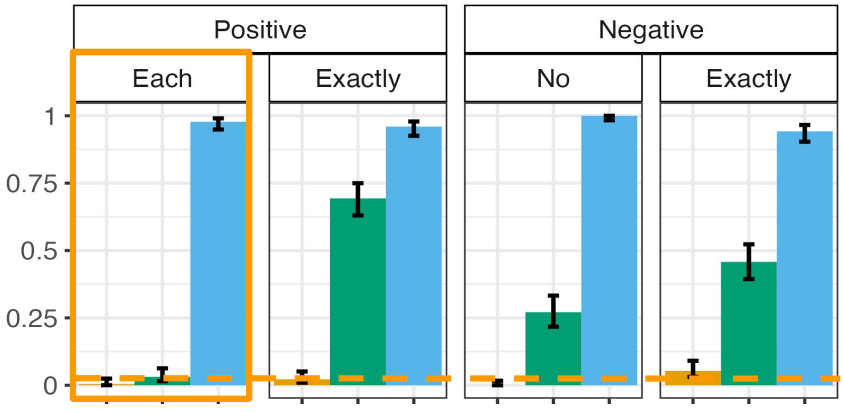
6	1451	1486	0.70	0.74

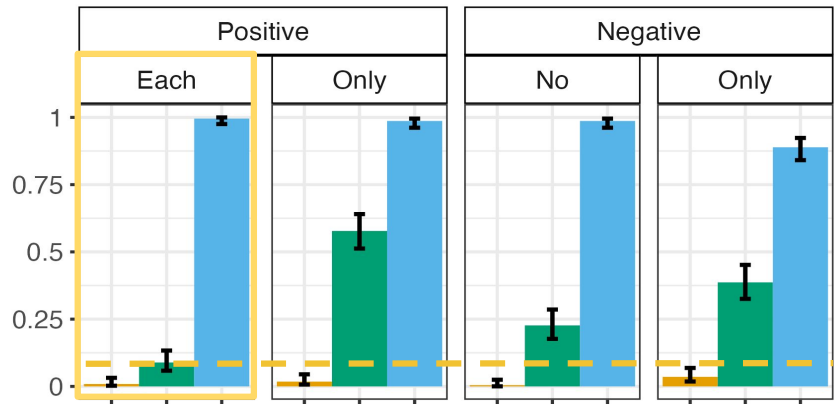
TVG performs better in Exp.1 than in Exp.2

Note: AIC/BIC estimates the amount of information lost by a model: the lower, the better; R^2 is the proportion of the variation in responses predictable from V1 and V2: the higher, the better

Exp.1 vs Exp.2







Condition False Weak True

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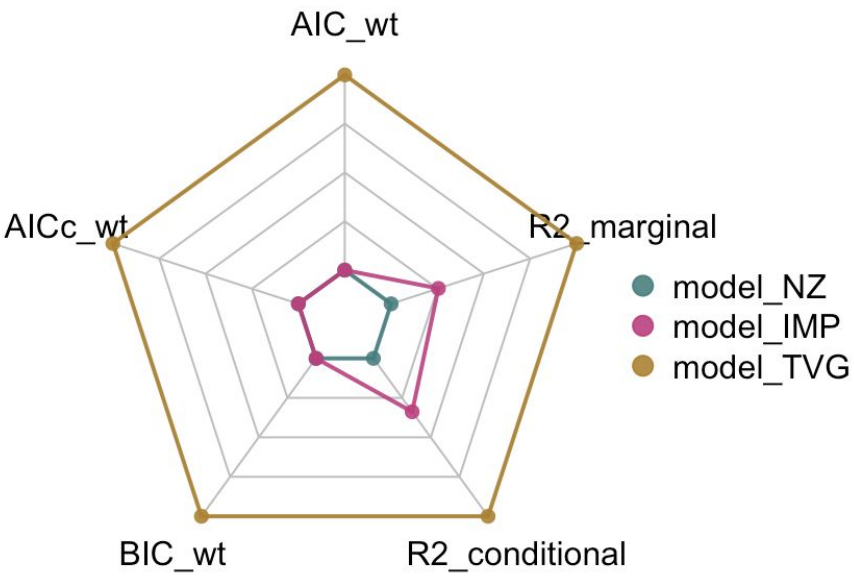
25% of the variance in responses left unexplained (RMSE ≈ 0.26)

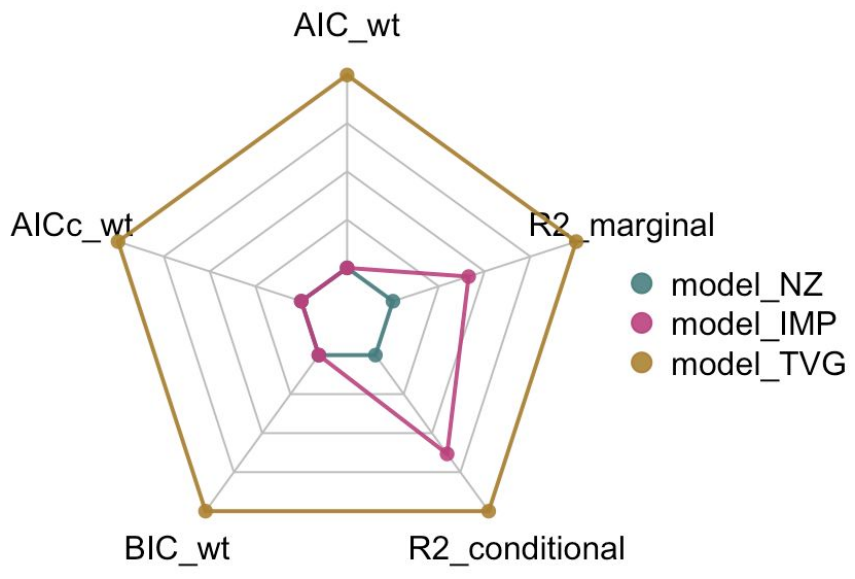
Note: AIC/BIC estimates the amount of information lost by a model: the lower, the better; R^2 is the proportion of the variation in responses predictable from V1 and V2: the higher, the better

Model performance: AIC, BIC weights

Exp.1 – Exactly



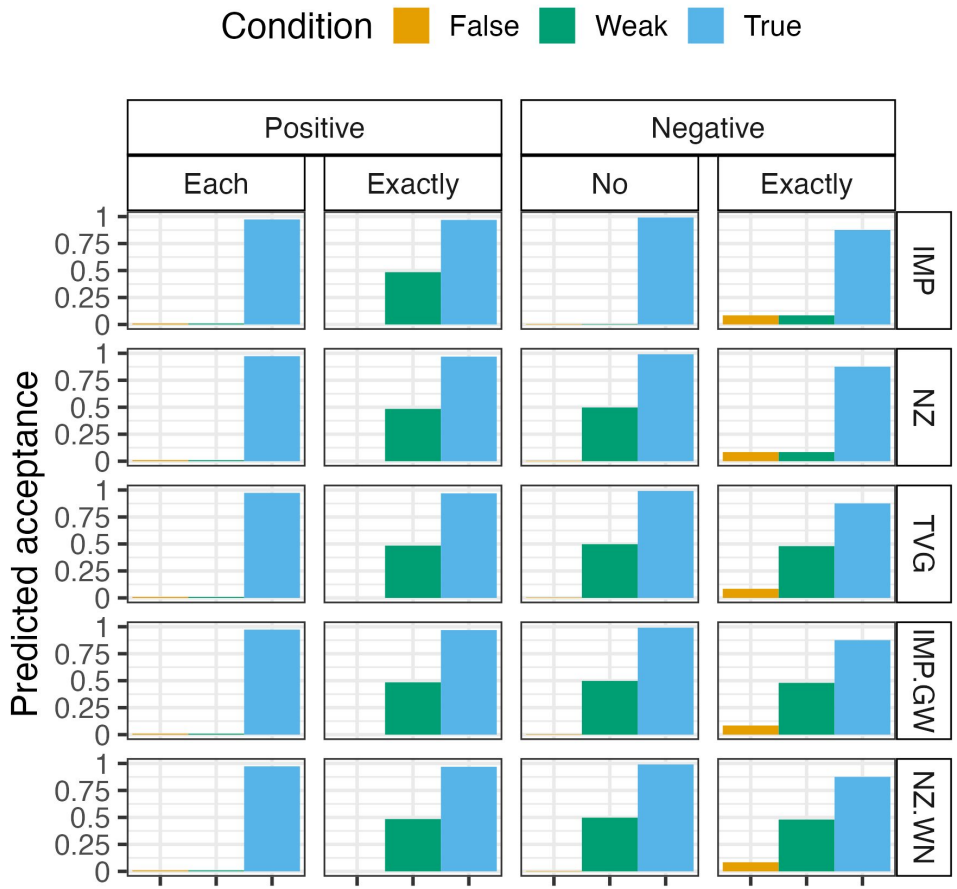
Exp.2 – Only



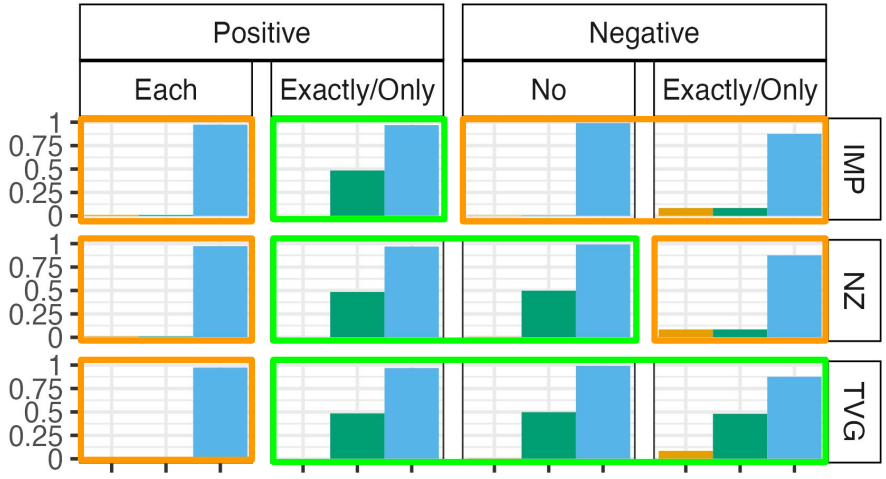
Visualizing the predictions

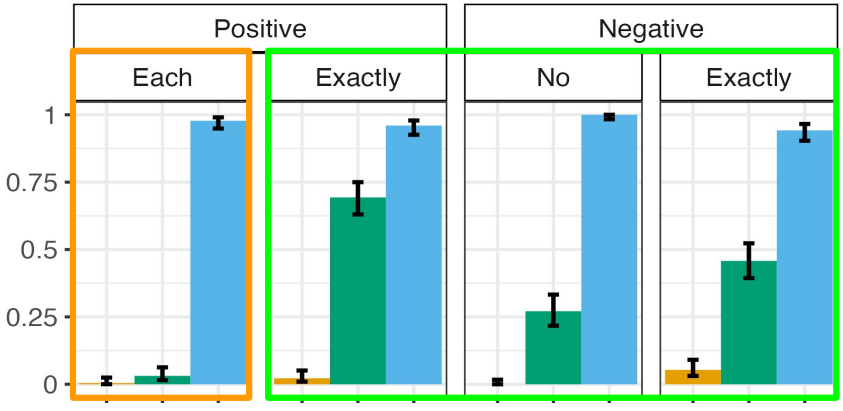
- Response error rates estimated from comprehension checks
- Ambiguity represented by the average of the min/max values
- No non-maximality effects, e.g., predictions for *Each-Weak*

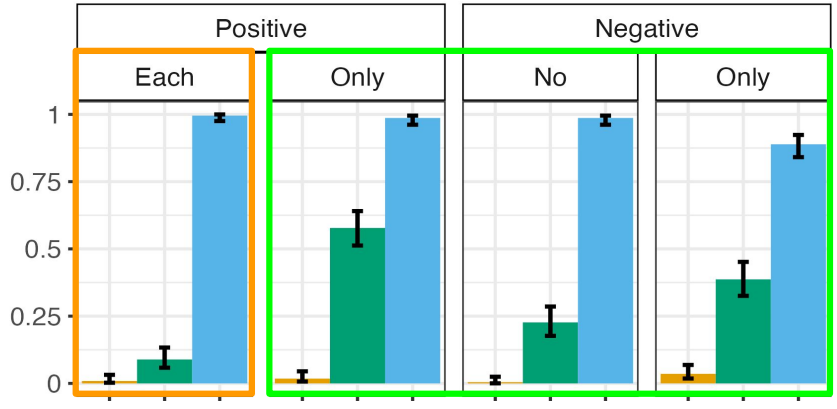
(these values are only used for illustrating the predicted patterns)



Predicted
vs. observed







Condition False Weak True

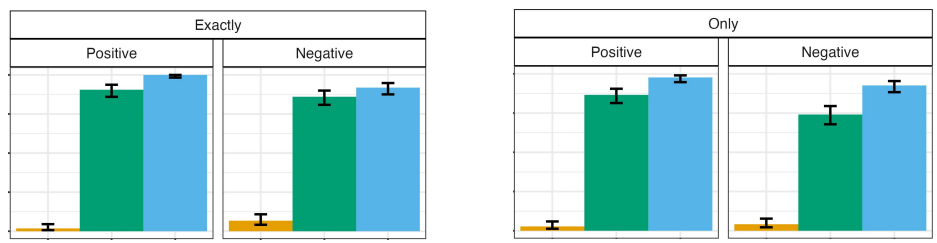
Extension: free choice

- All three approaches to homogeneity extend to FC (or started with FC)
- Test the plausibility of unified approaches to homogeneity and FC
- Same ambiguity in NM contexts? Distinct predictions there too.*

PILOT STUDIES

Exactly/Only one boy can buy `<item1>` or `<item2>`...

Exactly/Only one boy cannot buy `<item1>` or `<item2>`...



Weak readings readily available

* see Gotzner, Romoli & Santorio (2020) for discussion