Modified numerals in inquisitive pragmatics

Matthijs Westera

Institute for Logic, Language and Computation
University of Amsterdam

UGGS première
UCSC, 2013, January 26th

Goal

To defend a simple and uniform semantic analysis of (modified) numerals in light of data suggesting the contrary.

Goal

To defend a simple and uniform semantic analysis of (modified) numerals in light of data suggesting the contrary.

4 boys came	$\exists x.\|x\| = 4 \wedge B(x) \wedge C(x)$
At least 3 boys came	$\exists x.\|x\| \geq 3 \wedge B(x) \wedge C(x)$
More than 2 boys came	$\exists x.\|x\| > 2 \wedge B(x) \wedge C(x)$
At most 5 boys came	$\exists x.\|x\| \leq 5 \wedge B(x) \wedge C(x)$
Fewer than 6 boys came	$\exists x.\|x\| < 6 \wedge B(x) \wedge C(x)$

Goal

To defend a simple and uniform semantic analysis of (modified) numerals in light of data suggesting the contrary.

4 boys came	$\exists x.\lvert x\rvert = 4 \wedge B(x) \wedge C(x)$
At least 3 boys came	$\exists x.\lvert x\rvert \geq 3 \wedge B(x) \wedge C(x)$
More than 2 boys came	$\exists x.\lvert x\rvert > 2 \wedge B(x) \wedge C(x)$
At most 5 boys came	$\exists x.\lvert x\rvert \leq 5 \wedge B(x) \wedge C(x)$
Fewer than 6 boys came	$\exists x.\lvert x\rvert < 6 \wedge B(x) \wedge C(x)$

Some facts

- At least n boys came $\equiv$ More than $n-1$ boys came ($\equiv_T$ n boys came)
- At most n boys came $\equiv$ Fewer than $n+1$ boys came

Goal

To defend a simple and uniform semantic analysis of (modified) numerals in light of data suggesting the contrary.

4 boys came	$\exists x.\lvert x\rvert = 4 \wedge B(x) \wedge C(x)$
At least 3 boys came	$\exists x.\lvert x\rvert \geq 3 \wedge B(x) \wedge C(x)$
More than 2 boys came	$\exists x.\lvert x\rvert > 2 \wedge B(x) \wedge C(x)$
At most 5 boys came	$\exists x.\lvert x\rvert \leq 5 \wedge B(x) \wedge C(x)$
Fewer than 6 boys came	$\exists x.\lvert x\rvert < 6 \wedge B(x) \wedge C(x)$

Some facts

- At least n boys came $\equiv$ More than $n-1$ boys came ($\equiv_T$ n boys came)
- At most n boys came $\equiv$ Fewer than $n+1$ boys came
- The sentences with DE modifiers are always true.

Puzzle 1: '*n*' vs. 'at least *n*'

(1) a. 3 boys came. $\rightsquigarrow$ Exactly 3 boys came.
    b. At least 3 boys came. $\not\rightsquigarrow$ Exactly 3 boys came.

Puzzle 1: ‘*n*’ vs. ‘at least *n*’

(1) a. 3 boys came. $\rightsquigarrow$ Exactly 3 boys came.
b. At least 3 boys came. $\not\rightsquigarrow$ Exactly 3 boys came.

Explanation:

- a. and b. are truth-conditionally equivalent, but nevertheless **semantically distinct**.

Puzzle 1: ‘*n*’ vs. ‘at least *n*’

(1) a. 3 boys came. $\rightsquigarrow$ Exactly 3 boys came.
b. At least 3 boys came. $\not\rightsquigarrow$ Exactly 3 boys came.

Explanation:

- a. and b. are truth-conditionally equivalent, but nevertheless **semantically distinct**.
- The **exhaustivity** inference of a. is a pragmatic implicature stemming from this semantic distinction.

Puzzle 2: ‘At most’ and ‘fewer than’

The following is falsely predicted to be always true:

(2) {At most/fewer than} 3 boys came

Puzzle 2: 'At most' and 'fewer than'

The following is falsely predicted to be always true:

(2) {At most/fewer than} 3 boys came

Explanation:

- Like '3 boys came', (2) may have an **exhaustivity** implicature.

Puzzle 2: 'At most' and 'fewer than'

The following is falsely predicted to be always true:

(2) {At most/fewer than} 3 boys came

Explanation:

- Like '3 boys came', (2) may have an **exhaustivity** implicature.
- Somehow, for (2), this implicature is much more typical, perhaps even always there.

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the ‘maximal set’, unmodified numerals also to the ‘witness’ set:

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the ‘maximal set’, unmodified numerals also to the ‘witness’ set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.

b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the 'maximal set', unmodified numerals also to the 'witness' set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.

b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

Explanation:

- In a., anaphora to the maximal set happens only when there is an **exhaustivity implicature**.

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the 'maximal set', unmodified numerals also to the 'witness' set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.

b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

Explanation:

- In a., anaphora to the maximal set happens only when there is an **exhaustivity implicature**.
- Perhaps b. by default implicates exhaustivity in some as yet undiscovered way.

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

(4) A hexagon has $\left\{ \begin{array}{l} \text{at least 5} \\ \text{more than 4} \\ \text{at most 7} \\ \text{fewer than 8} \end{array} \right\}$ sides.

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

(4) A hexagon has $\left\{ \begin{array}{l} \#\text{at least 5} \\ \quad\text{more than 4} \\ \#\text{at most 7} \\ \quad\text{fewer than 8} \end{array} \right\}$ sides.

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

(4) A hexagon has $\left\{\begin{array}{l} \#\text{at least 5} \\ \quad\text{more than 4} \\ \#\text{at most 7} \\ \quad\text{fewer than 8} \end{array}\right\}$ sides.

Explanation:

- Only superlative modifiers convey **ignorance** (Nouwen)

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

(4) A hexagon has $\left\{ \begin{array}{l} \#\text{at least 5} \\ \quad \text{more than 4} \\ \#\text{at most 7} \\ \quad \text{fewer than 8} \end{array} \right\}$ sides.

Explanation:

- Only superlative modifiers convey **ignorance** (Nouwen)
- Only superlative modifiers convey **possibility** (Nouwen)

Puzzle 4: Comparative vs. superlative (2)

Geurts, et al. (2010)

Argument validity judgements:

a.	Berta had 3 beers	Berta had at least 3 beers	50
b.	Berta had 3 beers	Berta had more than 2 beers	100
c.	Berta had 3 beers	Berta had at most 3 beers	61
d.	Berta had 3 beers	Berta had fewer than 4 beers	93
e.	Berta had at most 2 beers	Berta had at most 3 beers	14
f.	Berta had fewer than 3 beers	Berta had fewer than 4 beers	71

Puzzle 4: Comparative vs. superlative (2)

Geurts, et al. (2010)

Argument validity judgements:

a.	Berta had 3 beers	Berta had at least 3 beers	50
b.	Berta had 3 beers	Berta had more than 2 beers	100
c.	Berta had 3 beers	Berta had at most 3 beers	61
d.	Berta had 3 beers	Berta had fewer than 4 beers	93
e.	Berta had at most 2 beers	Berta had at most 3 beers	14
f.	Berta had fewer than 3 beers	Berta had fewer than 4 beers	71

Explanation:

- a and c are blocked by the **ignorance** conveyed by their conclusion (Geurts, et al.)

Puzzle 4: Comparative vs. superlative (2)

Geurts, et al. (2010)

Argument validity judgements:

a.	Berta had 3 beers	Berta had at least 3 beers	50
b.	Berta had 3 beers	Berta had more than 2 beers	100
c.	Berta had 3 beers	Berta had at most 3 beers	61
d.	Berta had 3 beers	Berta had fewer than 4 beers	93
e.	Berta had at most 2 beers	Berta had at most 3 beers	14
f.	Berta had fewer than 3 beers	Berta had fewer than 4 beers	71

Explanation:

- a and c are blocked by the **ignorance** conveyed by their conclusion (Geurts, et al.)
- (But that does not mean the ignorance is a semantic entailment (Coppock and Brochhagen (submitted)))

Puzzle 5: ‘At most’ vs. the rest

Coppock and Brochhagen (submitted)

[Picture of four apples on a table] Truth judgment:

$$(5) \left\{ \begin{array}{l} \text{At least 3} \\ \text{More than 2} \\ \text{At most 5} \\ \text{Fewer than 6} \end{array} \right\} \text{apples are on the table.}$$

Puzzle 5: ‘At most’ vs. the rest

Coppock and Brochhagen (submitted)

[Picture of four apples on a table] Truth judgment:

(5) $\left\{\begin{array}{l} \text{ At least 3} \\ \text{ More than 2} \\ \text{?At most 5} \\ \text{ Fewer than 6} \end{array}\right\}$ apples are on the table.

Puzzle 5: ‘At most’ vs. the rest

Coppock and Brochhagen (submitted)

[Picture of four apples on a table] Truth judgment:

$$(5)\ \left\{\begin{array}{l} \text{At least 3} \\ \text{More than 2} \\ \text{?At most 5} \\ \text{Fewer than 6} \end{array}\right\} \text{ apples are on the table.}$$

Explanation:

- This setting disables **ignorance** inferences, for some reason.

Puzzle 5: 'At most' vs. the rest

Coppock and Brochhagen (submitted)

[Picture of four apples on a table] Truth judgment:

(5) $\left\{ \begin{array}{l} \text{At least 3} \\ \text{More than 2} \\ \text{?At most 5} \\ \text{Fewer than 6} \end{array} \right\}$ apples are on the table.

Explanation:

- This setting disables **ignorance** inferences, for some reason.
- However, it does not disable **possibility** inferences, for some reason.

Puzzle 5: ‘At most’ vs. the rest

Coppock and Brochhagen (submitted)

[Picture of four apples on a table] Truth judgment:

(5) $\left\{\begin{array}{l} \text{At least 3} \\ \text{More than 2} \\ \text{?At most 5} \\ \text{Fewer than 6} \end{array}\right\}$ apples are on the table.

Explanation:

- This setting disables **ignorance** inferences, for some reason.
- However, it does not disable **possibility** inferences, for some reason.
- In this case, for ‘at least 3’ the possibility inference happens to be true, for ‘at most 5’ it is false.

Hypothesis

- The uniform semantics can be maintained.

Hypothesis

- The uniform semantics can be maintained.
- Each of the distinguishing inferences has a *pragmatic* origin, not semantic.

Hypothesis

- The uniform semantics can be maintained.
- Each of the distinguishing inferences has a *pragmatic* origin, not semantic.

(6) At most six boys came to the party. They all wore a hat.

Shopping list:

Hypothesis

- The uniform semantics can be maintained.
- Each of the distinguishing inferences has a *pragmatic* origin, not semantic.

(6) At most six boys came to the party. They all wore a hat.

Shopping list:

- **Ignorance**: I'm not sure how many exactly.

Hypothesis

- The uniform semantics can be maintained.
- Each of the distinguishing inferences has a *pragmatic* origin, not semantic.

(6) At most six boys came to the party. They all wore a hat.

Shopping list:

- **Ignorance**: I'm not sure how many exactly.
- **Possibility**: I consider it possible that there were six.

Hypothesis

- The uniform semantics can be maintained.
- Each of the distinguishing inferences has a *pragmatic* origin, not semantic.

(6) At most six boys came to the party. They all wore a hat.

Shopping list:

- **Ignorance**: I'm not sure how many exactly.
- **Possibility**: I consider it possible that there were six.
- **Exhaustivity**: Not more than six boys came to the party.

Hypothesis

- The uniform semantics can be maintained.
- Each of the distinguishing inferences has a *pragmatic* origin, not semantic.

(6) At most six boys came to the party. They all wore a hat.

Shopping list:

- **Ignorance**: I'm not sure how many exactly.
- **Possibility**: I consider it possible that there were six.
- **Exhaustivity**: Not more than six boys came to the party.
- **Exhaustivity'**: All boys who came to the party wore a hat.

Structure

Framework

Solving the puzzles

Conclusion

Inquisitive semantics

Unrestricted inquisitive semantics

1. $[P(t_1,\ldots,t_n)]_g = \{\{w | \langle [t_1]_{w,g},\ldots,[t_n]_{w,g}\rangle \in [P]_w\}\}$
2. $[\varphi \vee \psi]_g = [\varphi]_g \cup [\psi]_g$
3. $[\varphi \wedge \psi]_g = [\varphi]_g \sqcap [\psi]_g$ (where $A \sqcap B = \{\alpha \cap \beta : \alpha \in A, \beta \in B\}$)
4. $[\exists x.\varphi]_g = \bigcup_{d\in D}[\varphi]_{g[x/d]}$
5. $[\forall x.\varphi]_g = \sqcap_{d\in D}[\varphi]_{g[x/d]}$

Inquisitive semantics

Unrestricted inquisitive semantics

1. $[P(t_1,\ldots,t_n)]_g = \{\{w | \langle [t_1]_{w,g},\ldots,[t_n]_{w,g}\rangle \in [P]_w\}\}$
2. $[\varphi \vee \psi]_g = [\varphi]_g \cup [\psi]_g$
3. $[\varphi \wedge \psi]_g = [\varphi]_g \sqcap [\psi]_g$ (where $A \sqcap B = \{\alpha \cap \beta : \alpha \in A, \beta \in B\}$)
4. $[\exists x.\varphi]_g = \bigcup_{d \in D}[\varphi]_{g[x/d]}$
5. $[\forall x.\varphi]_g = \sqcap_{d \in D}[\varphi]_{g[x/d]}$

Entailment

1. A entails B, $A \vDash B$, iff $\exists C, B \sqcap C = A$
2. A contains B, $B \subseteq A$, iff $\exists C, B \cup C = A$

Inquisitive pragmatics

(Grice, 1975)

Maxim of Relation

Only propose what is relevant.

Maxim of Quantity

Make your contribution just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if you believe it to be true.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what is relevant.

Maxim of Quantity

Make your contribution just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if you believe it to be true.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what is relevant.

Maxim of Quantity

Make your contribution just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if you believe it to be true.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what you consider to be relevant.

Maxim of Quantity

Make your contribution just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if you believe it to be true.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what you consider to be relevant.

Maxim of Quantity

Make the possibilities you propose just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if you believe it to be true.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what you consider to be relevant.

Maxim of Quantity

Make the possibilities you propose just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if:

1. you consider necessary the union of its possibilities; and
2. you consider possible all its possibilities.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what you consider to be relevant.

Maxim of Quantity

Make the possibilities you propose just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if:

1. you consider necessary the union of its possibilities; and
2. you consider possible all its possibilities.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what you consider to be relevant.

Maxim of Quantity

Make the possibilities you propose just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if:

1. you consider necessary the union of its possibilities; and
2. you consider possible all its possibilities.

- A is relevant iff $A \vDash QUD$.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what you consider to be relevant.

Maxim of Quantity

Make the possibilities you propose just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if:

1. you consider necessary the union of its possibilities; and
2. you consider possible all its possibilities.

- A is relevant iff $A \vDash QUD$.
- Goal (ex.): give as many answers to the QUD as possible.

Inquisitive pragmatics

(Grice, 1975) + (Westera, 2013)

Maxim of Relation

Only propose what you consider to be relevant.

Maxim of Quantity

Make the possibilities you propose just as informative as required for the current goal of the conversation.

Maxim of Quality

Propose a proposition only if:

1. you consider necessary the union of its possibilities; and
2. you consider possible all its possibilities.

- A is relevant iff $A \vDash QUD$.
- Goal (ex.): give as many answers to the *QUD* as needed.

Two additional background assumptions

Focus Principle (Beaver and Clark, 2008; Rooth, 1996)

A focused constituent presupposes a QUD to which it is an answer.

Two additional background assumptions

Focus Principle (Beaver and Clark, 2008; Rooth, 1996)

A focused constituent presupposes a QUD to which it is an answer.

Consequences:

- Modifiers ‘at least’ etc. presuppose a QUD to which their prejacent is an answer (Beaver and Coppock, 2012).

Two additional background assumptions

Focus Principle (Beaver and Clark, 2008; Rooth, 1996)

A focused constituent presupposes a QUD to which it is an answer.

Consequences:

- Modifiers 'at least' etc. presuppose a QUD to which their prejacent is an answer (Beaver and Coppock, 2012).
- For modified numerals, this means they presuppose a 'how many'-question.

Two additional background assumptions

Focus Principle (Beaver and Clark, 2008; Rooth, 1996)

A focused constituent presupposes a QUD to which it is an answer.

Consequences:

- Modifiers ‘at least’ etc. presuppose a QUD to which their prejacent is an answer (Beaver and Coppock, 2012).
- For modified numerals, this means they presuppose a ‘how many’-question.

Privacy Principle (Schwarzschild, 2002)

A quantifier may have an implicit, possibly singleton domain restriction that is known to only the speaker.

Two additional background assumptions

Focus Principle (Beaver and Clark, 2008; Rooth, 1996)

A focused constituent presupposes a QUD to which it is an answer.

Consequences:

- Modifiers 'at least' etc. presuppose a QUD to which their prejacent is an answer (Beaver and Coppock, 2012).
- For modified numerals, this means they presuppose a 'how many'-question.

Privacy Principle (Schwarzschild, 2002)

A quantifier may have an implicit, possibly singleton domain restriction that is known to only the speaker.

Consequences:

- Superlative modifiers reveal part of the domain restriction, while comparatives don't.

Two additional background assumptions

Focus Principle (Beaver and Clark, 2008; Rooth, 1996)

A focused constituent presupposes a QUD to which it is an answer.

Consequences:

- Modifiers ‘at least’ etc. presuppose a QUD to which their prejacent is an answer (Beaver and Coppock, 2012).
- For modified numerals, this means they presuppose a ‘how many’-question.

Privacy Principle (Schwarzschild, 2002)

A quantifier may have an implicit, possibly singleton domain restriction that is known to only the speaker.

Consequences:

- Superlative modifiers reveal part of the domain restriction, while comparatives don’t.
- Comparatives can be used with a singleton domain restriction (‘referentially’), superlatives cannot.

Structure

Framework

Solving the puzzles

Conclusion

Puzzle 1: '*n*' vs. 'at least *n*'

(1) a. 3 boys came. $\rightsquigarrow$ Exactly 3 boys came.
b. At least 3 boys came. $\not\rightsquigarrow$ Exactly 3 boys came.

Explanation:

- a. and b. are truth-conditionally equivalent, but nevertheless **semantically distinct**.
- The **exhaustivity** inference of a. is a pragmatic implicature stemming from this semantic distinction.

Puzzle 2: ‘At most’ and ‘fewer than’

The following is falsely predicted to be always true:

(2) {At most/fewer than} 3 boys came

Explanation:

- Like ‘3 boys came’, (2) may have an **exhaustivity** implicature.
- Somehow, for (2), this implicature is much more typical, perhaps even always there.

Puzzle 2: 'At most' and 'fewer than'

The following is falsely predicted to be always true:

(2) {At most/fewer than} 3 boys came

Explanation:

- Like '3 boys came', (2) may have an **exhaustivity** implicature.
- Somehow, for (2), this implicature is much more typical, perhaps even always there.

More precisely:

- (1) presupposes the QUD 'how many boys came?'.

Puzzle 2: 'At most' and 'fewer than'

The following is falsely predicted to be always true:

(2) {At most/fewer than} 3 boys came

Explanation:

- Like '3 boys came', (2) may have an **exhaustivity** implicature.
- Somehow, for (2), this implicature is much more typical, perhaps even always there.

More precisely:

- (1) presupposes the QUD 'how many boys came?'.
- In light of this QUD, (2) has an exhaustivity implicature.

Puzzle 2: ‘At most’ and ‘fewer than’

The following is falsely predicted to be always true:

(2) {At most/fewer than} 3 boys came

Explanation:

- Like ‘3 boys came’, (2) may have an **exhaustivity** implicature.
- Somehow, for (2), this implicature is much more typical, perhaps even always there.

More precisely:

- (1) presupposes the QUD ‘how many boys came?’.
- In light of this QUD, (2) has an exhaustivity implicature.
- Perhaps then the implicature is lexicalized (but this makes no difference).

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the 'maximal set', unmodified numerals also to the 'witness' set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.

b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

Explanation:

- In a., anaphora to the maximal set happens only when there is an **exhaustivity implicature**.
- Perhaps b. by default implicates exhaustivity in some as yet undiscovered way.

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the 'maximal set', unmodified numerals also to the 'witness' set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.

b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

More precisely:

- For (3a), the exhaustivity implicature and, with it, the maximal set anaphora, is optional.

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the 'maximal set', unmodified numerals also to the 'witness' set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.
b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

More precisely:

- For (3a), the exhaustivity implicature and, with it, the maximal set anaphora, is optional.
- (3b) never implicates exhaustivity, however, its responses might.

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the 'maximal set', unmodified numerals also to the 'witness' set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.

b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

More precisely:

- For (3a), the exhaustivity implicature and, with it, the maximal set anaphora, is optional.
- (3b) never implicates exhaustivity, however, its responses might.
- Any response to (3b) that reveals the contents of the discourse referent, will implicate exhaustivity.

Puzzle 3: Unmodified vs. modified

Modified numerals enable anaphora only to the 'maximal set', unmodified numerals also to the 'witness' set:

(3) a. {3/some/many} boys came to the party.
They all wore a hat. $\rightsquigarrow$ / $\not\rightsquigarrow$ All boys who came wore hats.

b. {At least/exactly/fewer than} 3 boys came to the party.
They all wore a hat. $\rightsquigarrow$ All boys who came wore hats.

More precisely:

- For (3a), the exhaustivity implicature and, with it, the maximal set anaphora, is optional.
- (3b) never implicates exhaustivity, however, its responses might.
- Any response to (3b) that reveals the contents of the discourse referent, will implicate exhaustivity.
- **Prediction:** For '3', 'some' and 'many', the kind of anaphora is QUD-dependent.

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

(4) A hexagon has $\left\{\begin{array}{l} \#\text{at least 5} \\ \quad \text{more than 4} \\ \#\text{at most 7} \\ \quad \text{fewer than 8} \end{array}\right\}$ sides.

Explanation:

- Only superlative modifiers convey **ignorance** (Nouwen)
- Only superlative modifiers convey **possibility** (Nouwen)

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

$$\text{(4) A hexagon has } \left\{ \begin{array}{l} \#\text{at least 5} \\ \quad \text{more than 4} \\ \#\text{at most 7} \\ \quad \text{fewer than 8} \end{array} \right\} \text{ sides.}$$

Explanation:

- Only superlative modifiers convey **ignorance** (Nouwen)
- Only superlative modifiers convey **possibility** (Nouwen)

More precisely:

- The relevant inferences are pragmatic implicatures.

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

(4) A hexagon has $\left\{\begin{array}{l} \#\text{at least 5} \\ \quad\text{more than 4} \\ \#\text{at most 7} \\ \quad\text{fewer than 8} \end{array}\right\}$ sides.

Explanation:

- Only superlative modifiers convey **ignorance** (Nouwen)
- Only superlative modifiers convey **possibility** (Nouwen)

More precisely:

- The relevant inferences are pragmatic implicatures.
- Comparative modifiers are used with a singleton domain restriction ('referentially') more easily than superlative modifiers, in which case the implicatures are absent.

Puzzle 4: Comparative vs. superlative modifiers (1)

Nouwen (2010)

[Knowing that a hexagon has exactly six sides]

(4) A hexagon has $\left\{ \begin{array}{l} \#\text{at least } 5 \\ \quad \text{more than } 4 \\ \#\text{at most } 7 \\ \quad \text{fewer than } 8 \end{array} \right\}$ sides.

Explanation:

- Only superlative modifiers convey **ignorance** (Nouwen)
- Only superlative modifiers convey **possibility** (Nouwen)

More precisely:

- The relevant inferences are pragmatic implicatures.
- Comparative modifiers are used with a singleton domain restriction ('referentially') more easily than superlative modifiers, in which case the implicatures are absent.
- **Prediction**: 'At least/at most 6' are perhaps better.

Puzzle 5: ‘At most’ vs. the rest

Coppock and Brochhagen (submitted)

[Picture of four apples on a table] Truth judgment:

$$(5)\ \left\{\begin{array}{l} \text{At least 3} \\ \text{More than 2} \\ \text{?At most 5} \\ \text{Fewer than 6} \end{array}\right\} \text{apples are on the table.}$$

Explanation:

- This setting disables **ignorance** inferences, for some reason.
- However, it does not disable **possibility** inferences, for some reason.
- In this case, for ‘at least 3’ the possibility inference happens to be true, for ‘at most 5’ it is false.

Structure

Framework

Solving the puzzles

Conclusion

Conclusion

- I have tried to defend the hypothesis that:
    - The uniform semantics can be maintained.
    - Each of the distinguishing inferences has a pragmatic origin, not semantic.

Conclusion

- I have tried to defend the hypothesis that:
  - The uniform semantics can be maintained.
  - Each of the distinguishing inferences has a pragmatic origin, not semantic.
- Inquisitive semantics and pragmatics is a concise but powerful toolbox.

Conclusion

- I have tried to defend the hypothesis that:
  - The uniform semantics can be maintained.
  - Each of the distinguishing inferences has a pragmatic origin, not semantic.
- Inquisitive semantics and pragmatics is a concise but powerful toolbox.
- Together with the Focus Principle and the Privacy Principle, all contrasts were accounted for.

Conclusion

- I have tried to defend the hypothesis that:
  - The uniform semantics can be maintained.
  - Each of the distinguishing inferences has a pragmatic origin, not semantic.
- Inquisitive semantics and pragmatics is a concise but powerful toolbox.
- Together with the Focus Principle and the Privacy Principle, all contrasts were accounted for.
- This highlights the importance of taking into account implicit QUDs when doing linguistic experiments.

Thanks!

Funded by the Netherlands Organisation for Scientific Research (NWO).
Thanks to Jeroen Groenendijk, Floris Roelofsen, Elizabeth Coppock, Thomas Brochhagen, and the audience of the Workshop on Questions and Inquisitive Semantics in Gothenborg.