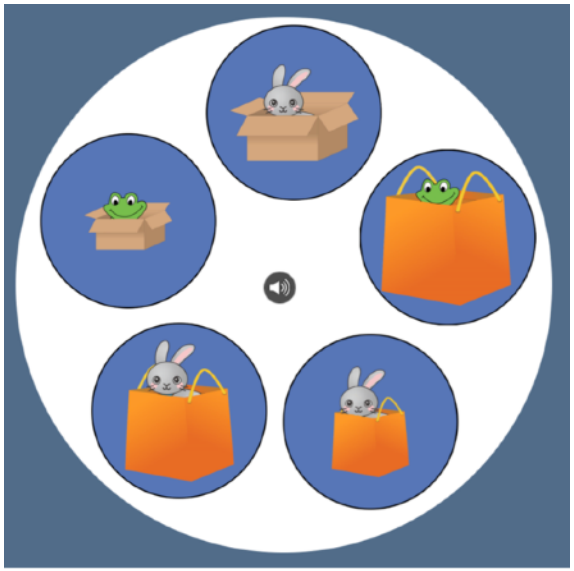
Semantics, Pragmatics, and Context in Grounded Human Language Understanding

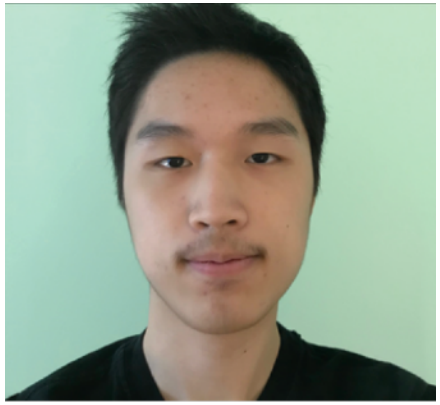


Roger Levy
Computational Psycholinguistics Laboratory (CPL)
Dept. of Brain & Cognitive Sciences
Massachusetts Institute of Technology

ViGIL 4.0
10 June 2021

Collaborators

Helena Aparicio



Curtis Chen

Elizabeth Coppock

Jennifer Hu

Michael Henry Tessler

Polina Tsvilodub

Noga Zaslavsky

The challenge of language understanding

The challenge of language understanding

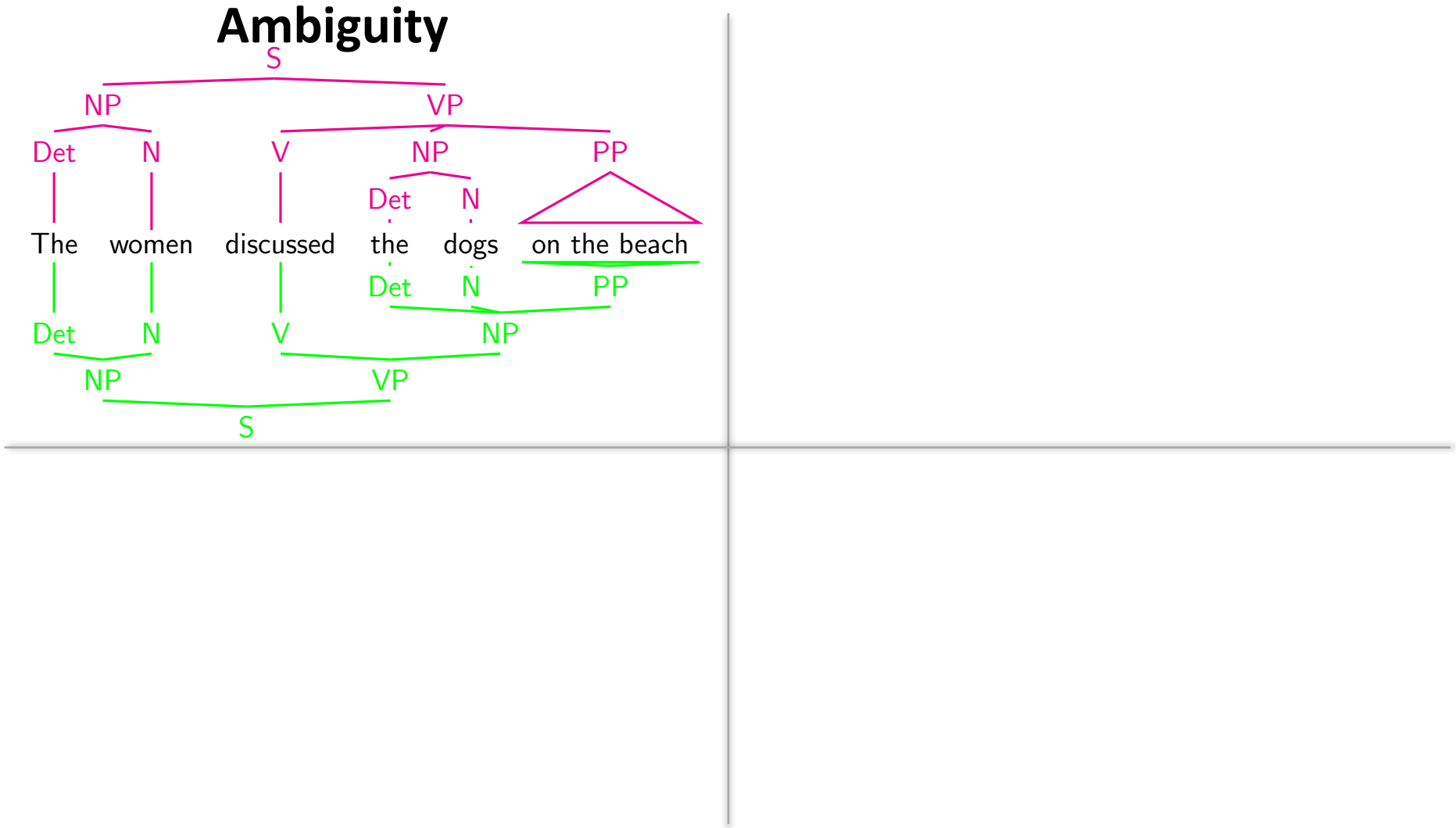
- How do humans communicate so well with language?

The challenge of language understanding

- How do humans communicate so well with language?

The challenge of language understanding

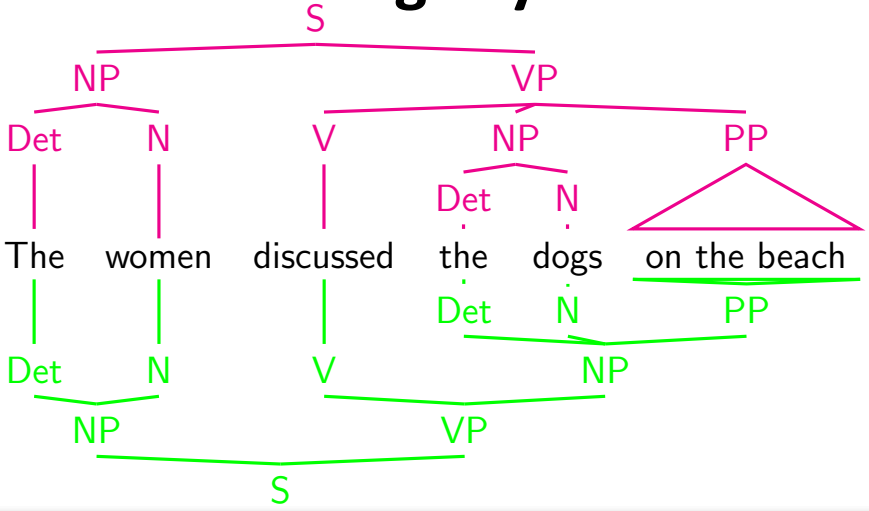
- How do humans communicate so well with language?



The challenge of language understanding

- How do humans communicate so well with language?

Ambiguity

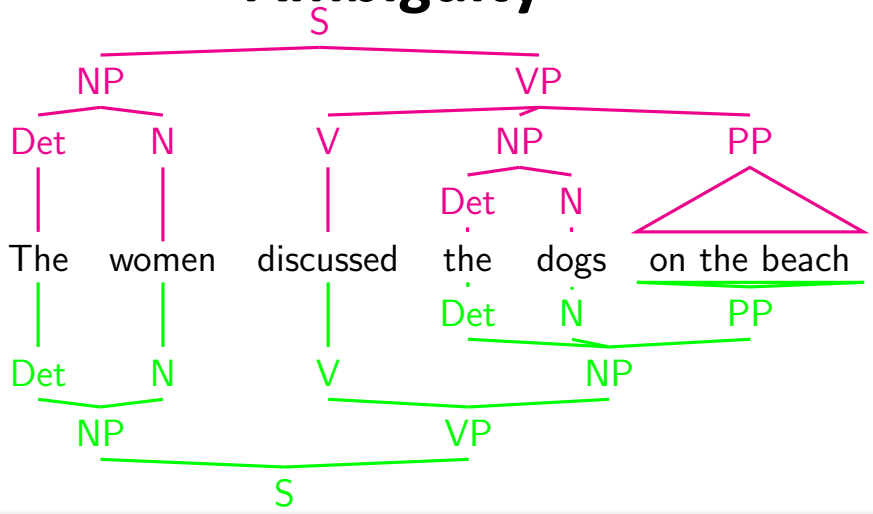


Environmental noise

The challenge of language understanding

- How do humans communicate so well with language?

Ambiguity



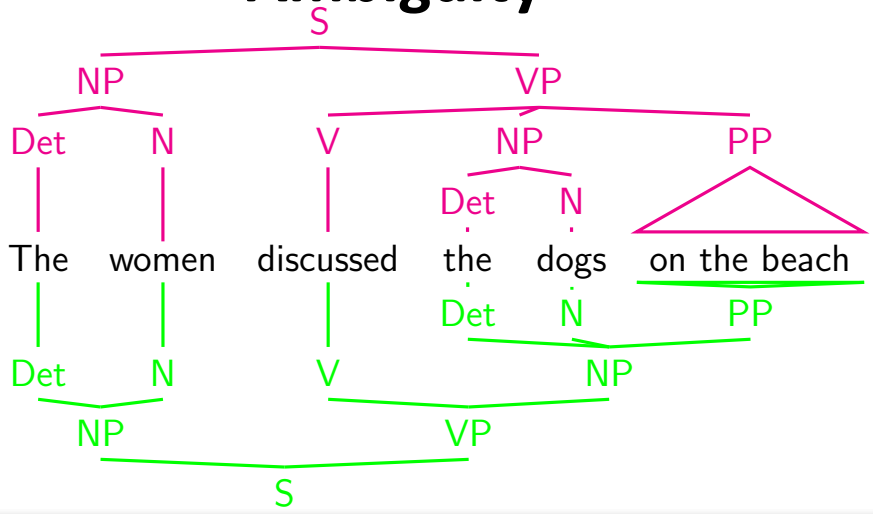
Environmental noise

Memory Limitations

The challenge of language understanding

- How do humans communicate so well with language?

Ambiguity



Environmental noise

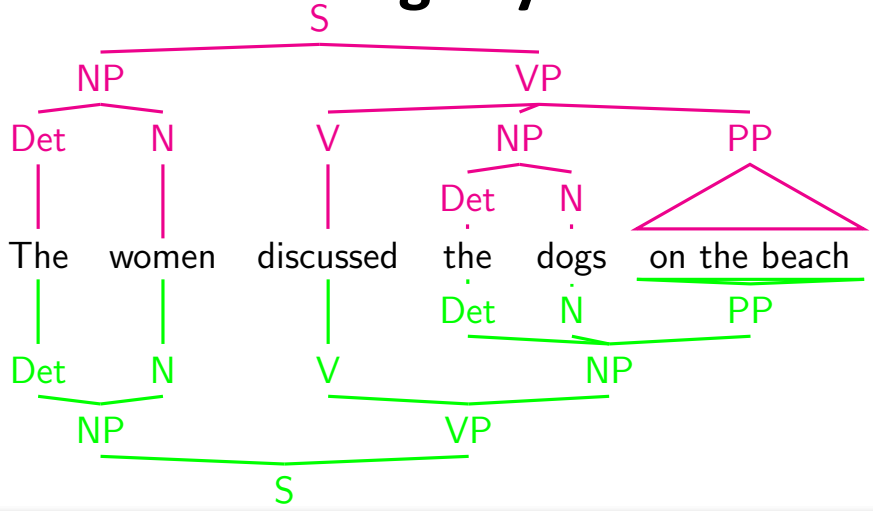
Memory Limitations

Incomplete knowledge of one's interlocutors

The challenge of language understanding

- How do humans communicate so well with language?

Ambiguity



Environmental noise

Memory Limitations

Incomplete knowledge of one's interlocutors

- And how can we get machines to do the same?

Amazing things humans do with language

Amazing things humans do with language

The brightly milted porcupine daxed a dinner party-ready nest out of temble.

Amazing things humans do with language

The brightly milted porcupine daxed a dinner party-ready nest out of temble.

Colorless green ideas sleep furiously. —*Chomsky, 1957*

Amazing things humans do with language

The brightly milted porcupine daxed a dinner party-ready nest out of temble.

Colorless green ideas sleep furiously. —*Chomsky, 1957*

**Furiously sleep ideas green colorless.*

Amazing things humans do with language

The brightly milted porcupine daxed a dinner party-ready nest out of temble.

Colorless green ideas sleep furiously. —*Chomsky, 1957*

**Furiously sleep ideas green colorless.*

Amazing things humans do with language

The brightly milted porcupine daxed a dinner party-ready nest out of temble.

Colorless green ideas sleep furiously. —*Chomsky, 1957*

**Furiously sleep ideas green colorless.*

The teacher spoon-fed me the example.

Amazing things humans do with language

The brightly milted porcupine daxed a dinner party-ready nest out of temble.

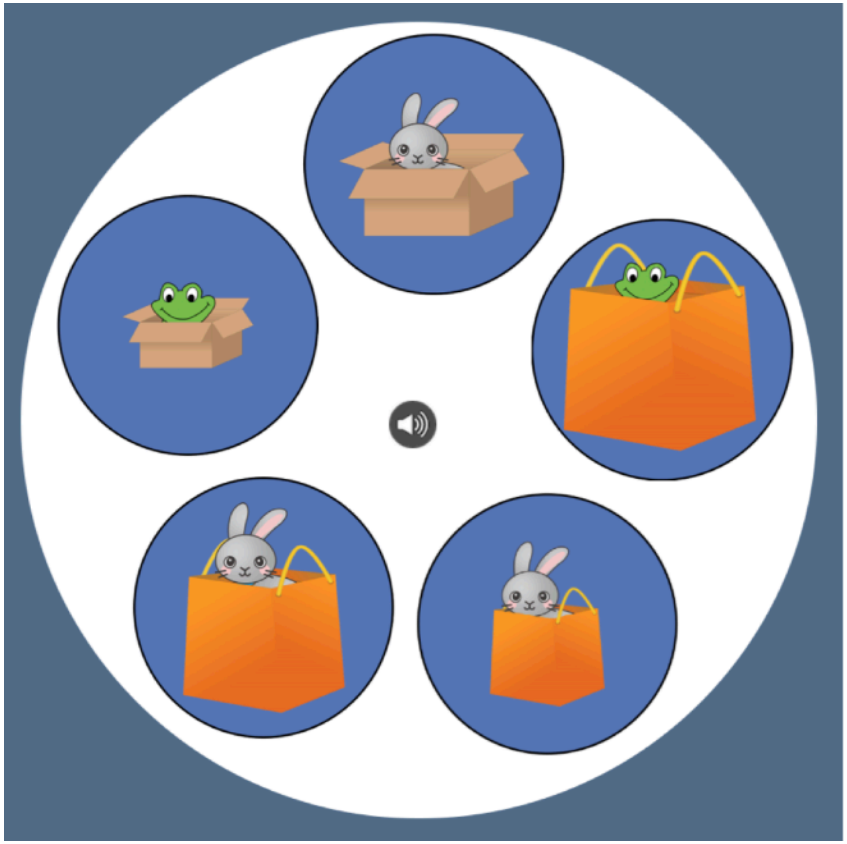
Colorless green ideas sleep furiously. *—Chomsky, 1957*

**Furiously sleep ideas green colorless.*

The teacher spoon-fed me the example.

Science is a glacier. *— Lai, Curran, & Menn, 2009*

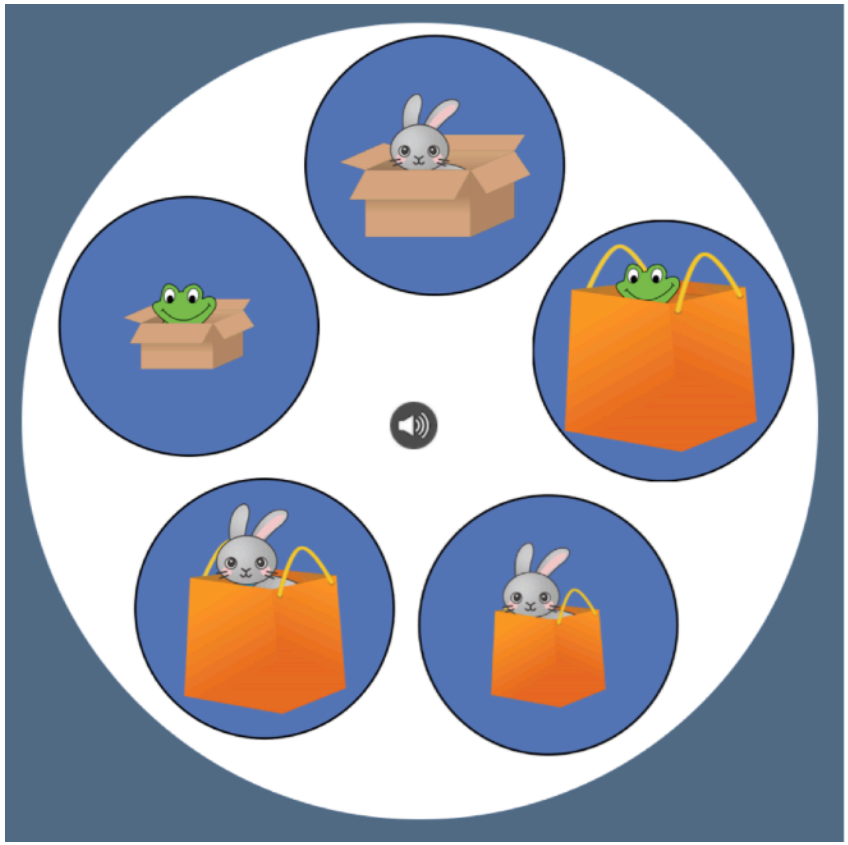
Amazing things humans do with language



(Aparicio, Levy, & Coppock)

Amazing things humans do with language

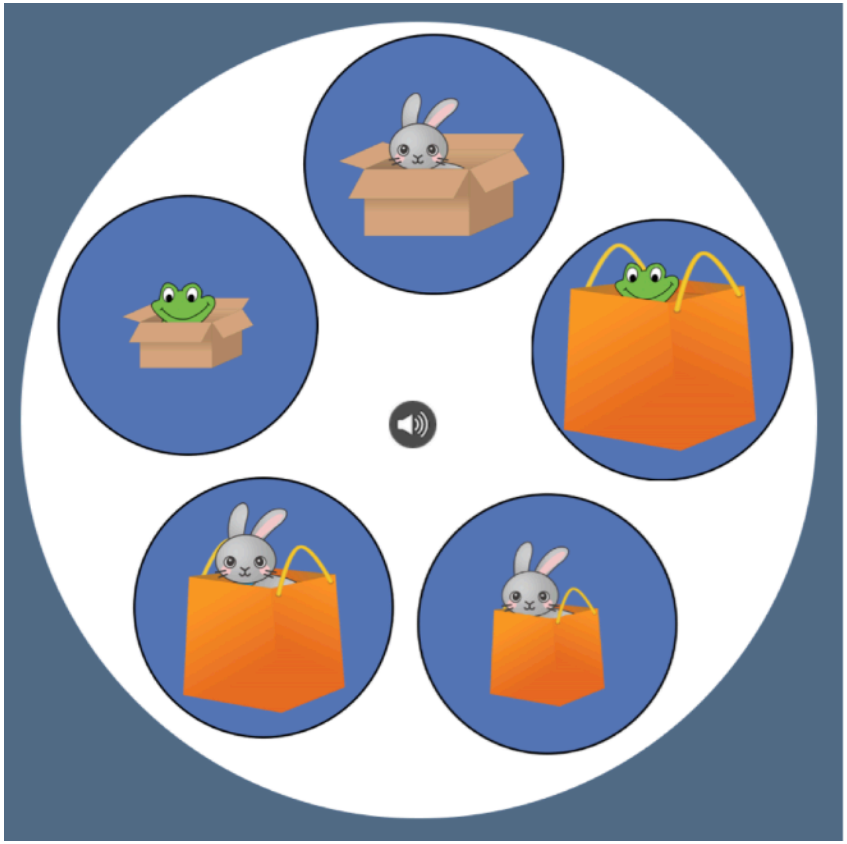
Point to the frog on the left.



(Aparicio, Levy, & Coppock)

Amazing things humans do with language

✔ Point to the frog on the left.

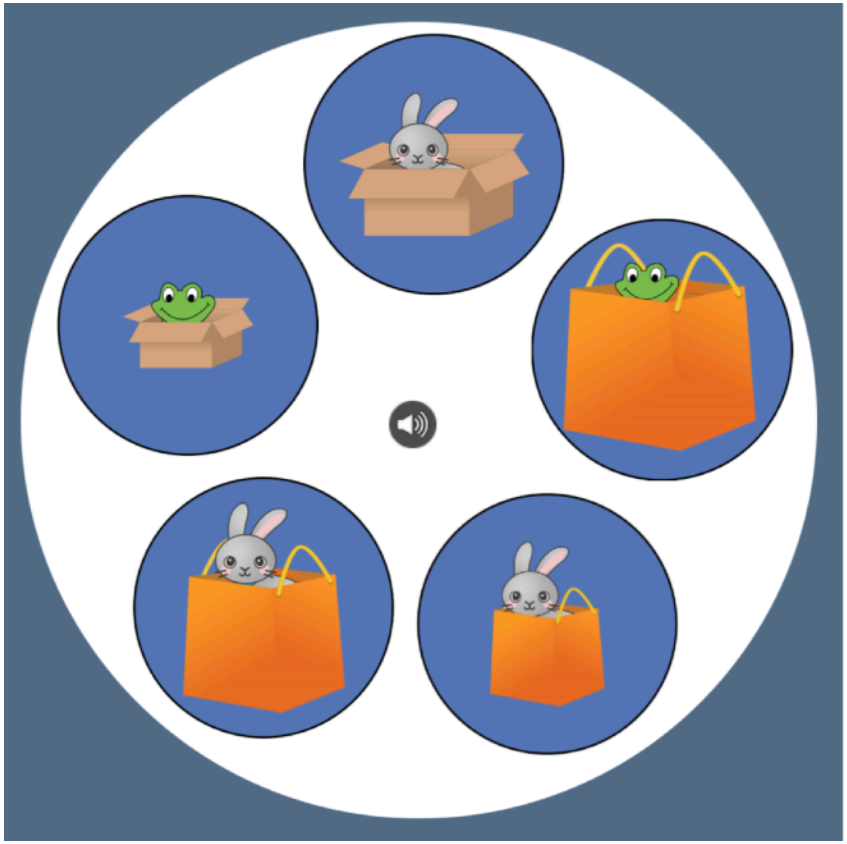


(Aparicio, Levy, & Coppock)

Amazing things humans do with language

✔ Point to the frog on the left.

Point to the rabbit.

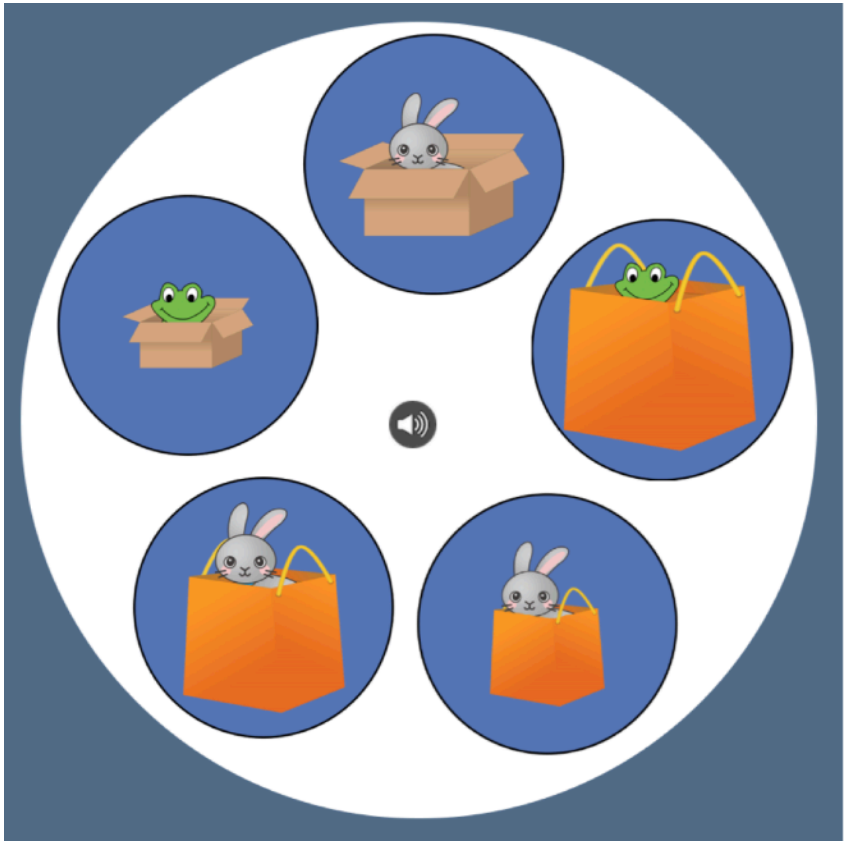


(Aparicio, Levy, & Coppock)

Amazing things humans do with language

✔ Point to the frog on the left.

✘ Point to the rabbit.



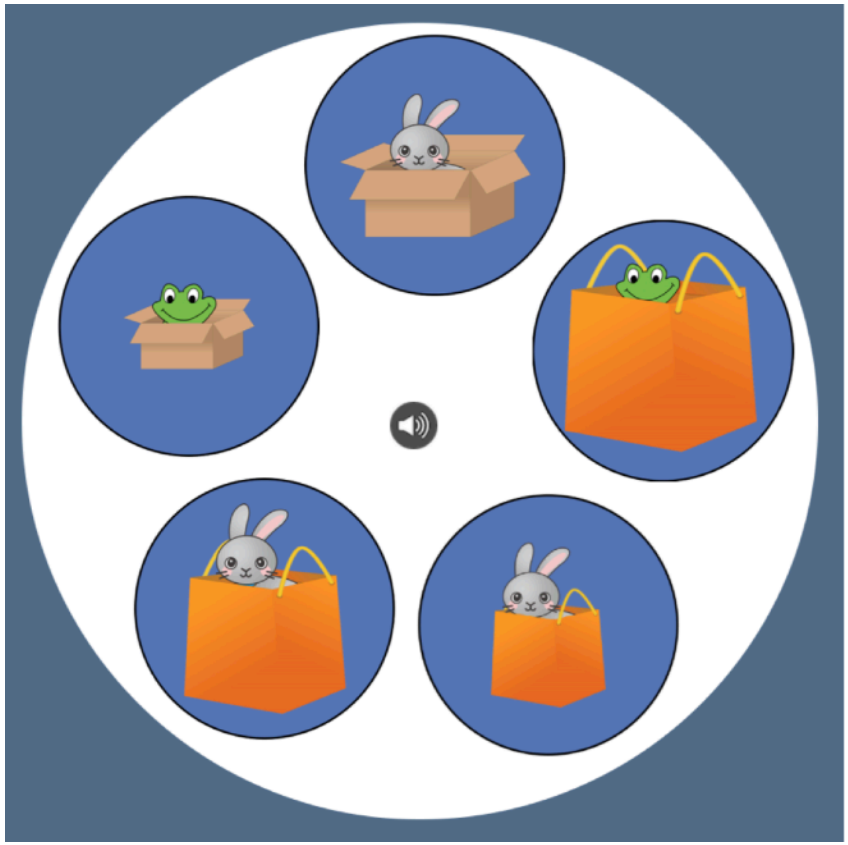
(Aparicio, Levy, & Coppock)

Amazing things humans do with language

✔ Point to the frog on the left.

✘ Point to the rabbit.

Point to the box.



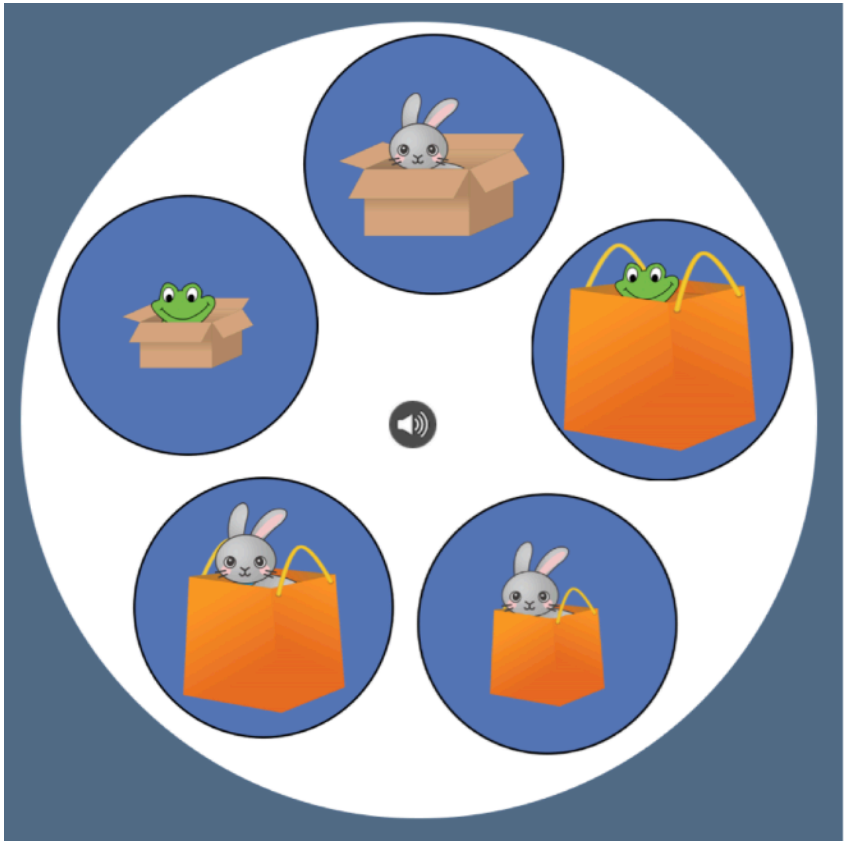
(Aparicio, Levy, & Coppock)

Amazing things humans do with language

✔ Point to the frog on the left.

✘ Point to the rabbit.

✘ Point to the box.



(Aparicio, Levy, & Coppock)

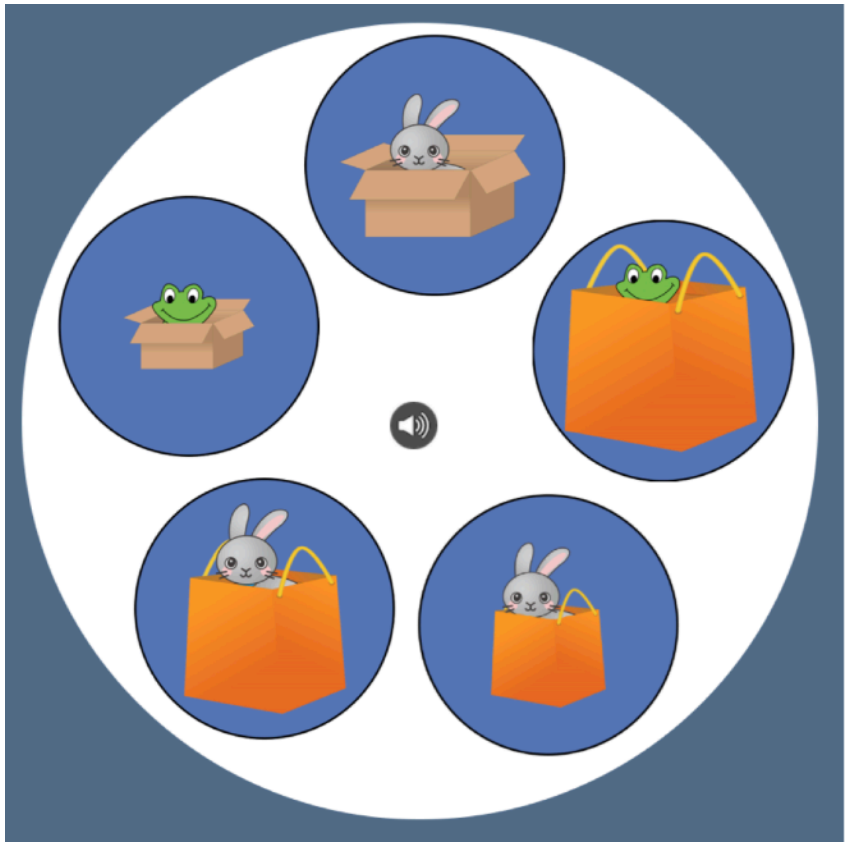
Amazing things humans do with language

✔ Point to the frog on the left.

✘ Point to the rabbit.

✘ Point to the box.

Is the rabbit in the box?



(Aparicio, Levy, & Coppock)

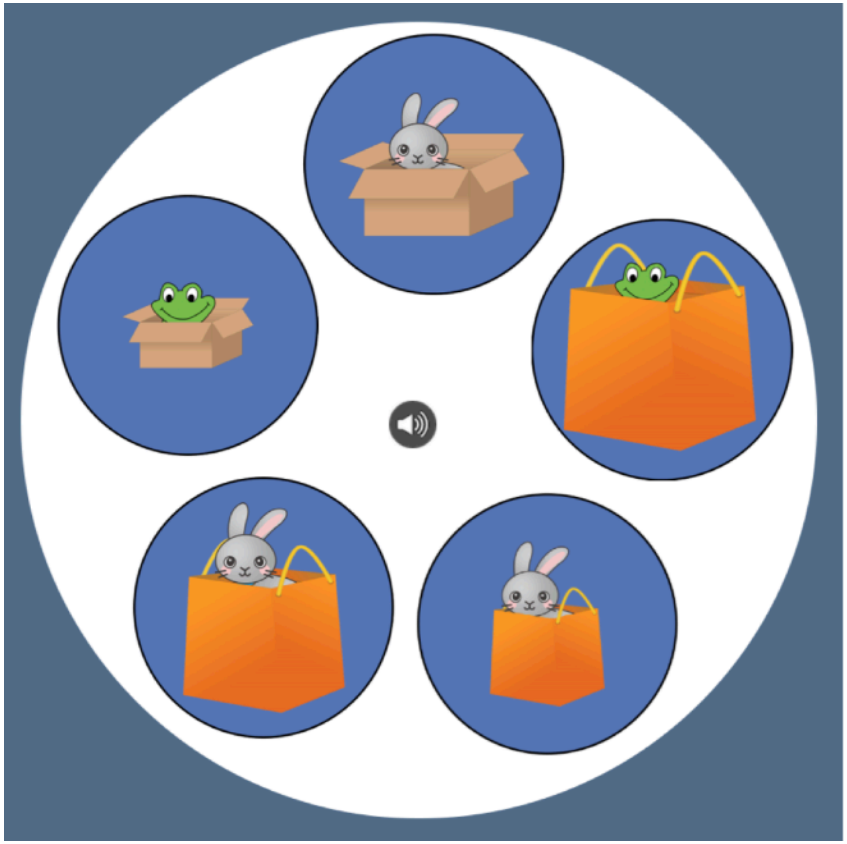
Amazing things humans do with language

✔ Point to the frog on the left.

✘ Point to the rabbit.

✘ Point to the box.

✘ Is the rabbit in the box?



(Aparicio, Levy, & Coppock)

Amazing things humans do with language

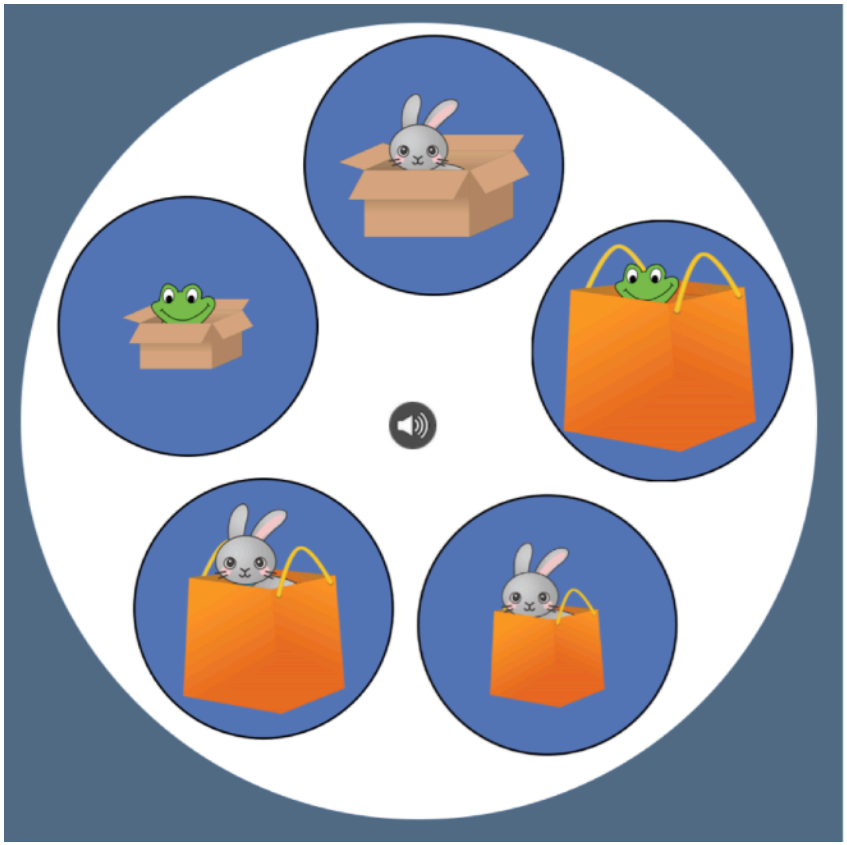
✔ Point to the frog on the left.

✘ Point to the rabbit.

✘ Point to the box.

✘ Is the rabbit in the box?

Point to the rabbit in the box.



(Aparicio, Levy, & Coppock)

Amazing things humans do with language

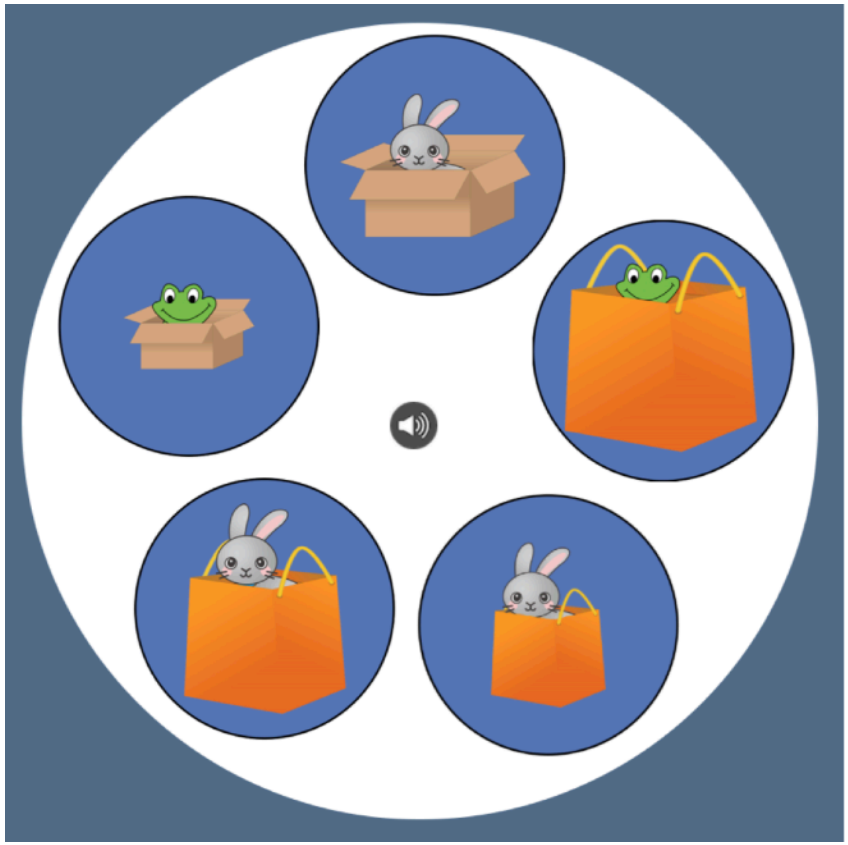
✔ Point to the frog on the left.

✘ Point to the rabbit.

✘ Point to the box.

✘ Is the rabbit in the box?

✔ Point to the rabbit in the box.



(Aparicio, Levy, & Coppock)

Vignettes

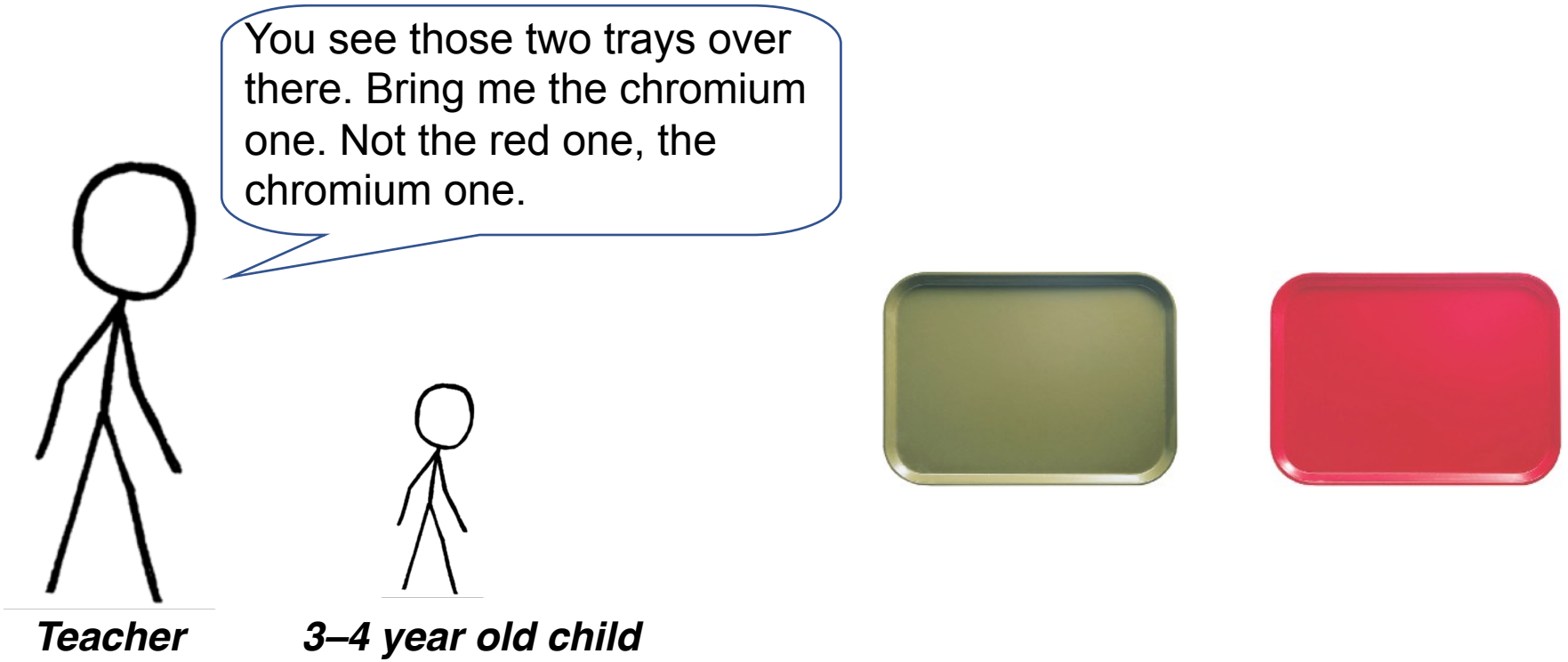
- Unknown words and pragmatic inference
- The nature of semantic scales and comparatives
- Syntax & inferring comparison classes for semantic scales
- Putting it all together: Complex descriptions and pragmatic inference in context

Vignettes

- Unknown words and pragmatic inference
- The nature of semantic scales and comparatives
- Syntax & inferring comparison classes for semantic scales
- Putting it all together: Complex descriptions and pragmatic inference in context

Unknown words and pragmatic inference

- Carey & Bartlett (1978) "fast mapping"



- Even after a single exposure, there is some learning (a better representation for the color olive and/or that "chromium" names a color) that persists a week later!

Unspoken alternatives in pragmatic inference

Unspoken alternatives in pragmatic inference

Bob says “hat”

Unspoken alternatives in pragmatic inference

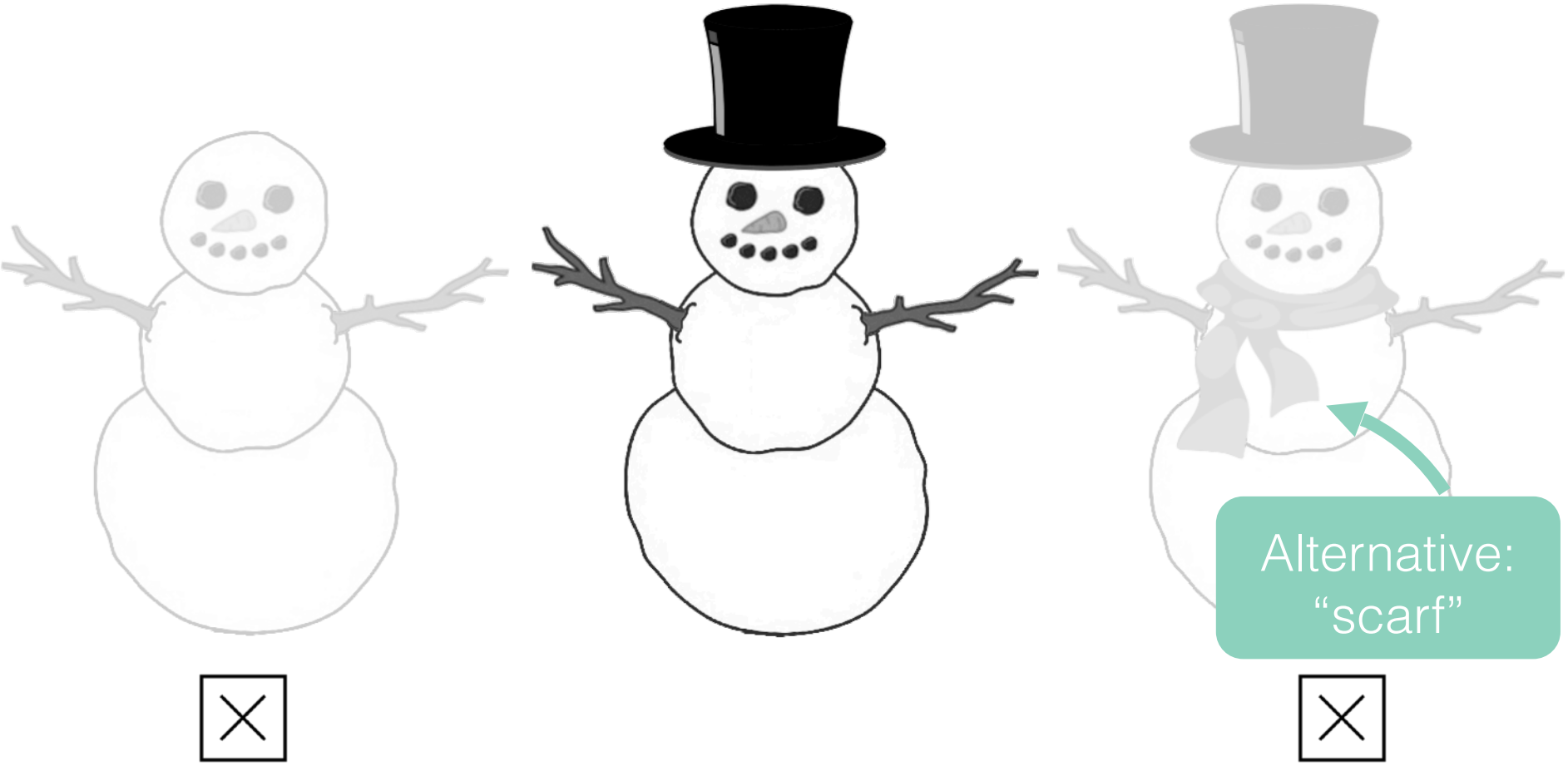
Bob says “hat”

Unspoken alternatives in pragmatic inference

Bob says “hat”

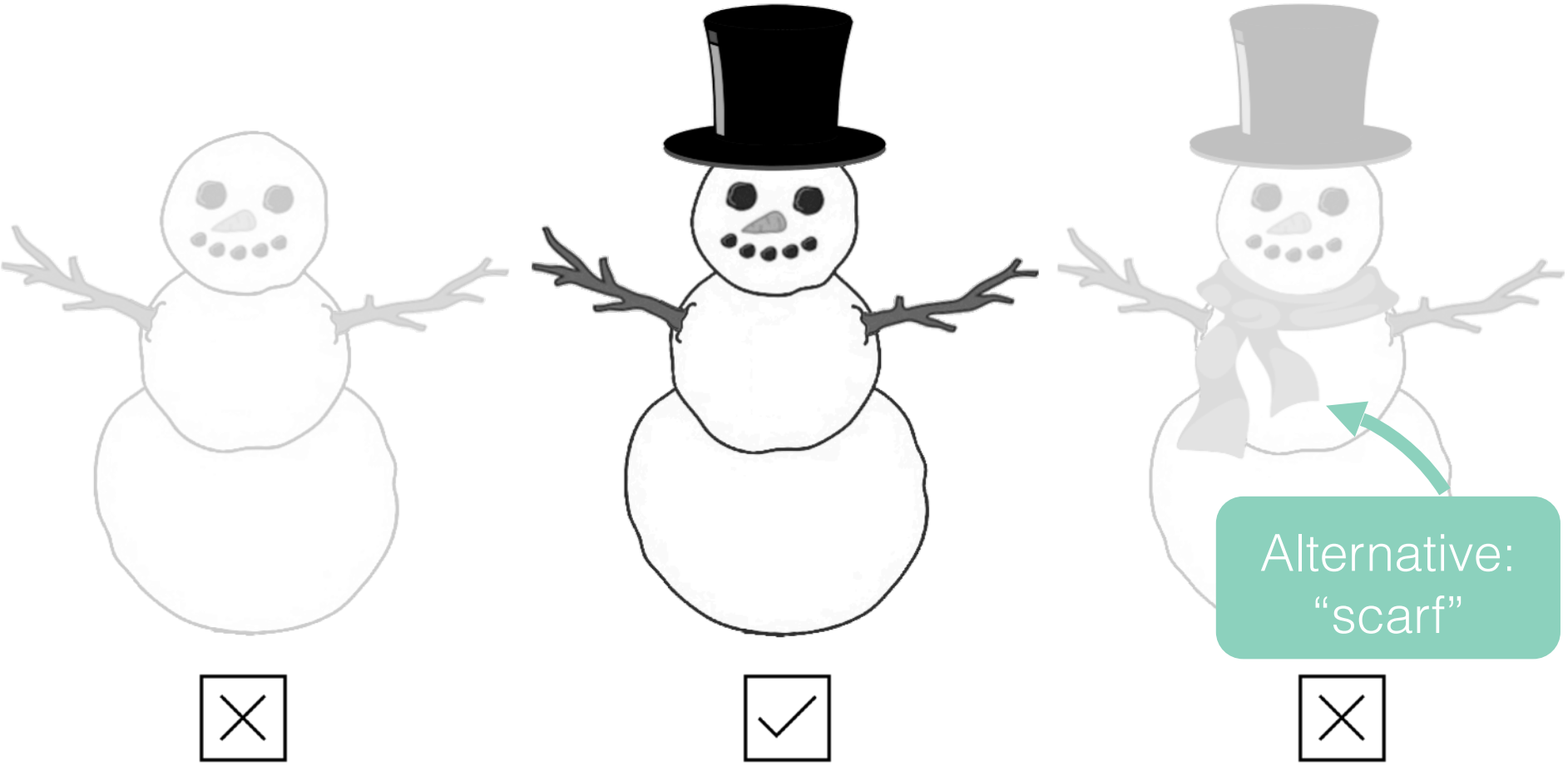
Unspoken alternatives in pragmatic inference

Bob says “hat”



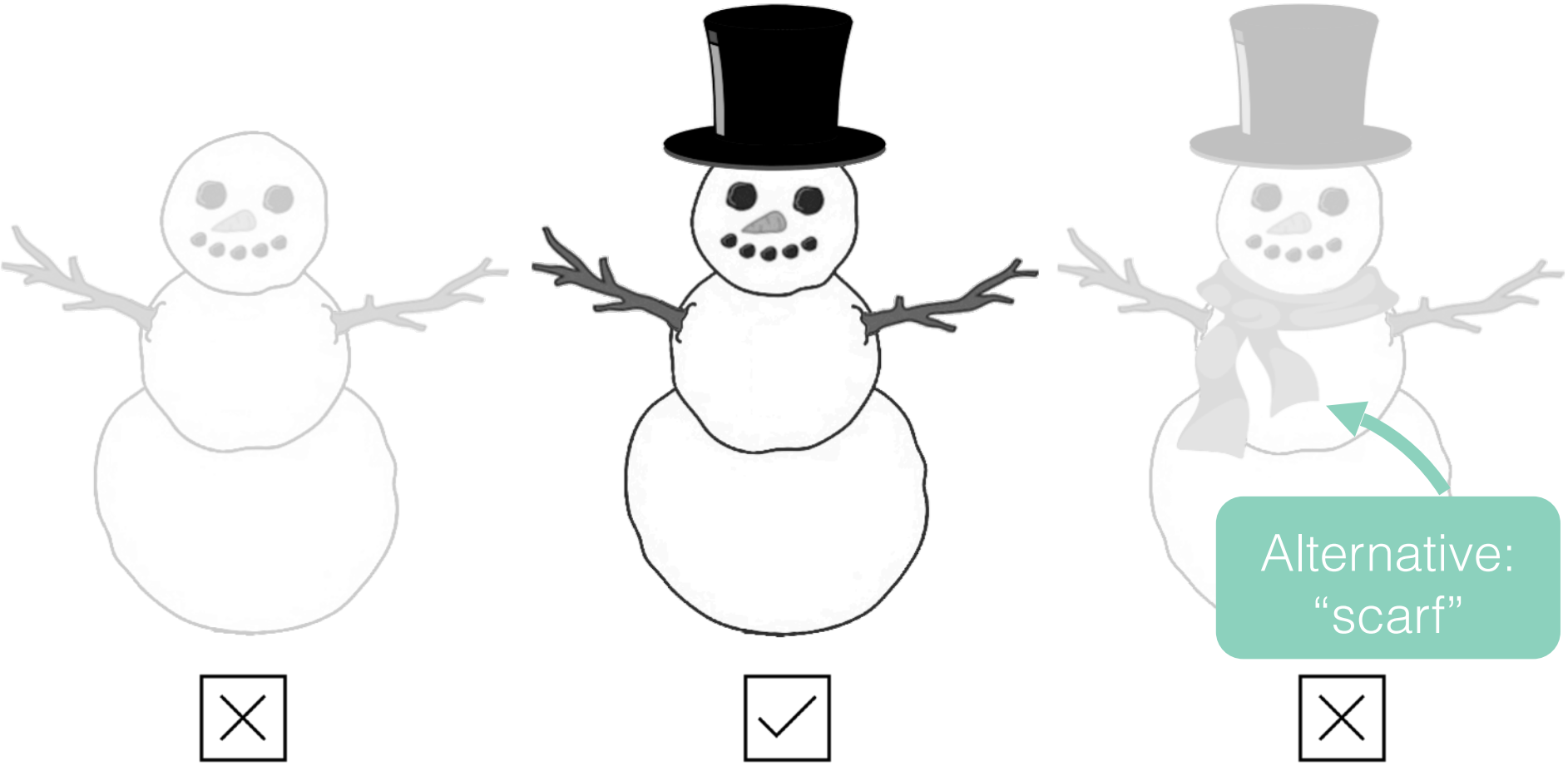
Unspoken alternatives in pragmatic inference

Bob says “hat”



Unspoken alternatives in pragmatic inference

Bob says “hat”

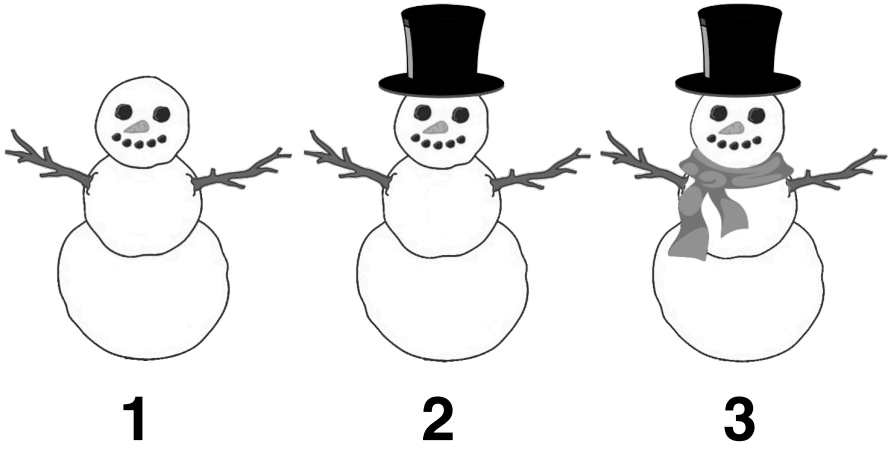


Scalar implicature (SI)

Scalar implicature: traditional account

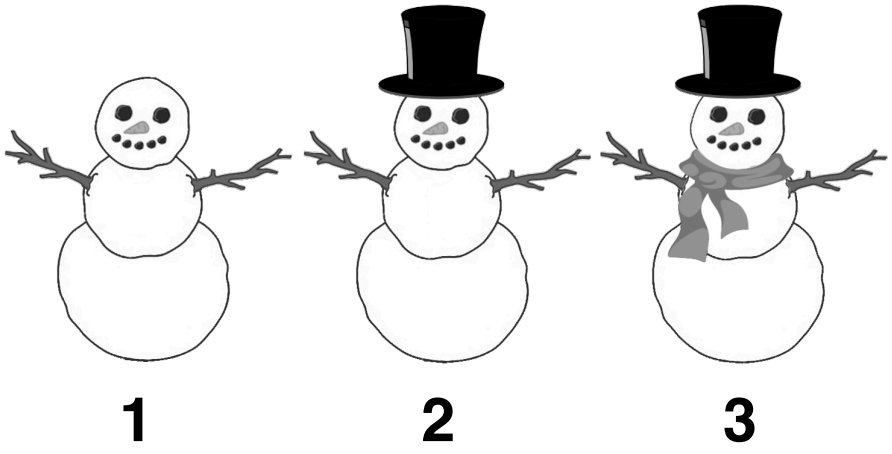
1 2 3

Scalar implicature: traditional account



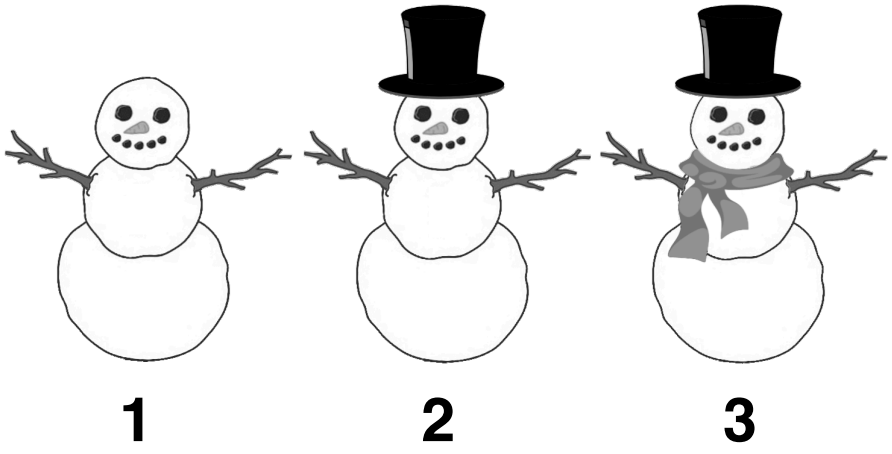
- Bob said *hat* – either snowman 2 or 3 could be possible

Scalar implicature: traditional account



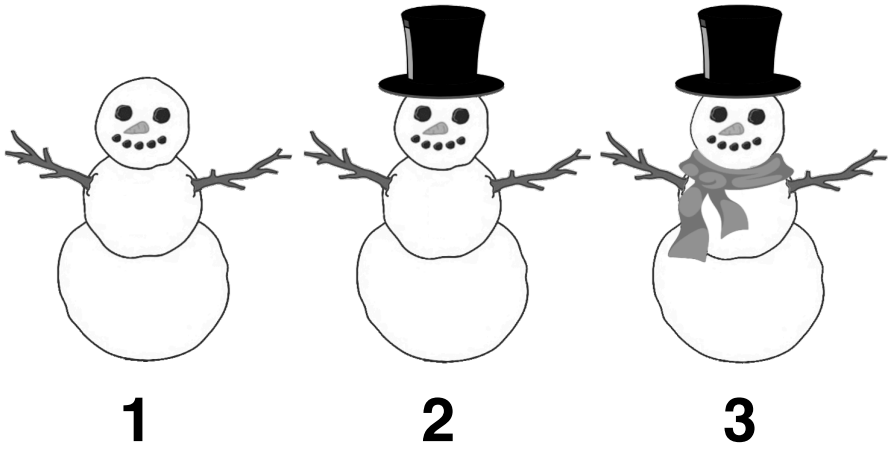
- Bob said *hat* – either snowman 2 or 3 could be possible
- But *scarf* is an **alternative*** to *hat*

Scalar implicature: traditional account



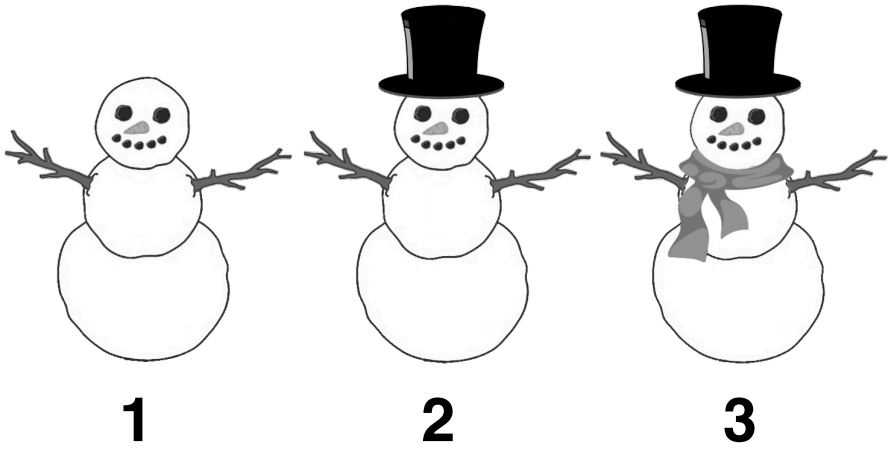
- Bob said *hat* – either snowman 2 or 3 could be possible
- But *scarf* is an **alternative*** to *hat*
- If Bob had said *scarf*, I would have chosen snowman 3 – and Bob knows that, and I know that Bob knows that, and Bob knows that I know that Bob knows that, and...

Scalar implicature: traditional account



- Bob said *hat* – either snowman 2 or 3 could be possible
- But *scarf* is an **alternative*** to *hat*
- If Bob had said *scarf*, I would have chosen snowman 3 – and Bob knows that, and I know that Bob knows that, and Bob knows that I know that Bob knows that, and...
- Thus I can conclude that Bob didn't mean snowman 3

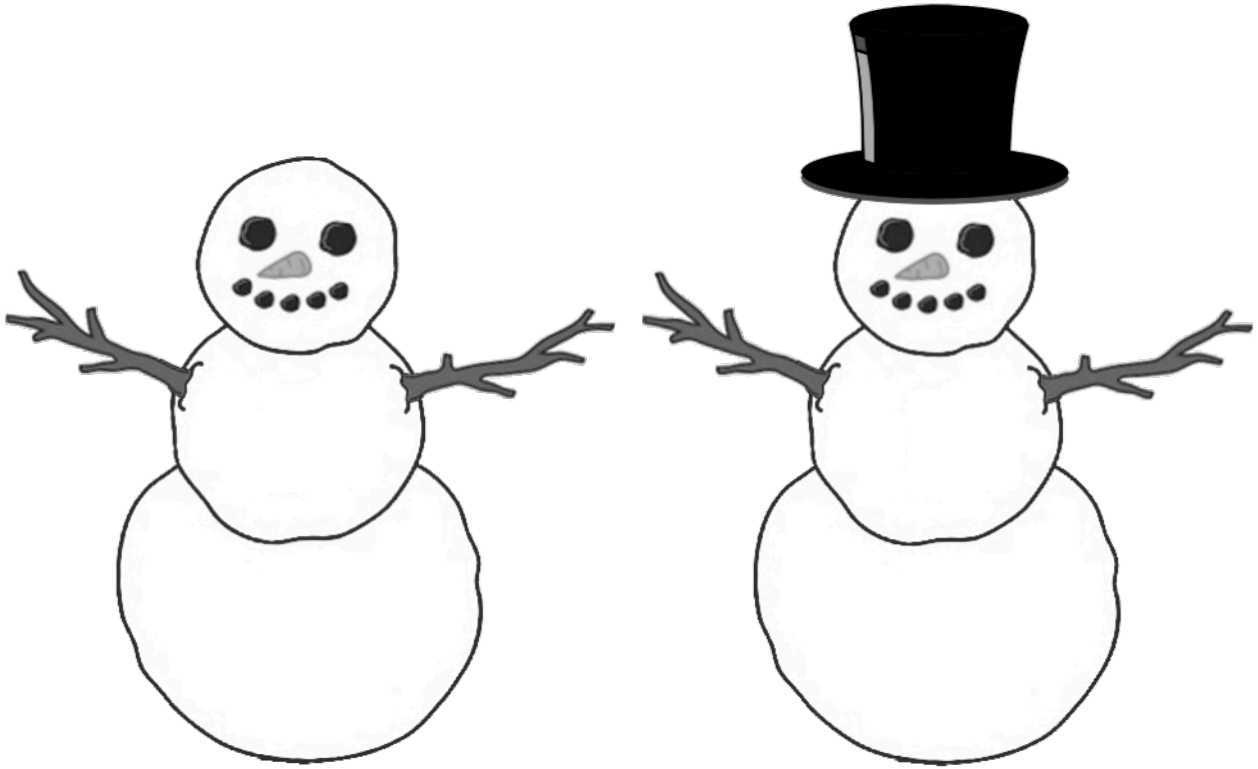
Scalar implicature: traditional account



- Bob said *hat* – either snowman 2 or 3 could be possible
- But *scarf* is an **alternative*** to *hat*
- If Bob had said *scarf*, I would have chosen snowman 3 – and Bob knows that, and I know that Bob knows that, and Bob knows that I know that Bob knows that, and...
- Thus I can conclude that Bob didn't mean snowman 3
- ⇒ I should conclude that Bob meant snowman 2

Can unknown words drive scalar inference?

Bob says “hat”



(Hu, Zaslavsky, & Levy, 2021)

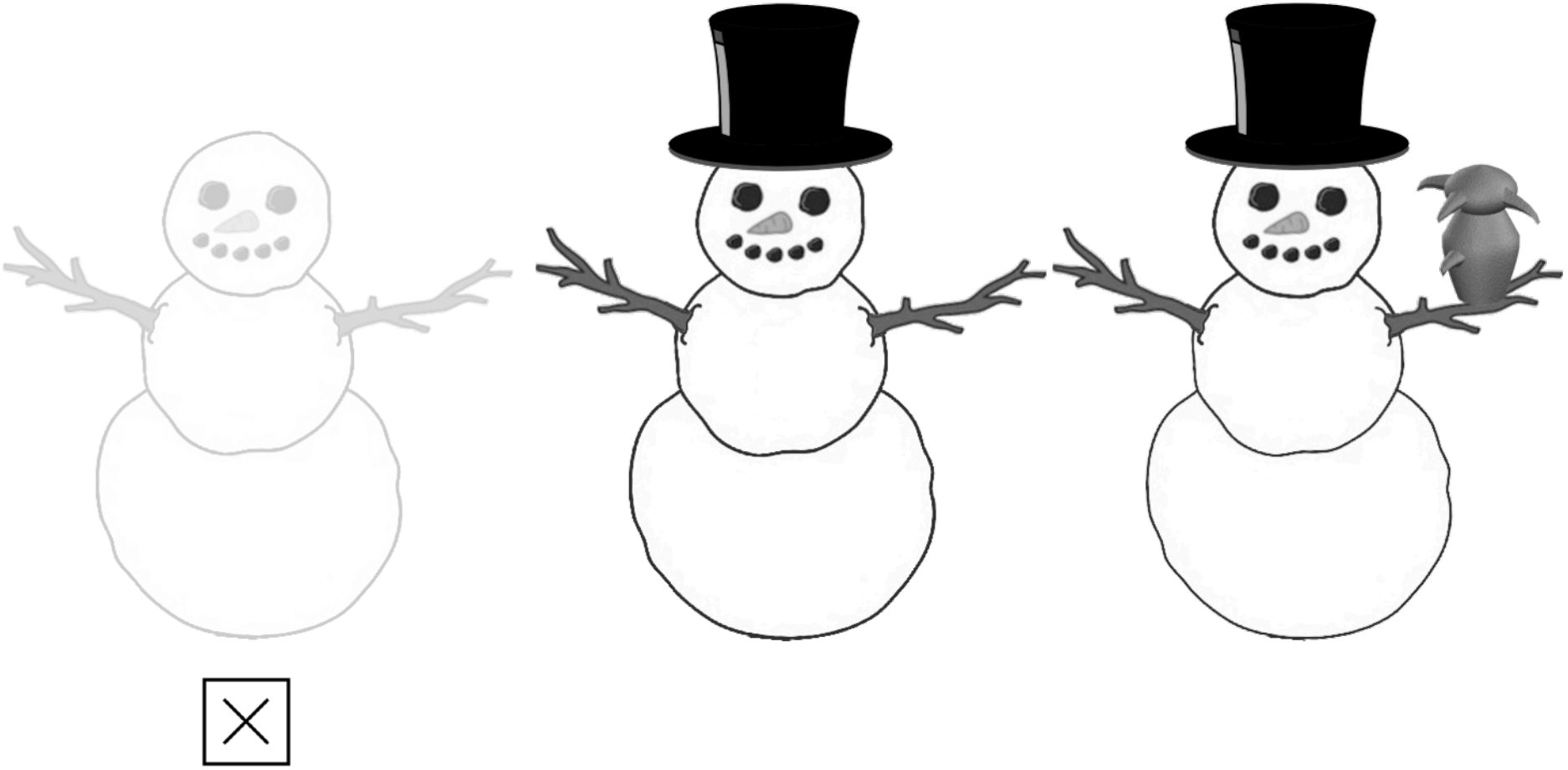
Can unknown words drive scalar inference?

Bob says “hat”

(Hu, Zaslavsky, & Levy, 2021)

Can unknown words drive scalar inference?

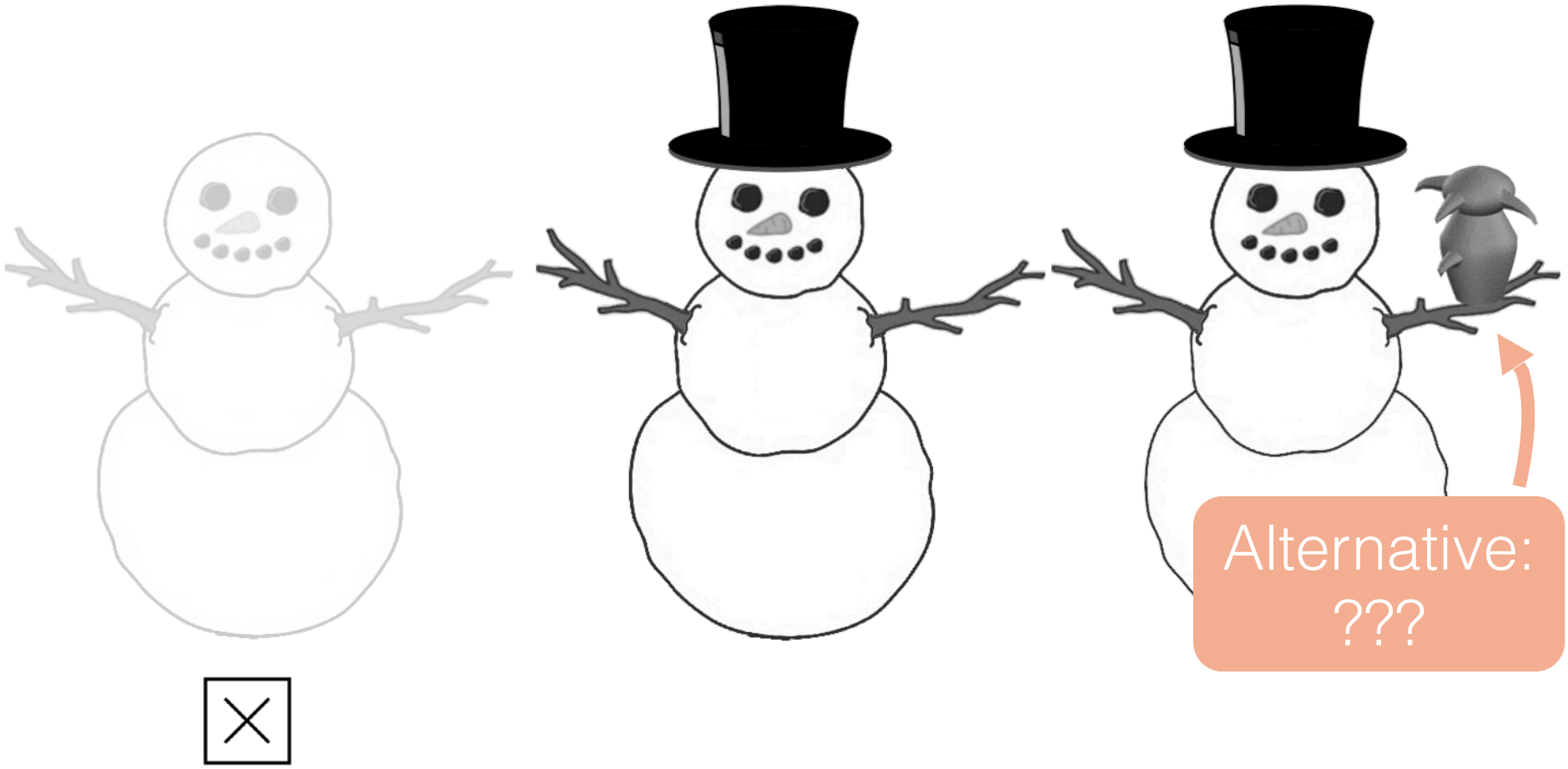
Bob says “hat”



(Hu, Zaslavsky, & Levy, 2021)

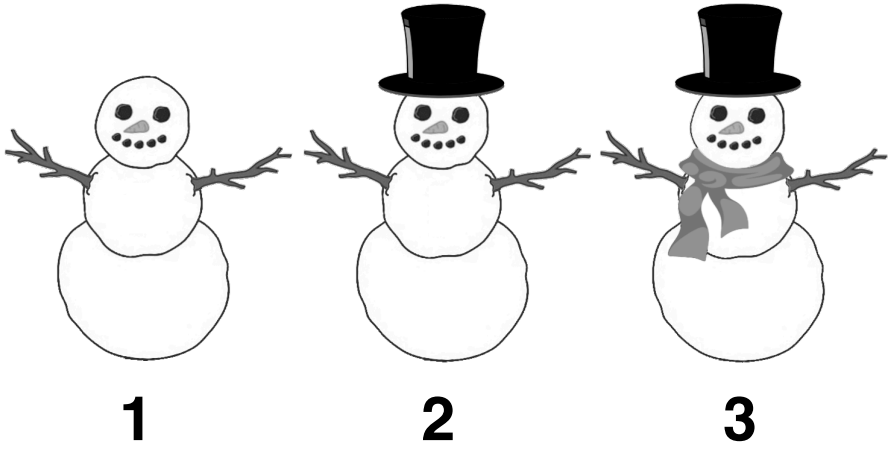
Can unknown words drive scalar inference?

Bob says “hat”



(Hu, Zaslavsky, & Levy, 2021)

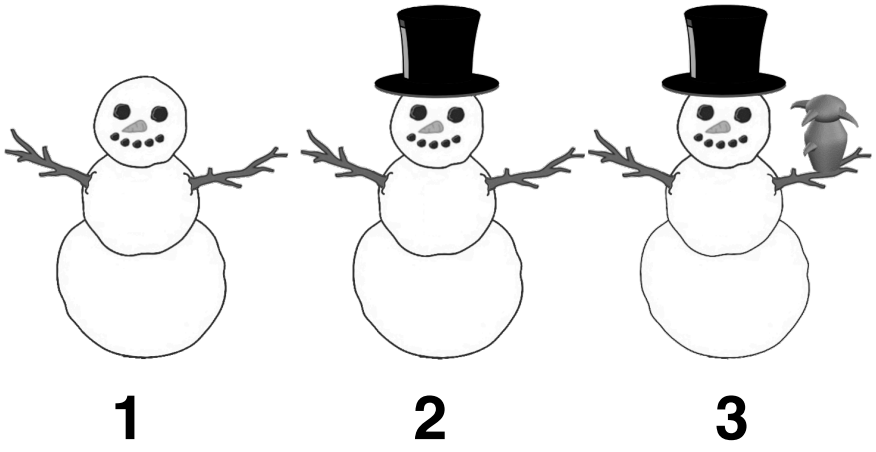
Does the traditional account go through?



- Bob said *hat* – either snowman 2 or 3 could be possible
- But *scarf* is an **alternative*** to *hat*
- If Bob had said *scarf*, I would have chosen snowman 3 – and Bob knows that, and I know that Bob knows that, and Bob knows that I know that Bob knows that, and..
- Thus I can conclude that Bob didn't mean snowman 3
- ⇒ I should conclude that Bob meant snowman 2

(Hu, Zaslavsky, & Levy, 2021)

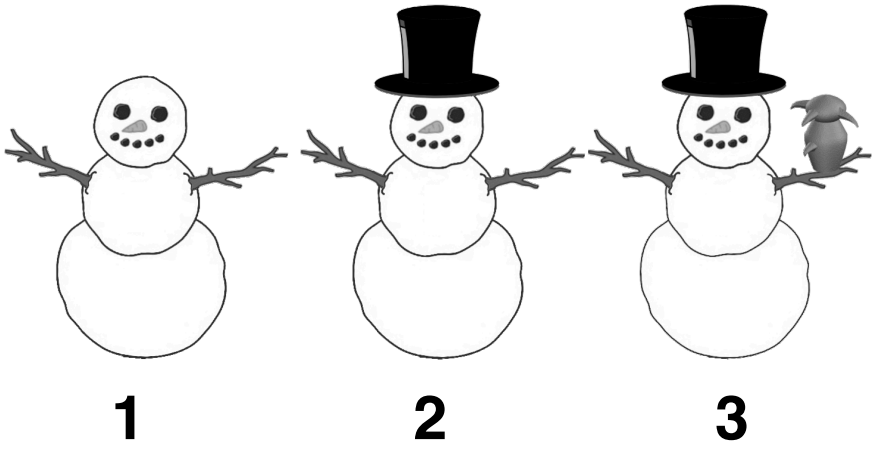
Does the traditional account go through?



- Bob said *hat* – either snowman 2 or 3 could be possible
- But *????* is an **alternative*** to *hat*
- If Bob had said *????*, I would have chosen snowman 3 – and Bob knows that, and I know that Bob knows that, and Bob knows that I know that Bob knows that, and...
- Thus I can conclude that Bob didn't mean snowman 3
- ⇒ I should conclude that Bob meant snowman 2

(Hu, Zaslavsky, & Levy, 2021)

Does the traditional account go through?



- Bob said *hat* – either snowman 2 or 3 could be possible
- But *????* is an **alternative*** to *hat*
- If Bob had said *????*, I would have chosen snowman 3 – and Bob knows that, and I know that Bob knows that, and Bob knows that I know that Bob knows that, and...
- Thus I can conclude that Bob didn't mean snowman 3
- ⇒ I should conclude that Bob meant snowman 2

(Hu, Zaslavsky, & Levy, 2021)

Does the traditional account go through?

- Bob said *hat* – either snowman 2 or 3 could be possible
- But *????* is an **alternative*** to *hat*
- If Bob had said *????*, I would have chosen snowman 3 – and Bob knows that, and I know that Bob knows that, and Bob knows that I know that Bob knows that, and...
- Thus I can conclude that Bob didn't mean snowman 3
- ⇒ I should conclude that Bob meant snowman 2

(Hu, Zaslavsky, & Levy, 2021)

Potential accounts

(Hu, Zaslavsky, & Levy, 2021)

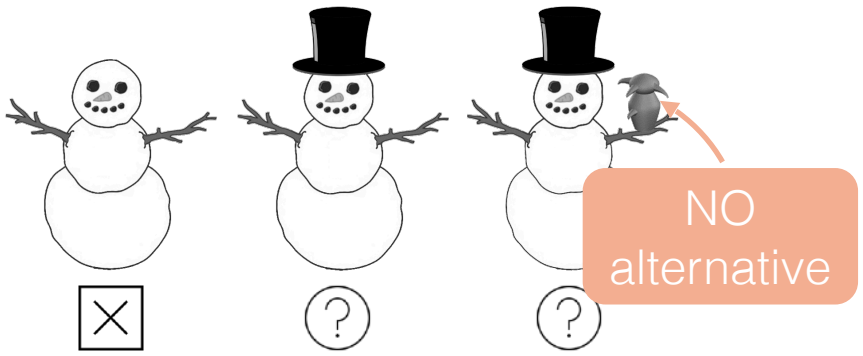
Potential accounts

If the label for a certain feature is **not in common ground**, then it might not enter the computations underlying SI.

(Hu, Zaslavsky, & Levy, 2021)

Potential accounts

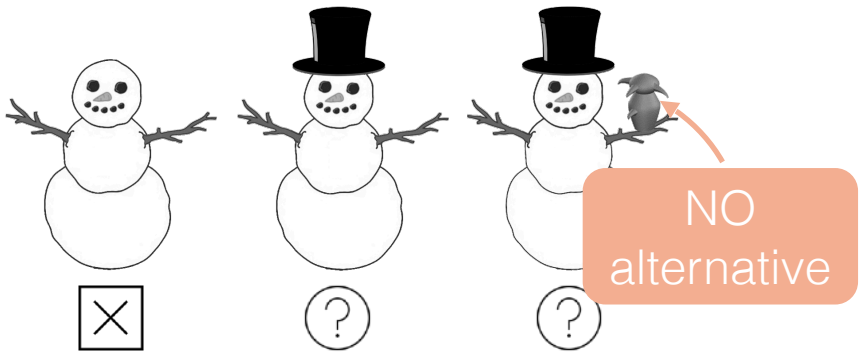
If the label for a certain feature is **not in common ground**, then it might not enter the computations underlying SI.



(Hu, Zaslavsky, & Levy, 2021)

Potential accounts

If the label for a certain feature is **not in common ground**, then it might not enter the computations underlying SI.

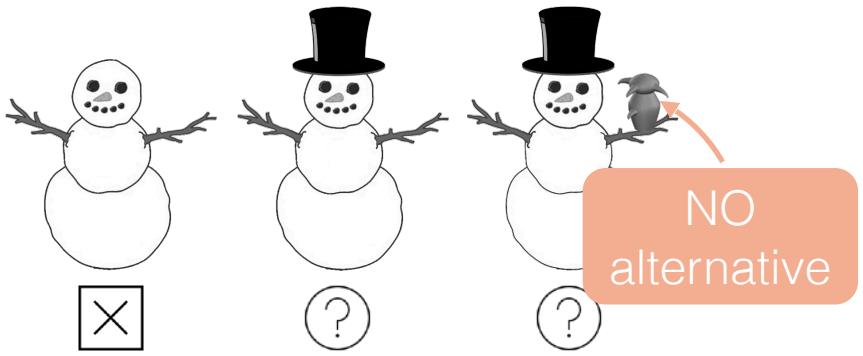


If speakers generate and use **new lexical entries** from one exposure, then nonce objects may drive SI like familiar objects.

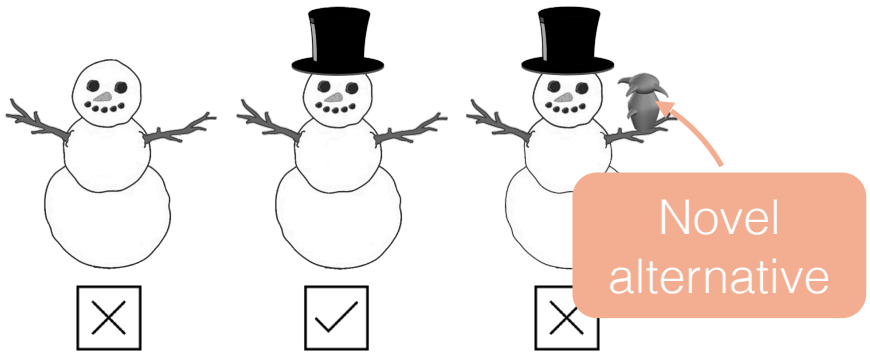
(Hu, Zaslavsky, & Levy, 2021)

Potential accounts

If the label for a certain feature is **not in common ground**, then it might not enter the computations underlying SI.



If speakers generate and use **new lexical entries** from one exposure, then nonce objects may drive SI like familiar objects.



(Hu, Zaslavsky, & Levy, 2021)

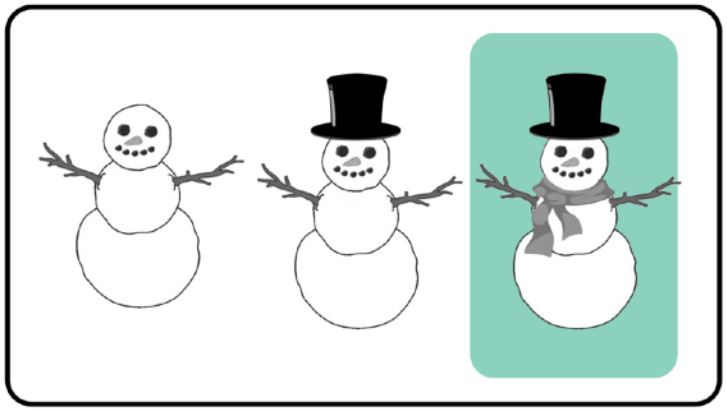
(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive scalar implicature?

(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive scalar implicature?

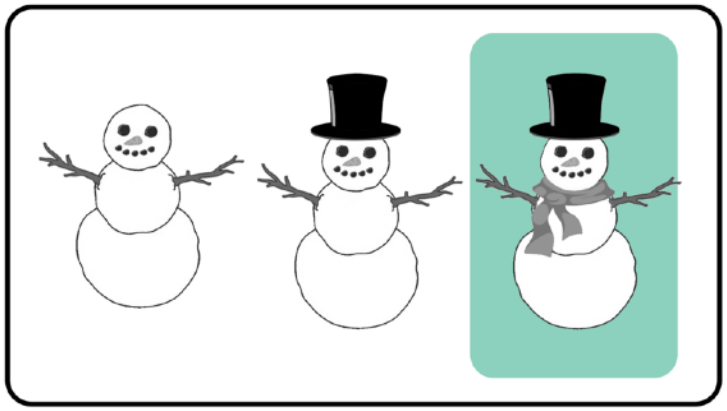
Condition 1:
Familiar feature



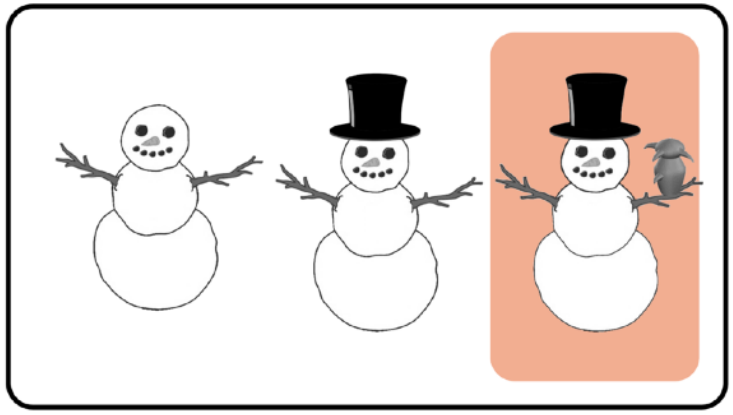
(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive scalar implicature?

Condition 1:
Familiar feature



Condition 2:
Nonce feature

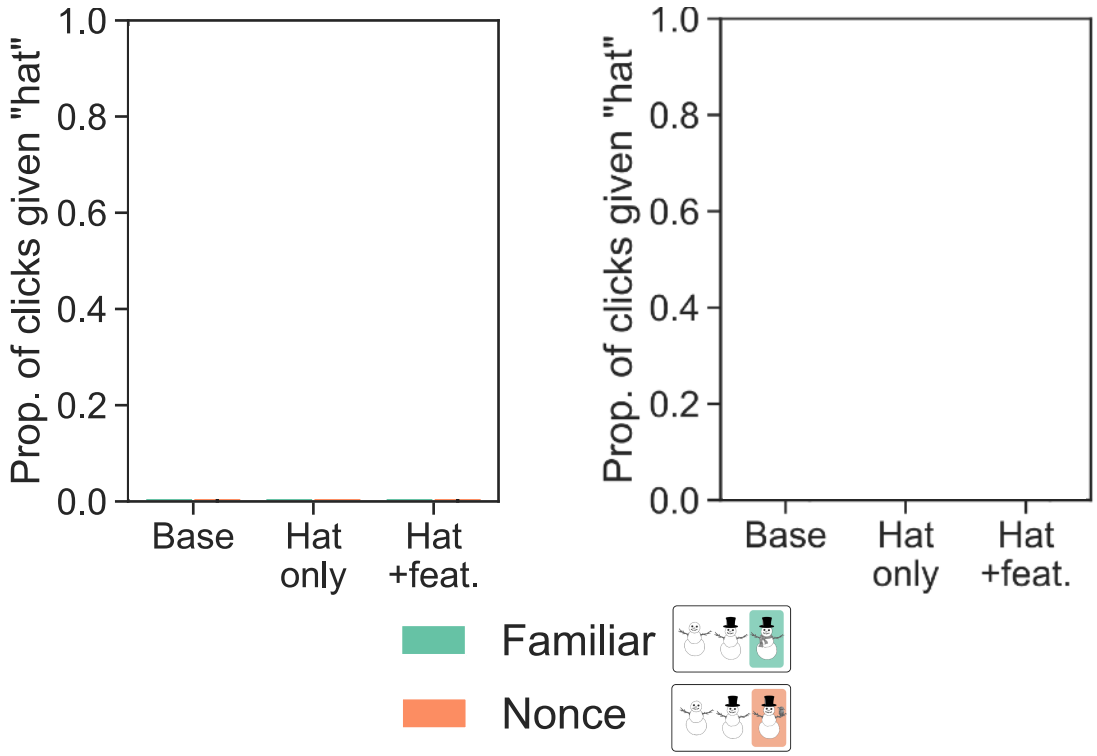


(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive SI?

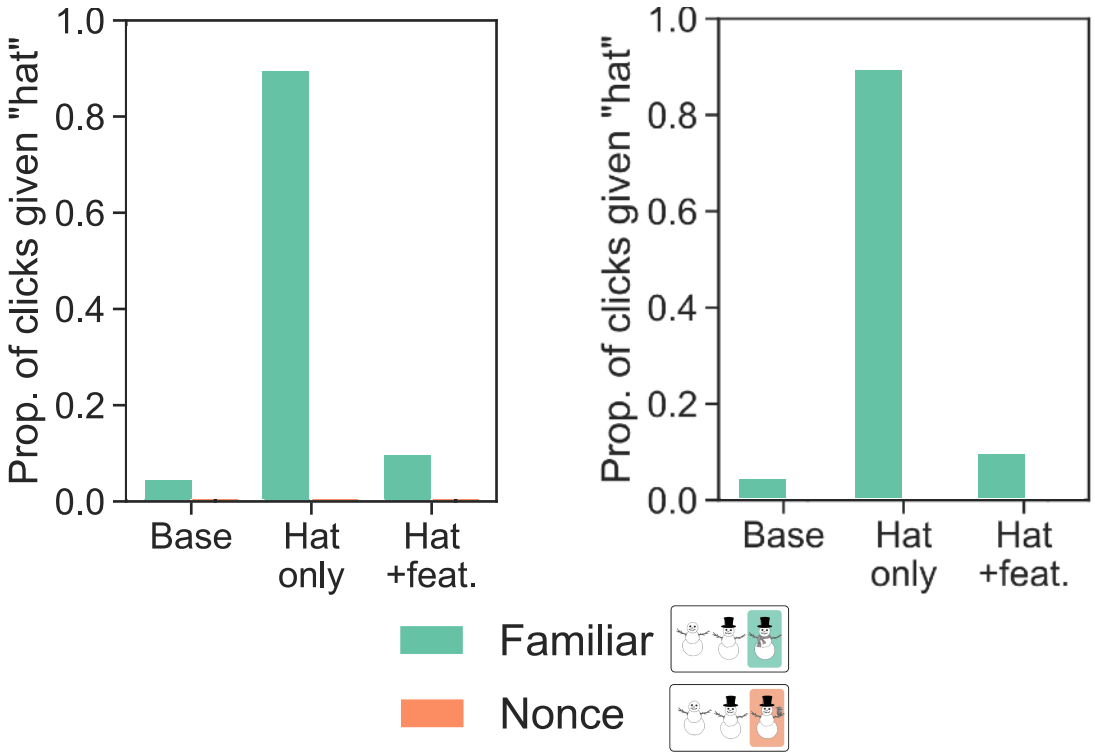
(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive SI?



(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive SI?

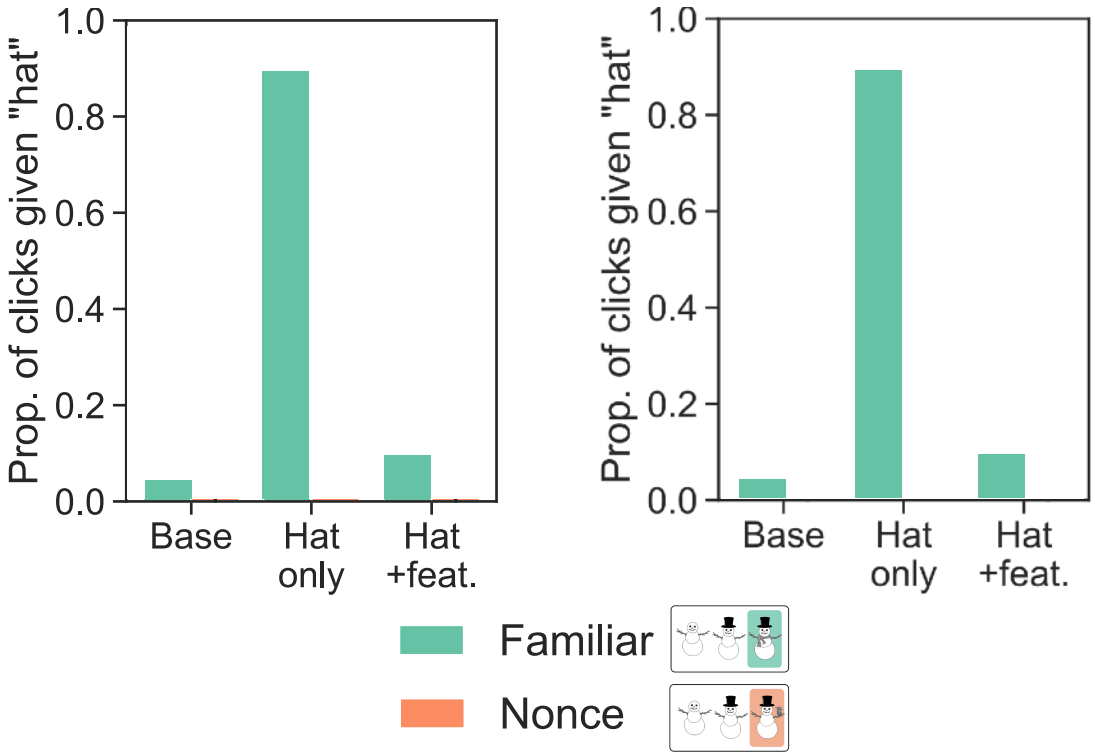


(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive SI?

Hypothesis 1

No. There is no alternative label in common ground.

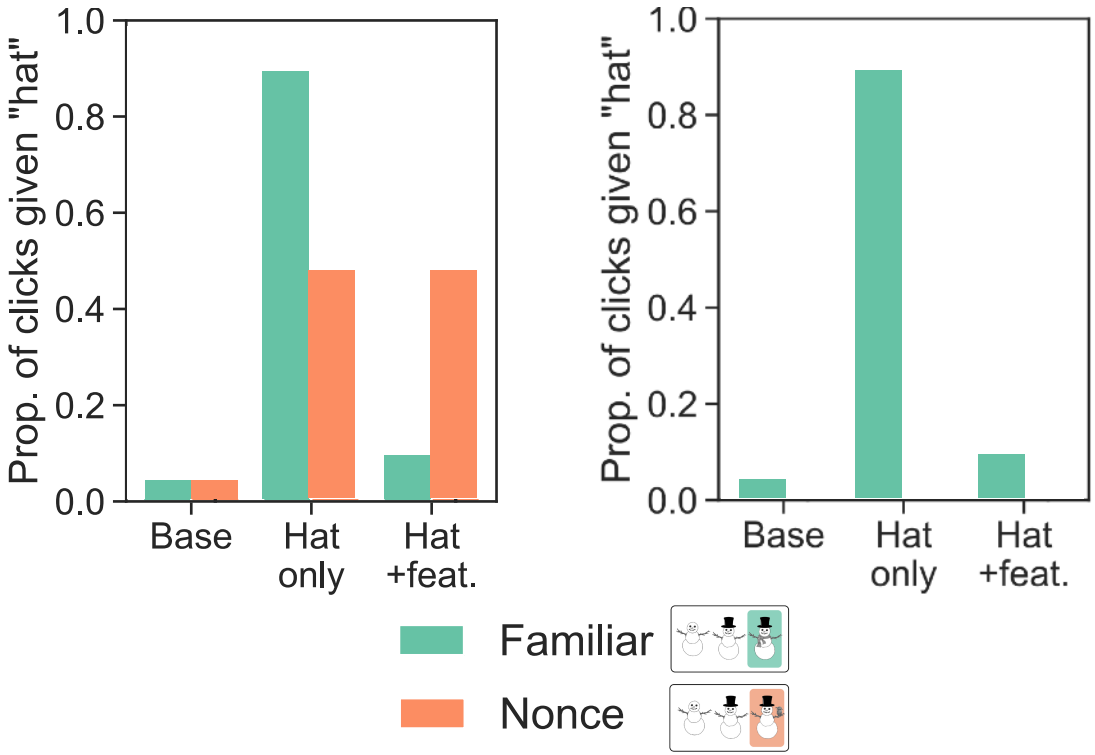


(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive SI?

Hypothesis 1

No. There is no alternative label in common ground.

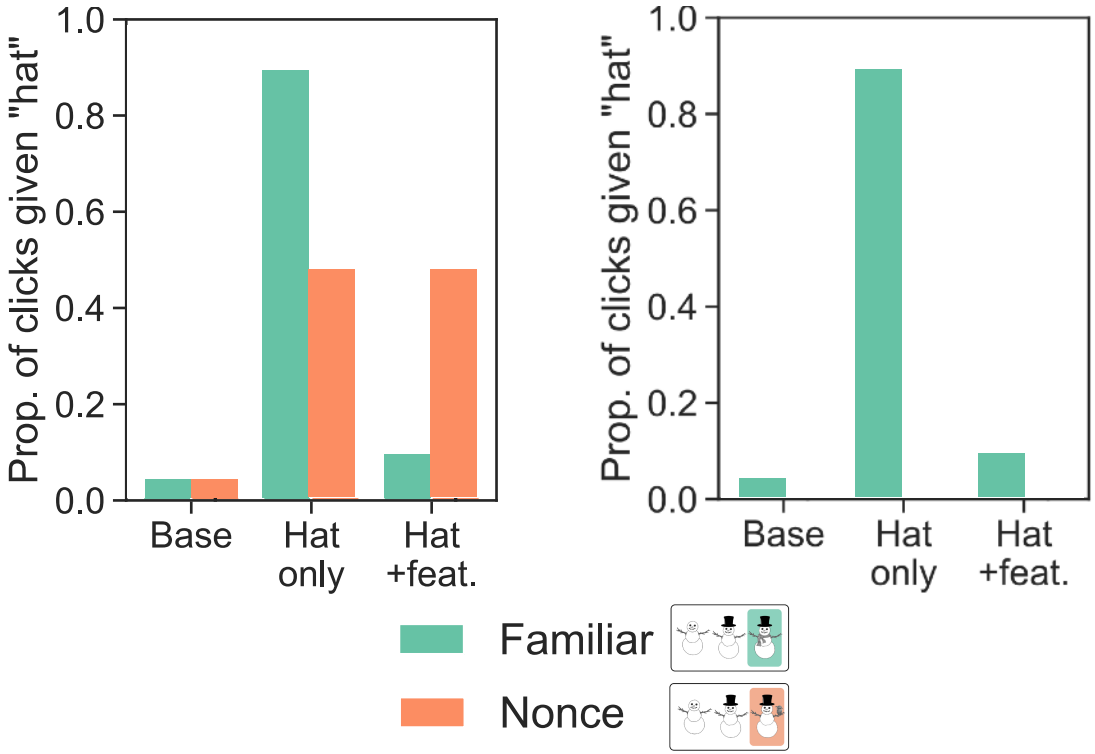


(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive SI?

Hypothesis 1
No. There is no alternative label in common ground.

Hypothesis 2
Yes. People can reason about novel lexical entries.

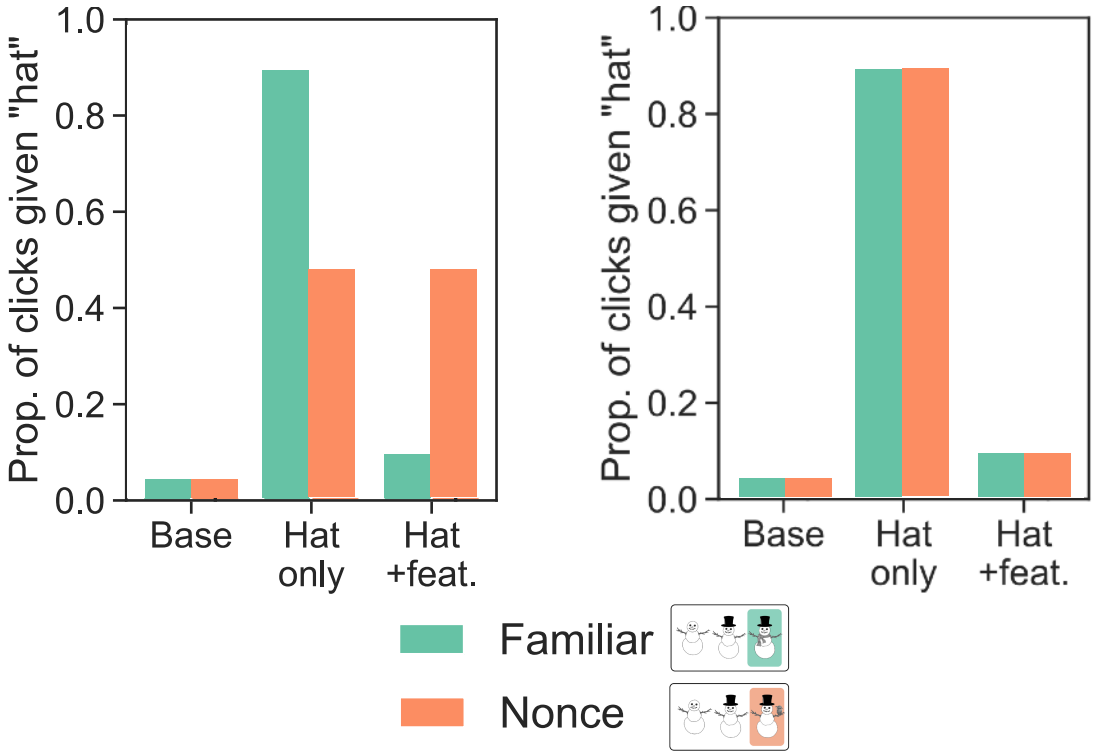


(Hu, Zaslavsky, & Levy, 2021)

Do nonce objects drive SI?

Hypothesis 1
No. There is no alternative label in common ground.

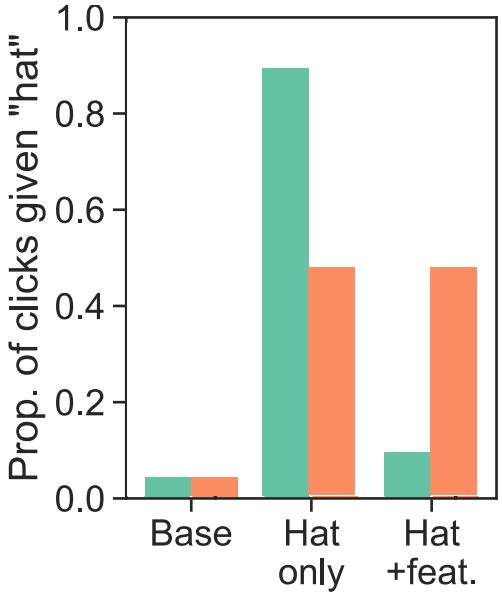
Hypothesis 2
Yes. People can reason about novel lexical entries.



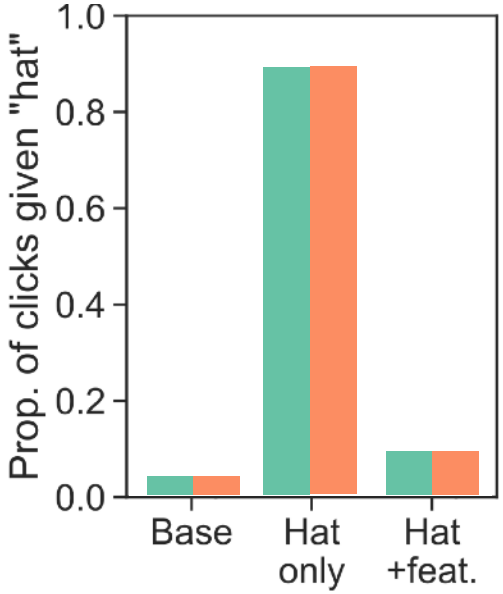
(Hu, Zaslavsky, & Levy, 2021)

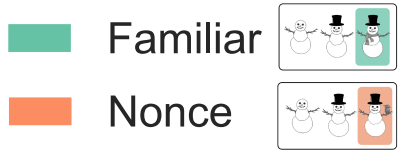
Do nonce objects drive SI?

Hypothesis 1
No. There is no alternative label in common ground.

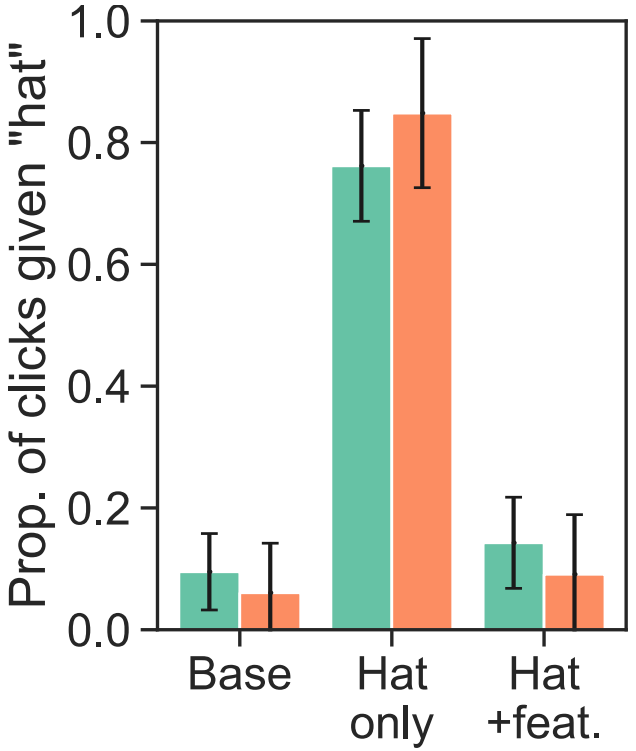


Hypothesis 2
Yes. People can reason about novel lexical entries.





Results

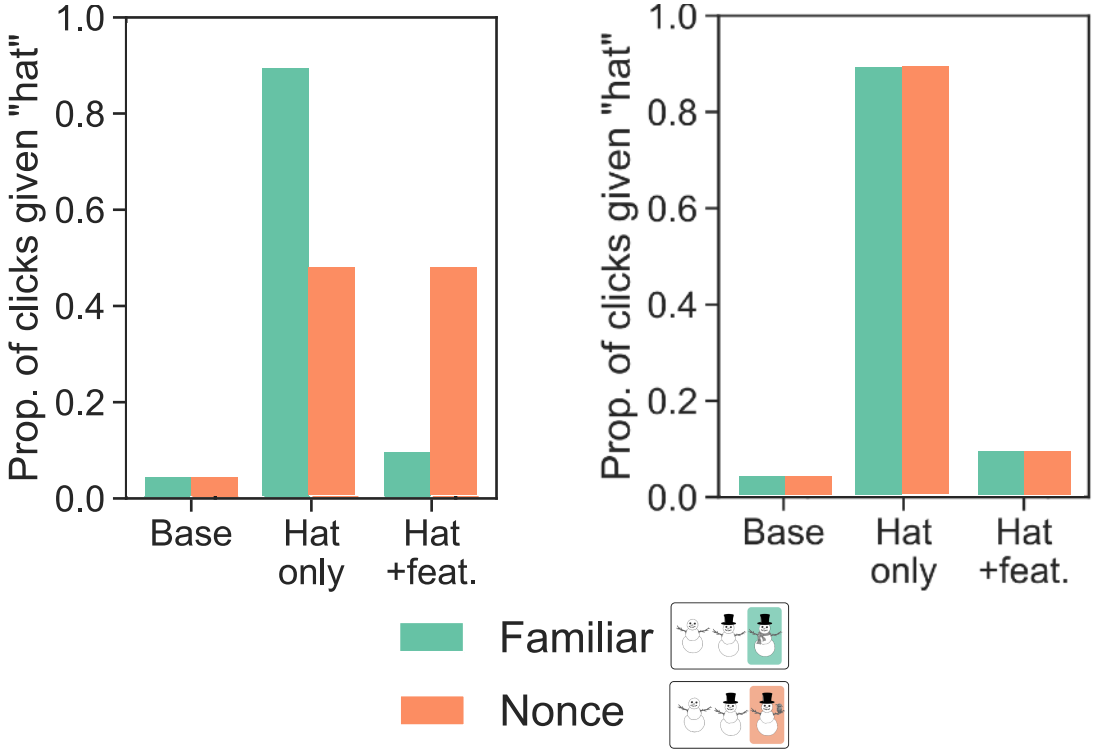


(Hu, Zaslavsky, & Levy, 2021)

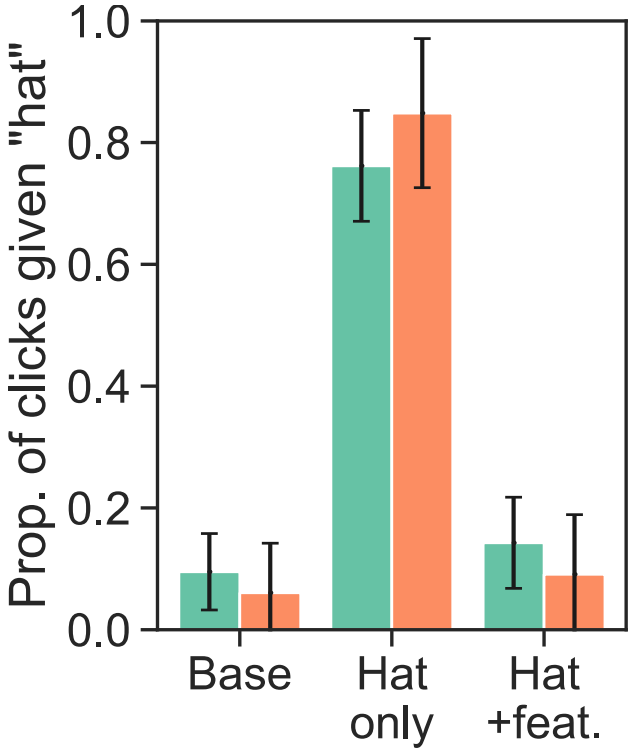
Do nonce objects drive SI?

Hypothesis 1
No. There is no alternative label in common ground.

Hypothesis 2
Yes. People can reason about novel lexical entries.



Results



(Hu, Zaslavsky, & Levy, 2021)

Vignettes

- Unknown words and pragmatic inference
- The nature of semantic scales and comparatives
- Syntax & inferring comparison classes for semantic scales
- Putting it all together: Complex descriptions and pragmatic inference in context

Degree semantics for scalar adjectives

Mary is tall

(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:

Mary is tall

(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*

Mary is tall

(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*

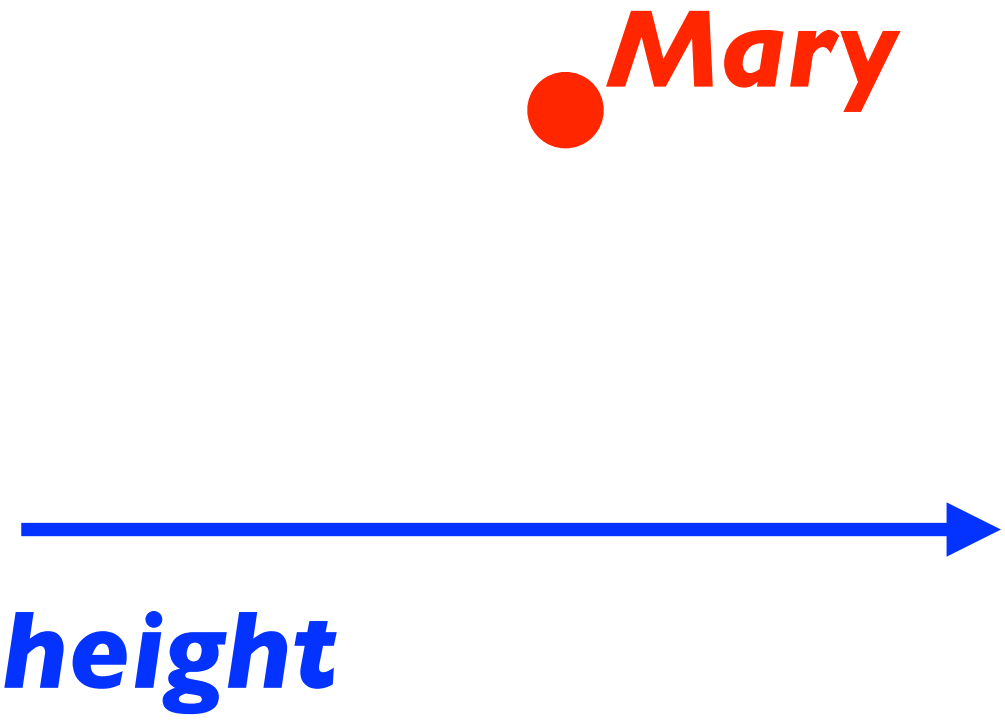
Mary is tall

(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*

Mary is tall

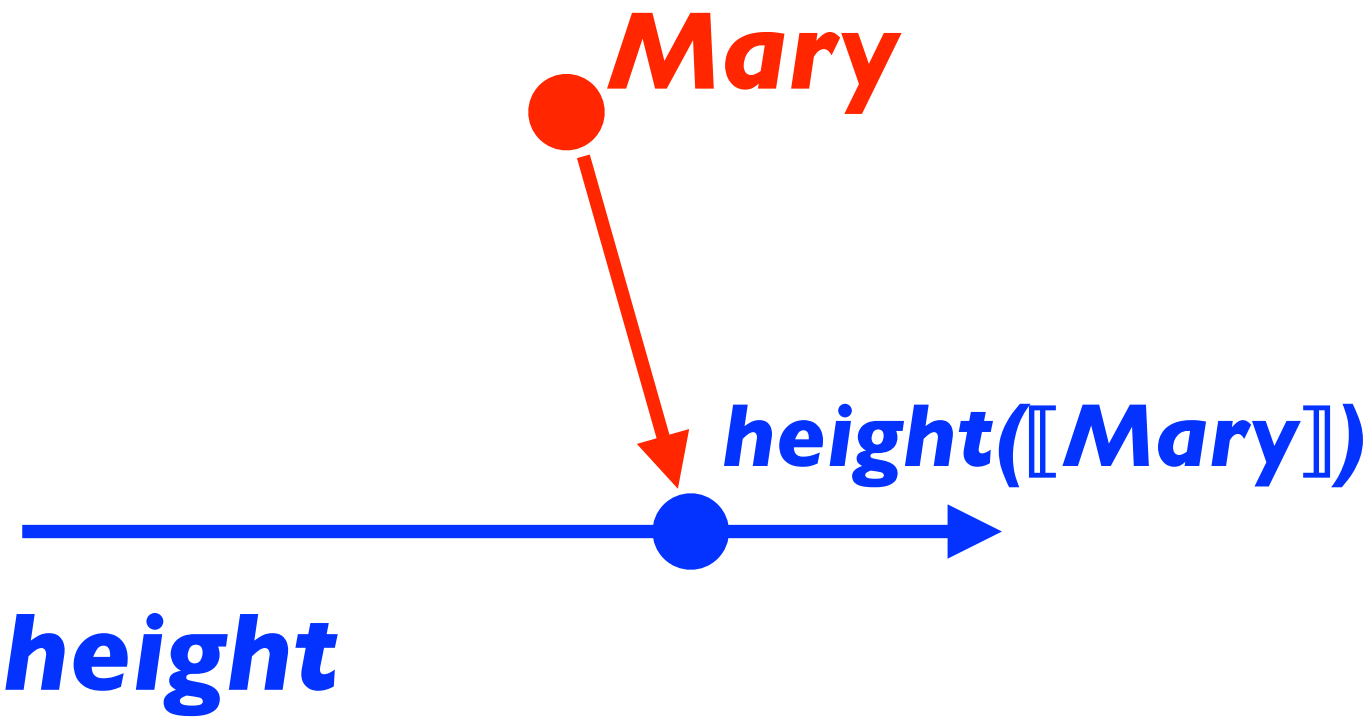


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*

Mary is tall

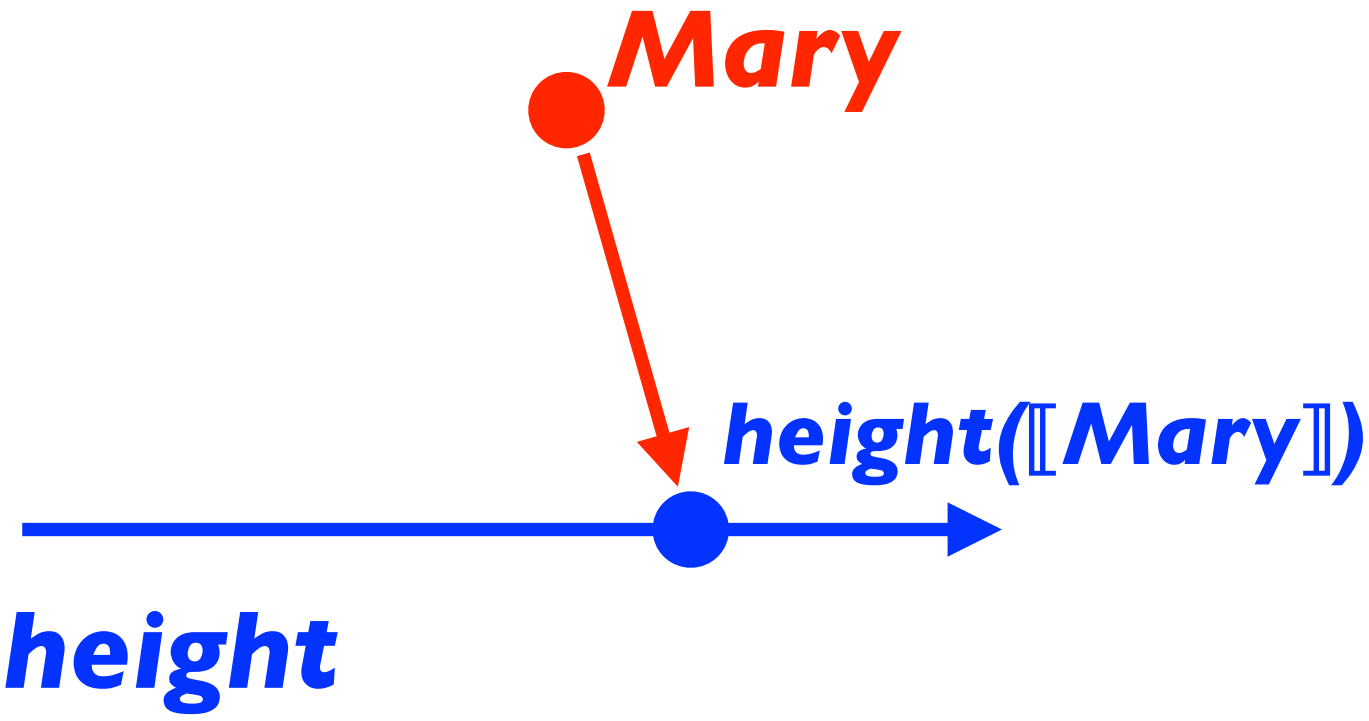


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall

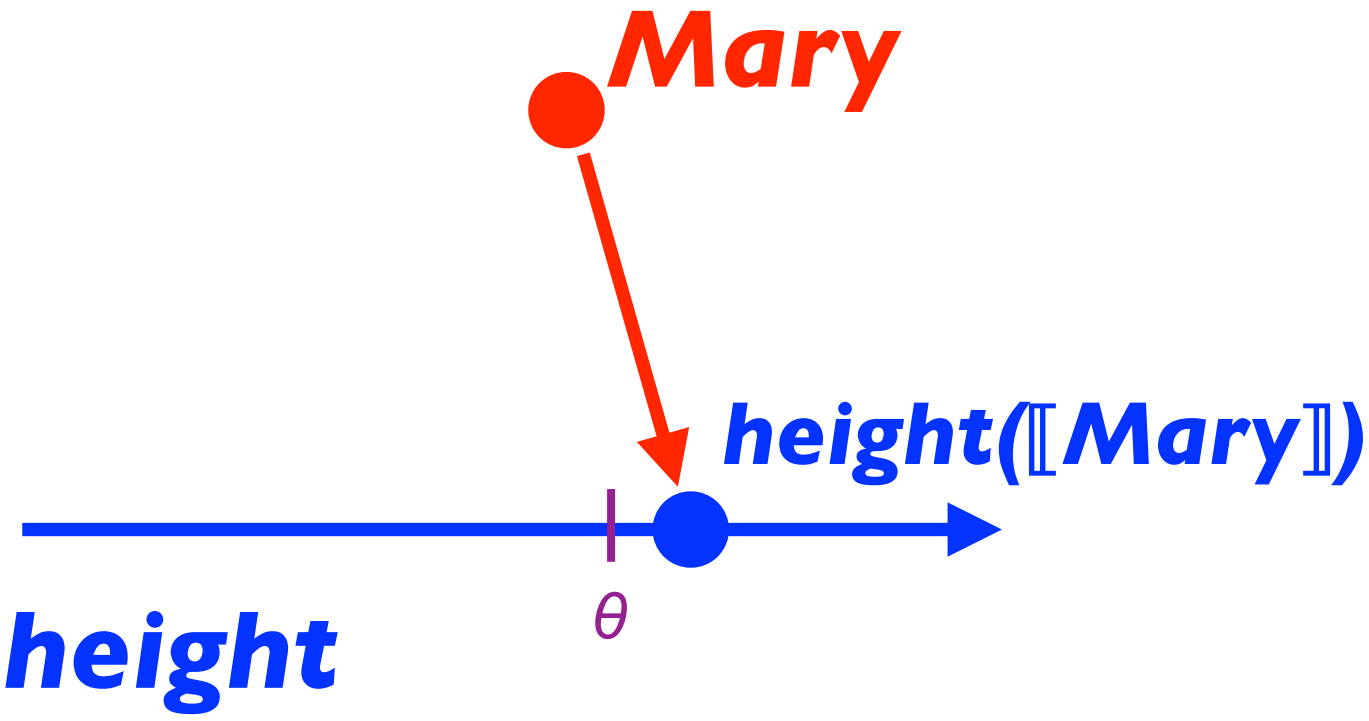


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall

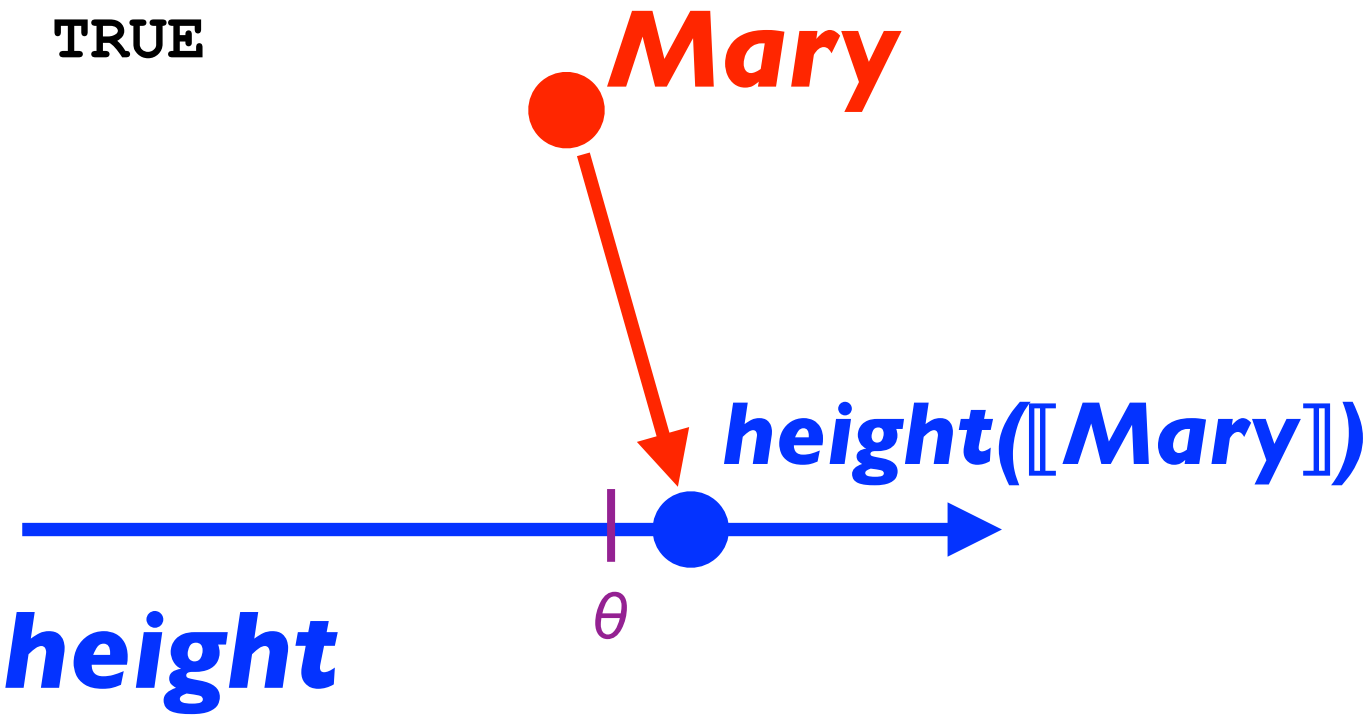


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall **TRUE**

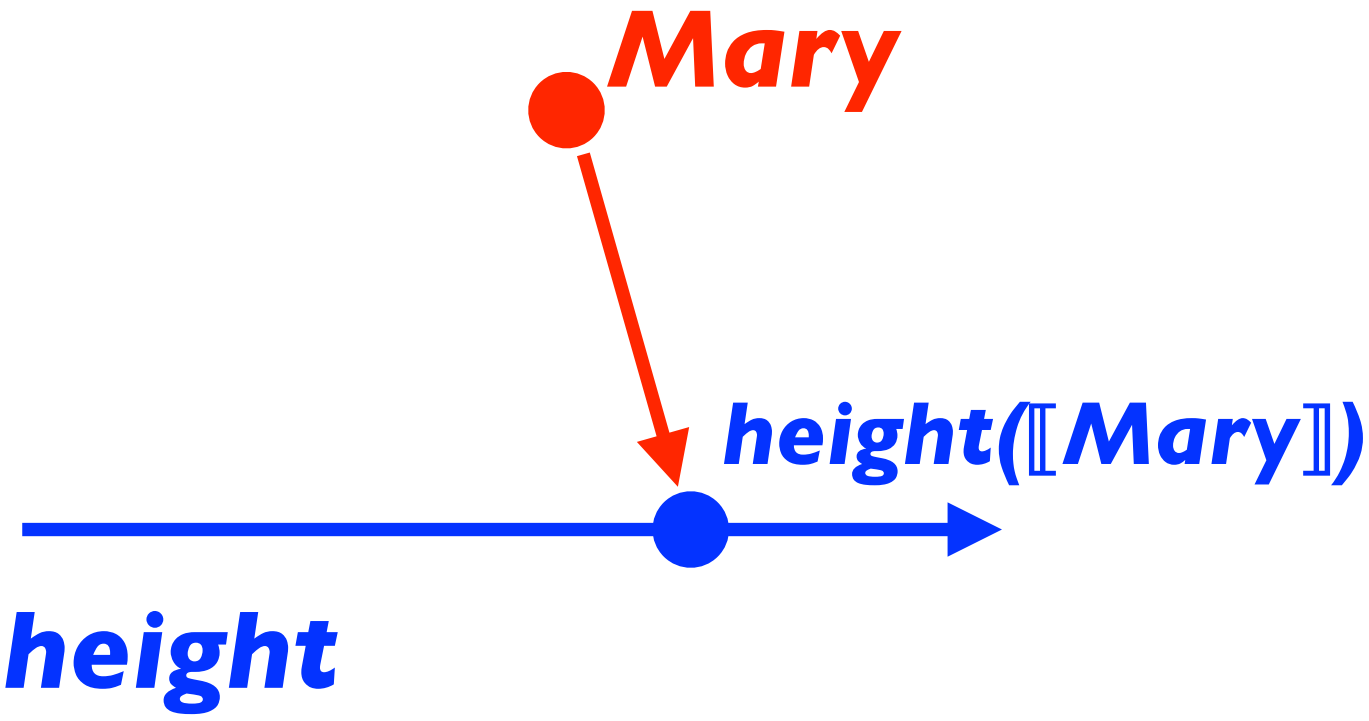


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall

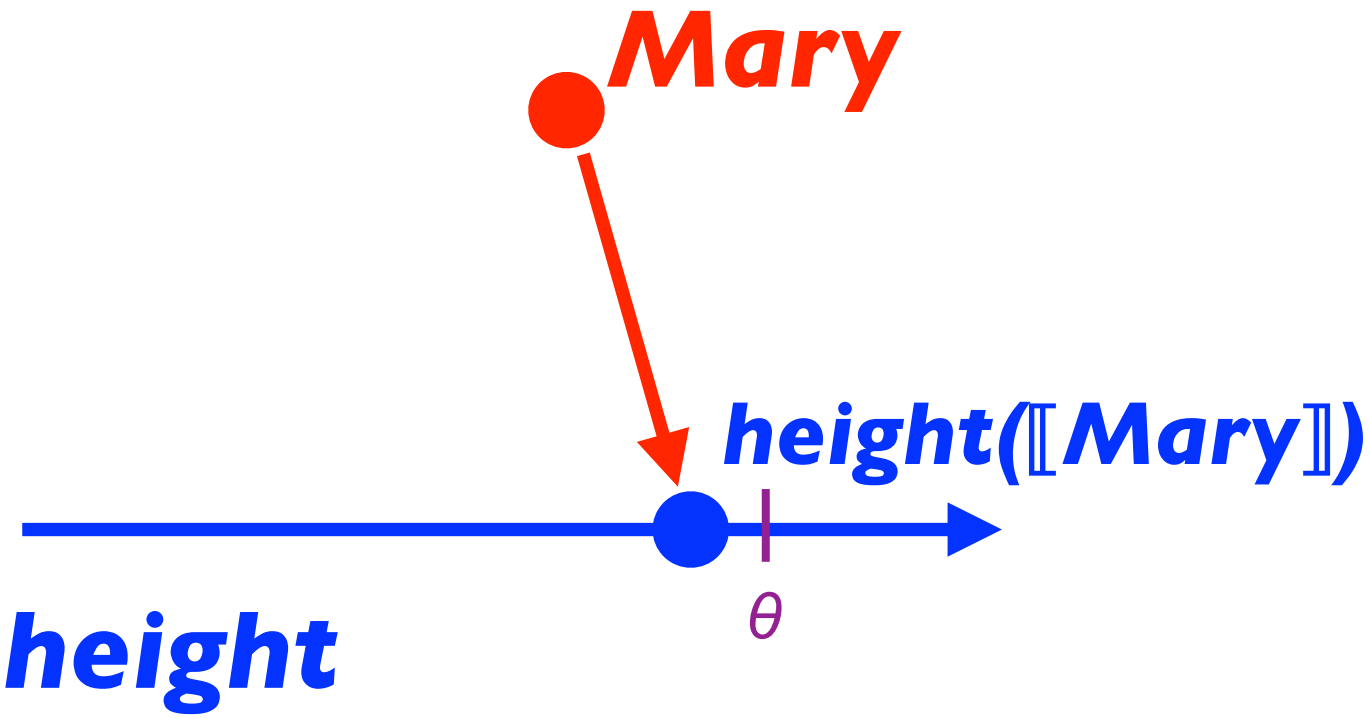


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall

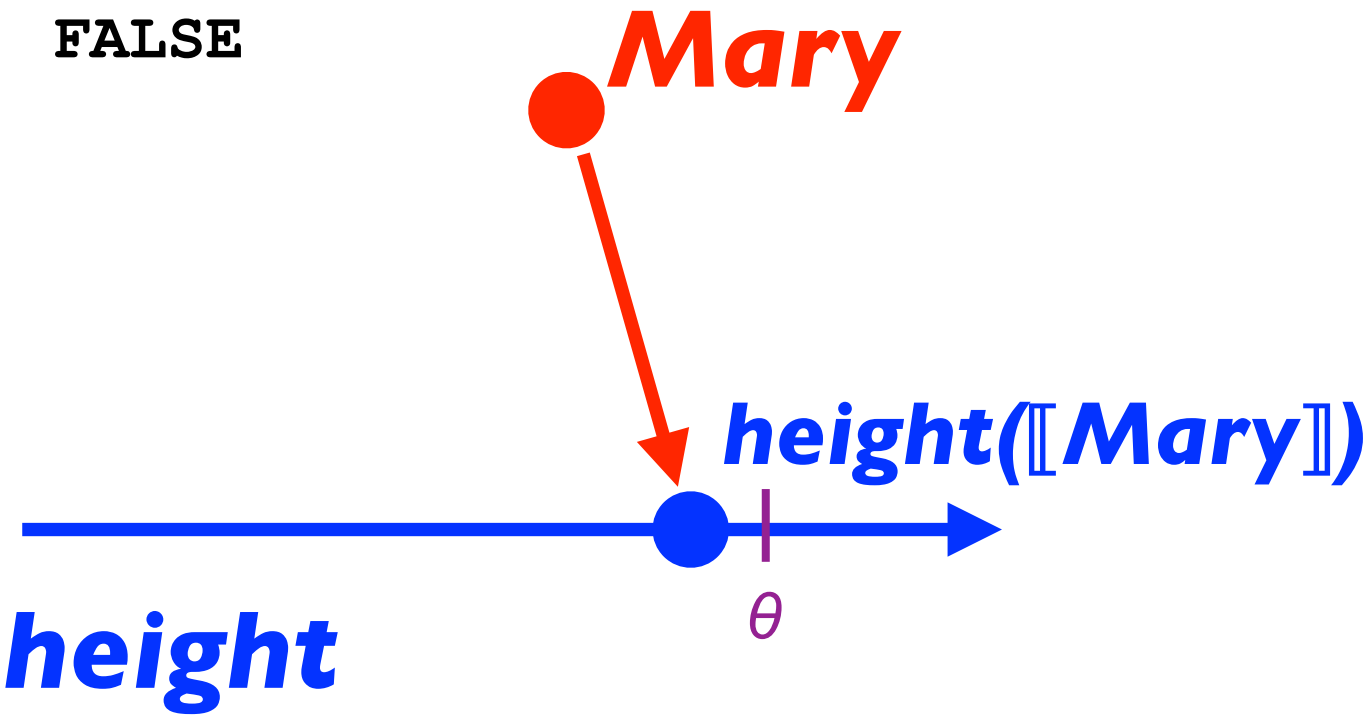


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall **FALSE**

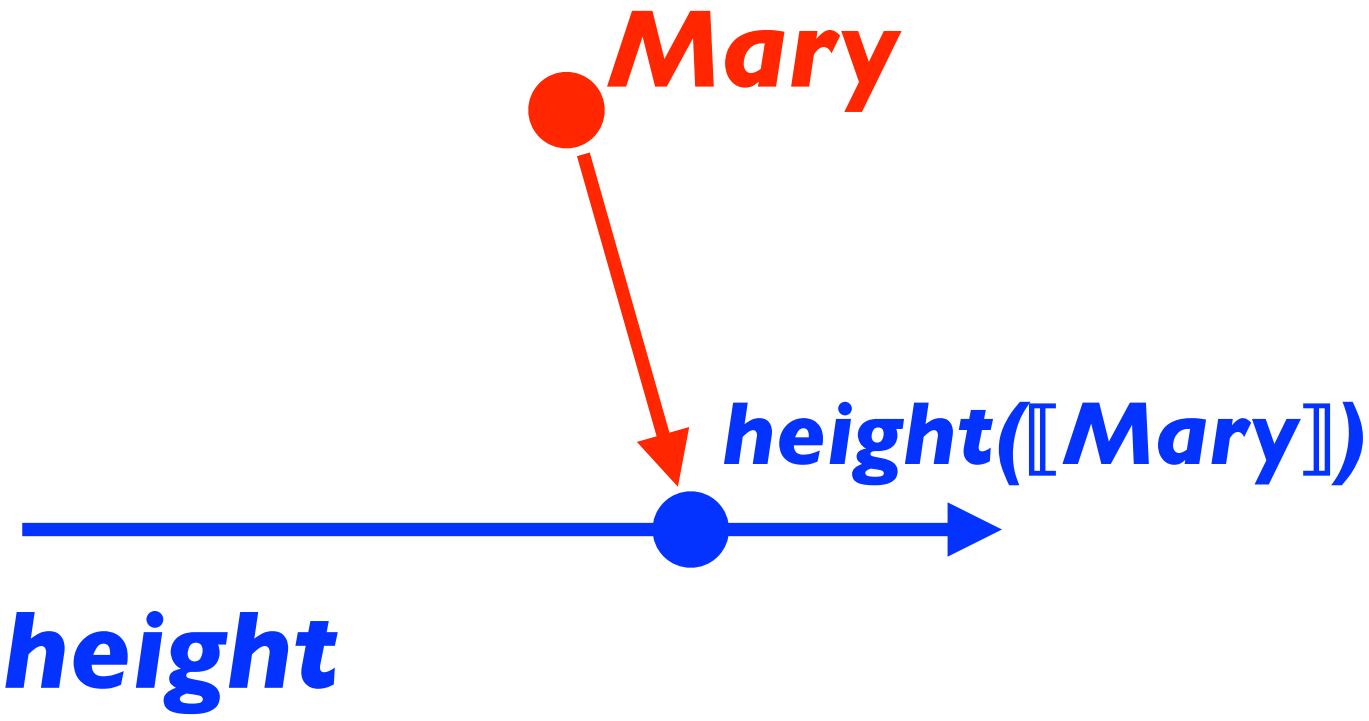


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall

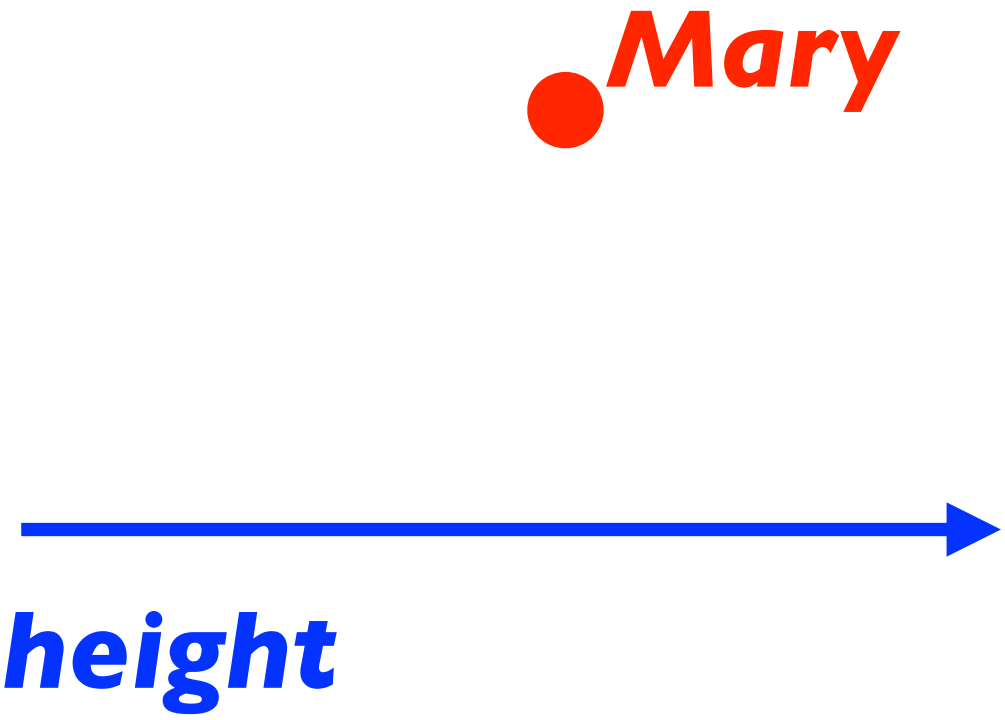


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall

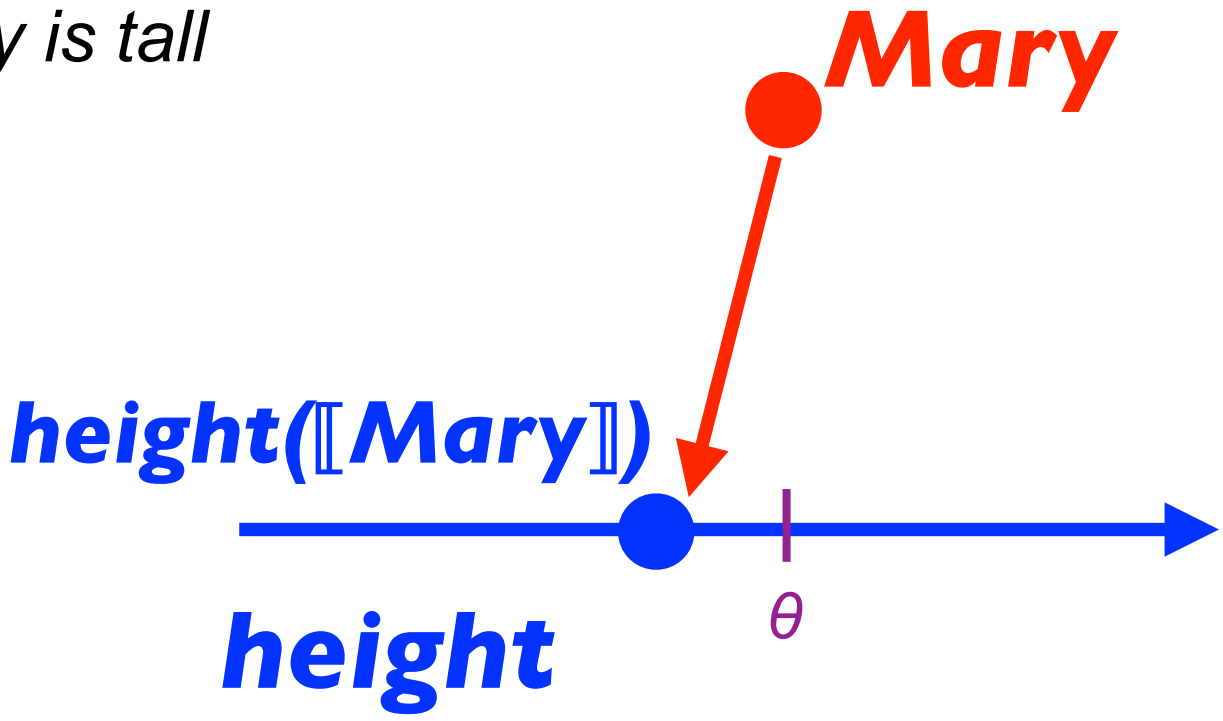


(Kennedy, 2007)

Degree semantics for scalar adjectives

- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall

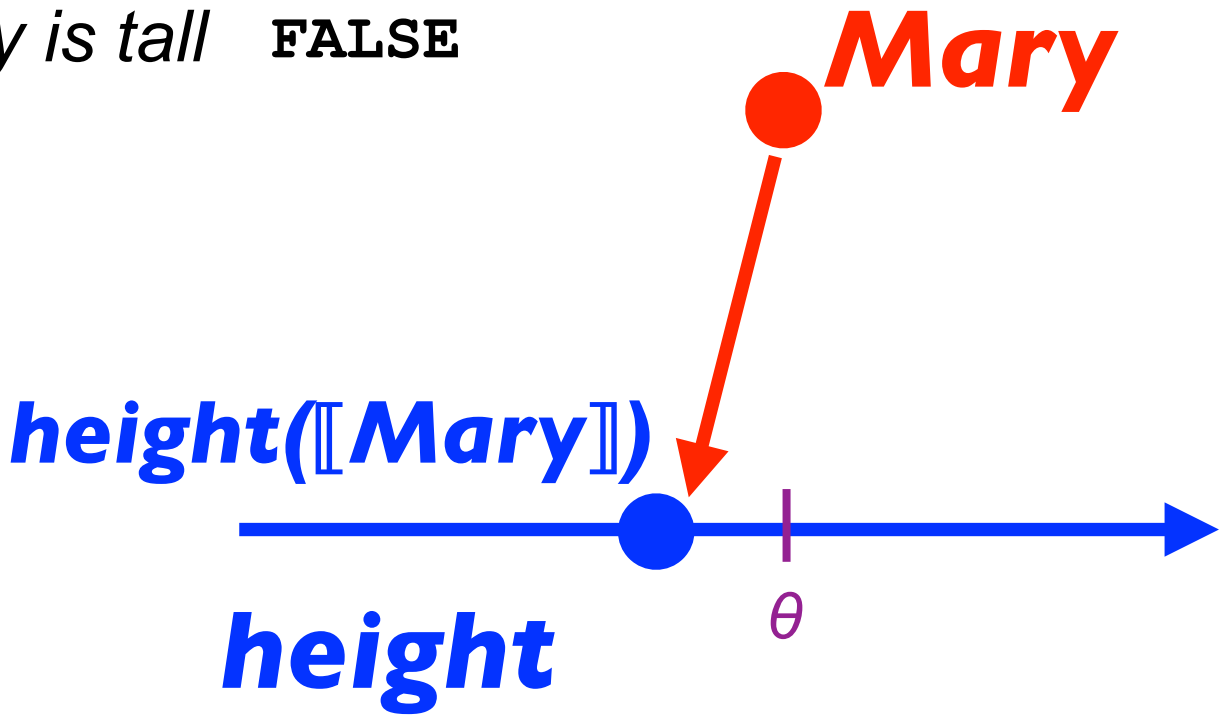


(Kennedy, 2007)

Degree semantics for scalar adjectives

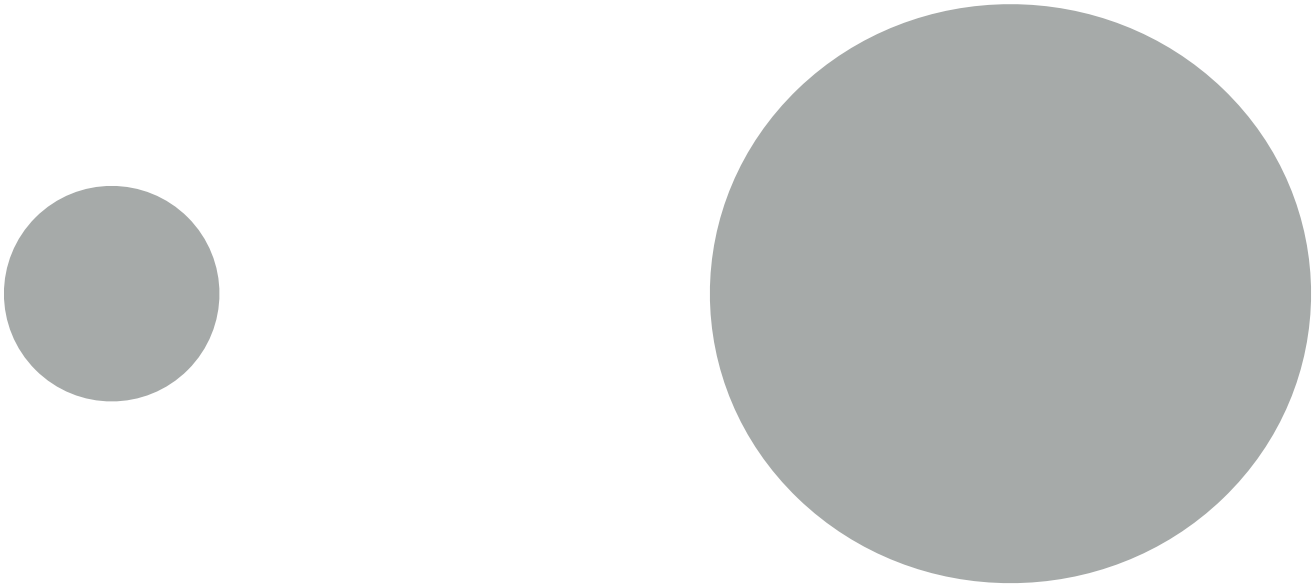
- The meaning of a scalar adjective like *big* or *tall* does two things:
  1. Projects a referent onto some **value** on a *scale*
  2. Predicates that that **value** is greater than some **threshold** θ

Mary is tall **FALSE**



(Kennedy, 2007)

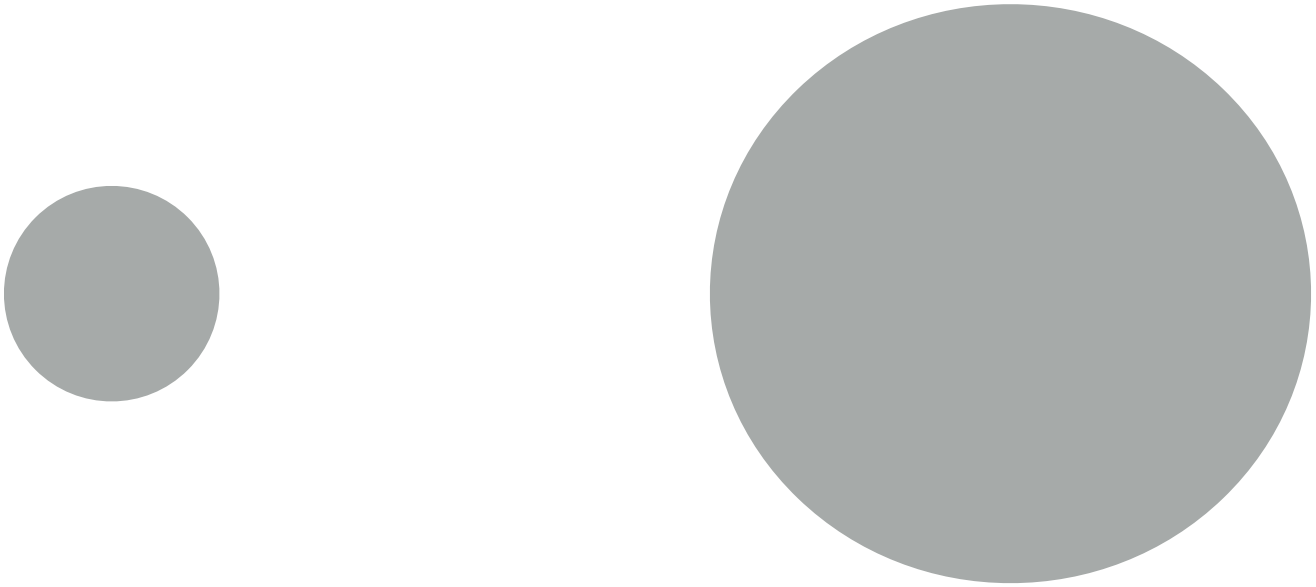
Degree semantics also underlie comparatives



(Aparicio, Chen, Levy, & Coppock)

Degree semantics also underlie comparatives

The left circle is bigger than the right circle.

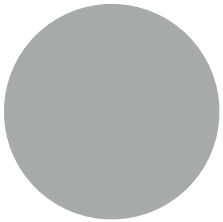


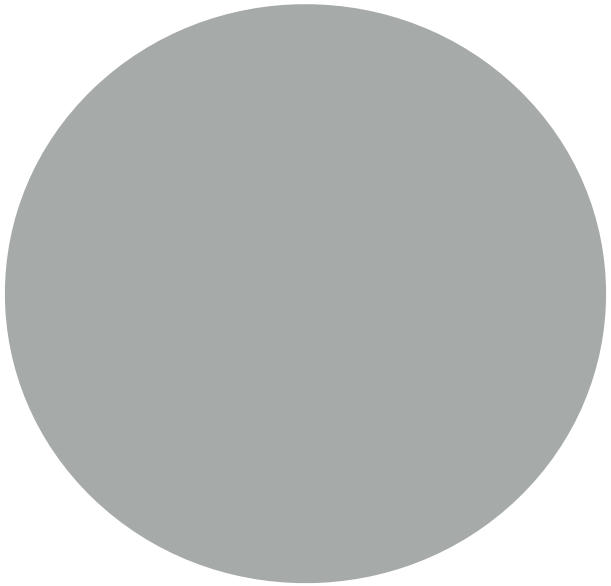
(Aparicio, Chen, Levy, & Coppock)

Degree semantics also underlie comparatives

The left circle is bigger than the right circle.

Point to the bigger circle.



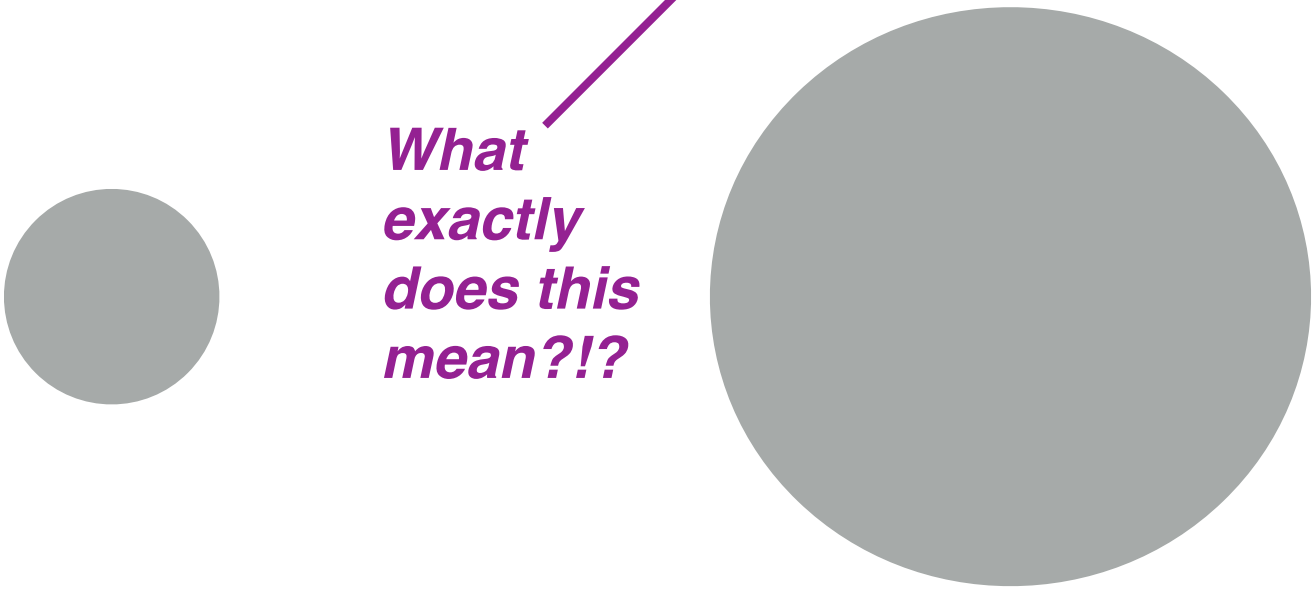


(Aparicio, Chen, Levy, & Coppock)

Degree semantics also underlie comparatives

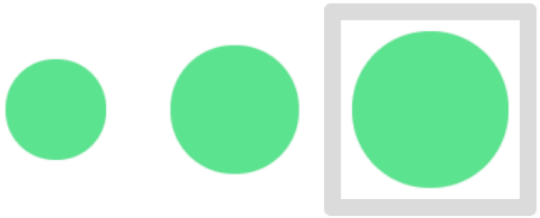
The left circle is bigger than the right circle.

Point to the bigger circle.



(Aparicio, Chen, Levy, & Coppock)

Two theories of the comparative

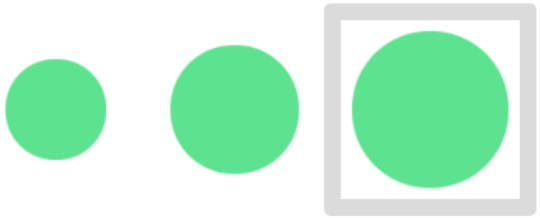


the biggest circle

the bigger circle

1. "bigger" requires that there are two ***referents*** in the context of the comparison class

Two theories of the comparative

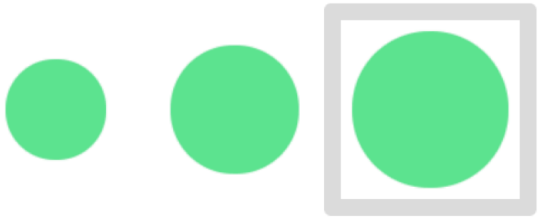


the biggest circle 😀

the bigger circle

1. "bigger" requires that there are two ***referents*** in the context of the comparison class

Two theories of the comparative

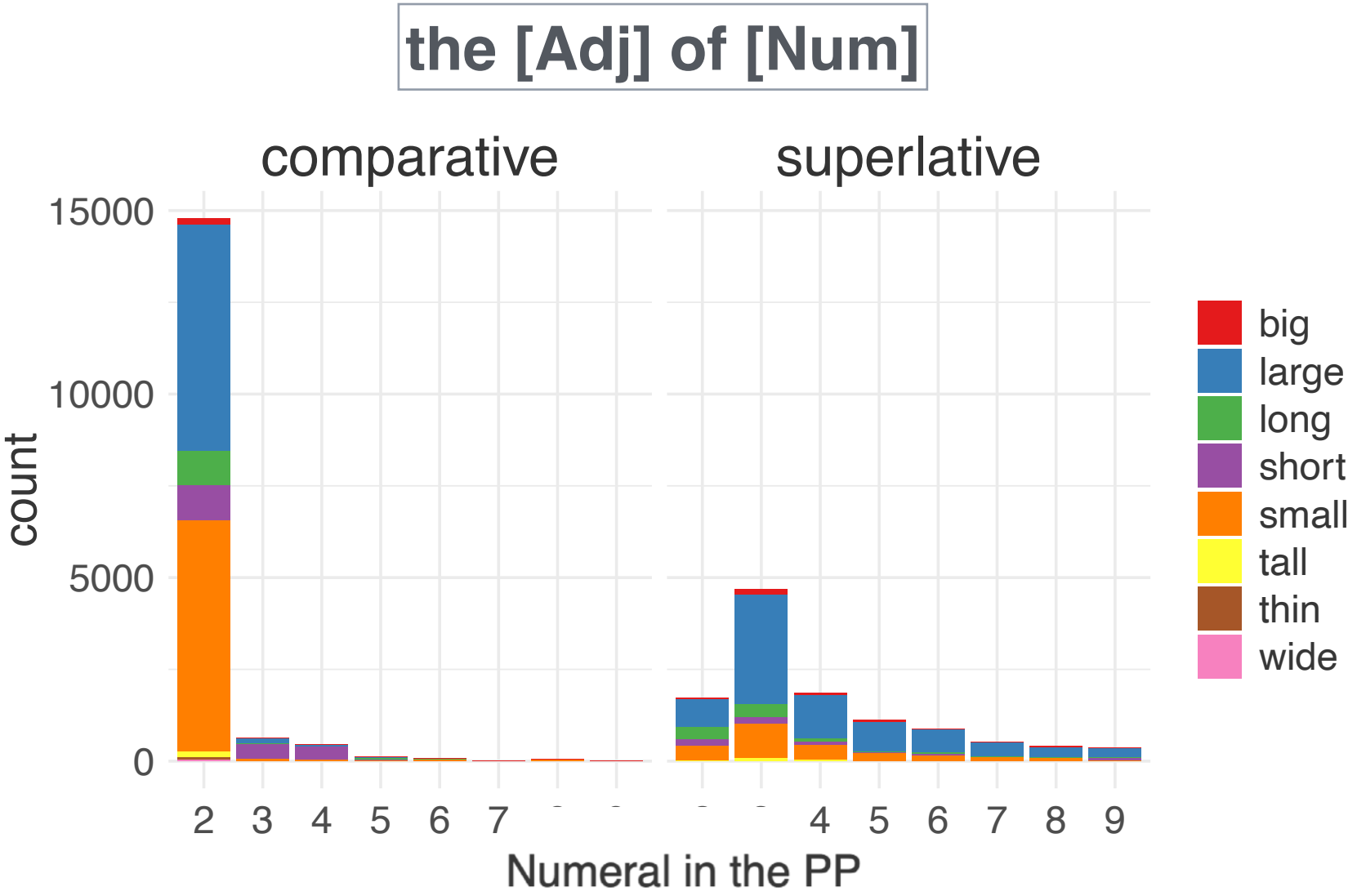


the biggest circle 😀

the bigger circle 😕

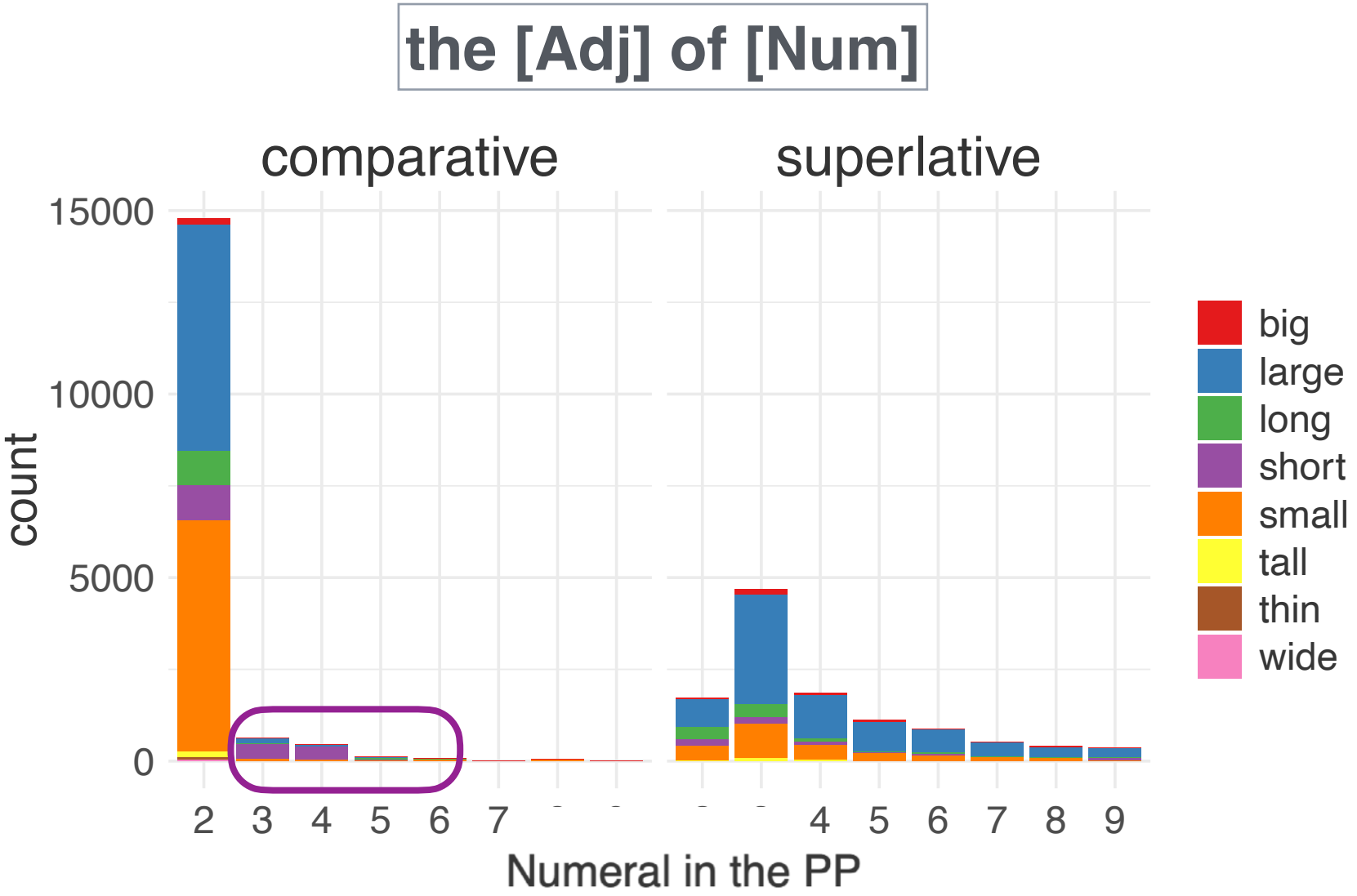
1. "bigger" requires that there are two ***referents*** in the context of the comparison class

Corpus data



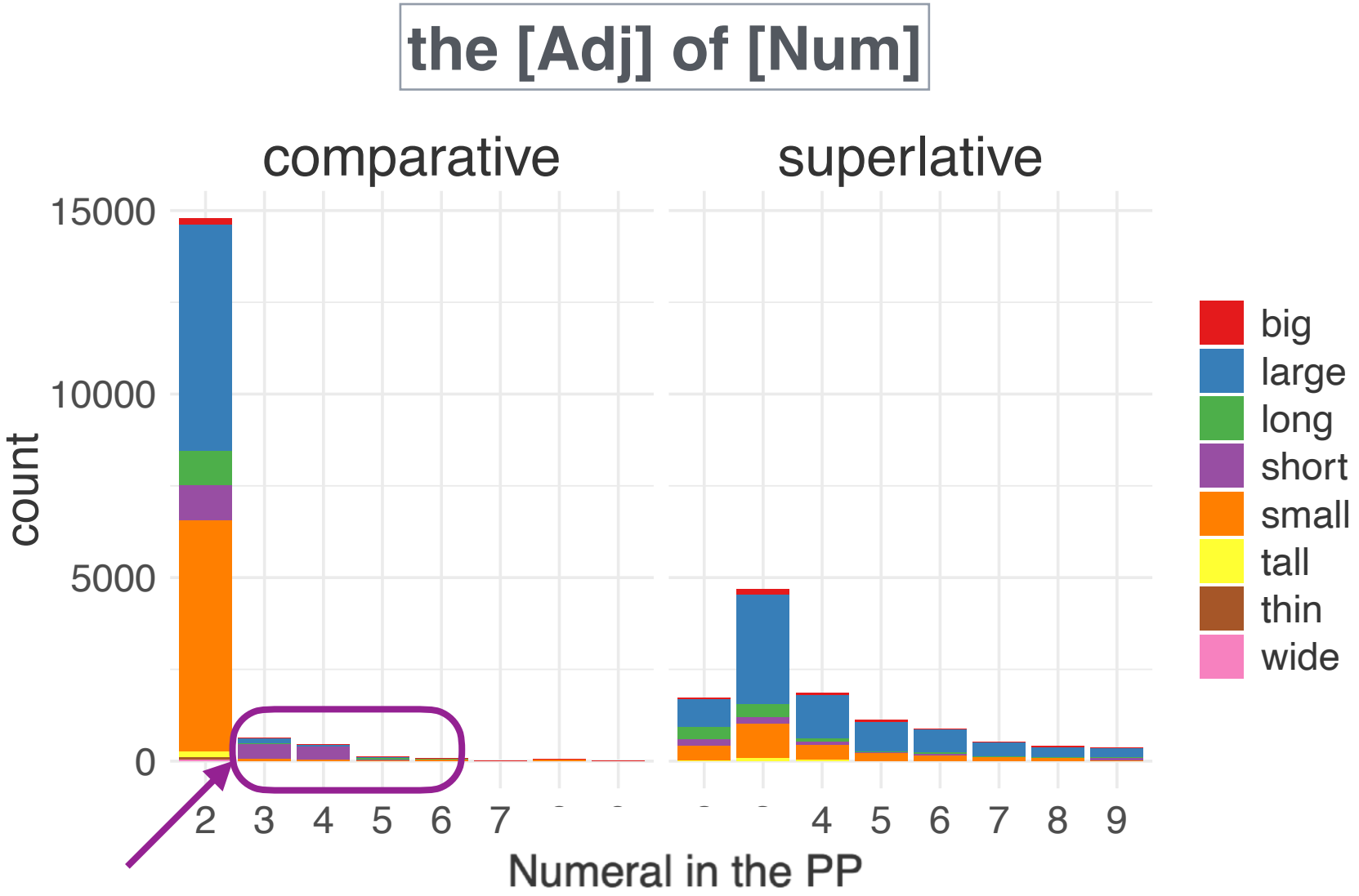
(Aparicio, Chen, Levy, & Coppock)

Corpus data



(Aparicio, Chen, Levy, & Coppock)

Corpus data



*people **do** sometimes use "the Adj-er of three"!*

(Aparicio, Chen, Levy, & Coppock)

A revealing example from the wild

Fitness › Workouts › Arm Exercises

Is It Better to Work the Back With Biceps or Triceps?

By Sara Lindberg | Updated April 29, 2019

Reviewed by Andra Picincu, CN, CPT

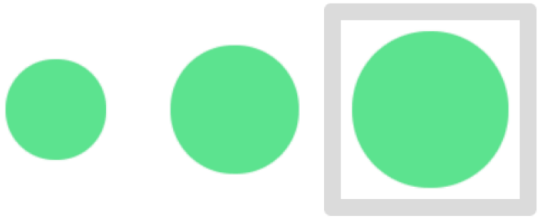
Working the pulling muscles of the back and biceps together helps prevent overtraining and eliminates the need to train arms on their own day.

Another muscle group to consider pairing your back workout with is the triceps. "Back and triceps workouts are a great way to ensure that you get indirect workload on the biceps, but get the direct work on the triceps while still working on ***the bigger of the three muscles*** *— the back," explains Carneiro.*

https://www.livestrong.com/article/550451-is-it-better-to-work-the-back-with-biceps-or-triceps/

(Aparicio, Chen, Levy, & Coppock)

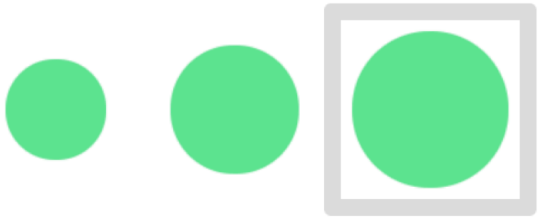
Two theories of the comparative



the biggest circle 😀

the bigger circle 😕

Two theories of the comparative

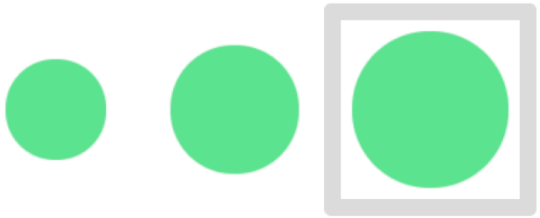


the biggest circle 😀

the bigger circle 😕

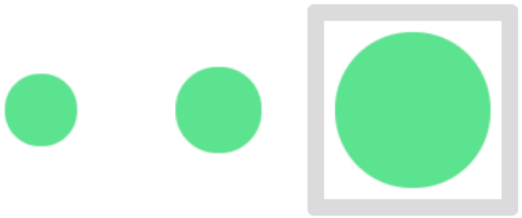
1. "bigger" requires that there are two ***referents*** in the context of the comparison class

Two theories of the comparative



the biggest circle 😀

the bigger circle 😕

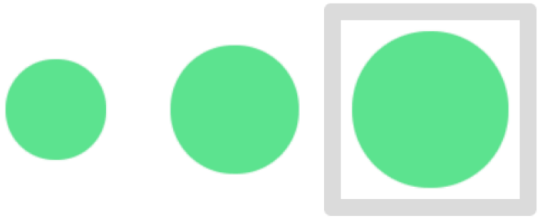


the biggest circle

the bigger circle

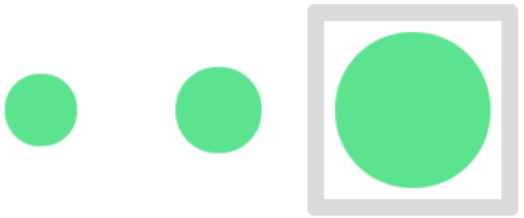
1. "bigger" requires that there are two ***referents*** in the context of the comparison class

Two theories of the comparative



the biggest circle 😀

the bigger circle 😕

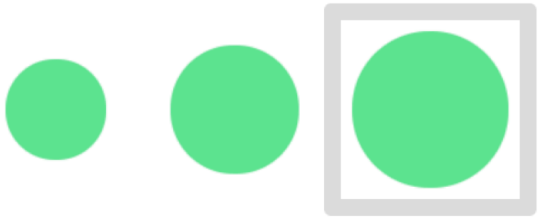


the biggest circle 😀

the bigger circle

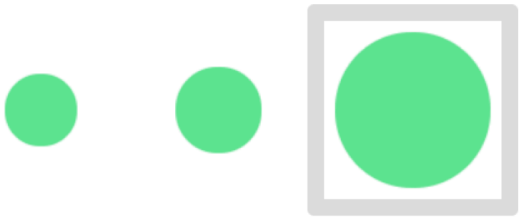
1. "bigger" requires that there are two ***referents*** in the context of the comparison class

Two theories of the comparative



the biggest circle 😀

the bigger circle 😕

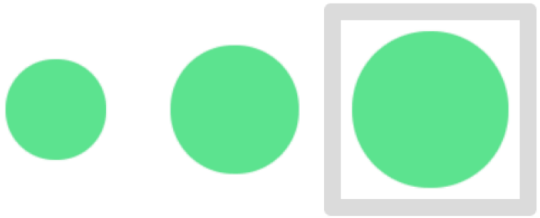


the biggest circle 😀

the bigger circle 🤔

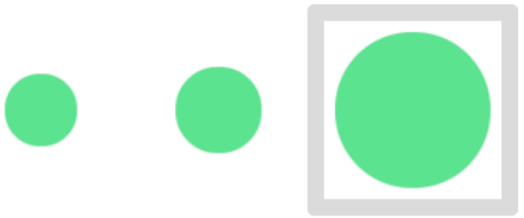
1. "bigger" requires that there are two ***referents*** in the context of the comparison class

Two theories of the comparative



the biggest circle 😀

the bigger circle 😕



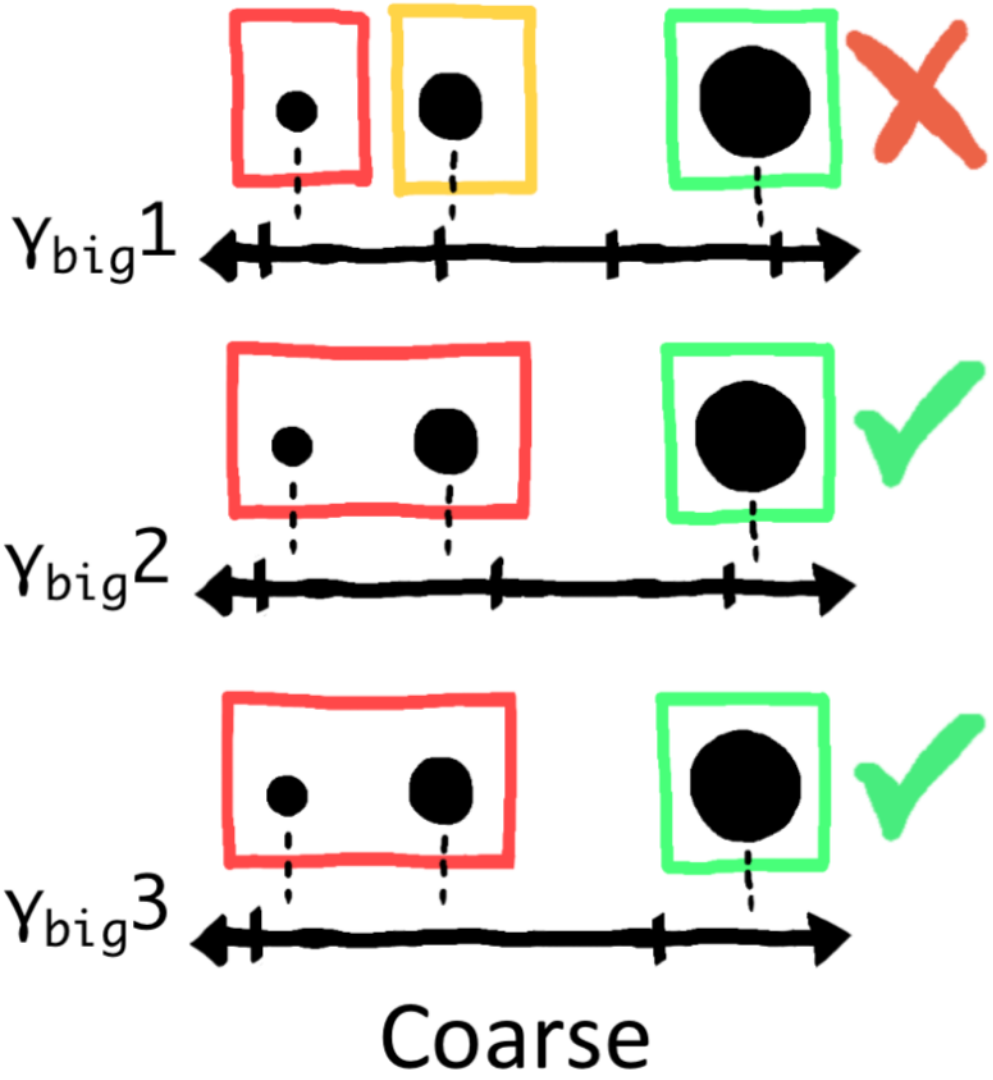
the biggest circle 😀

the bigger circle 🤔

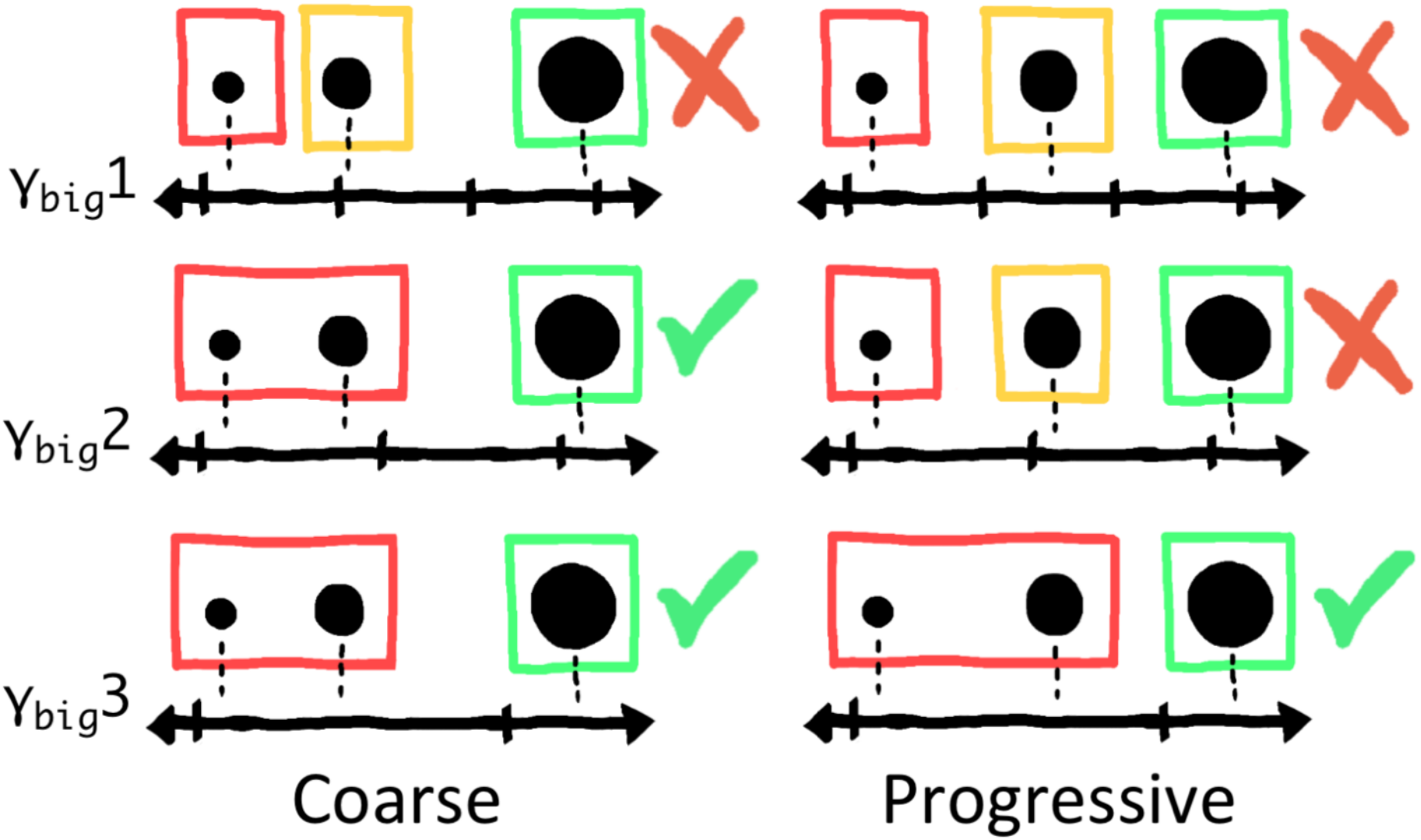
1. "bigger" requires that there are two ***referents*** in the context of the comparison class

2. "bigger" requires that there are two ***granularities*** in the context of the comparison class

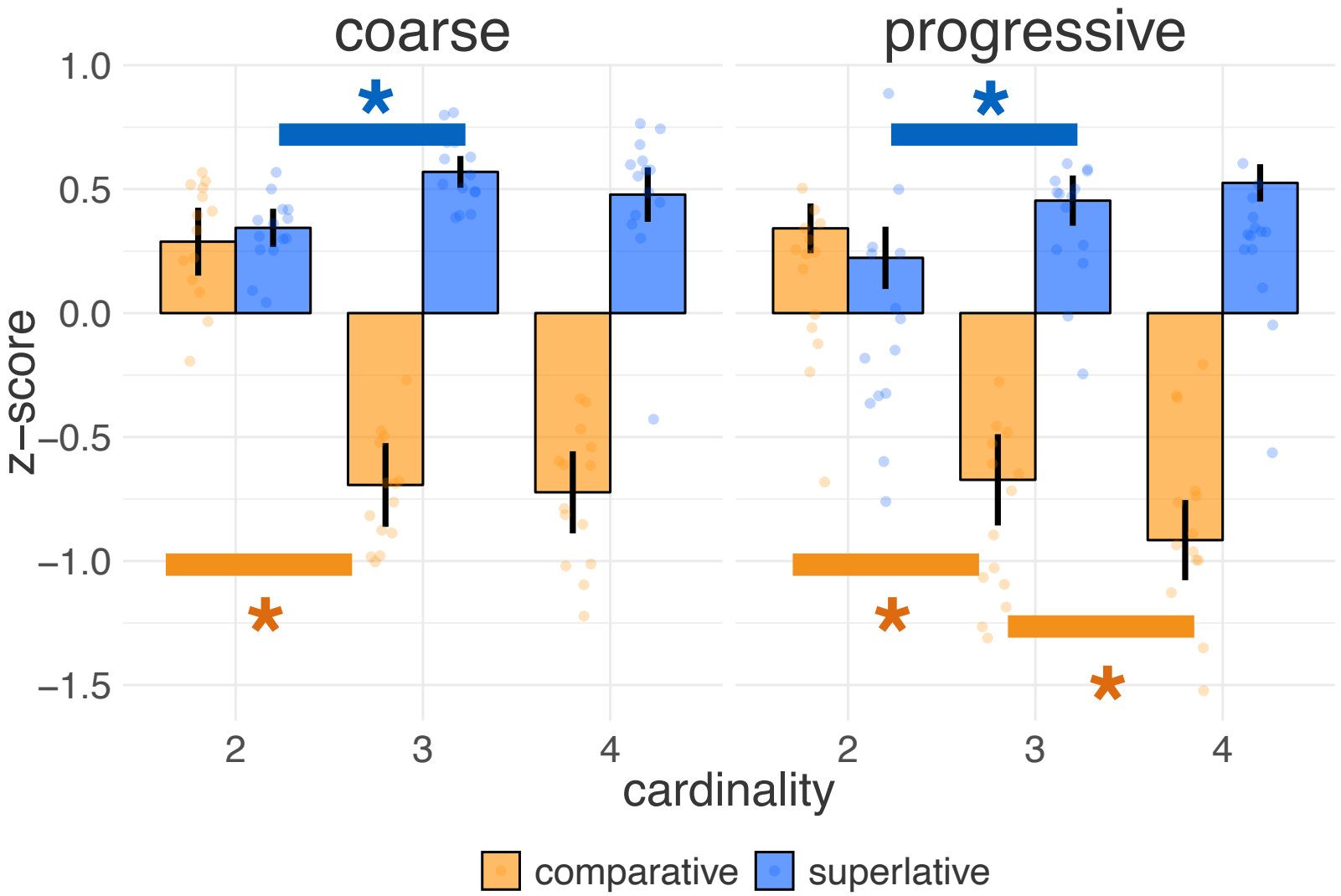
Theory of granularity inference



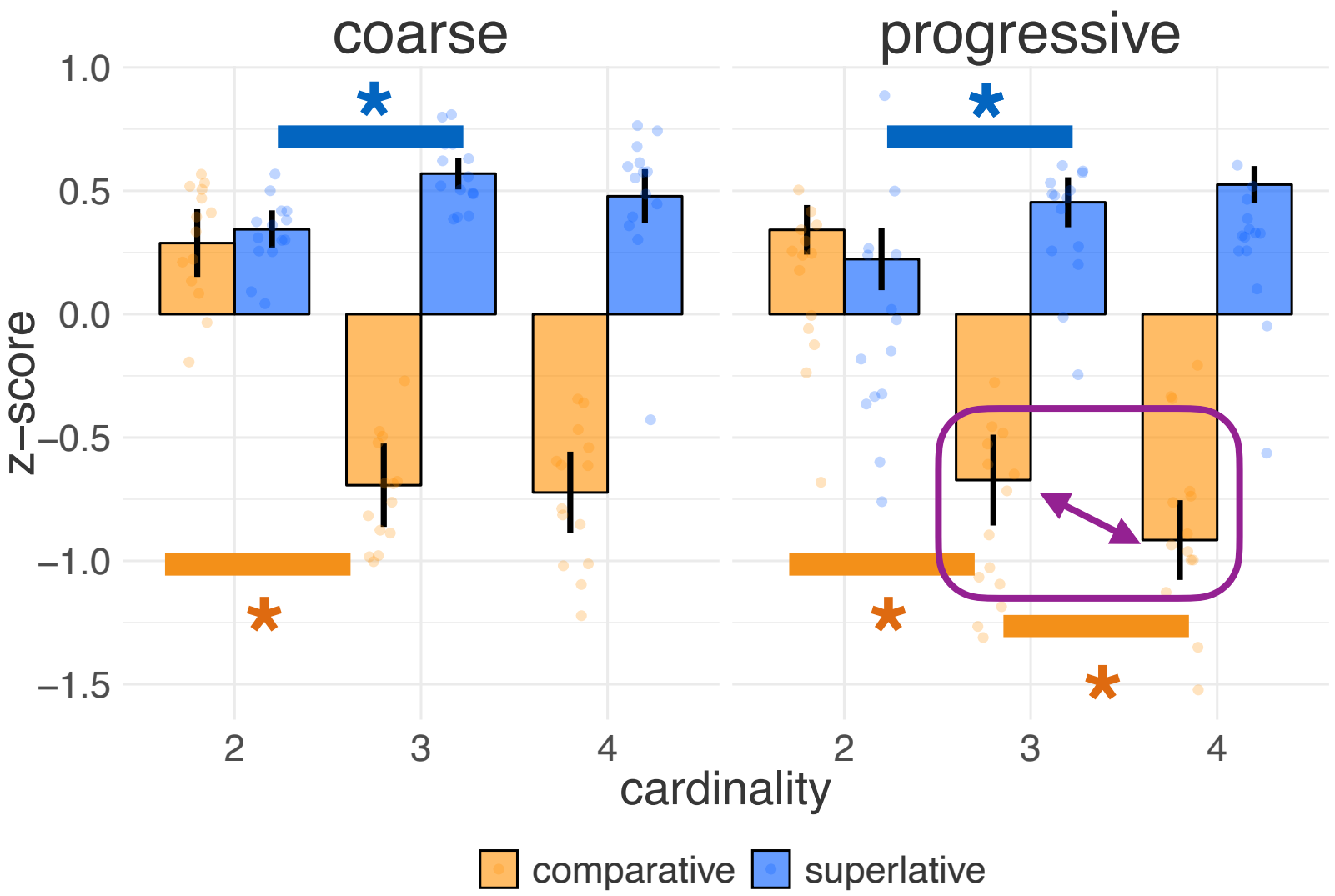
Theory of granularity inference



Experiment results



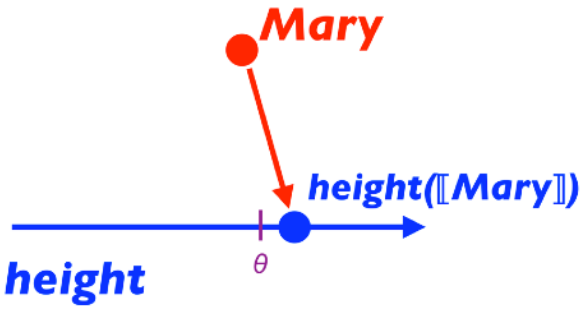
Experiment results



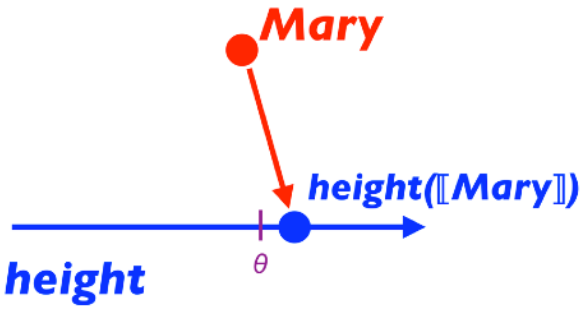
Vignettes

- Unknown words and pragmatic inference
- The nature of semantic scales and comparatives
- Syntax & inferring comparison classes for semantic scales
- Putting it all together: Complex descriptions and pragmatic inference in context

What else the degree semantics doesn't say

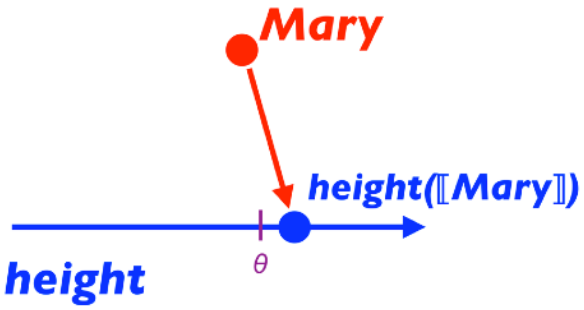


What else the degree semantics doesn't say



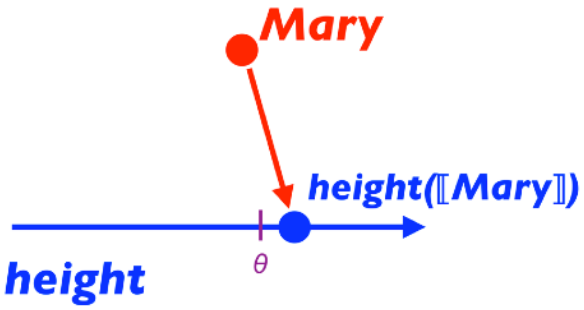
- How do we know the comparison class?

What else the degree semantics doesn't say



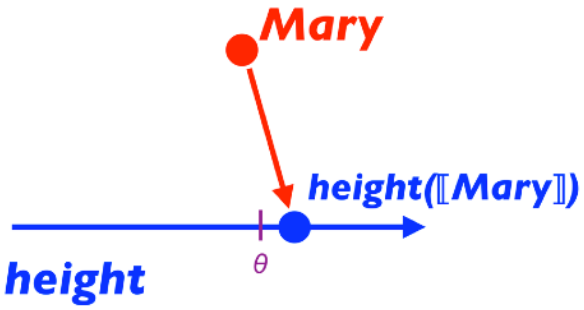
- How do we know the comparison class?
  - How does *tall elephant* turn out to mean something different from *tall mouse*?

What else the degree semantics doesn't say



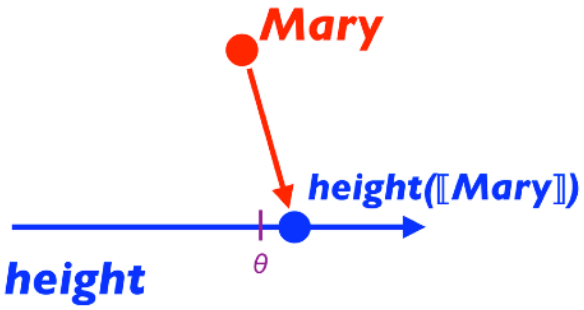
- How do we know the comparison class?
  - How does *tall elephant* turn out to mean something different from *tall mouse*?
  - How can the same *individual* be evaluated as either tall or not tall in different contexts?

What else the degree semantics doesn't say



- How do we know the comparison class?
  - How does *tall elephant* turn out to mean something different from *tall mouse*?
  - How can the same *individual* be evaluated as either tall or not tall in different contexts?

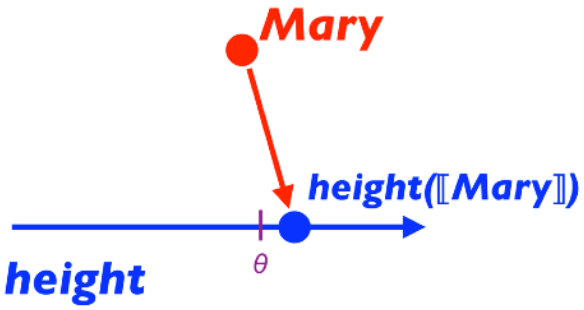
What else the degree semantics doesn't say



- How do we know the comparison class?
  - How does *tall elephant* turn out to mean something different from *tall mouse*?
  - How can the same *individual* be evaluated as either tall or not tall in different contexts?

Stephen Curry is tall.

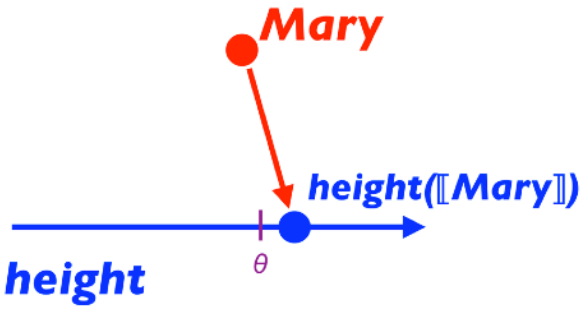
What else the degree semantics doesn't say



- How do we know the comparison class?
  - How does *tall elephant* turn out to mean something different from *tall mouse*?
  - How can the same *individual* be evaluated as either tall or not tall in different contexts?

Stephen Curry is tall.

What else the degree semantics doesn't say

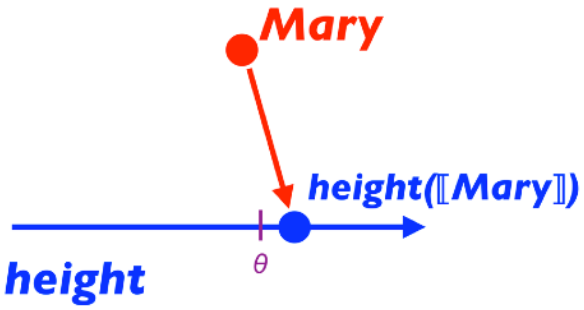


- How do we know the comparison class?
  - How does *tall elephant* turn out to mean something different from *tall mouse*?
  - How can the same *individual* be evaluated as either tall or not tall in different contexts?

Stephen Curry is tall.

(Stephen Curry is 6'2"; this is the 12th percentile of NBA player heights)

What else the degree semantics doesn't say



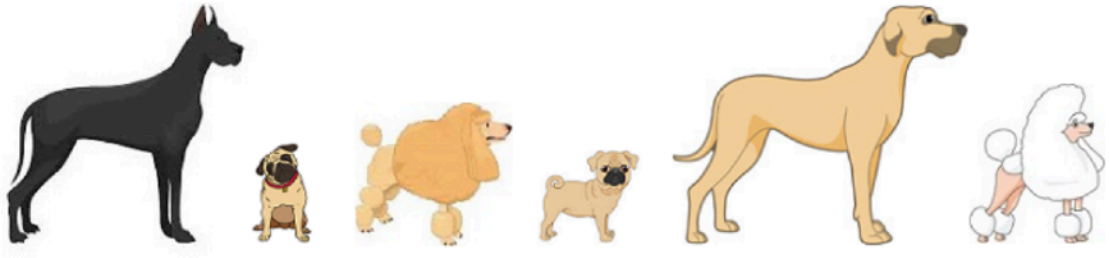
- How do we know the comparison class?
  - How does *tall elephant* turn out to mean something different from *tall mouse*?
  - How can the same *individual* be evaluated as either tall or not tall in different contexts?

Stephen Curry is tall.

Stephen Curry is a tall basketball player.

(Stephen Curry is 6'2"; this is the 12th percentile of NBA player heights)

You and your friend see the following:



Your friend runs far ahead of you, and you see him in the distance:

Your friend says: ***That's a big great dane.***

Context Basic-Level
Syntax Predicate NP
Noun Subordinate Category

What do you think your friend meant?

It is big relative to other _____.

(Tessler, Tsvilodub, Snedeker, Franke, Levy)

You and your friend see the following:

Your friend runs far ahead of you, and you see him in the distance:

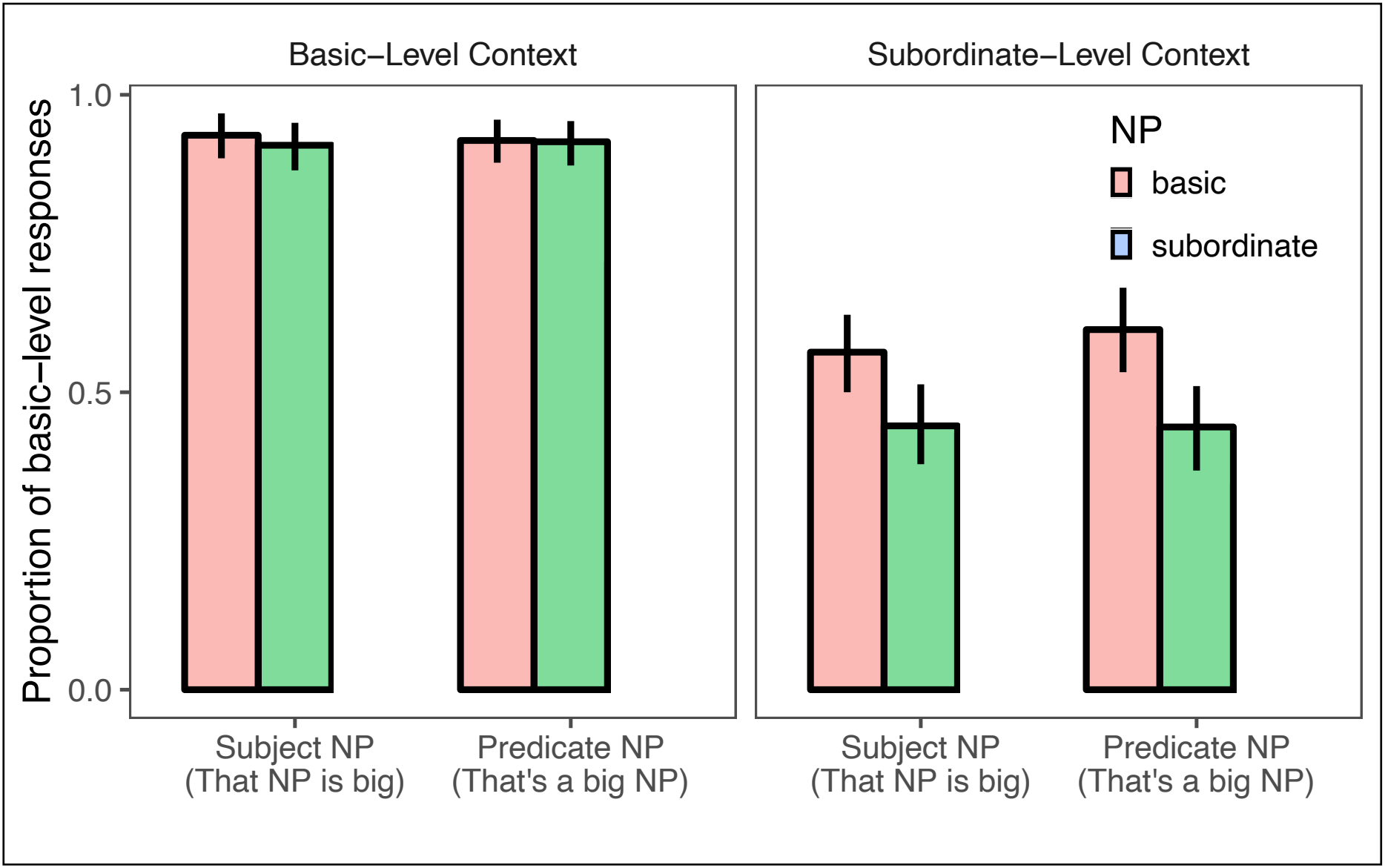
Your friend says: ***That dog is big.***

Context Subordinate-level
Syntax Subject NP
Noun Basic-level Category

What do you think your friend meant? *It is big relative to other _____.*

(Tessler, Tsvilodub, Snedeker, Franke, Levy)

Results



(Tessler, Tsvilodub, Snedeker, Franke, Levy)

Vignettes

- Unknown words and pragmatic inference
- The nature of semantic scales and comparatives
- Syntax & inferring comparison classes for semantic scales
- Putting it all together: Complex descriptions and pragmatic inference in context

Definites

Point at the bag

(Aparicio, Levy, & Coppock)

Definites

which one?!

Point at the bag

(Aparicio, Levy, & Coppock)

Definites

Property of definites: require a unique referent

Point at the bag

(Aparicio, Levy, & Coppock)

Definites

Request violates a cooperative norm for communication rooted in the semantics of the definite determiner

Point at the bag

(Aparicio, Levy, & Coppock)

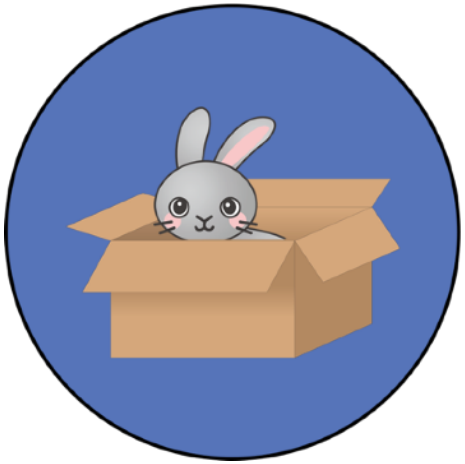
Definites

Reference Failure

Point at the bag

(Aparicio, Levy, & Coppock)

Haddock Descriptions

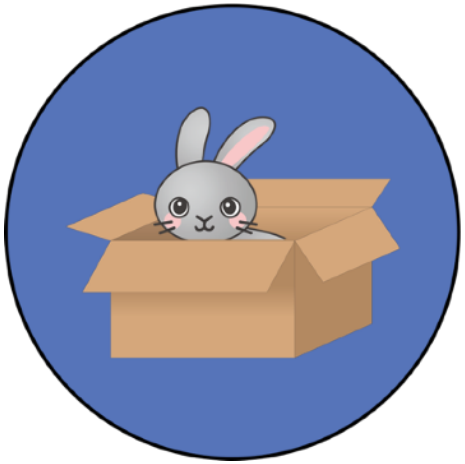


The rabbit in the bag

Haddock (1987)

(Aparicio, Levy, & Coppock)

Haddock Descriptions

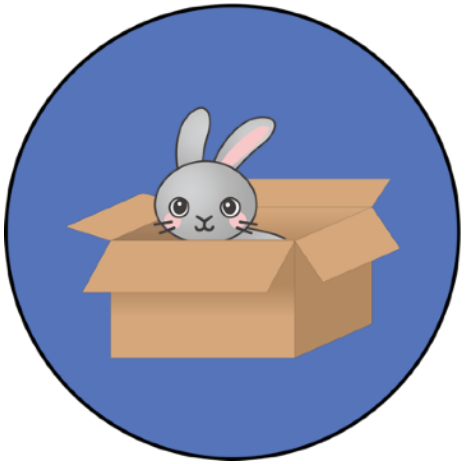


The rabbit in [the bag]

Haddock (1987)

(Aparicio, Levy, & Coppock)

Haddock Descriptions



[The rabbit in [the bag]]

Haddock (1987)

(Aparicio, Levy, & Coppock)

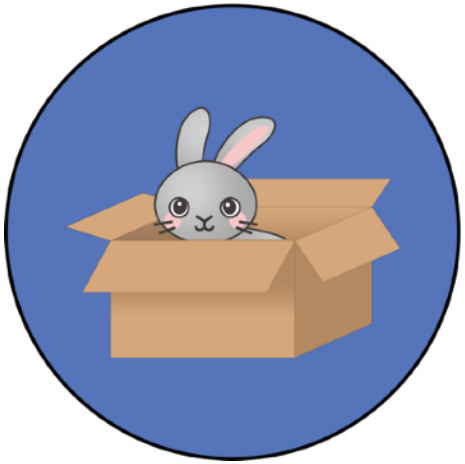
Haddock Descriptions

The rabbit in the bag

Haddock (1987)

(Aparicio, Levy, & Coppock)

Puzzle



The rabbit in the bag

(Aparicio, Levy, & Coppock)

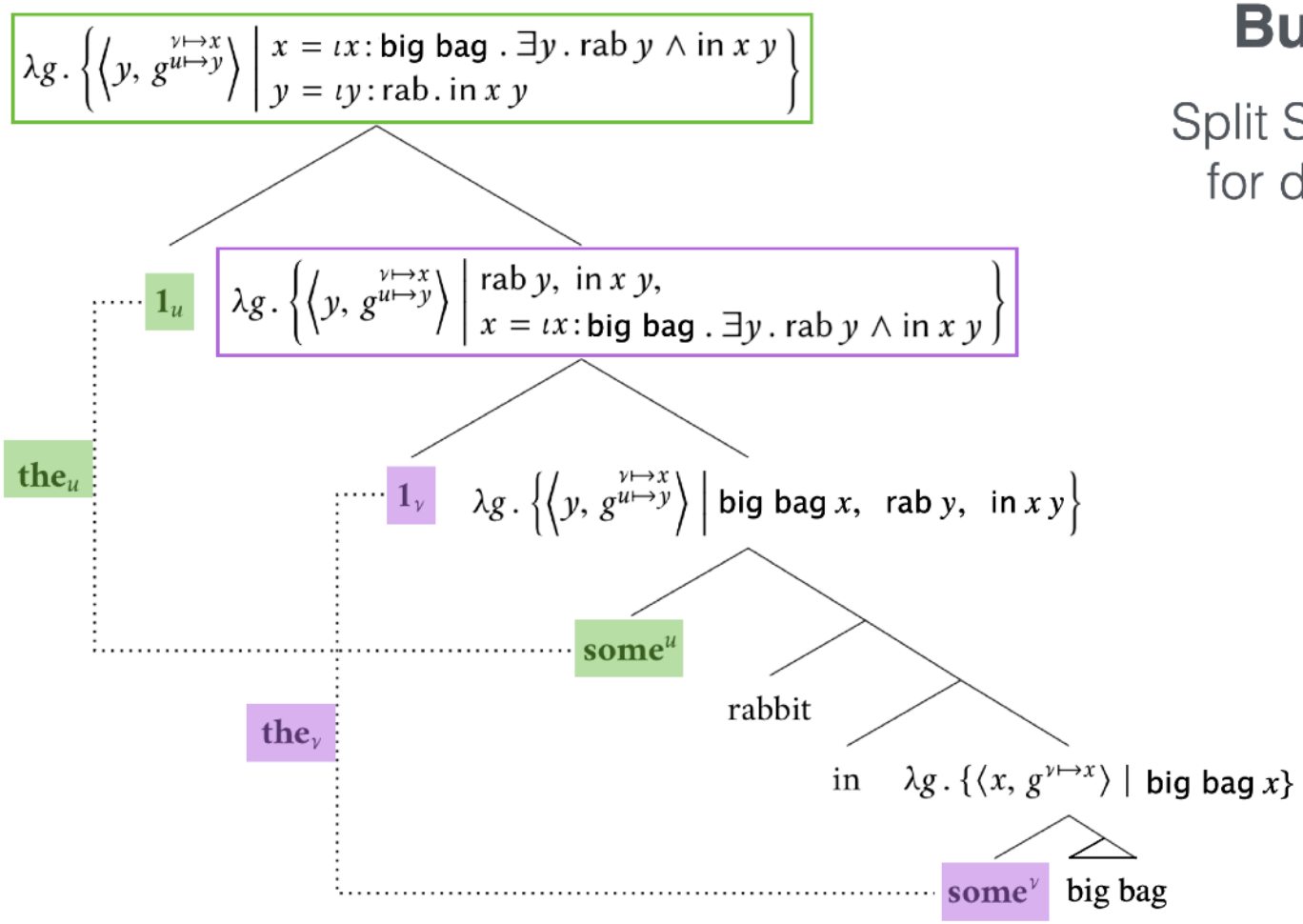
Puzzle

Why doesn't the embedded definite fail to refer?

The rabbit in the bag

(Aparicio, Levy, & Coppock)

A semantic account for Haddock descriptions



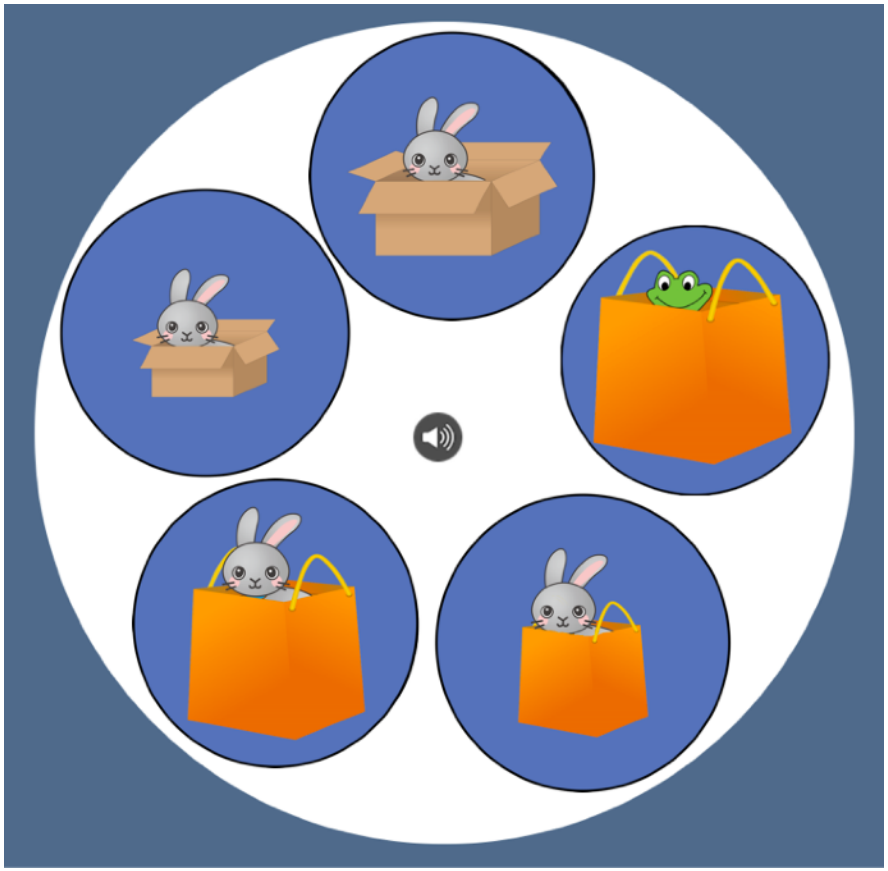
Bumford (2017)

Split Scope interpretation for definite determiner

(Aparicio, Levy, & Coppock)

Experiment: *threshold uncertainty* condition

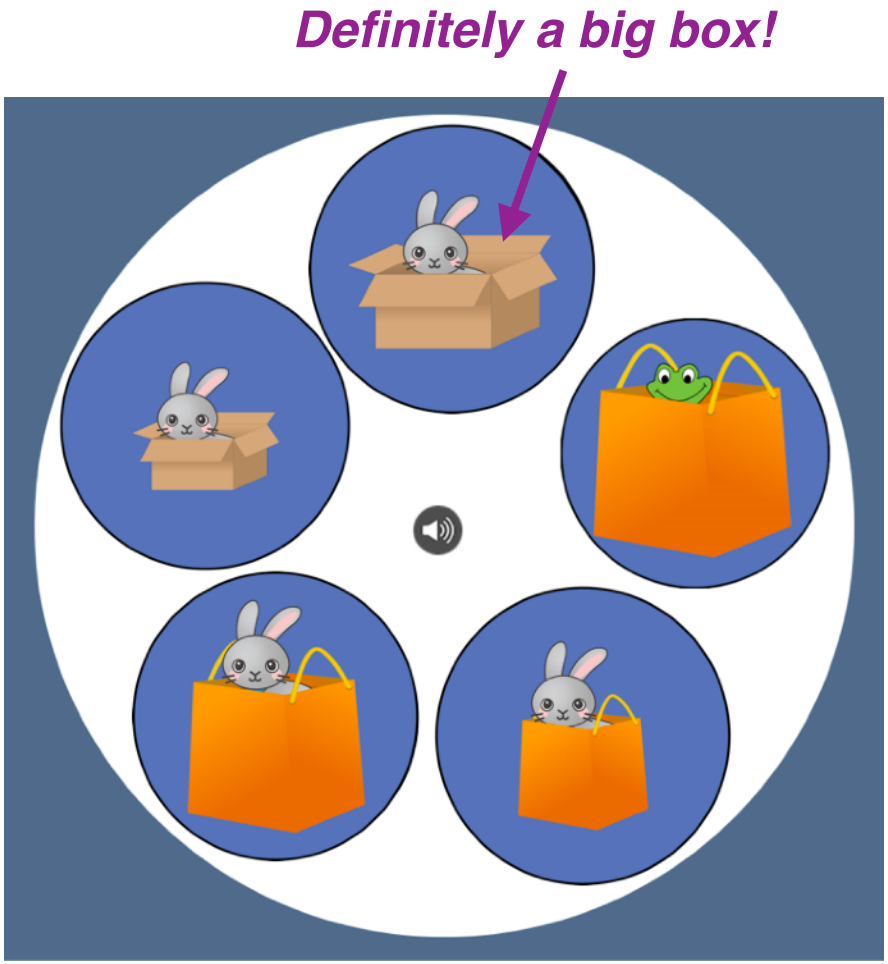
Click on the rabbit in the big [***]



(Aparicio, Levy, & Coppock)

Experiment: *threshold uncertainty* condition

Click on the rabbit in the big [***]

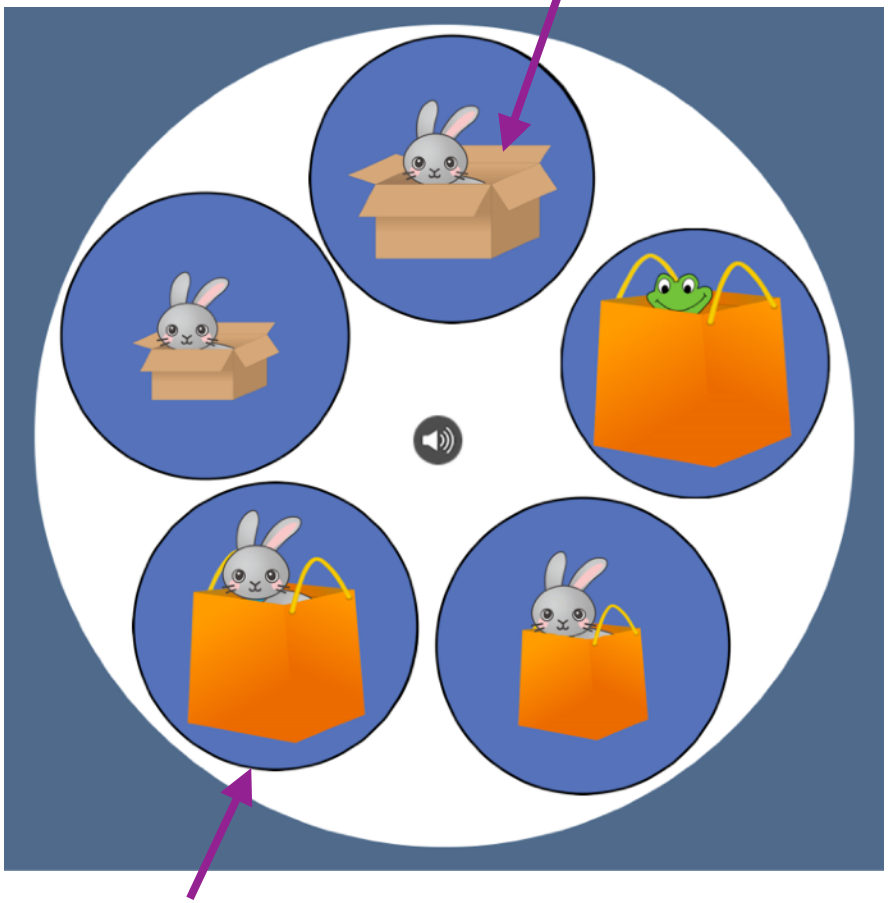


(Aparicio, Levy, & Coppock)

Experiment: *threshold uncertainty* condition

Click on the rabbit in the big [***]

Definitely a big box!

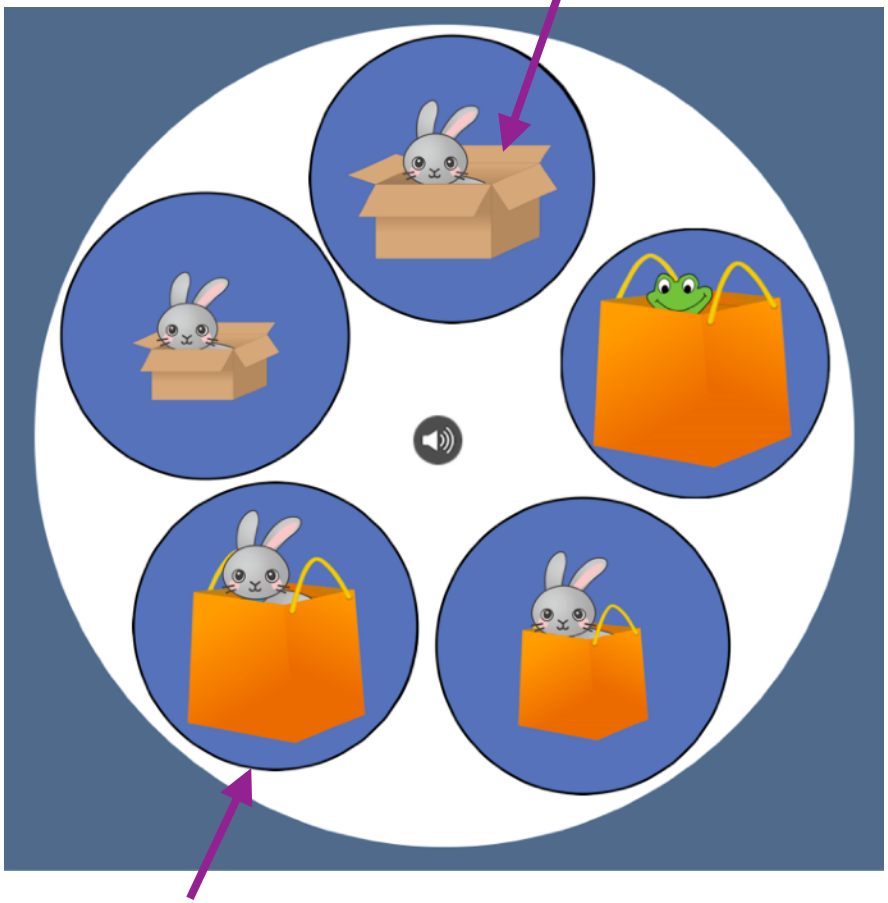


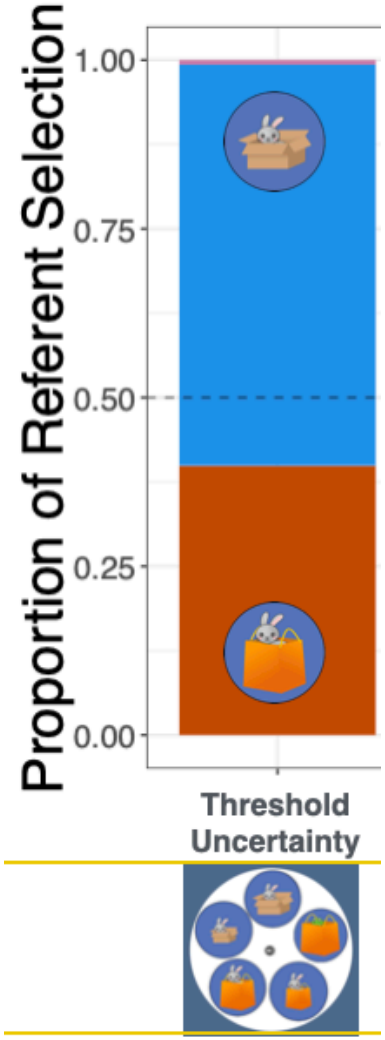
Not necessarily a big bag!

(Aparicio, Levy, & Coppock)

Experiment: *threshold uncertainty* condition

Click on the rabbit in the big [***]

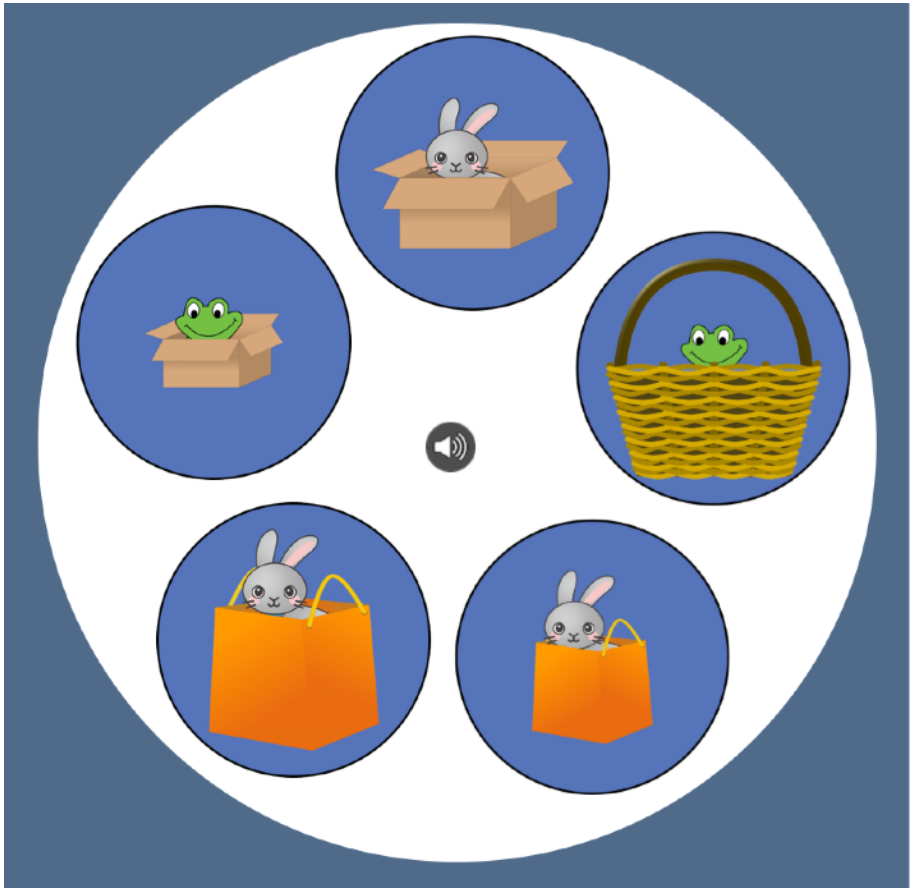


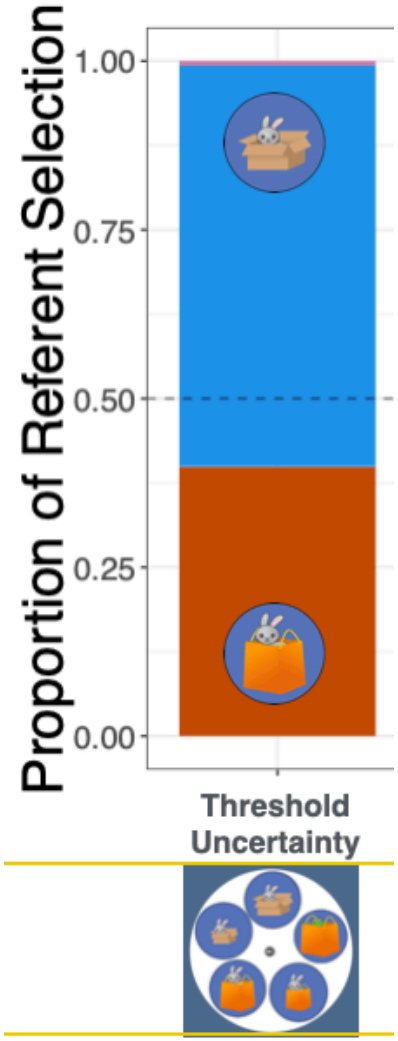


(Aparicio, Levy, & Coppock)

Experiment: *informativity violation* condition

Click on the rabbit in the big [***]



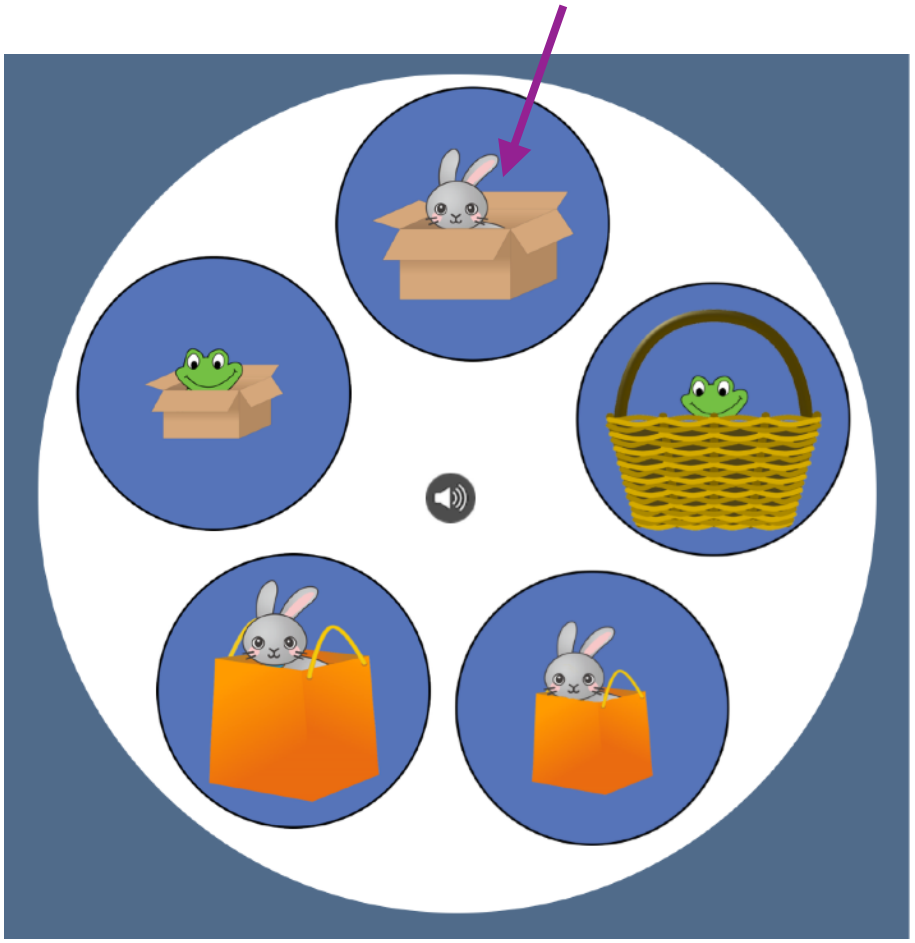


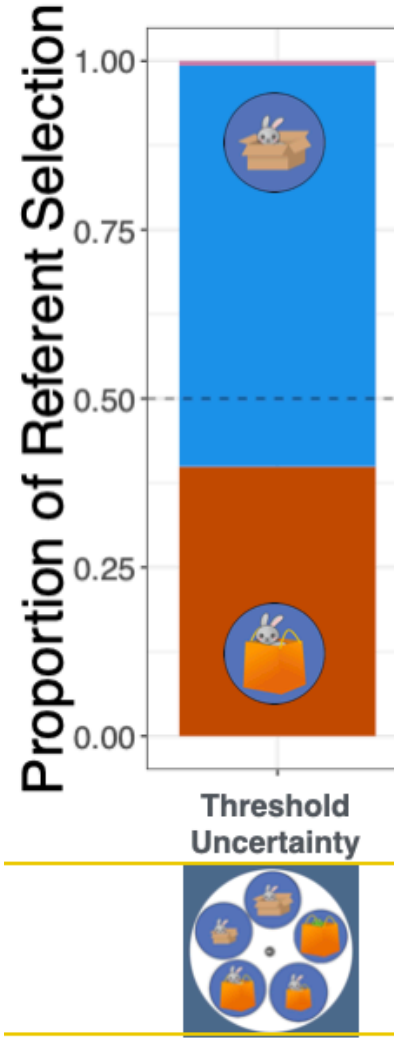
(Aparicio, Levy, & Coppock)

Experiment: *informativity violation* condition

Click on the rabbit in the big [***]

Wouldn't have needed to say "big"!



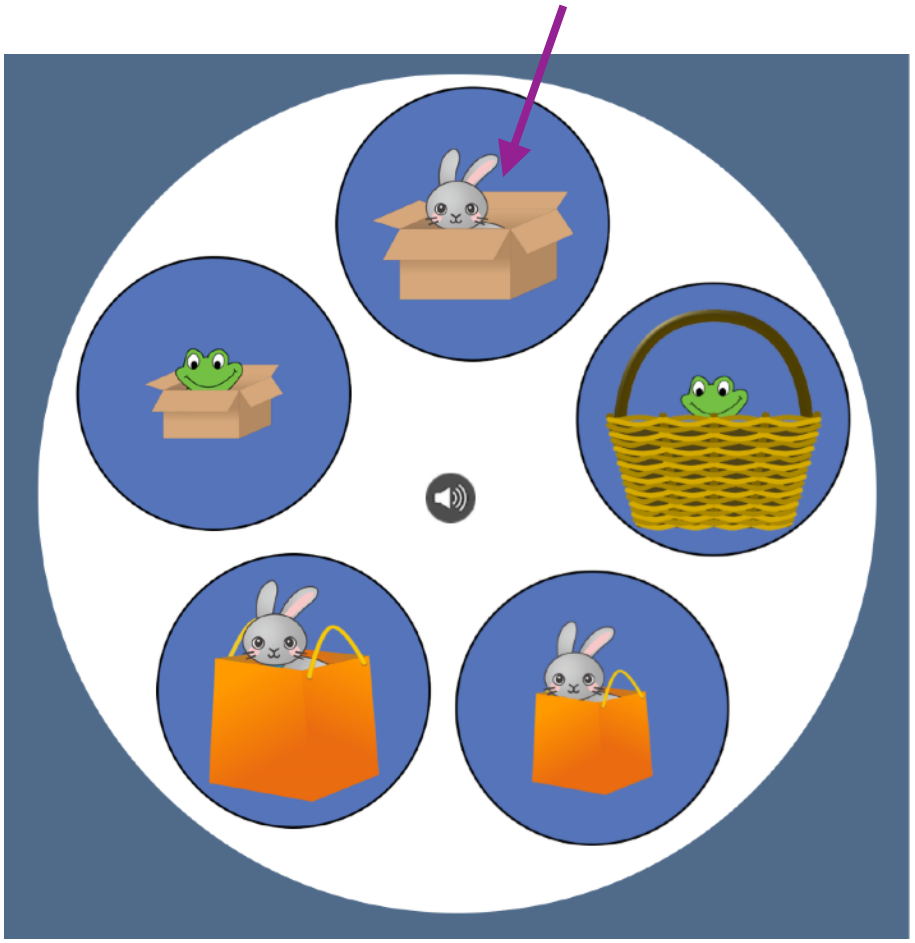


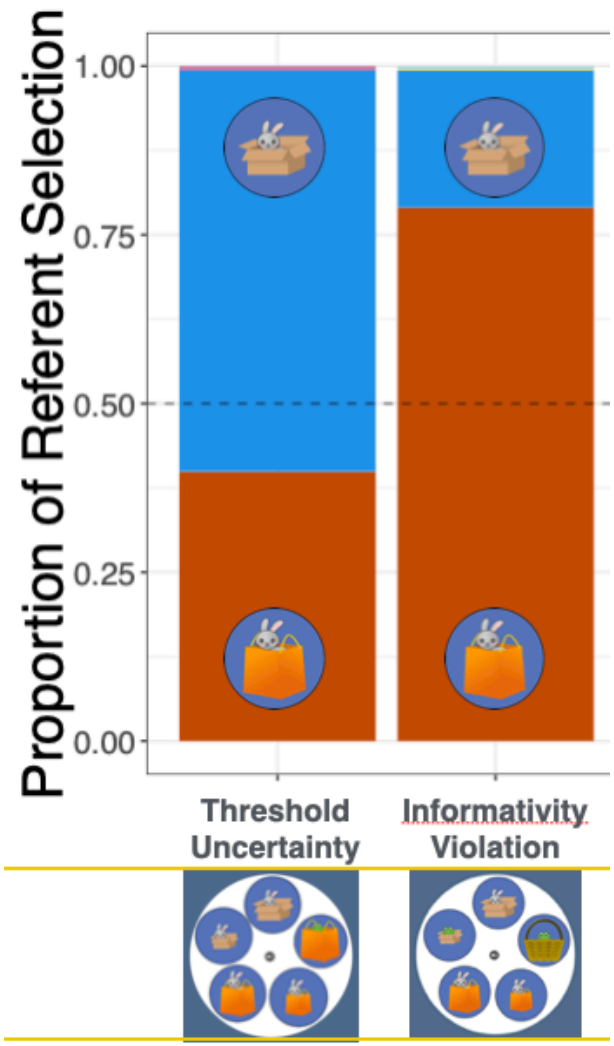
(Aparicio, Levy, & Coppock)

Experiment: *informativity violation* condition

Click on the rabbit in the big [***]

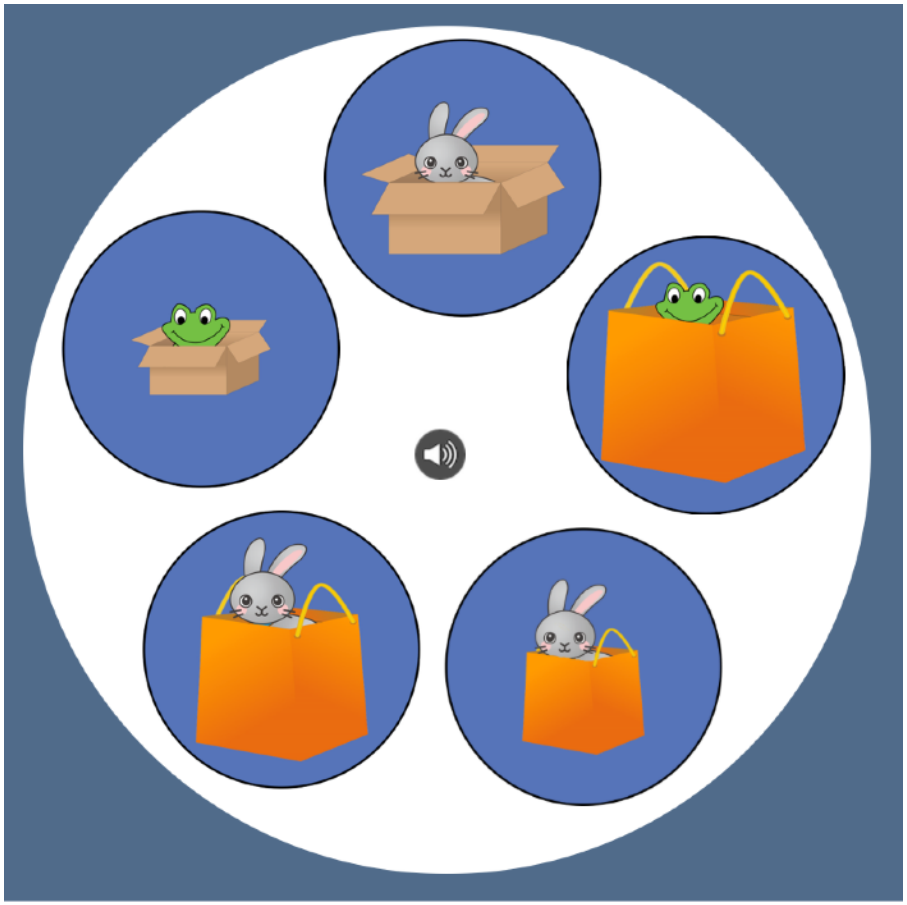
Wouldn't have needed to say "big"!

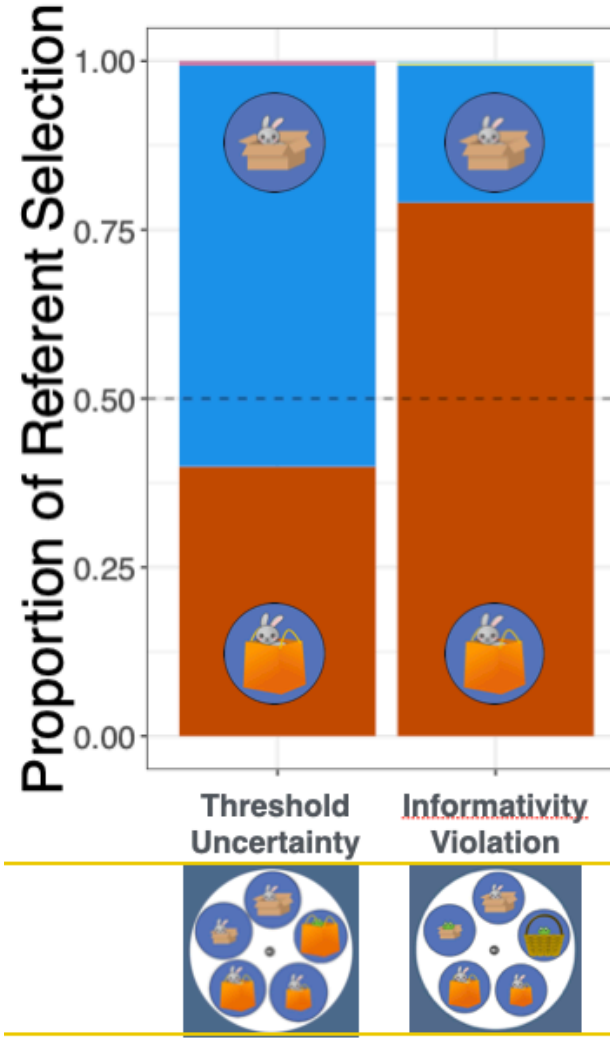




Threshold uncertainty *and* informativity violation

Click on the rabbit in the big [***]

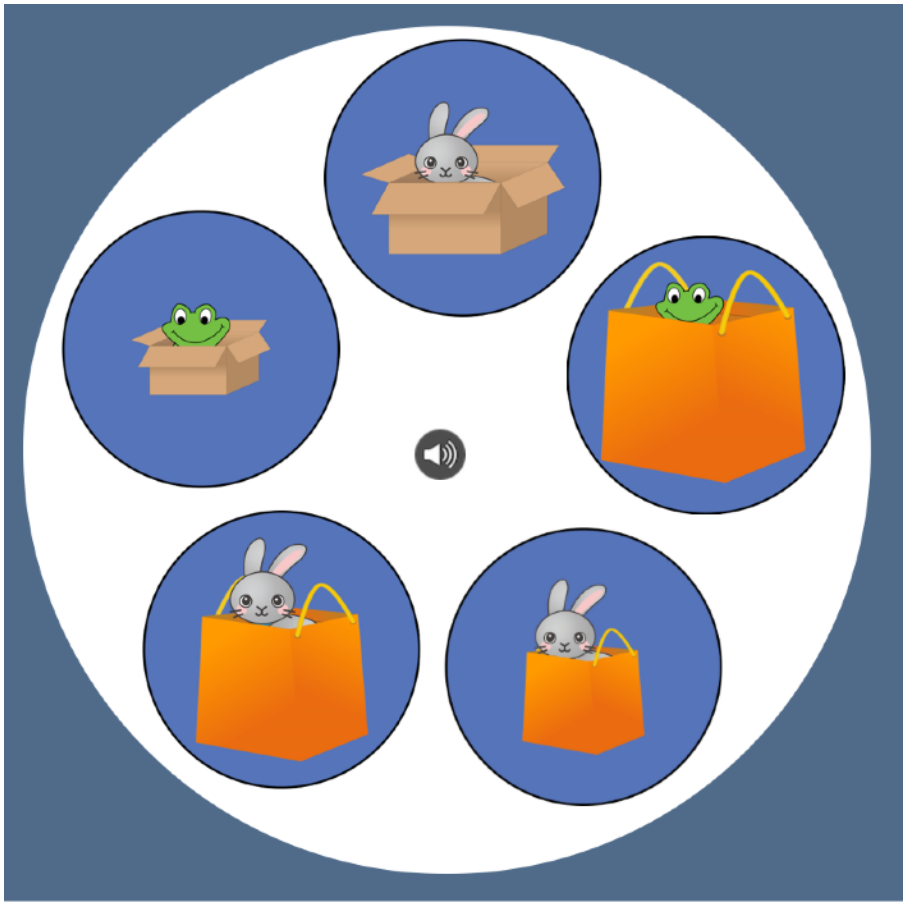


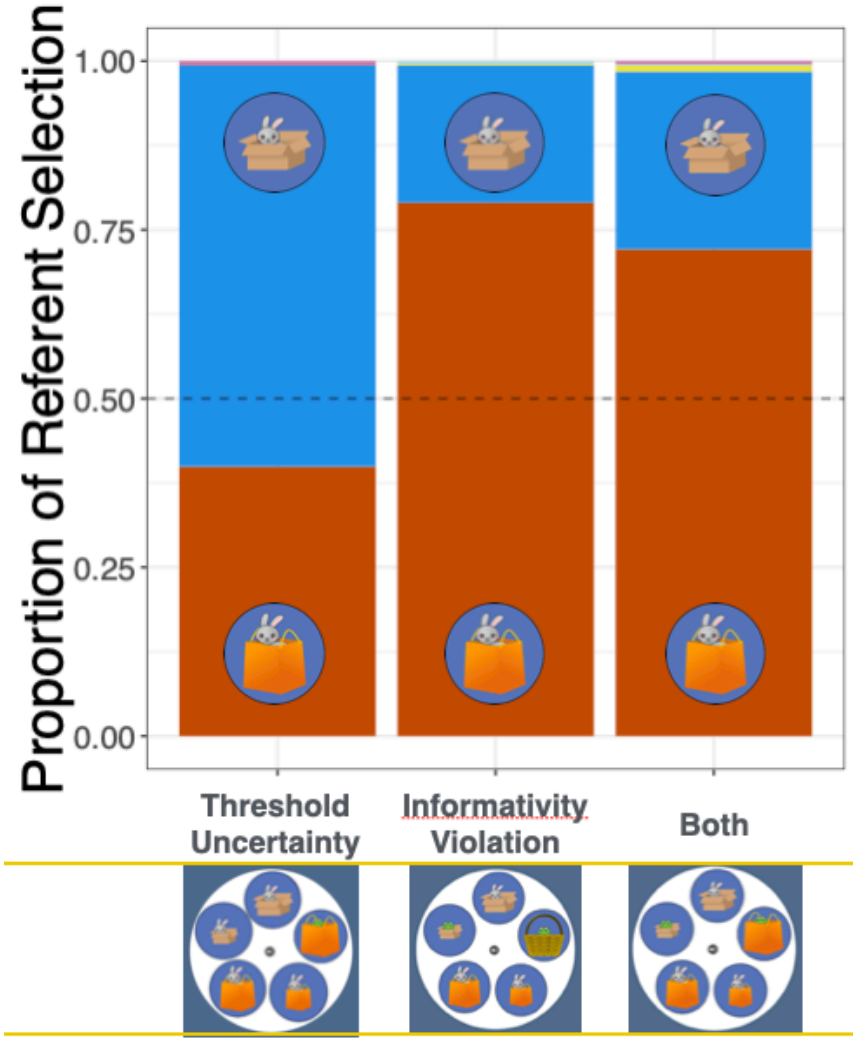


(Aparicio, Levy, & Coppock)

Threshold uncertainty *and* informativity violation

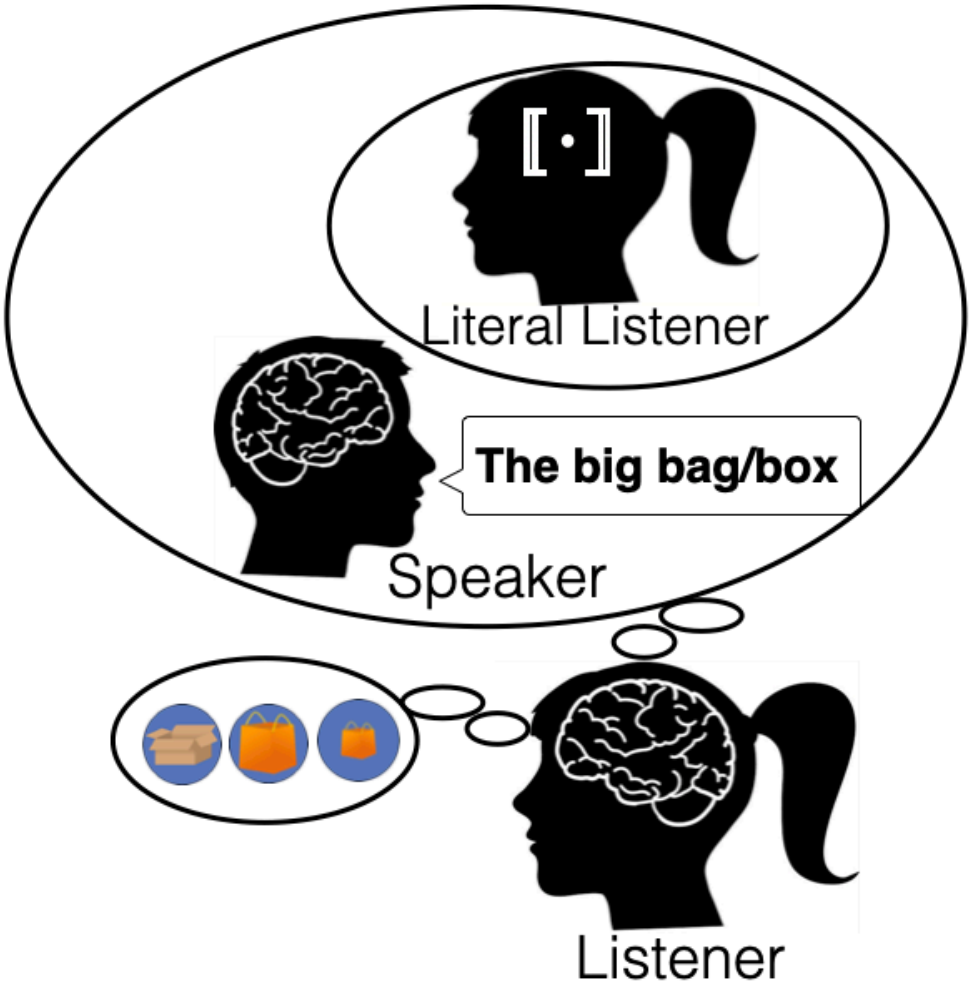
Click on the rabbit in the big [***]





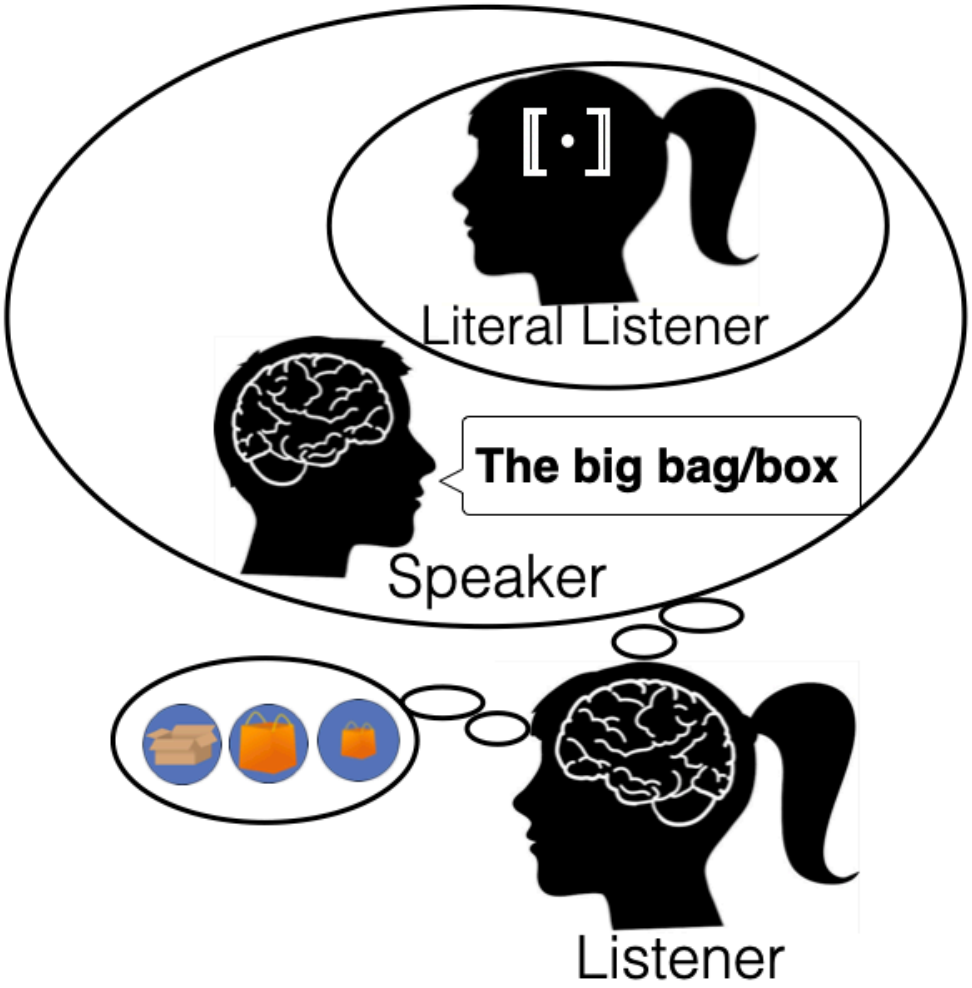
(Aparicio, Levy, & Coppock)

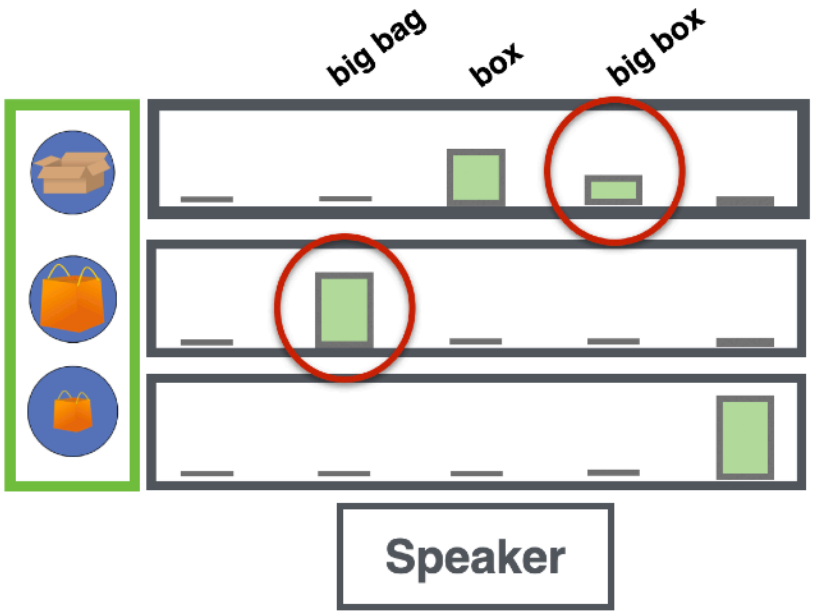
Modeling with Bayesian pragmatics



(Aparicio, Levy, & Coppock)

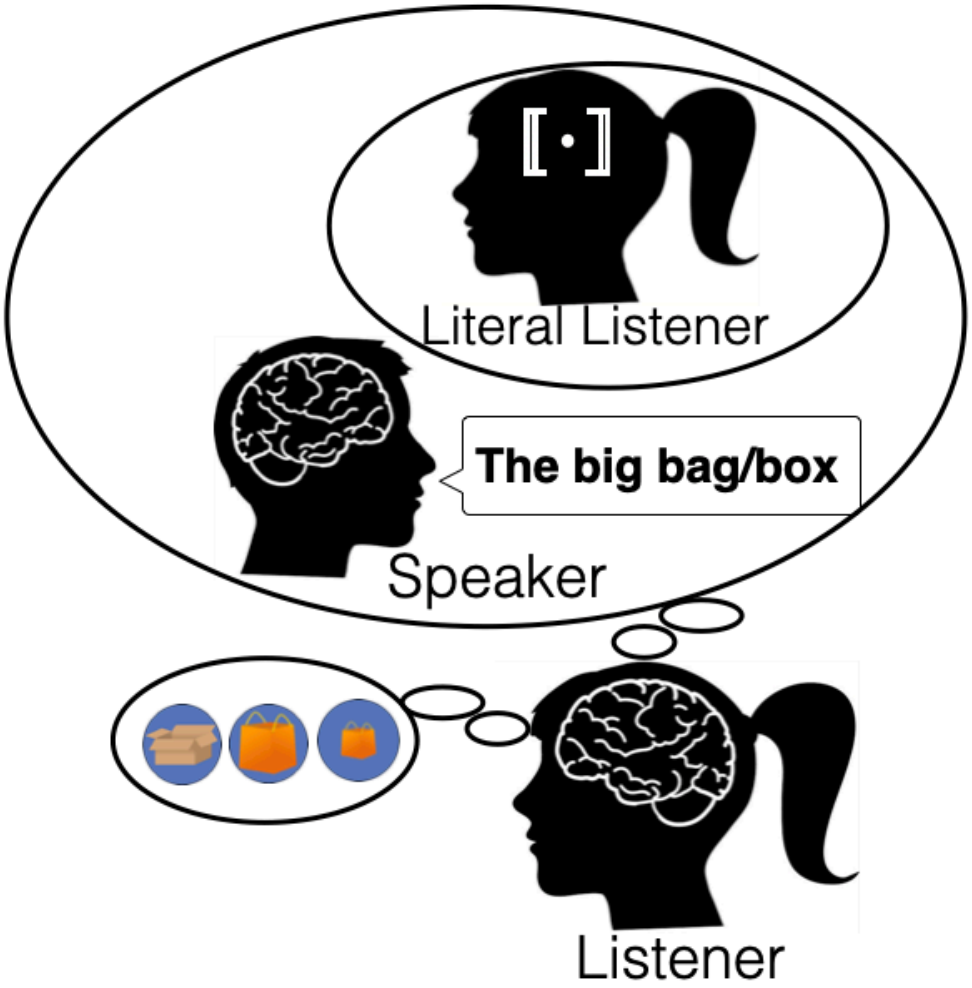
Modeling with Bayesian pragmatics

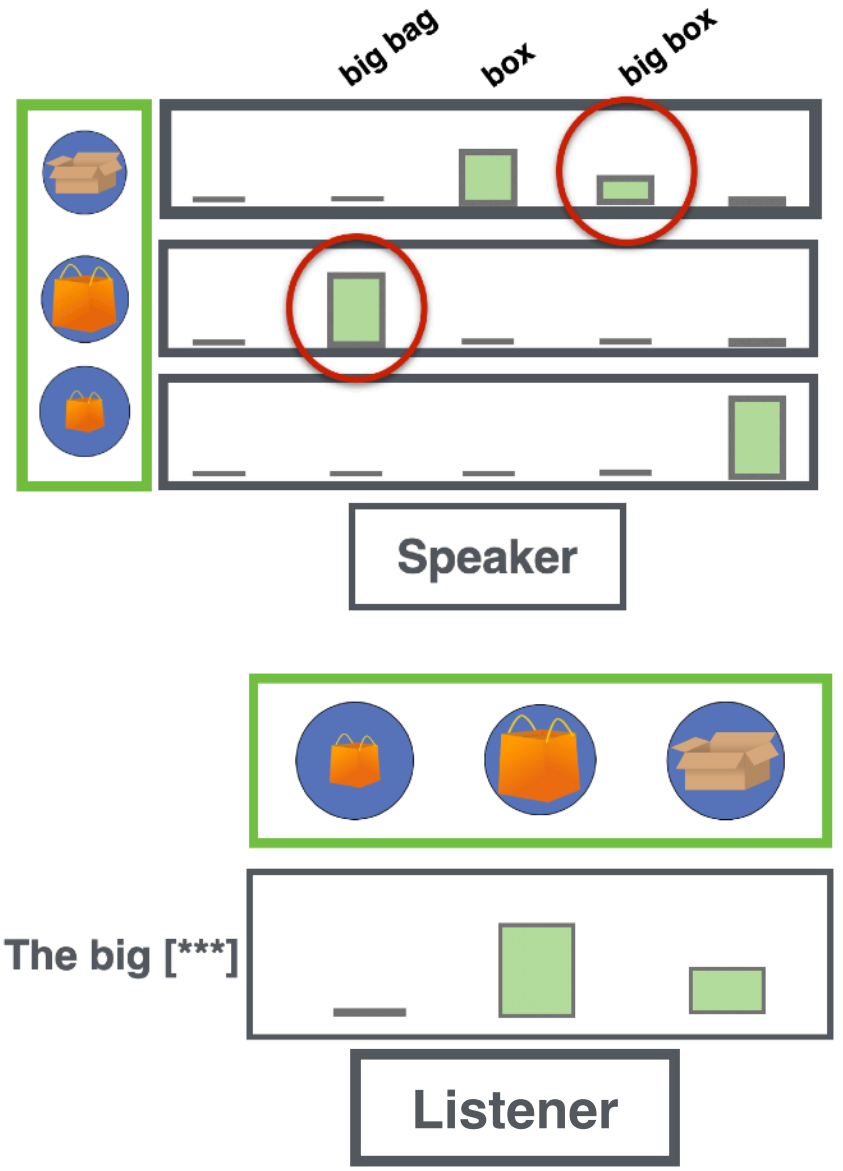




(Aparicio, Levy, & Coppock)

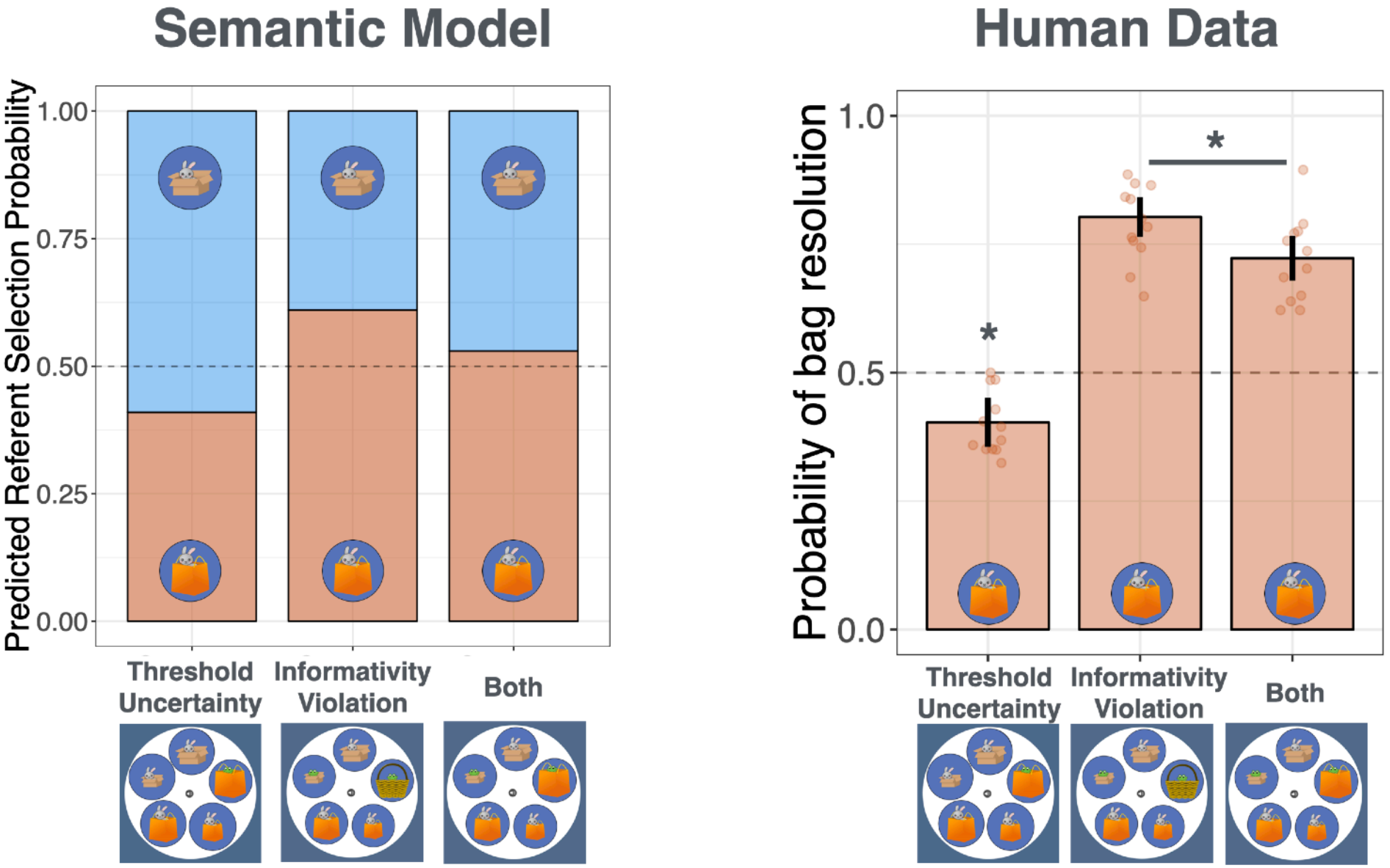
Modeling with Bayesian pragmatics





(Aparicio, Levy, & Coppock)

Model derives qualitative patterns of human response

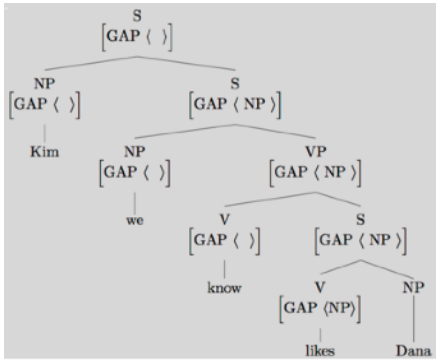


(Aparicio, Levy, & Coppock)

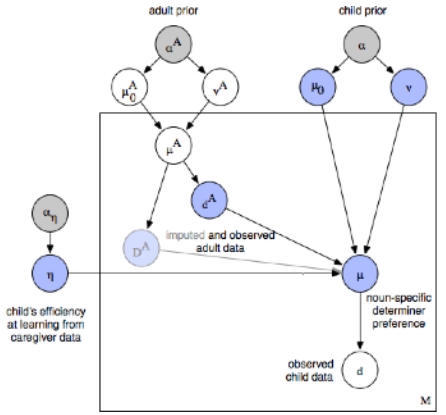
Vignettes

- Unknown words and pragmatic inference
- The nature of semantic scales and comparatives
- Syntax & inferring comparison classes for semantic scales
- Putting it all together: Complex descriptions and pragmatic inference in context

Zeroing in on truly human-like language



Theory of linguistic knowledge

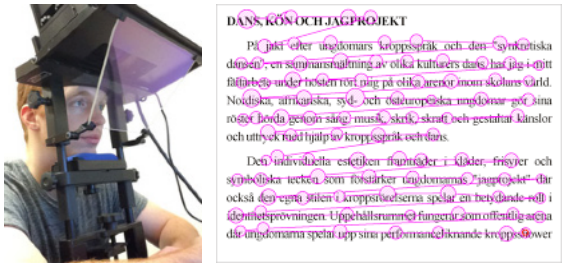


Computational Models

Human Language

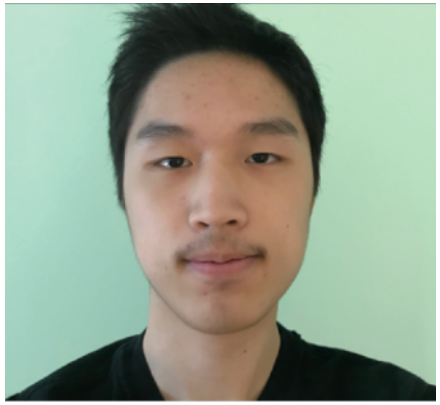
Language Datasets

Psychological Experimentation



Collaborators

Helena Aparicio



Curtis Chen

Elizabeth Coppock

Jennifer Hu

Michael Henry Tessler

Polina Tsvilodub

Noga Zaslavsky

Thank you for listening!

http://cpl.mit.edu

http://www.mit.edu/~rplevy