# Context effects in the interpretation of embedded gradable adjectives

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Background

The interpretation of relative adjectives (e.g., *tall*, *big*, *small*) is dependent on a contextually salient COMPARISON CLASS (Kennedy 1999) that determines the value of adjectival threshold.

the tall building
CC: Buildings in the context

the tall glass
CC: Glasses in the context
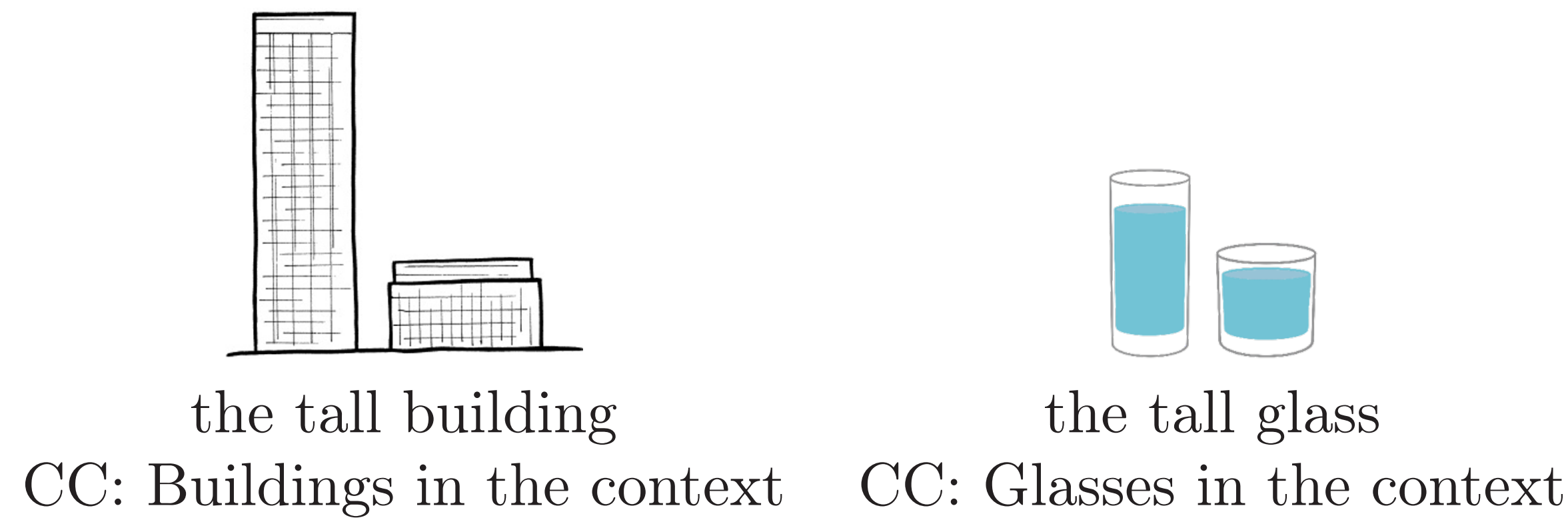
However, it is an open question whether embedded adjectives (e.g. *the rabbit in the big bag*; cf. Haddock 1987) are interpreted with respect to local or global comparison classes.

the rabbit in the big bag
Local CC: bags in the context
Global CC: rabbit-containing bags in the context
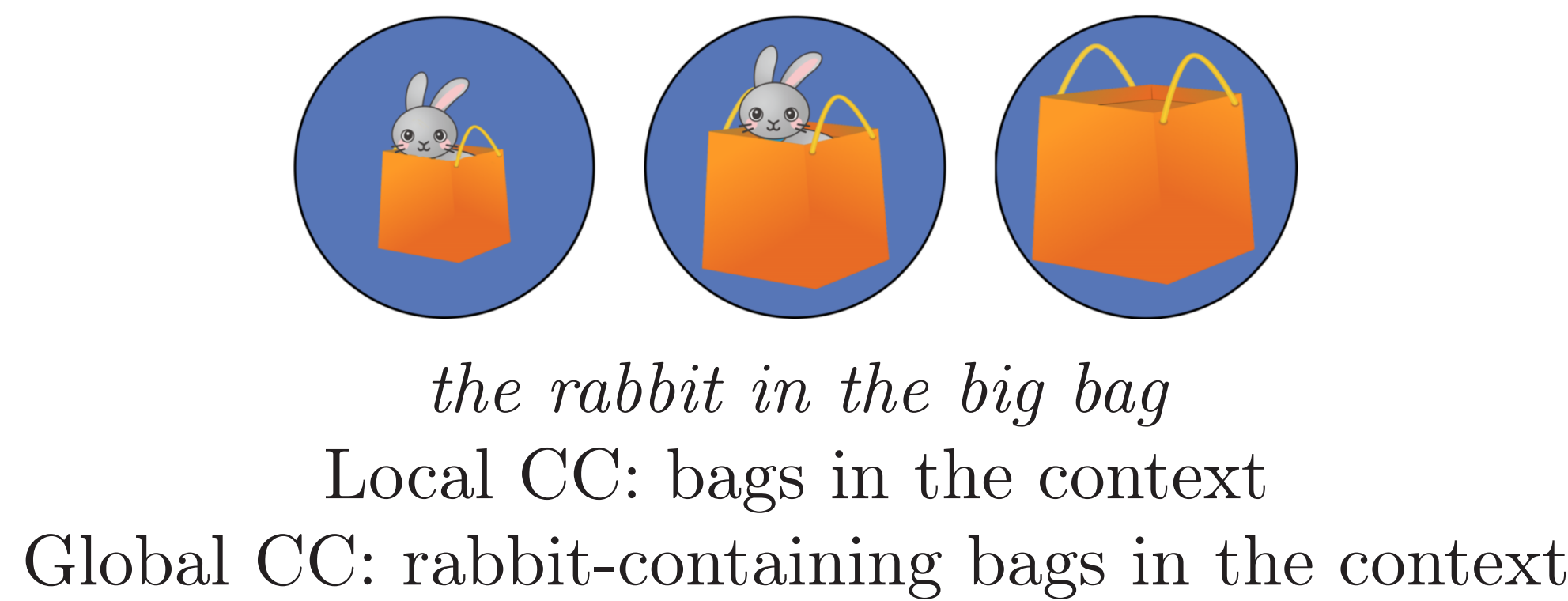
Research Question

In *rabbit in the big bag*, what counts as *big*? To be big, does a bag have to be big for a bag with a rabbit in it, or just big for a bag?

the rabbit in the big bag

CC=bags
Two possible thresholds

CC=rabbit-containing bags
One possible threshold
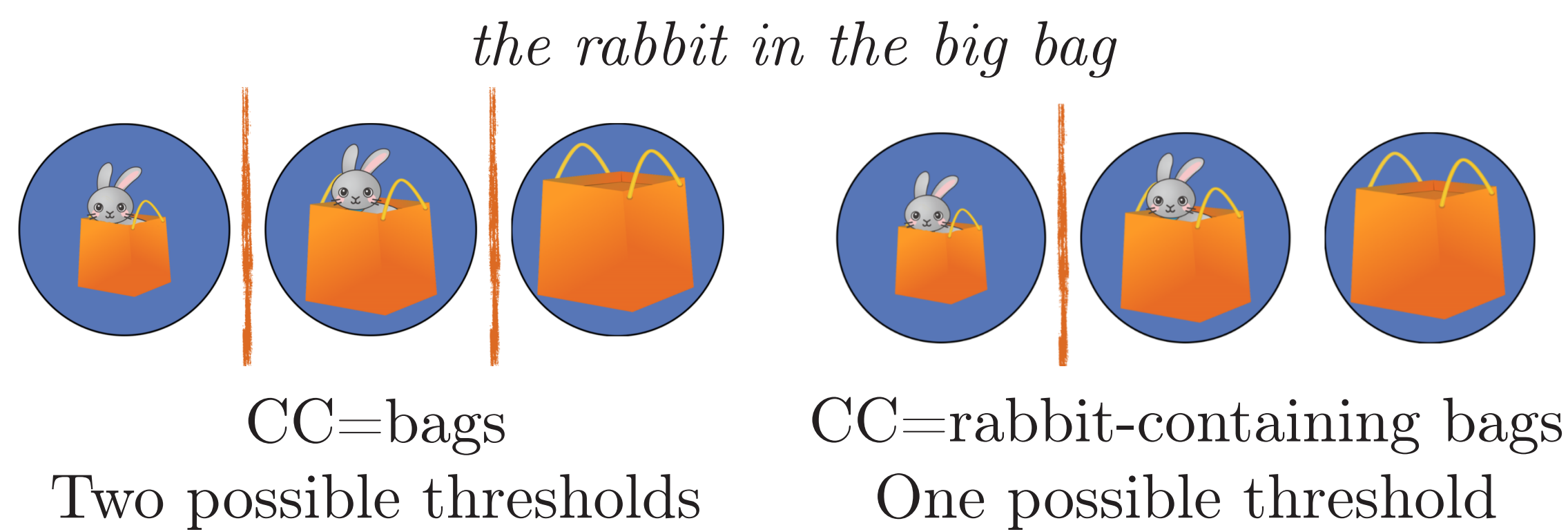
In general, when definite descriptions are interpreted relative to a restricted domain (e.g. *rabbit-containing* bags), must the comparison class for a gradable adjective contained within it shrink accordingly?
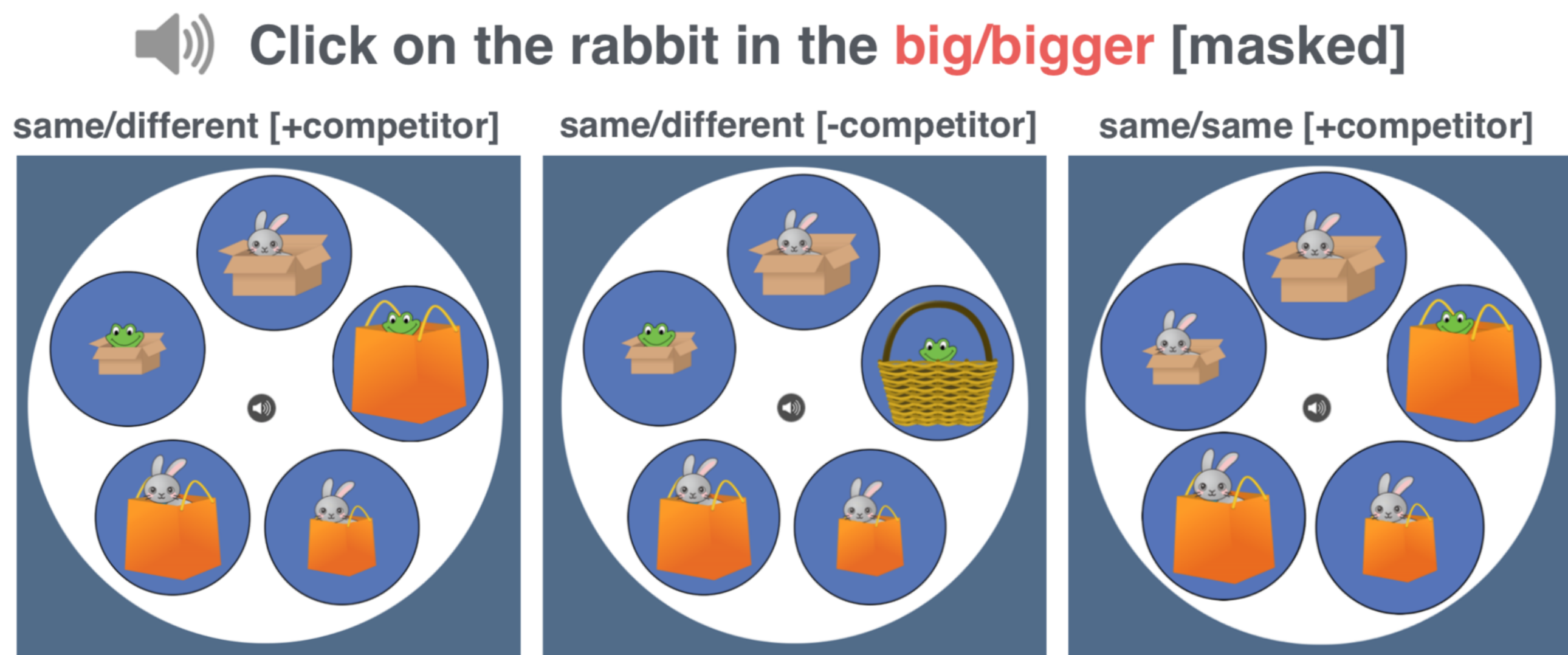
Predictions

Prediction 1: If the threshold for embedded adjectives is calculated w.r.t. **restricted** CCs, threshold calculation should be **insensitive** to individuals that are in the extension of the embedded noun but do not satisfy the semantic requirements of the description.

Prediction 2: If the threshold for embedded adjectives is calculated w.r.t. **unrestricted** CCs, threshold calculation should be **sensitive** to individuals that are in the extension of the embedded noun, even if they do not satisfy the semantic requirements of the description.

Design/Procedure and Results

Design/Procedure.

🔊 **Click on the rabbit in the** big/bigger **[masked]**

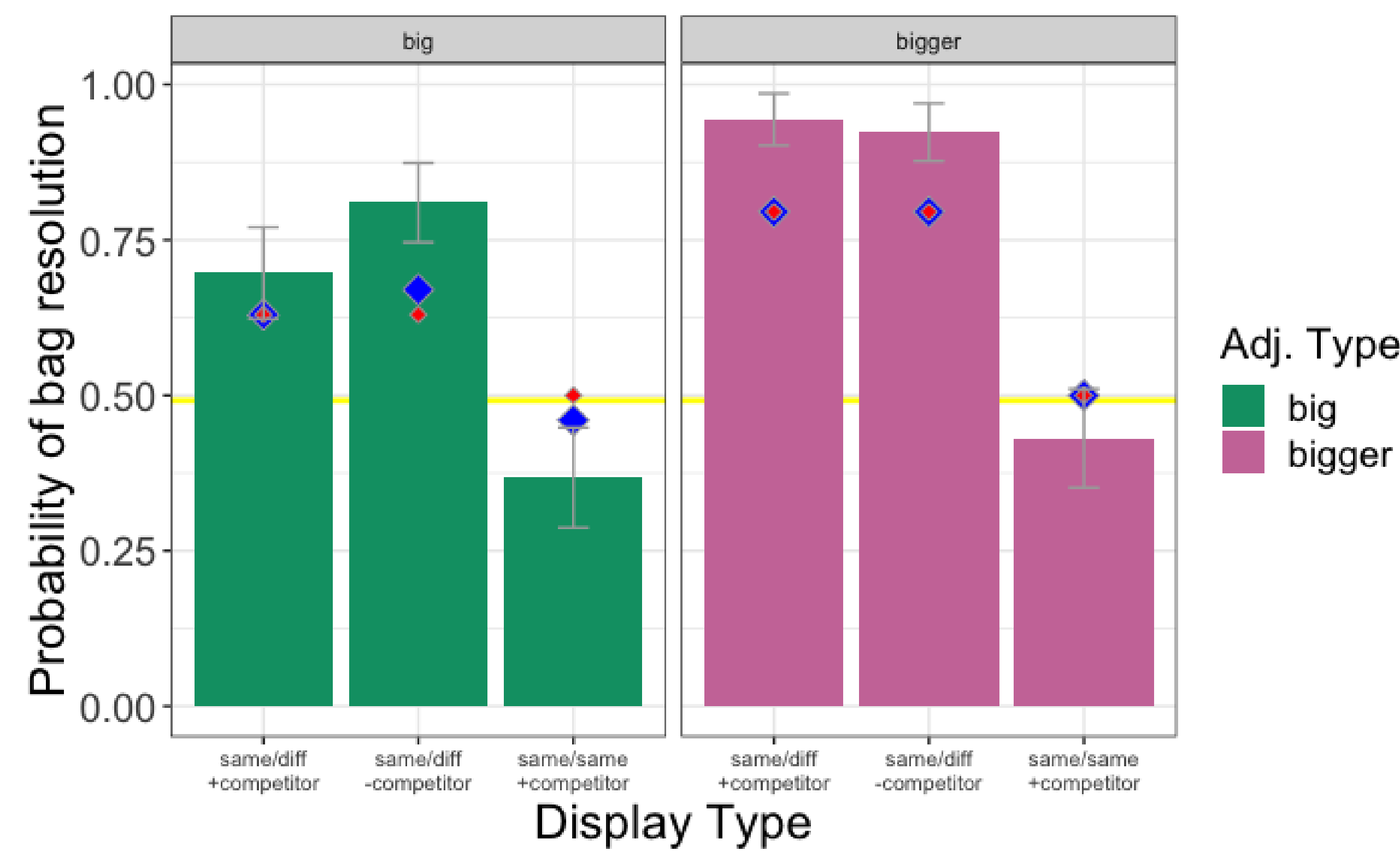same/different [+competitor]　　same/different [-competitor]　　same/same [+competitor]

Treatment variables:

- display type
- *big* vs. *bigger*
- Target 1 = bag or box.

12 items, 24 fillers, Latin square design.
75 participants recruited through Prolific and AMT.

Results.

(bar chart: y-axis "Probability of bag resolution" from 0.00 to 1.00; panels "big" and "bigger"; x-axis "Display Type" with categories same/diff +competitor, same/diff -competitor, same/same +competitor; Adj. Type legend: big (green), bigger (magenta))

Target 1 = rabbit in medium **bag** (in displays above)
Target 2 = rabbit in medium **box** (in displays above)
(<1% clicks to non-targets)

Main findings.

- Informativity is the biggest factor; if *the rabbit in the box* would have sufficed, the bag is preferred.
- Moreover, the appropriateness of *big* is negatively affected by the presence of a competitor object; not so for *bigger*.
  ⇒ Threshold computation is sensitive to domains other than the ones based on which the definite description refers.

RSA Model

Literal listener: $L_0(r \mid d, C, \theta) \propto [\![d]\!]^{C,\theta}(r) P(r)$
where $P(r) = \epsilon$ if $r = \mathsf{fail}$; else uniform among $r \in C$

Speaker: $S_1(d \mid r, C, \theta) \propto L_0(r \mid d, C, \theta) - \mathsf{cost}(d)$
where $\mathsf{cost}(d) = \mathsf{length}(d)$

Pragmatic listener: Marginalizing over C, θ, and N_2:
$L_1(r \mid d = N_1$ in the (Adj) [masked]) $\propto$
$\sum_C \sum_\theta \sum_{N_2}$
$\quad S_1(d = N_1$ in the (Adj) $N_2 \mid r, C, \theta) P(r \mid C) P(\theta \mid C, d) P(C)$

$P(\theta \mid C, d = N_1$ in the (Adj) $N_2)$
$= \begin{cases} \text{uniform} & \text{among } \{\theta : \exists x \in C : [\![N_2]\!](x) \text{ and } \mathsf{size}(x) = \theta \\ & \text{\color{red}[and } x \text{ contains an } N_1]\} \\ 0 & \text{otherwise} \end{cases}$

Global context $\mathcal{C} = \{r_1, r_2, r_3, r_4, r_5\}$; $P(C)$ is uniform among $\wp(\mathcal{C})$.

Research question in these terms: Nature of $P(\theta \mid C, d)$.
Do we only consider the sizes of rabbit-containing bags (i.e. N_1-containing xs)? Yes: red diamond ◆; No: blue diamond ◆.

Semantics

Bumford (2017) gives a semantic analysis of Haddock descriptions that allows us to effectively ignore the uniqueness requirement of the inner definite in the types of displays we consider.

$[\![$the rabbit in the (Adj) $N_2]\!]^{\theta, C}(r) = 1$ if and only if: r is the unique r' such that $[\![$rabbit in the (Adj) $N_2]\!]^{\theta, C}(r') = 1$

Positive (*big*)

$[\![$rabbit in the big $N_2]\!]^{\theta, C}(r) = 1$ if and only if:

r is a rabbit in C that is in a b such that:

- $[\![N_2]\!](b) = 1$
- $\mathsf{size}(b) > \theta$

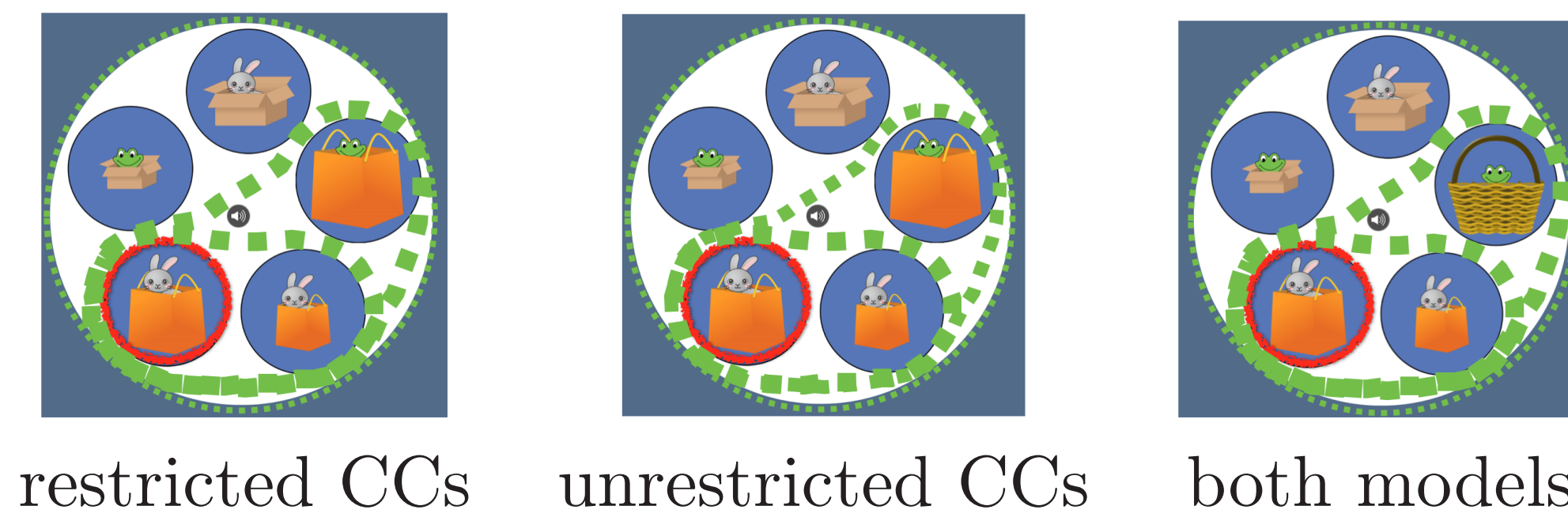### Comparative (*bigger*)

$[\![$rabbit in the bigger $N_2]\!]^{\theta, C}(r) = 1$ if and only if:

r is a rabbit in C that is in a b such that:

- $[\![N_2]\!](b) = 1$
- there is a b' such that $[\![N_2]\!](b') = 1$ and $\mathsf{size}(b) > \mathsf{size}(b')$
- and if *bigger* takes high scope with the definite:
  b' contains a rabbit *(0.5 probability of high scope)*

Model Dynamics

restricted CCs　　unrestricted CCs　　both models

Conclusion

The flexibility with which definite descriptions find their referent is to some extent independent of the flexibility with which gradable adjectives find their threshold.

Future Directions

- Can this paradigm be extended to adjudicate between semantic vs. pragmatic approaches to Haddock descriptions?
  - Preliminary finding: Pragmatic approaches can yield qualitatively decent results, using an L_2 who reasons about an S_2 who reasons about L_1.
- What does behavior on this kind of task tell us about the interpretation of comparatives?
  - So far it appears that participants prefer restricted CCs.
- Is MAXIMIZE CONTEXT useful to assume, implemented e.g. as an prior on contexts proportional to their size?

Selected References

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