

Linguistic and non-linguistic cues to acquiring the strong distributivity of *each*

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To acquire *each*, learners need to figure out its:

Semantic category:

Quantity (not property)

→ Syntactic bootstrapping

Quantificational content:

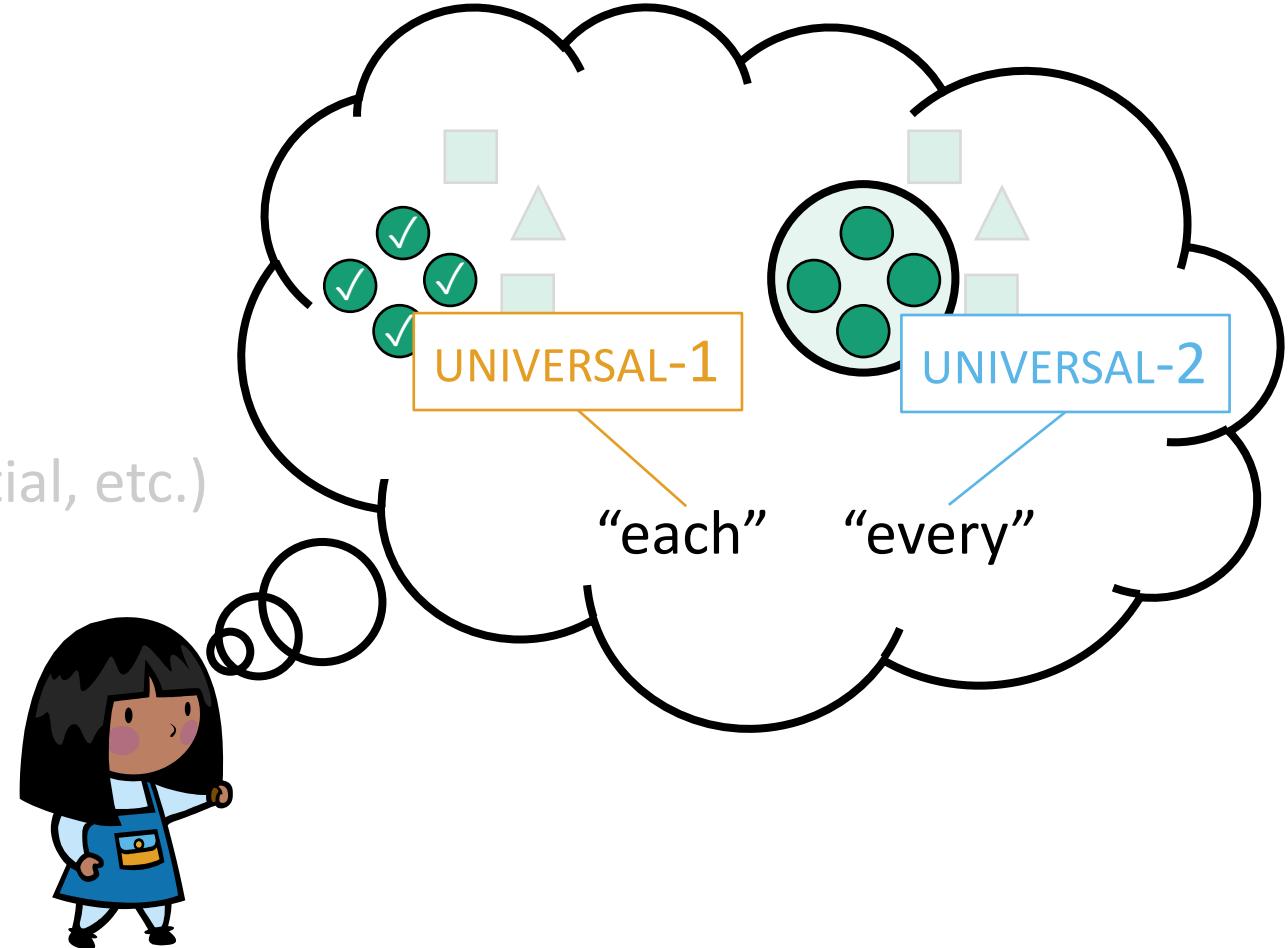
Universal (not proportional, existential, etc.)

→ Pragmatic context

Representational format:

Strongly distributive (not like *every*)

→ ?



Roadmap

Each is somehow **more distributive** than *every/all*

- Linguistic & Psycholinguistic evidence
- Various syntactic/semantic explanations

Acquisition proposal

- linguistic + perceptual cues lead to representing domain as object-files

Results of corpus investigation

- Parents use *each* to quantify over small #'s of physically present things

Each & Every are “distributive universals”

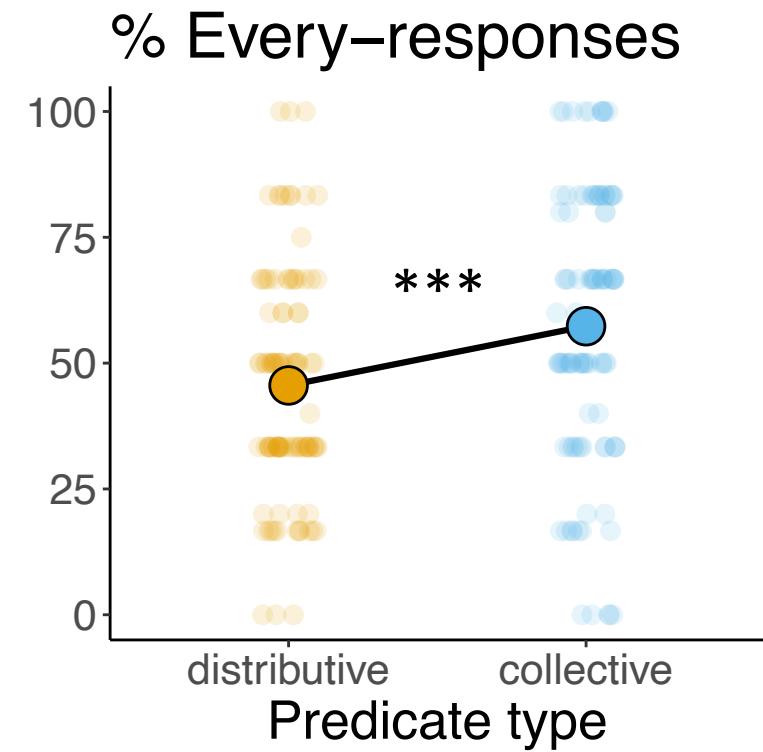
After class, {each/every} student gathered in the hall.
(COLLECTIVE)

Each is (even) worse with collective predicates

Math class at the local middle school lasts a full hour.

After class, {each/every} student gathered in the hall.
(COLLECTIVE)

After class, {each/every} student went to their locker.
(DISTRIBUTIVE)



n=100

Each supports pair-list readings

(1) Which book did you loan to **each** student?

- a. ✓ *Frankenstein* to Frank, *Persuasion* to Paula, and *Moby Dick* to Mary

(2) Which book did you loan to **every** student?

- a. # *Frankenstein* to Frank, *Persuasion* to Paula, and *Moby Dick* to Mary
- b. ✓ There's no one book that I loaned to every student

Each is unfriendly to genericity

- (3) **Each** martini needs an olive
 - a. *some particular cocktails are in need of garnishes*

- (4) **Every** martini needs an olive
 - a. *some particular cocktails are in need of garnishes*
 - b. *in general, the recipe calls for an olive*

Each is unfriendly to genericity

- (3) **Each** martini needs an olive
- (4) **Every** martini needs an olive

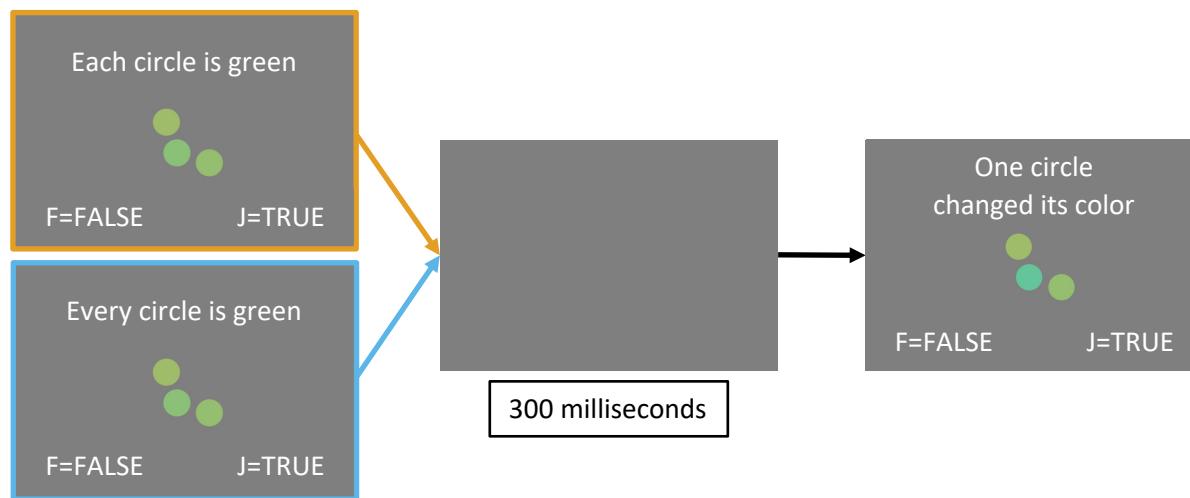
If someone said (3)/(4), how many martinis would you guess they have in mind?

Quantifier	≤ 3	4-5	≥ 6	Infinitely many	Exhaustive (e.g., “all of them”)
Each	62	10	12	0	9
Every	29	13	21	5	30

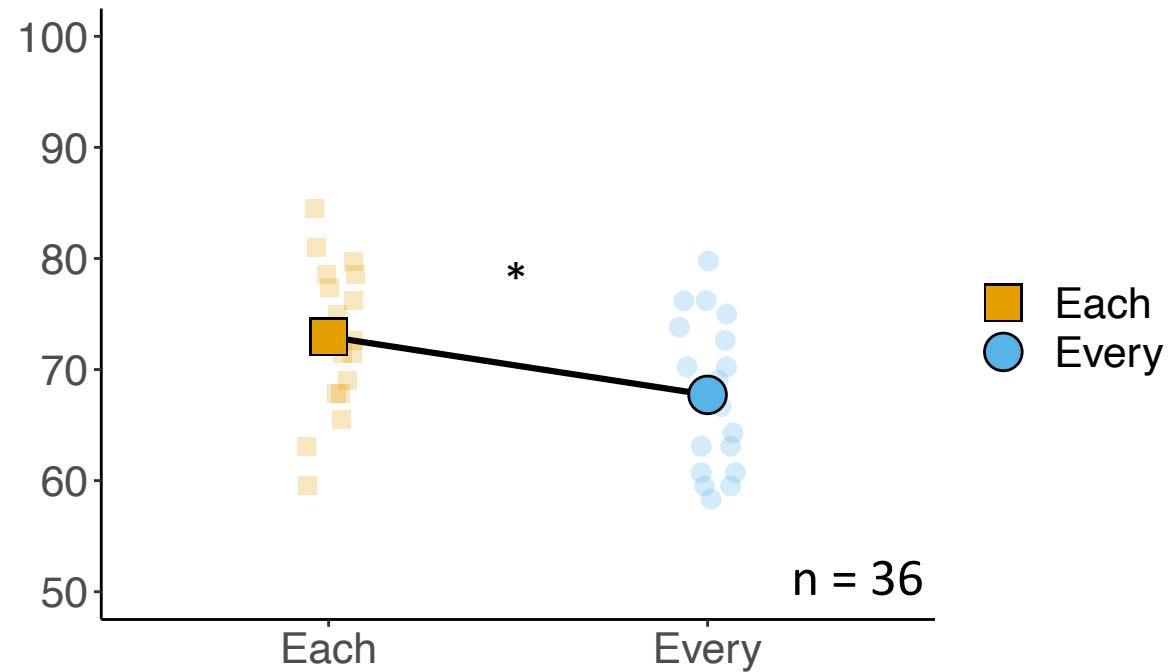
n=198

Each encourages encoding individual properties

“Each ... directs one's attention to the individuals as they appear, in some succession or other, one by one” – Vendler (1962)



Change detection accuracy

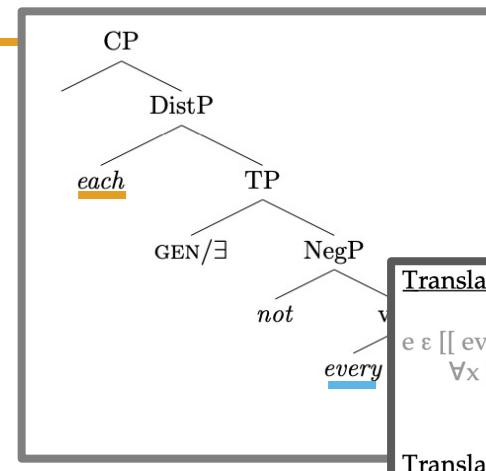


Each is more distributive than *every/all*

- supports pair-list readings
- is worse with collective predicates
- is unfriendly to genericity
- encourages encoding individual properties

Syntactic Position

(Beghelli & Stowell 1997)



Translation of Every

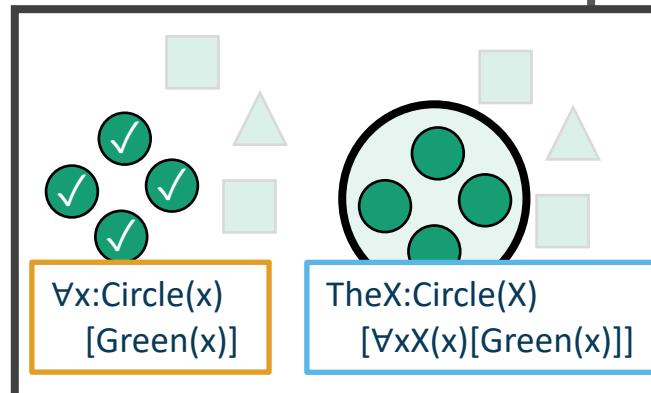
$$e \in [[\text{every } N]](f) \text{ iff } \forall x [x \in [[N]] \rightarrow \exists e' \leq e [e' \in f(x) \& \exists y [y \in [[N]] \& y \neq x \& \exists e'' \leq e [e'' \in f(y) \& e' \neq e'']]]]$$

Translation of Each

$$\text{each/every } N](f) \text{ iff } \forall x [x \in [[N]] \rightarrow \exists e' \leq e [e' \in f(x) \& \forall y [y \in [[N]] \& y \neq x \rightarrow \forall e'' \leq e [e'' \in f(y) \rightarrow e' \neq e'']]]]$$

Condition on event differentiation

(Tunstall 1998)



Lexical-semantic difference

(Knowlton, Pietroski, Halberda, & Lidz 2021)

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Results of corpus investigation

→ Parents use *each* to quantify over small #'s of physically present things

Object-files as route of semantic access

each circle is green

≈ Any thing that is a circle is s.t. **it** is green

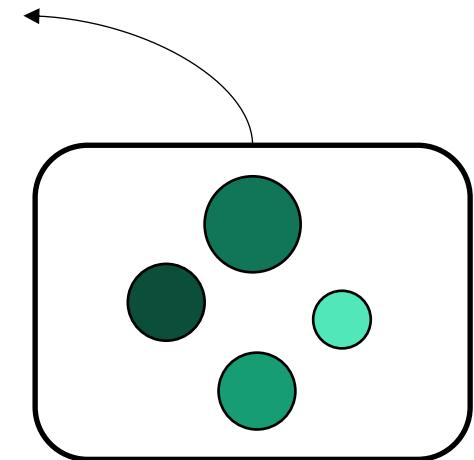
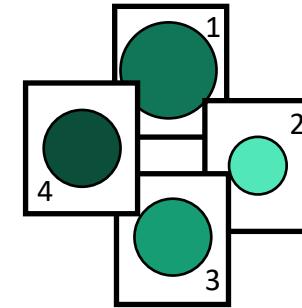


Object-file representations (Kahneman, Treisman & Gibbs 1992)

- Initiated based on spatial information (Xu & Carey 1996)
- Working memory limit of 3-4 (Feigenson & Carey 2005)

every circle is green

≈ The things that are circles are s.t. **they** are all green



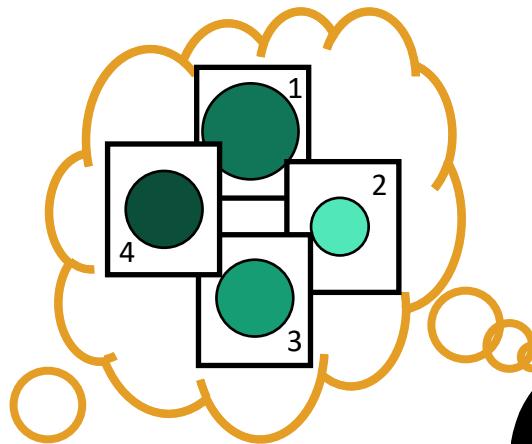
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- ↑
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Which concept of universal quantification does “each” pick out?

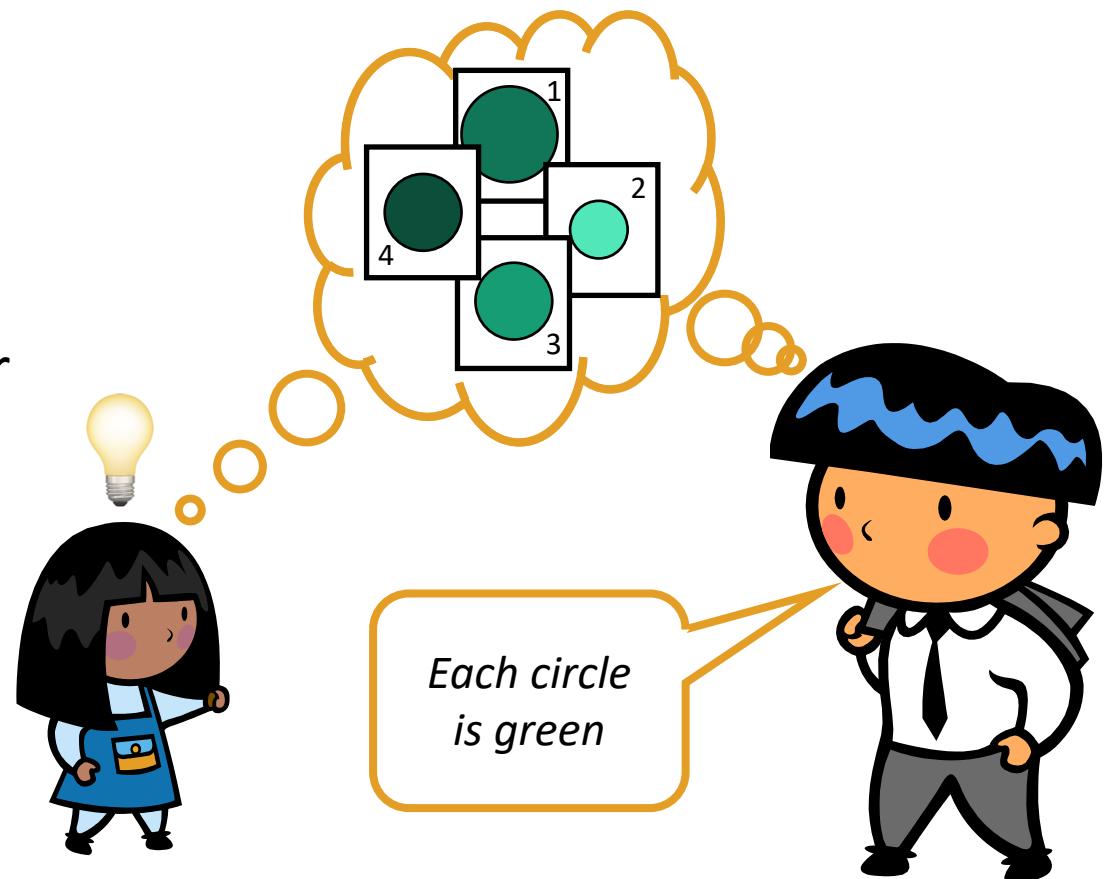


Each circle is green



Object-files as route of semantic access

- Linguistically, *each* encourages treating the domain of quantification as individuals (=object-files)
- Perceptually, small numbers of physically present objects/actions trigger object-file representations
- Proposal: quantifying over small, physically present domains = ideal circumstances for acquiring *each*



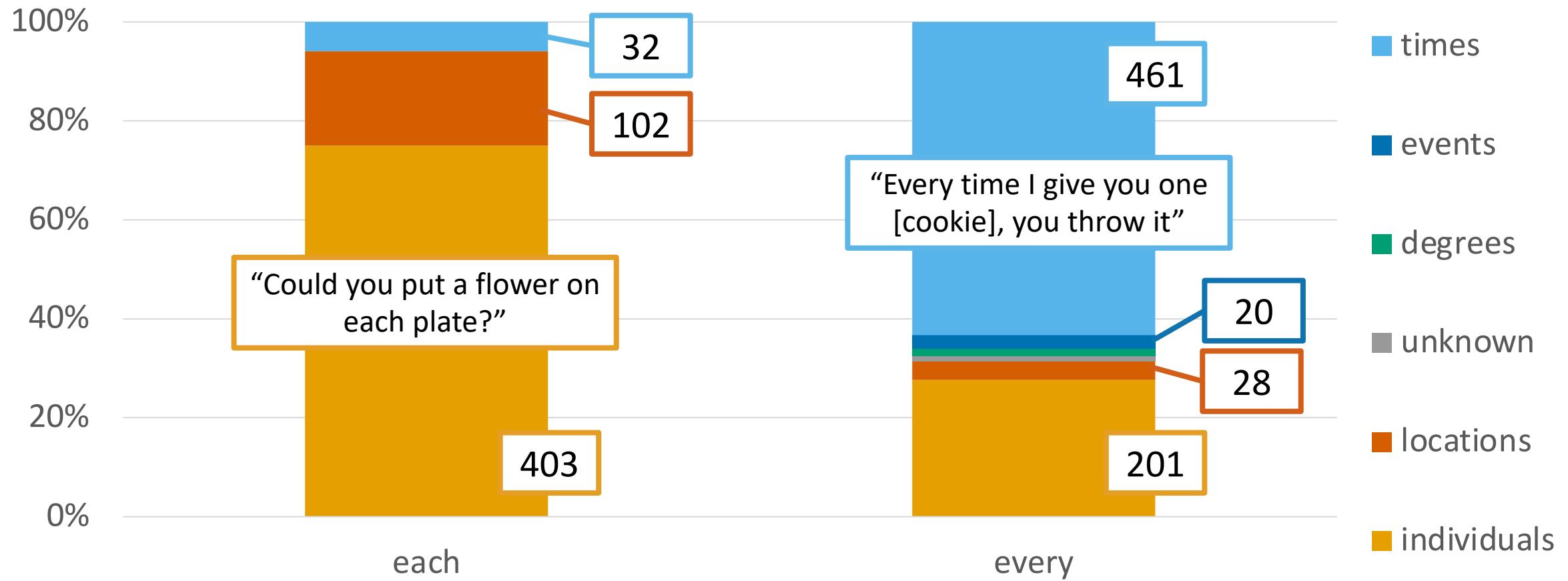
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Results of corpus investigation

➔ Parents use *each* to quantify over small #s of physically present things

What's being quantified over in speech to children?



Naturalistic parent-child interactions

LDP Corpus (14 – 58mo): 233,390 utterances

→ 223 “each”

→ 139 “every”

→ 2,915 “all”

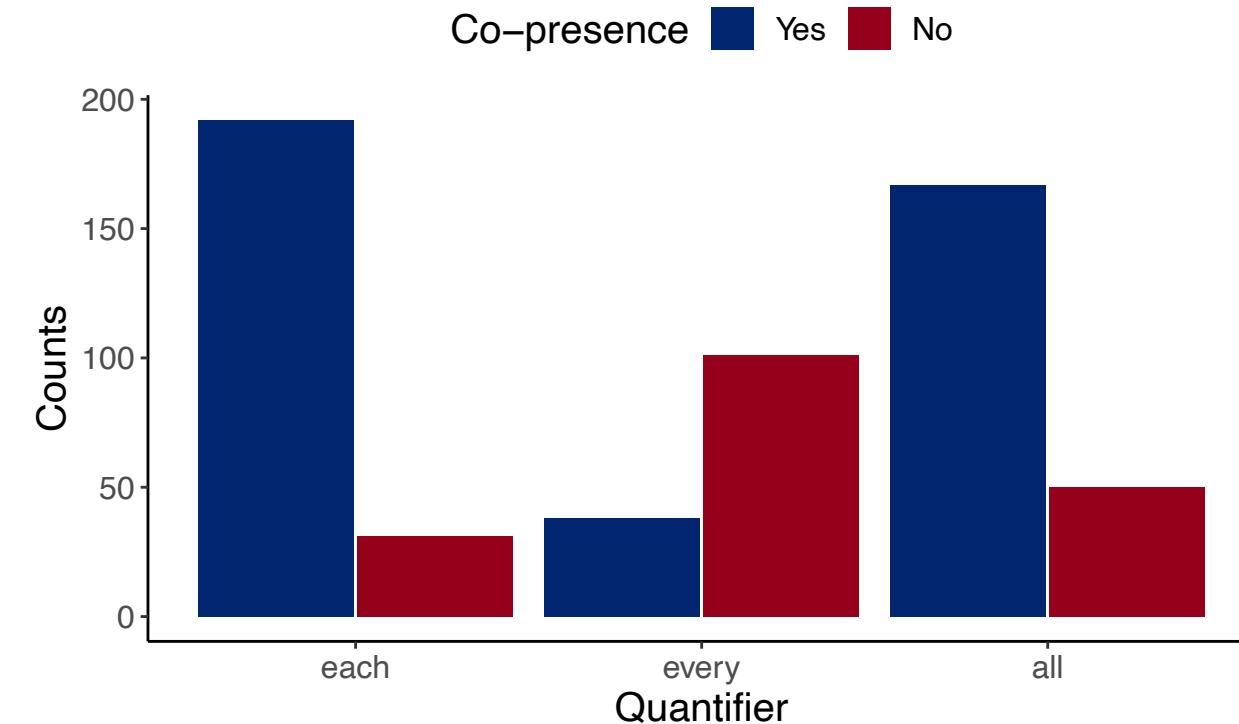
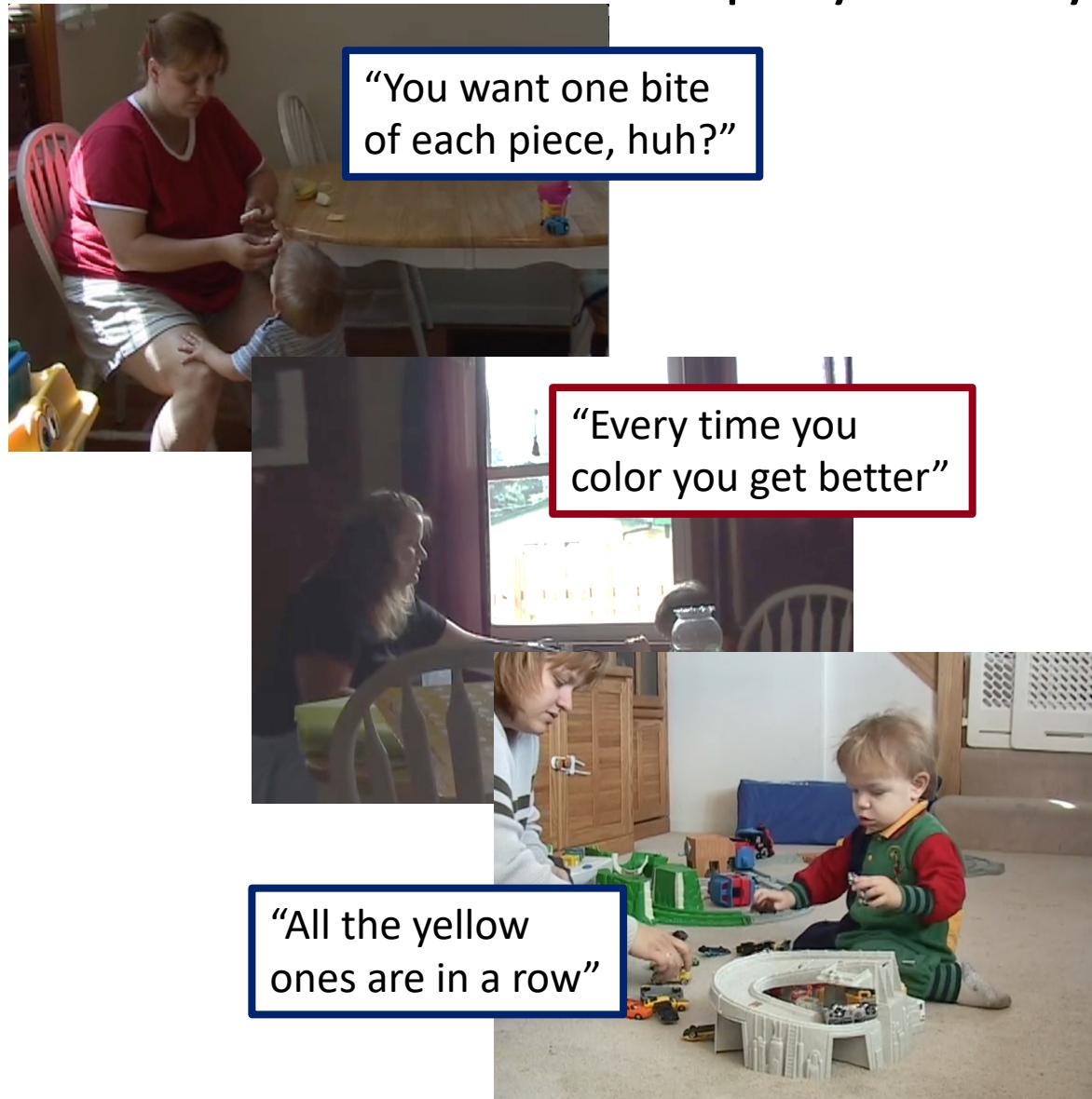


“You want one bite of each piece, huh?”

“Every time you color you get better”

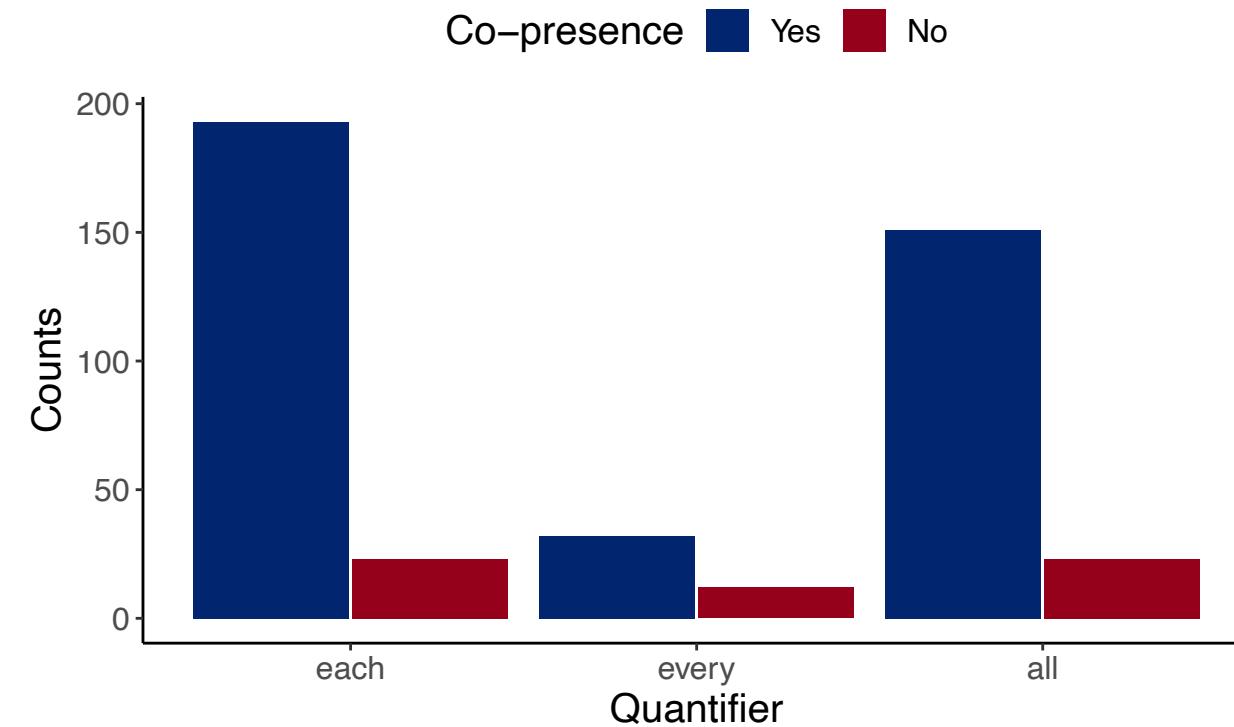
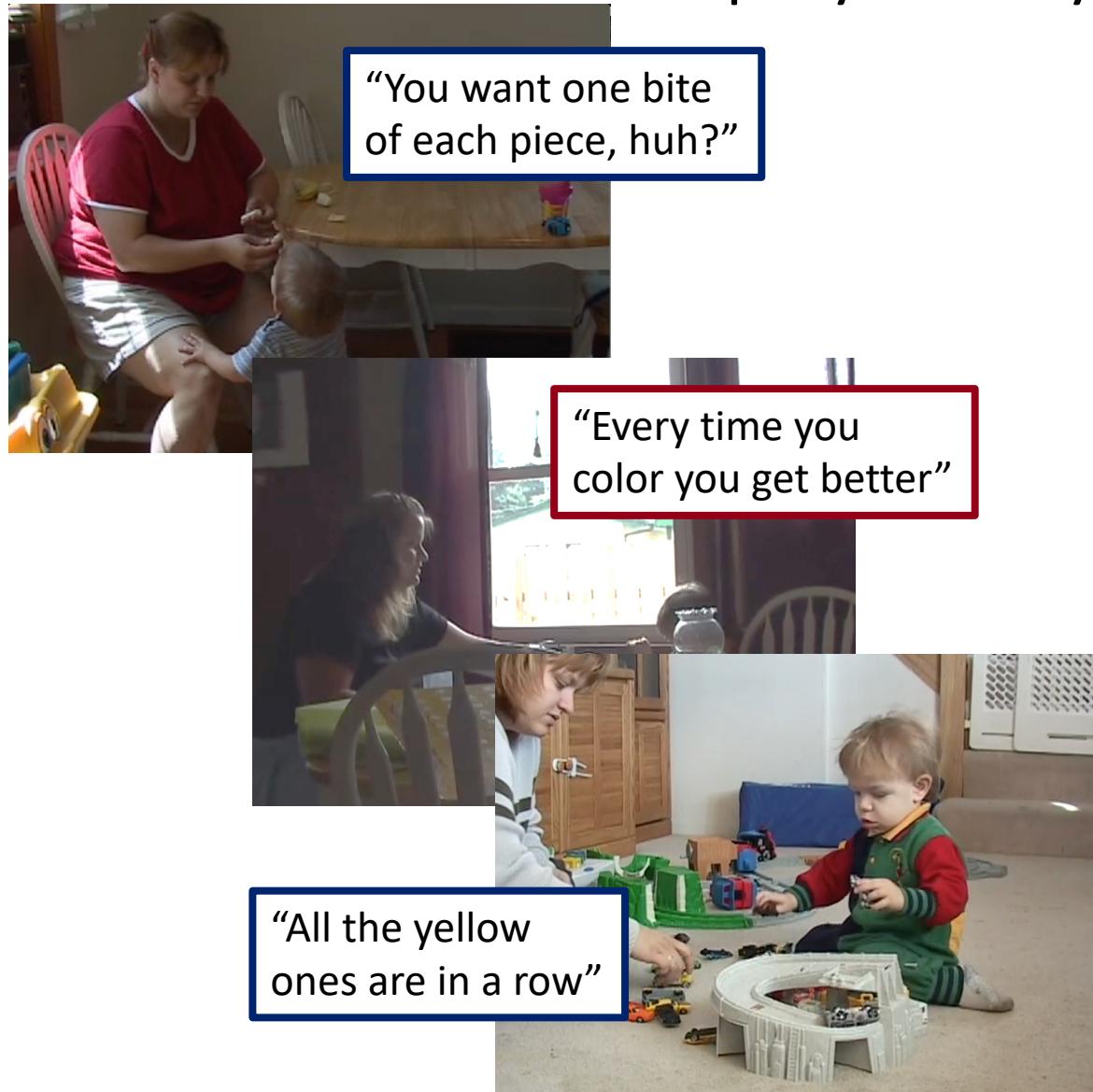
“All the yellow ones are in a row”

Is the domain physically present?



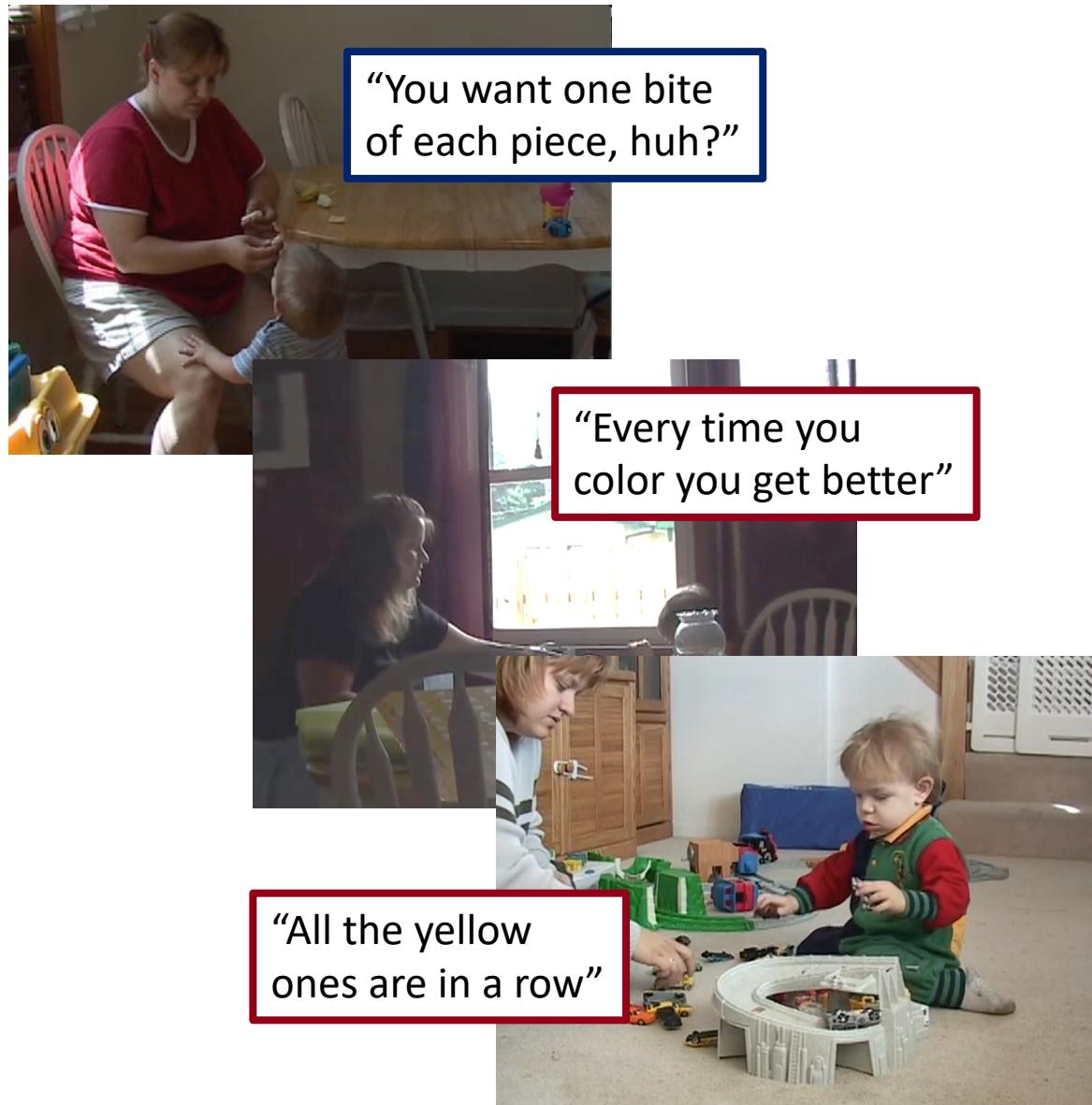
each vs. *every*: $\chi^2=133.87$, $p<.001$
each vs. *all*: $\chi^2=5.37$, $p<.05$

Is the domain physically present? (excluding times)

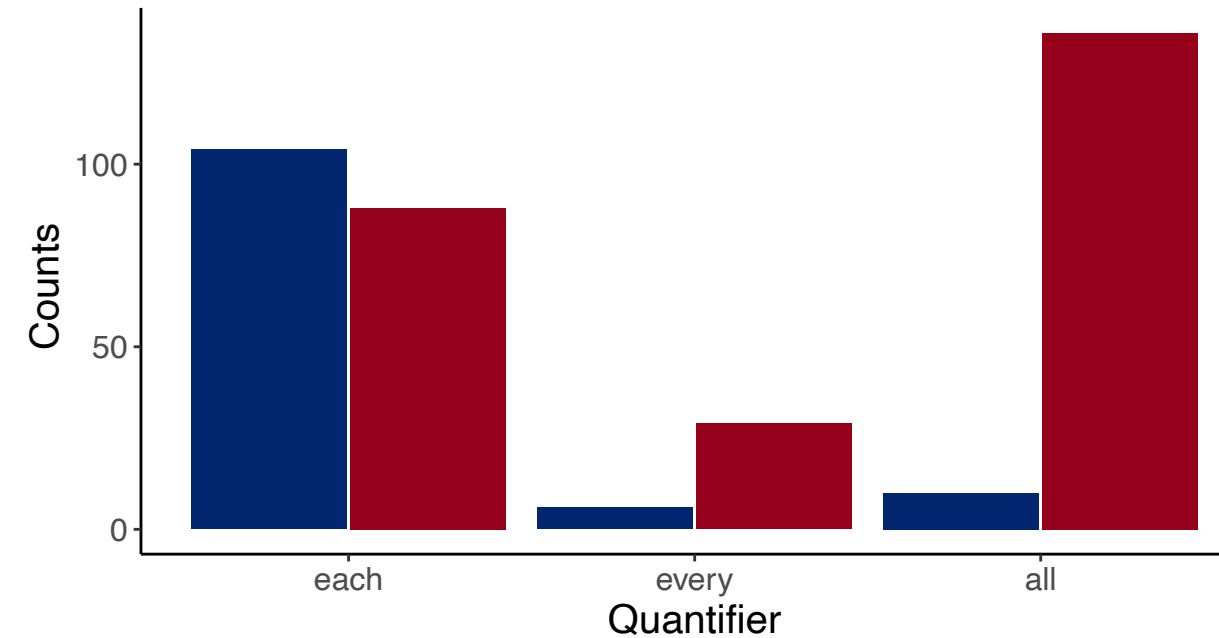


each vs. *every*: $\chi^2=7.30$, $p<.01$
each vs. *all*: $\chi^2=0.39$, $p=.53$

Is the domain within the WM limit?



Within working memory limit (< 4 items) Yes No



each vs. *every*: $\chi^2=16.25$, $p<.001$
each vs. *all*: $\chi^2=80.97$, $p<.001$

Object-files as a route of semantic access



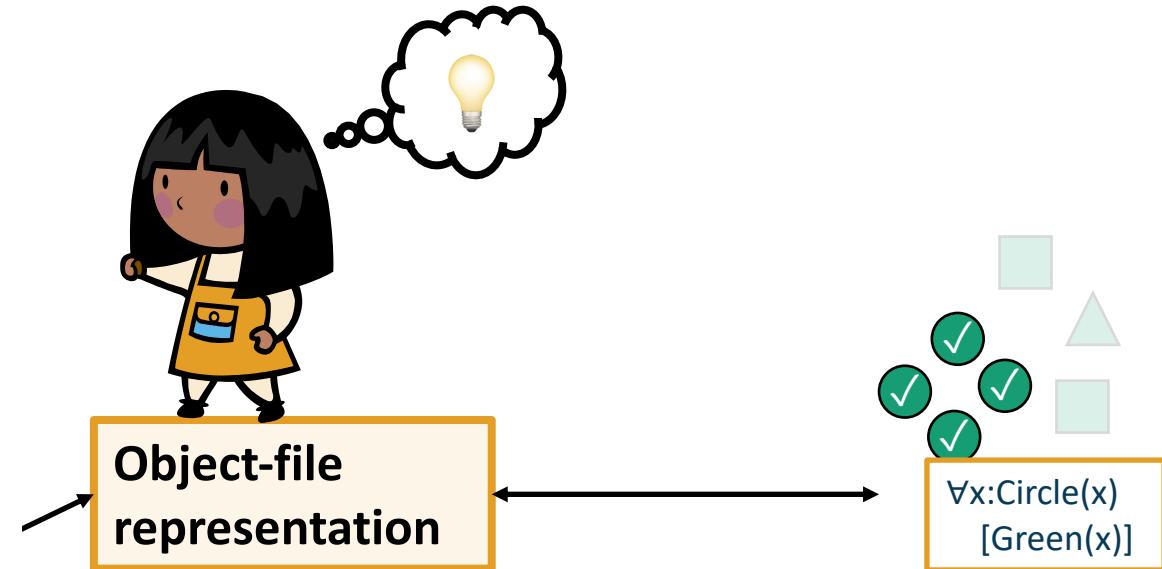
"You want one bite
of each piece, huh?"

Domain of quantification is
often physically present in
small numbers (<4)

Triggers

→ Current findings: the relevant perceptual and linguistic data
are available in speech to children

→ Ongoing work: are these cues in-principle usable by learners?



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Finger painting courtesy of Alex Oppenheimer (1;6)

