24.904
Language Acquisition

Class 20: Quantification, continued

Last time

- **Conservativity universal:** All determiner-quantifiers in natural languages are conservative

  - A quantifier Q is conservative if Q(A)(B) = Q(A)(A∩B)

Domain

  - Q is conservative if, when evaluating e.g. Q(girls)(smiled), only the smiling-status of *girls* matter when evaluating the truth of the quantificational statements

  - If a quantifier is conservative, the first argument—i.e. the NP denotation—determines the ‘domain’ that the sentence is about. Individuals outside of this domain are irrelevant.

Last time

- When presented with sentences of the form *Every X is Y* in situations where every X is indeed Y, but there is an extra Y, children, unlike adults, judge the sentence False.

Is every rabbit riding an elephant?

Adults: Yes

4-6-year-olds: No

Why? extra elephant

Last time

- One proposal about over-exhaustive search errors, namely that children have a one-to-one interpretation for *every* sentences

- Surprising if q-meanings in natural language are conservative…

Today

- Other accounts of over-exhaustive search errors

- Non-adult semantic representations

- Non-adult pragmatic abilities

Event quantification

Philip 1995

- Basic idea: children misinterpret *every* as a sentence-level quantifier ranging over *events* rather than as ranging over individuals

Event quantification

- Event quantifiers in English:

(1) a. Sue **always** runs in the morning
b. Sue **usually** runs in the morning
c. Sue **mostly** runs in the morning
d. Sue **sometimes** runs in the morning

- "Unselective", unlike quantifiers over individuals like *every*

(2) Sue always runs *in the morning*
Every event in which Sue is a participant that is a running event is an event that takes place in the morning

(3) Sue always *runs* in the morning
Every event in which Sue is a participant that is in the morning is an event of running

Event quantification

- "Is every bunny riding an elephant?" is for the child similarly ambiguous:

  (1) Is it the case that…

  a) Every event in which the bunny is a participant is a riding event?

  or

  b) Every event in which an elephant is a participant is a riding event?

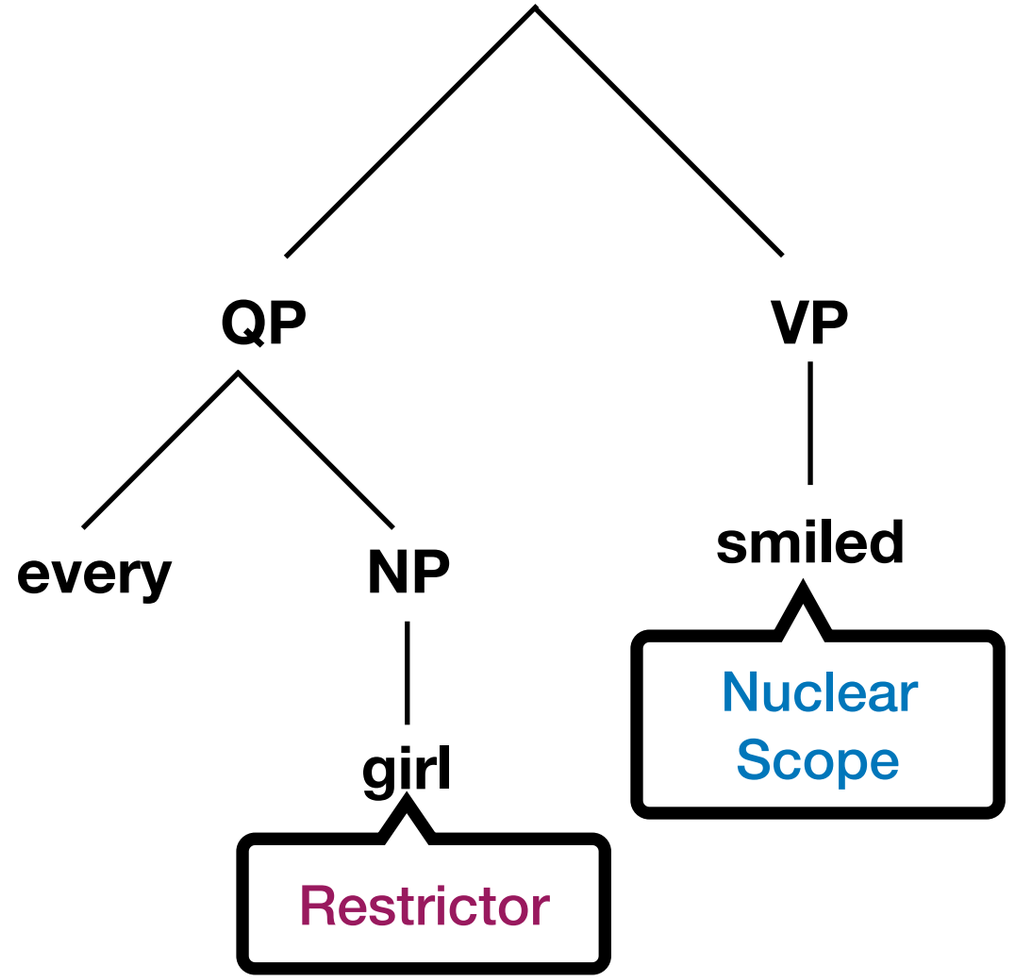
- Crucially, the event quantification account involves positing a non-adult semantic representation for universal quantifiers like *every* in early child language

Evidence against

- Experimental evidence for early knowledge of core logical properties of *every* (at least as early as the over-exhaustive error stage)

Entailments

- The two arguments of *every* show distinct logical properties
  - the **restrictor** set licenses inferences to *subsets* (⟹ downward entailing)
  - the **nuclear scope** licenses inferences to *supersets* (⟹ upward entailing)

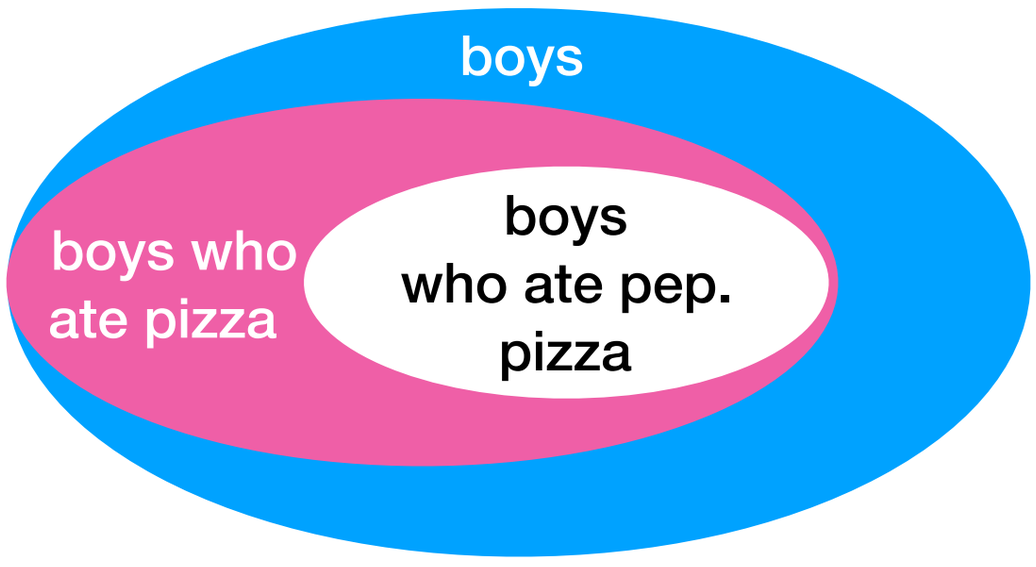


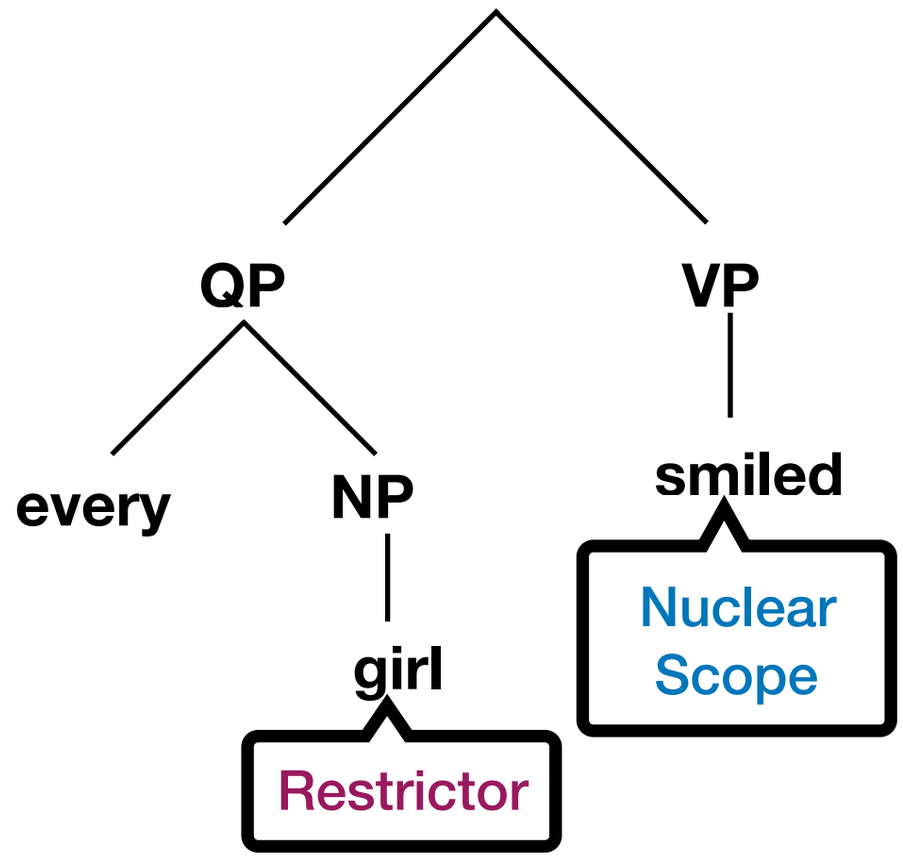
Entailments

(1) Every boy who ate pizza got sick

⟹ Every boy who ate pepperoni pizza got sick

⇏ Every boy got sick



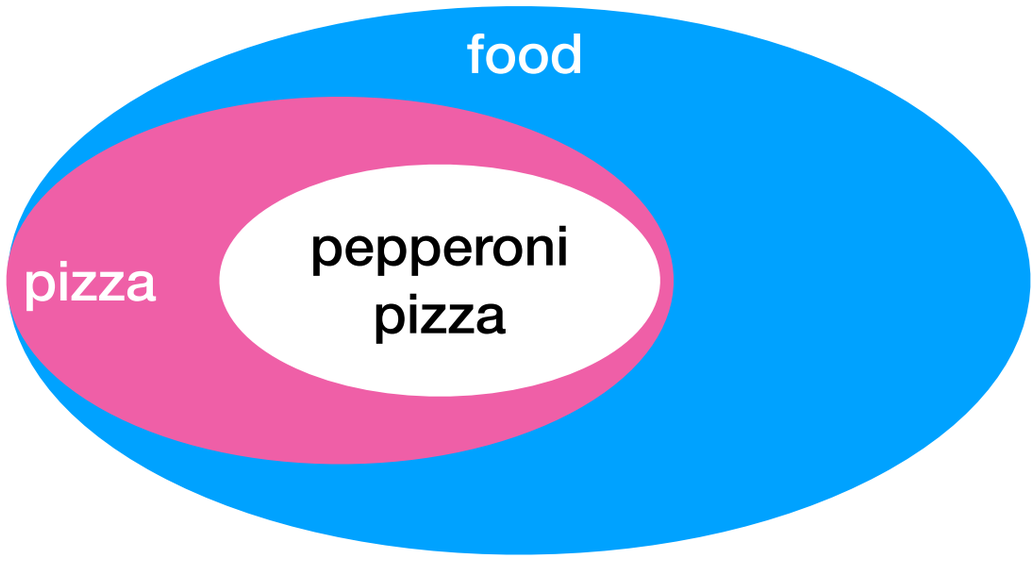


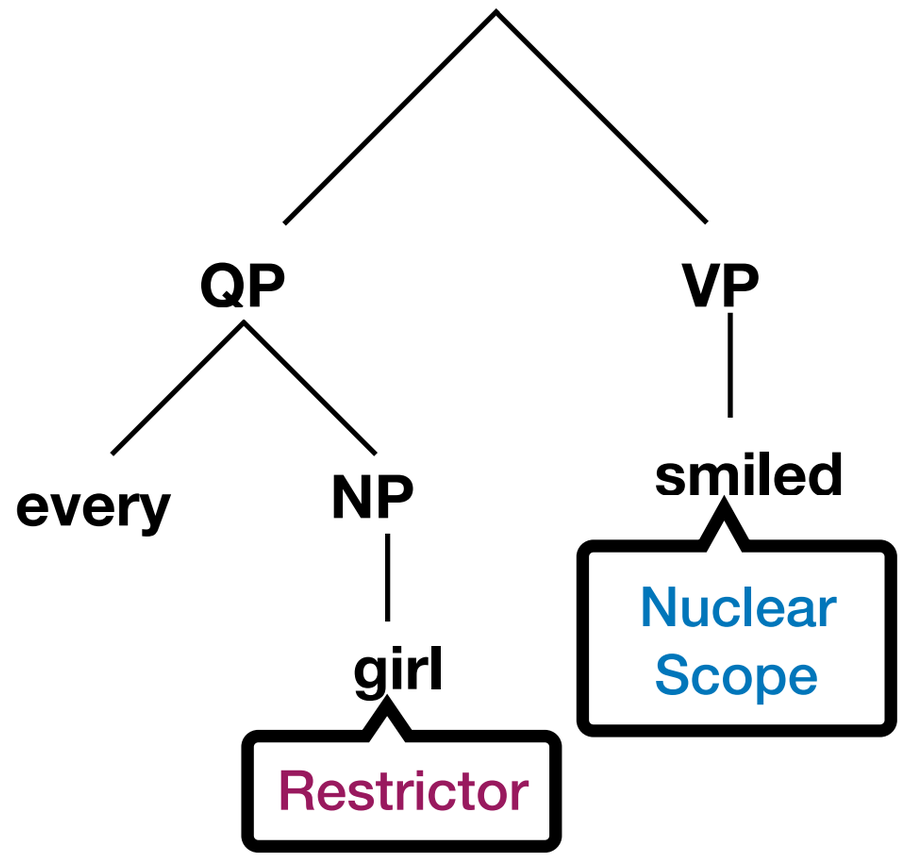
Entailments

(2) Every boy ate pizza

⇏ Every boy ate pepperoni pizza

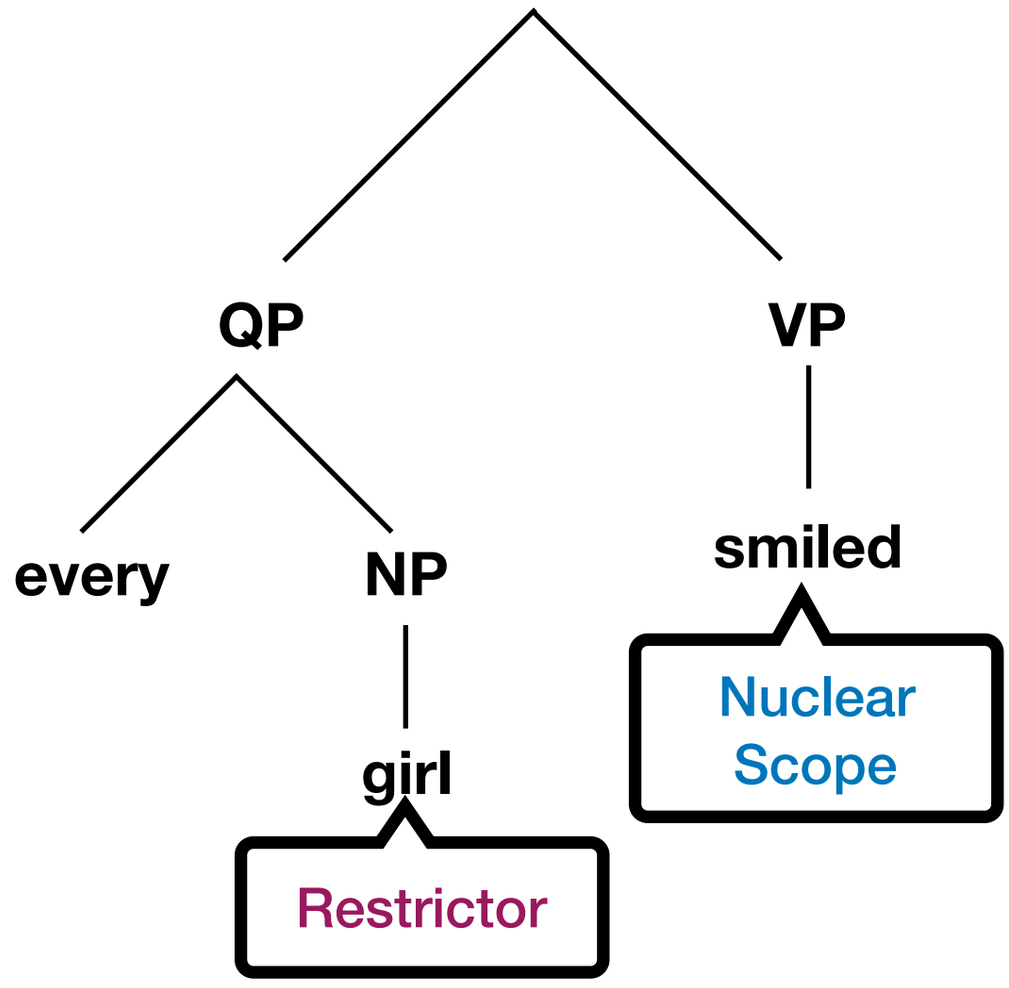
⟹ Every boy ate food





Entailments

- The two arguments of *every* show distinct logical properties
  - the restrictor set licenses “conjunctive” interpretations of disjunctions (*or*)
  - the nuclear scope licenses only “disjunctive” interpretations of disjunctions

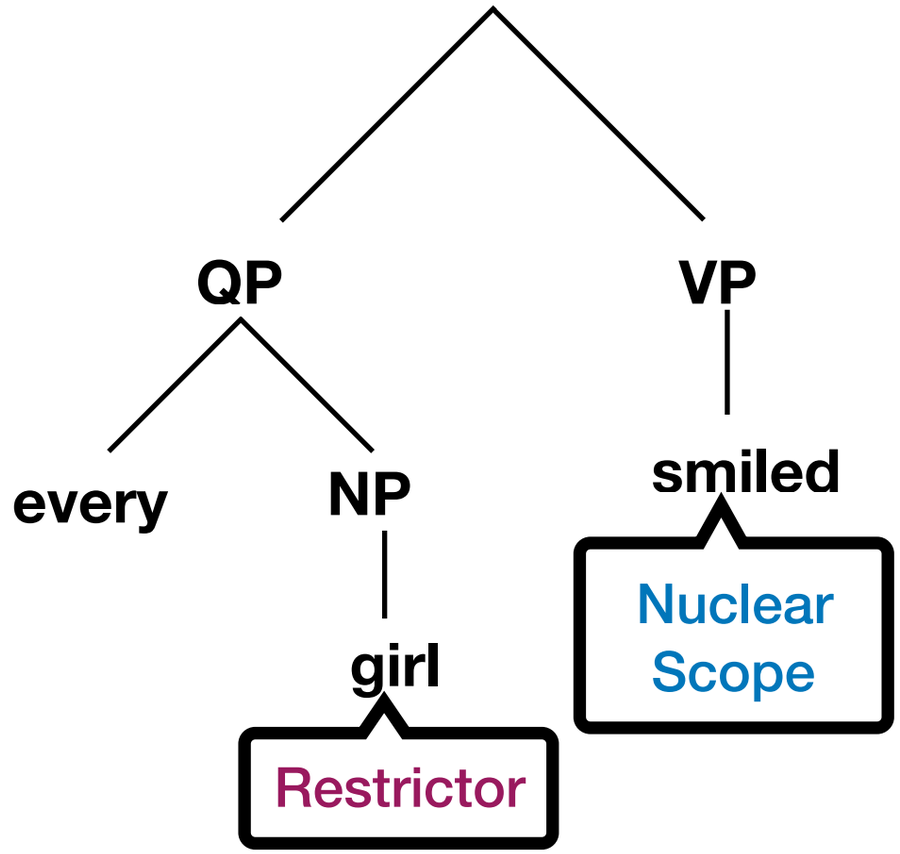


Entailments

(1) Every boy who ate cheese or pepperoni pizza got sick

⟹ Every boy who ate cheese pizza got sick AND every boy who ate pepperoni pizza got sick

⇏ Every boy who ate cheese pizza got sick OR every boy who ate pepperoni pizza got sick

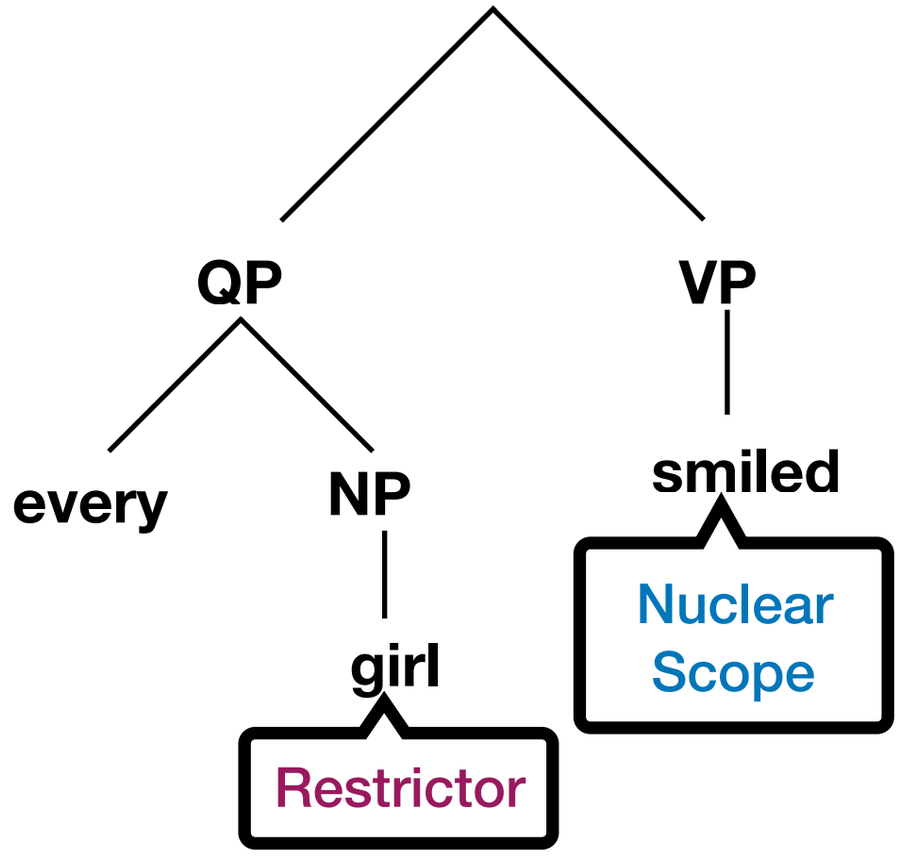


Entailments

(2) Every boy ate pepperoni or cheese pizza

⇏ Every boy ate pepperoni pizza AND cheese pizza

⇒ Every boy ate pepperoni pizza OR cheese pizza



Gualmini et al. 2003

- Do children in the over-exhaustive-search-error making stage know these logical properties of *every*?

- 20 4-and-5-year-olds (M=5;1) in a TVJT

Gualmini et al. 2003

This is a story about five trolls who go to the fast food owned by Genie. The Trolls order food. One troll gets a big hot-dog, two trolls order onion rings and two trolls order French fries. Genie serves all the food and asks the trolls whether they need anything else. The Troll who ordered the hot-dog says he does not need anything else. The two trolls who ordered French fries ask for mustard, and Genie gives a big bottle of mustard to each of them, The two trolls who ordered onion rings also ask for mustard. Genie says: “I am sorry, but I do not have any more regular mustard”.

Puppet: Every troll who ordered French fries or onion rings got some mustard. (False)

- Children correctly rejected the target sentences 95% of the time (on 76 out of 80 trials)

Upshot

- Children seem to know core semantic properties of *every,* making less plausible the idea that they start out with a non-adult ‘event-quantifier’ meaning
  - NB: also an argument against the one-to-one story
- But if they do have the right meaning representation, what’s going awry?

Pragmatic problems

- In these "extra object” scenarios, children have difficulties identifying which objects in the context should be taken as relevant/irrelevant

Drozd and van Loosbroek 2006, Philip 2011, Smits 2011, a.o

Domain restriction

(1) Every student is happy.

Domain restriction

You should really come to MIT Linguistics.

(1) Every student is happy.

Domain restriction

You should really come to MIT Linguistics.

(1) Every student is happy.
= every student *in MIT Linguistics* is happy

Domain restriction

- When we use quantificational expressions like *every* or *most,* we are rarely quantifying over every single member of the restrictor set

- The domain of quantification seems to be much narrower

Domain restriction

- How do we do this?
  - Enrich the structure
  - Every C_i NP VP, where C is a predicate-denoting pronoun that picks up its meaning from the context.
  - Thus:

(1) [Every C_i student] is happy. [i —> {x: x is in course 24}]

= [Every x who is in in course 24 & a student] is happy

Domain restriction

- Like regular pronouns, these domain-restriction pronouns require a contextually salient antecedent

- Consequently, interpreting (1) out of the blue is hard. Surely not every student in the world?

  (1) [Every C_i student] is happy.

Extra object scenarios

- In scenarios that elicit over exhaustive search errors, adults restrict their domain based on the scene/image

(1)[Every C_i rabbit] is riding an elephant.

[i —> {x: x is in the picture}]

Is every rabbit riding an elephant?

Extra object scenarios

- Children, on the other hand, might restrict the domain differently

- For instance, they might imagine a relevant bunny that's supposed to be riding the elephant

(1)[Every C_i rabbit] is riding an elephant.

[i —> {x: x is supposed to be on an elephant}]

Is every rabbit riding an elephant?

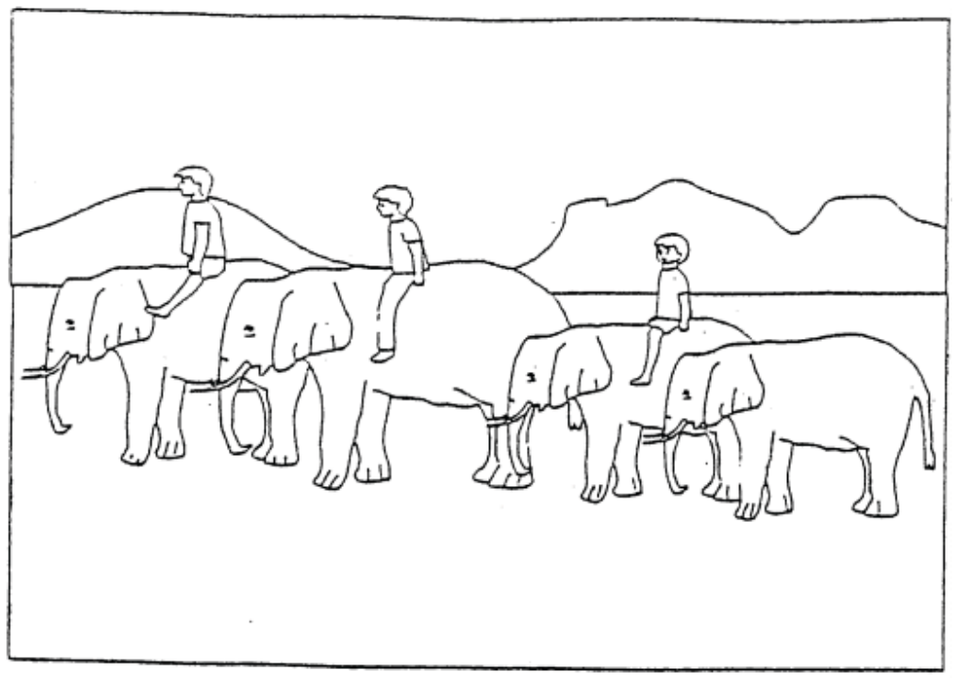
Extra object scenarios

Is every jockey on a horse?

Drozd and van Loosbroek 2006

Experiment 1

- 52 4-5-y.o in a Y/N question task
- the quantifier *iedere* ‘every’ (8 trials)



Test: Is every boy riding an elephant?

Rijdt iedere jongen op een olifant?

	% correct
4-year-olds	56%
5-year-olds	65%

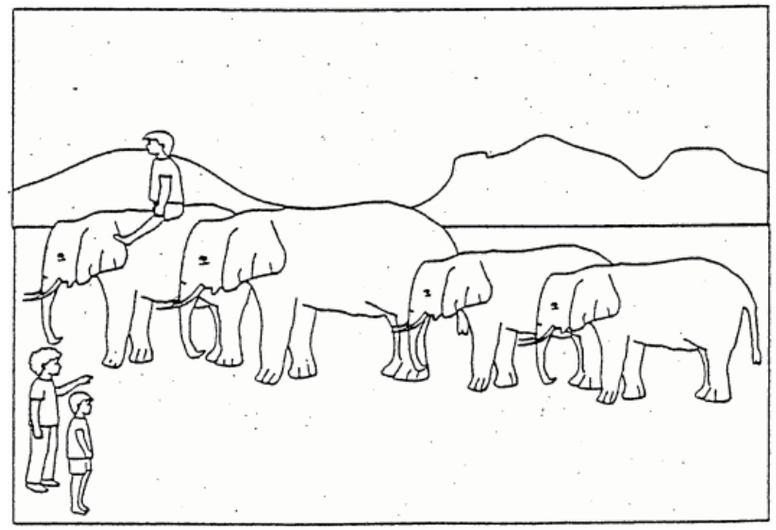
Drozd and van Loosbroek 2006

Experiment 2

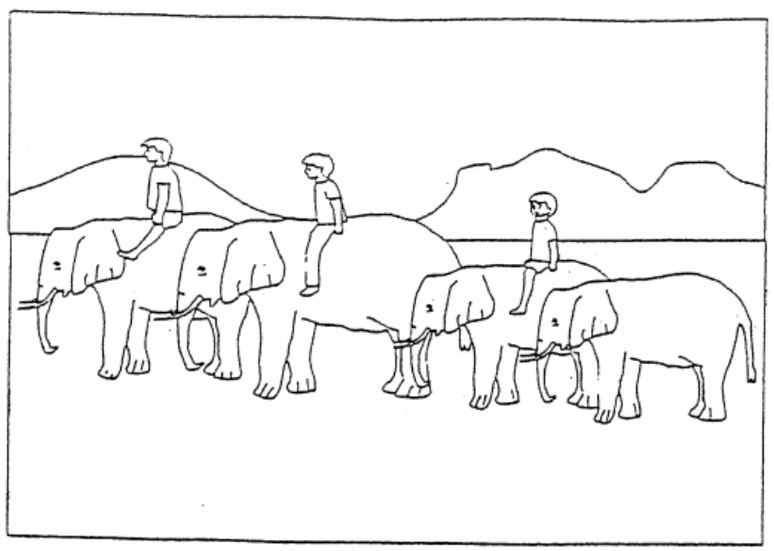
- 78 Dutch acquiring children 4-5 yo
- Y/N questions but test sentences preceded by a domain-setting context and warm up question of three types:

Context:
Dit lijkt wel een woestijn.(‘This looks like a desert.’)
Allemaal zand en bergen. (‘All sand and mountains’)
En dit zijn jongens? (‘And these are boys?’)
Hier zie je…?(olifanten) (‘Here you see…? (elephants))

- “Show me”: Point to the boys!
- “Irrelevant property”: Does every boy have shoes?
- “Relevant property”: Is every boy sitting on an elephant?



Context



Test: Is every boy riding an elephant?
Rijdt iedere jongen op een olifant?

Drozd and van Loosbroek 2006

Condition	Age	% correct
Show me!	4-year-olds	75%
	5-year-olds	65%
Irrelevant property	4-year-olds	65%
	5-year-olds	77%
Relevant property	4-year-olds	87%
	5-year-olds	81%

Philip 2011

- The domain can be manipulated not just be preceding discourse, but changing the visual features of the scene

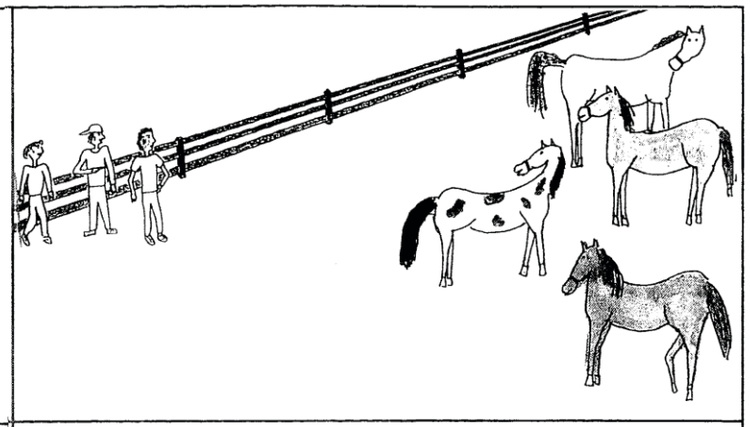
- 166 Dutch acquiring 4-5-year-olds; final sample = 88
  - after elimination of 32 kids who were not attentive and 46 kids for being under exhaustive search error makers

- Question after story task
  - 2 conditions: “conspicuous" extra object (CEO) vs. “inconspicuous” extra object (IEO)
  - 1 trial per condition

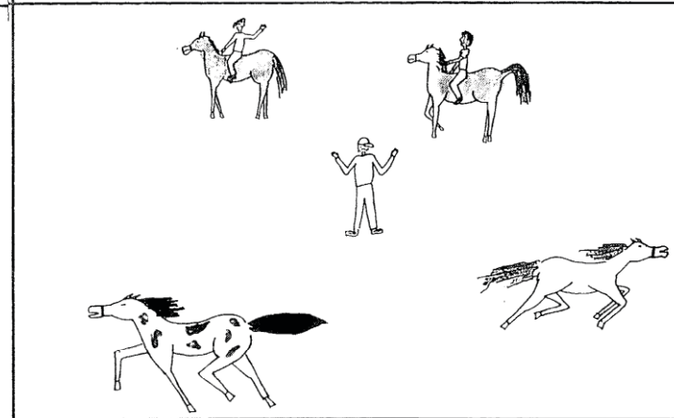
Philip 2011

Sample CEO item

STORY-TELLER
This is a story about a bunch of horses. One day they were in a field eating grass....[Puppet interrupts to ask how many horses and what they look like; child answers]*...Suddenly three boys appear at the edge of the field. The yellow horse with spots says, "Oh no! Boys! I bet they're going to try to ride us."*

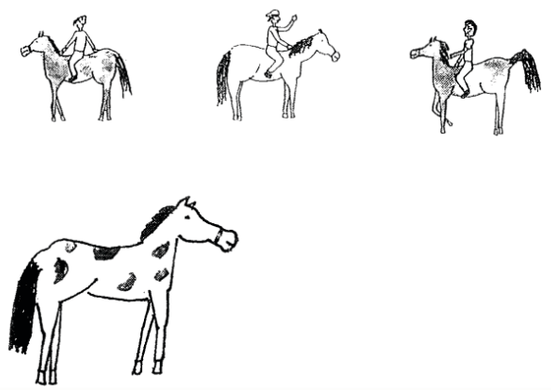


STORY-TELLER
And that's what the boys try to do. The brown horse and the black horse get caught and have to give a boy a ride, but the white horse and the yellow one with spots run away so the boy with a yellow hat doesn't get to ride a horse.



STORY-TELLER
Then the white horse is also caught by one of the boys....

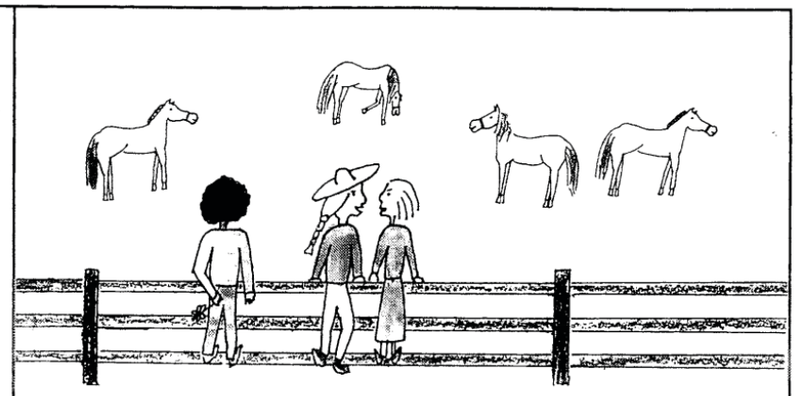
STORY-TELLER
And now the boy with the yellow hat is riding a horse. The yellow horse with spots is happy because he doesn't have to carry any boy. Okay, Drakkie. Can you tell us something about this story?
PUPPET
Easy. ***Each boy is riding a horse.***
CHILD
Not the yellow one with spots.



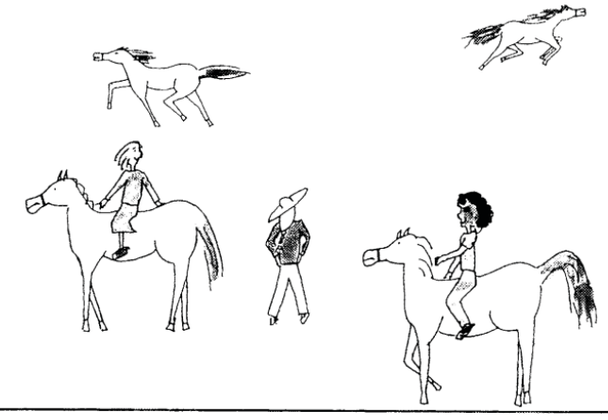
Philip 2011

Sample IEO item

STORY-TELLER
This is a story about a some girls. One day they were taking a walk in the country side....[Puppet interrupts to ask how many girls and what they look like; child answers]*...After a while the girls find some horses. The girl with the yellow hat says,"Look! Horse! Let's try to ride them."*



STORY-TELLER
And that's what the girls try to do. The girl with the red sweater catches a horse and she gets a ride, and so does the girl with the blue pants, but the girl with the yellow hat can't catch a horse so she doesn't get to ride one.

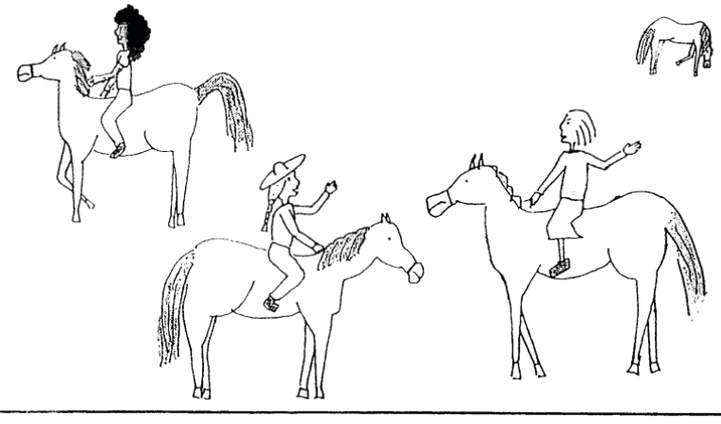


STORY-TELLER
Then the girl with the red sweater catches another horse....

STORY-TELLER
Now the girl with the yellow hat is riding a horse. Okay, Drakkie. Make a guess. Tell us something that's happening in this story.

PUPPET
Sure. ***Each girl is riding a horse.***

CHILD
That's right. (adult response)



Philip 2011

Groups		n	Number subjects and percent of group giving EP responses	
			# subjects	% of group
Younger children	CEO group	21	9	43%
	IEO group	24	2	8%
Older children	CEO group	20	5	25%
	IEO group	23	1	4%
Child CEO group		41	14	34%
Child IEO group		47	3	6%
Adult CEO group		16	1	6%

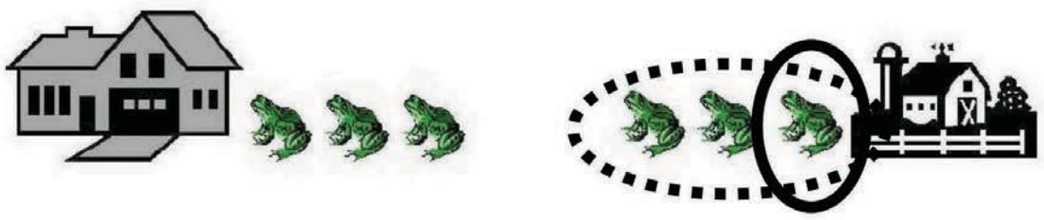
A domain identification problem

- The puzzlingly non-adult behavior in children's interpretation of universally quantified statements is likely not *semantic*

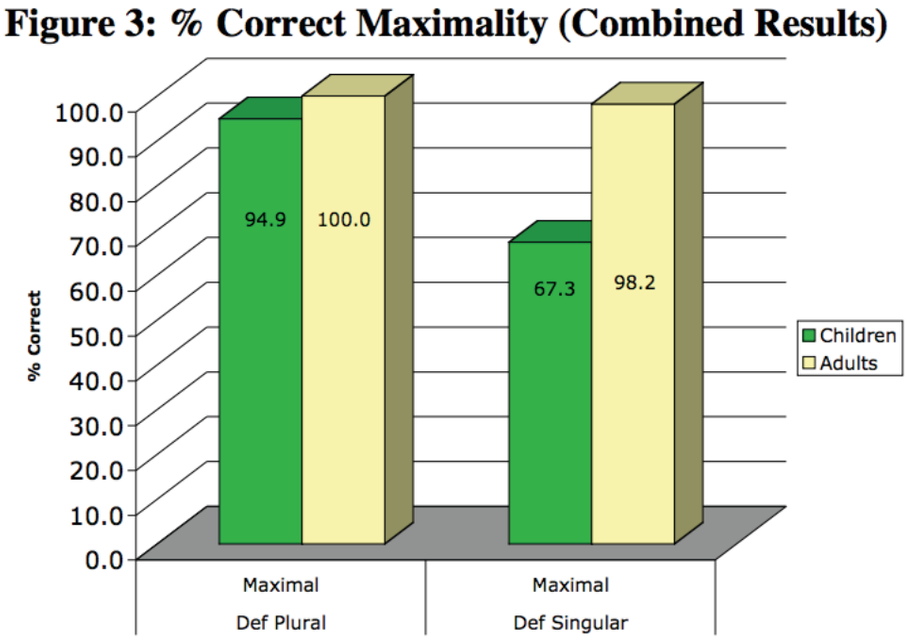
- Rather, children may diverge from adults in identifying the appropriate domain of quantification

A domain identification problem

- Similar problems elsewhere?



Give me the frog(s) next to the barn



Other ideas…

- The problem is with the *indefinite* (Federico's question from last class; see also Denic & Chemla 2020)
  - in the absence of contextual support, children suppose that there's a non-accidental relation between elephants and bunnies, leading to an anaphoric relational construal of the indefinite
  - assuming universal projection of presuppositions, this leads the child to accommodate an extra unseen rabbit

every rabbit$_i$ is riding an R$_i$ elephant.
⇒ every rabbit is riding its elephant

Chen et al. 2020

Next time

- Scalar implicatures
  - read Noveck (2001)