LSci 51/Psych 56L: Acquisition of Language

Lecture 13

Lexical development II

Announcements

Be working on review questions for lexical development

HW4 due 11/5/21

The course of early lexical development

First words

10-15 months: first words produced that actually sound like the words the child is trying to approximate (and they have a fixed meaning, as opposed to being sound sequences the child likes to say)

Note: This doesn't mean children don't understand words before this age, though. Bergelson & Swingley (2012, 2014, 2015) show that 6- to 9-month-olds understand familiar concrete object words like "nose" and "cookie".

First words

10-15 months: first words produced that actually sound like the words the child is trying to approximate (and they have a fixed meaning, as opposed to being sound sequences the child likes to say)

Bergelson & Swingley (2013) show that 10- to 13-month-olds understand words like “all gone”, “hug”, “bye”, and “wet”, while Nomikou, Rohlfing, Cimiano, and Mandler (2018) show that 10-month-olds understand verbs like “eat”, “sleep”, and “read”.

First words

10-15 months: first words produced that actually sound like the words the child is trying to approximate (and they have a fixed meaning, as opposed to being sound sequences the child likes to say)

Skarabela, Ota, O'Connor, & Arnon (2021) show that 11- to 12-month-olds, who may not yet be saying even single words, can understand multiword phrases like “clap your hands”.

https://www.sciencedaily.com/releases/2021/03/210330121242.htm

First words

10-15 months: first words produced that actually sound like the words the child is trying to approximate (and they have a fixed meaning, as opposed to being sound sequences the child likes to say)

Note: Bergelson & Aslin (2017) show that 6-month-olds even recognize words as more related ("car" and "stroller") and less related ("car" and "juice").

https://www.sciencedaily.com/releases/2017/11/171120174513.htm

Words as referential

https://www.sciencedaily.com/releases/2015/09/150902093259.htm

Marno, Farroni, Dos Santos, Ekramnia, Nespor, & Mehler 2015: 4-month-olds expect speech sounds uttered by a human who's looking at them to refer to something in the world (i.e., be referential).

"This suggests that infants at this early age already have some knowledge that language implies a relation between words and the surrounding physical world. Moreover, they are also ready to find out these relations, even if they don't know anything about the meanings of the words yet. Thus, a good advice to mothers is to speak to their infants, because infants might understand much more than they would show, and in this way their attention can be efficiently guided by their caregivers." — Hanna Marno

Not-just-words as referential
[Extra]

https://www.sciencedaily.com/releases/2015/11/151102152720.htm

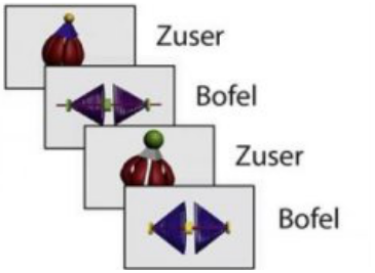
Ferguson & Waxman 2016: 6-month-olds can learn that beep sounds can be used for conceptual categorization after seeing those beeps used by people in communicative contexts.

"This shows that infants have the social capacity to recognize an entirely new social communicative signal in their environment. And once recognized, they can use it to support cognition. Babies, like adults, are already on the lookout for new ways that the people around them communicate with one another." — Sandra Waxman

Words as referential…after sleeping
[Extra]

https://www.sciencedaily.com/releases/2017/08/170808145935.htm

Friedrich, Wilhelm, Mölle, Born, & Friederici (2017) on the importance of sleep: 6- and 8-month-olds can associate a novel word form (like “bofel”) with a referent, but only after a 50 minute (but not 30 minute) nap.



First words

First words tend to be context-bound:

ex: “car” said when looking at cars out of apartment window, but not when looking at cars up close or when seeing a picture of a car

Children’s usage: have simply identified one particular event in the context of which it’s appropriate to use that word, but haven’t realized its more abstract coverage

First words

First words video & why might these words be learned earlier

http://www.ted.com/talks/deb_roy_the_birth_of_a_word.html

(~5:45 through ~11:00 of 19:52)

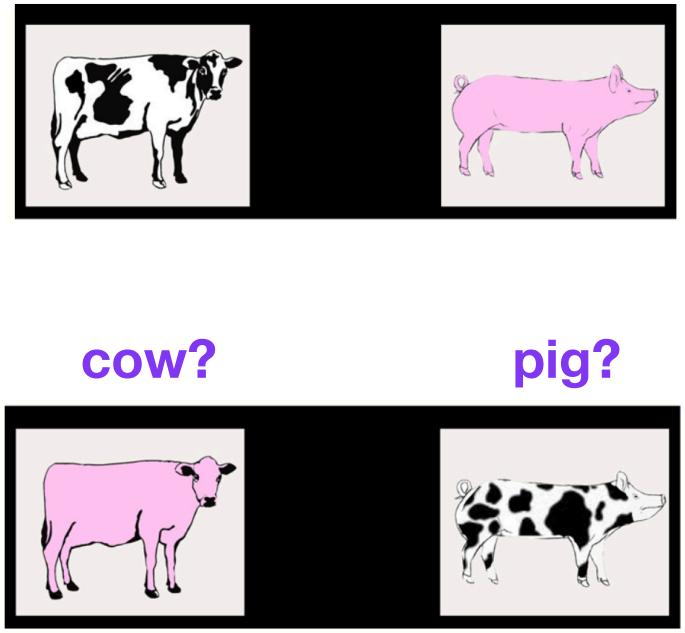
First words

Even if children realize a word has more extended use, they still may not realize it has the meaning that adults have for it

Ex: “more” = request for more, not general comparison

“…toddlers clearly vary in what they know about even highly familiar words. Our results demonstrate that regularities in toddlers’ vocabulary structure influence the properties they prioritize in object recognition, and possibly what they ‘know’ about familiar objects.”

- Perry & Saffran 2017



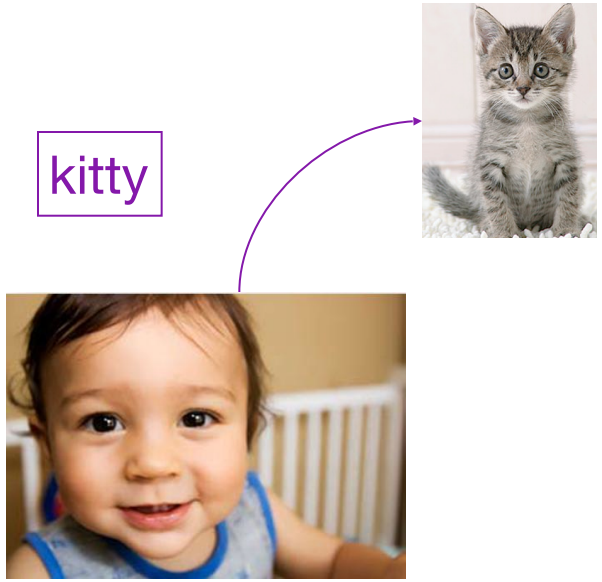
Color vs. Shape

First words

Even if children realize a word has more extended use, they still may not realize it has the meaning that adults have for it

Ex: “more” = request for more, not general comparison

Often, first words are parts of routines or language games. Children must then realize that these words can be extended.



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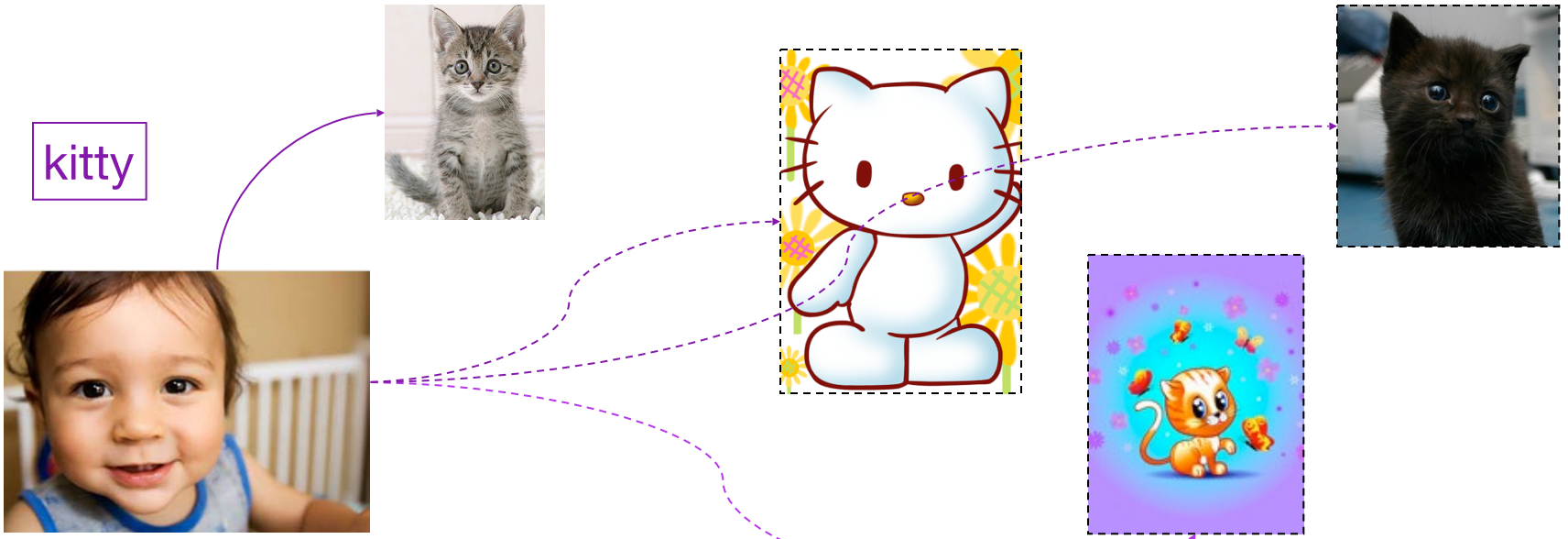
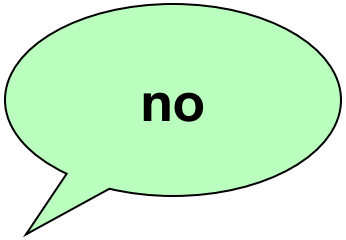


First words

[Extra]

The extension process doesn't happen at the same time for all words. Some referential words may coexist with words that are contextual. Which words are which will vary from child to child.

Jacqui: "no" = context-bound, used when refusing something offered by her mother (wouldn't say it when offered by someone else or while indicating her dislike of something, etc.)

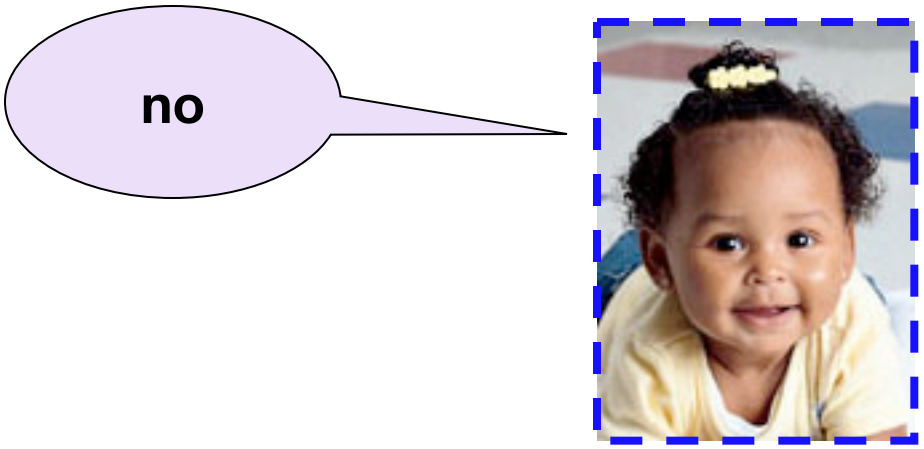


First words

[Extra]

The extension process doesn't happen at the same time for all words. Some referential words may coexist with words that are contextual. Which words are which will vary from child to child.

Jenny: "no" = referential, used when pushing a drink away, while crawling to a step she was not allowed to climb, while refusing a request by her mother



First words

In general, it's *not* because children don't hear these words in different contexts. Their parents used the words in many different contexts.

So what's the problem?

It's not an easy task to extract the common meaning from different contexts.

kitty = ?

First words

In general, it's *not* because children don't hear these words in different contexts. Their parents used the words in many different contexts.

So what's the problem?

It's not an easy task to extract the common meaning from different contexts.

cute = ?

First words

So what's the problem?

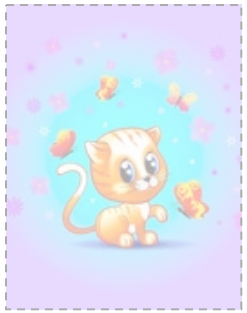
It's even harder if you're just looking at a single instance at a time.

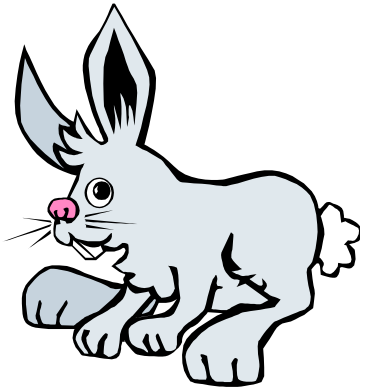
sad?

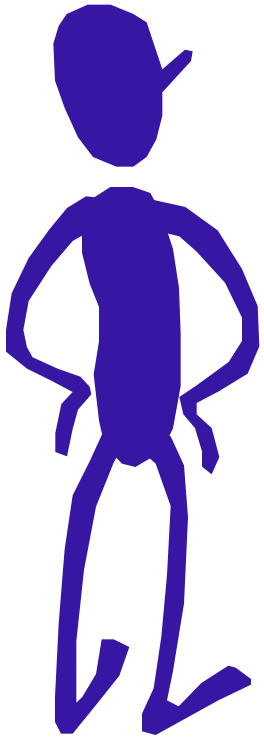
fuzzy?

kitty?

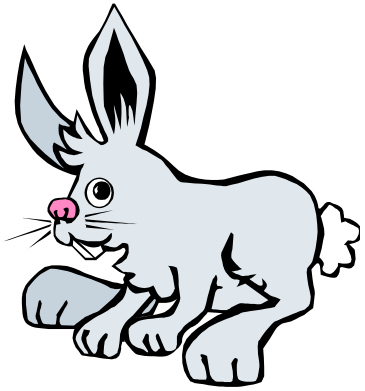
cute?







What does “gavagai” mean?



What does “gavagai” mean?

Rabbit?

Mammal?

gray rabbit?

Animal?

Carrot eater?

vegetarian?

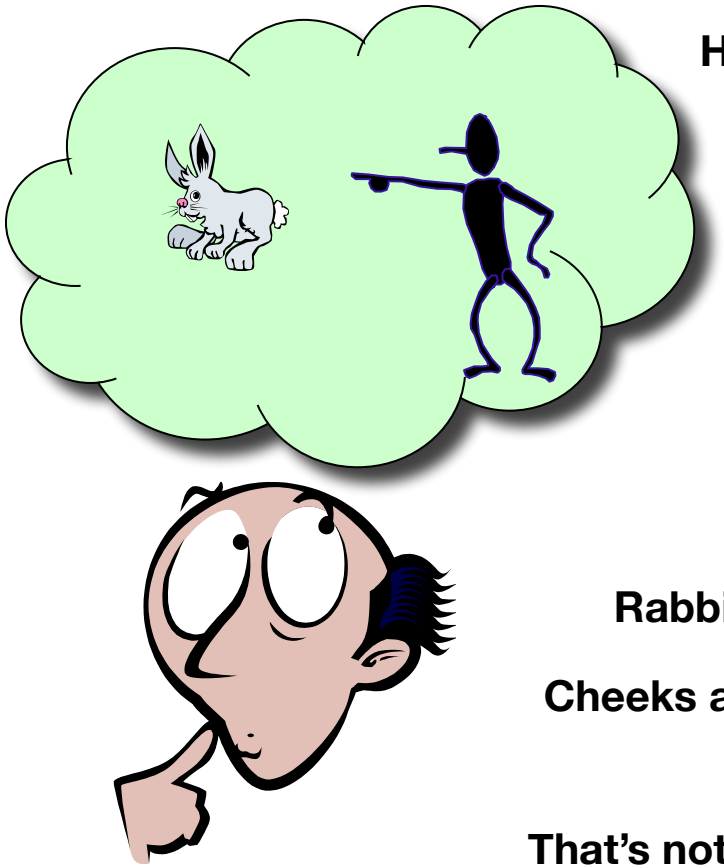
Ears?

Long ears?

Is it gray?

Fluffy?

What a cutie!



Thumping

Hopping

Scurrying

Stay!

Look!

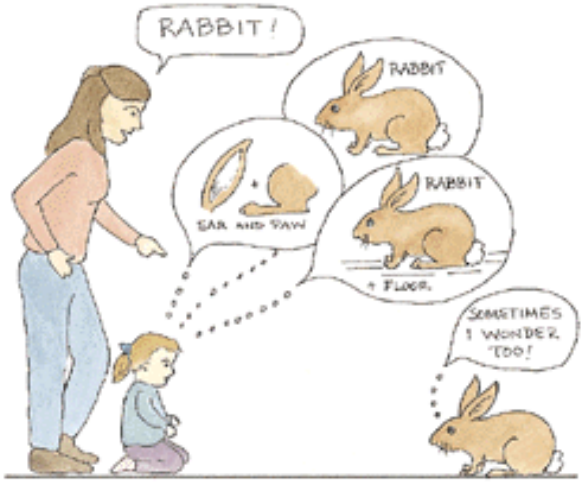
Meal!

Rabbit only until eaten!

Cheeks and left ear!

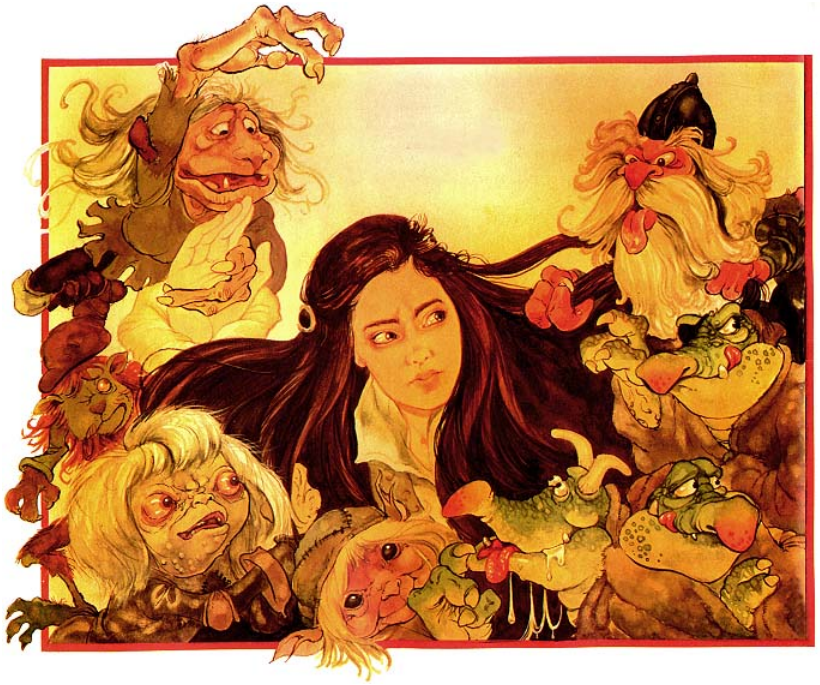
That’s not a dog!

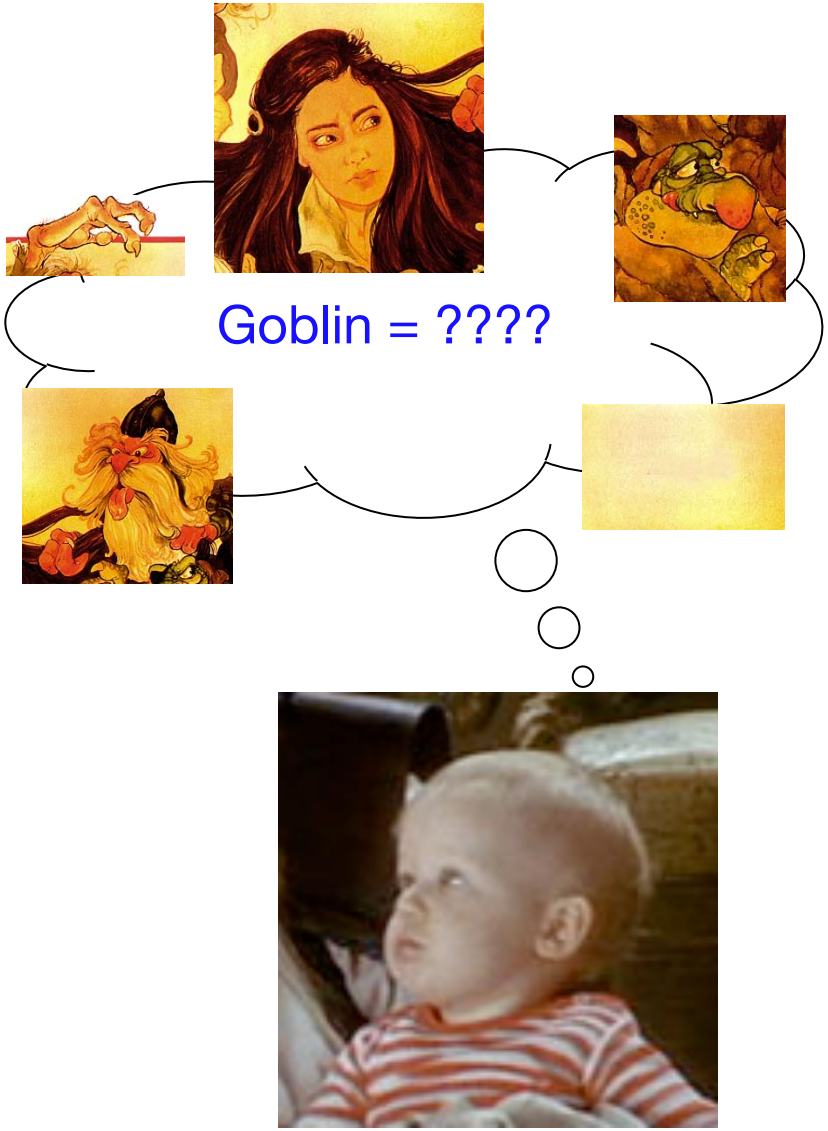
Same problem the child faces



A little more context…

"Look! There's a goblin!"





The mapping problem

Even if something is explicitly labeled in the input ("Look! There's a goblin!"), how does the child know what *specifically* that word refers to? (Is it the head? The feet? The staff? The combination of eyes and hands? Attached goblin parts?…)

Quine (1960): An infinite number of hypotheses about word meaning are possible given the input the child has. That is, the input underspecifies the word's meaning.

The mapping problem

http://www.thelingspace.com/episode-35
https://www.youtube.com/watch?v=Ci-5dVVvf0U
2:04 - 2:32

Even basic words can be hard

[Extra]

Even learning what seem like very basic words (“Daddy”) can be hard when the appearance of the referent changes in unexpected ways.

https://www.youtube.com/watch?v=_k0fnTiKEMc&feature=player_embedded

(Until about 1:08)

The word form itself may vary

In multilingual environments where words may be spoken in different accents (e.g., “bean” /bin/ pronounced as “bin” /bɪn/), children have to generalize across different phonological word forms. This ability increases steadily with age (Creel 2014), starting at 12 to 13 months, though it takes some time to develop fully (Newman, Morini, Kozlovsky, & Panza 2018).

However, acoustic variation within a single speaker can actually be helpful for figuring out the important parts of word forms at 14 months (Galle, Apfelbaum, & McMurray 2015).

One solution: Fast mapping

Children begin by making an initial fast mapping between a new word they hear and its likely meaning. They guess, and then modify the guess as more input comes in.

Experimental evidence of fast mapping

(Carey & Bartlett 1978, Dollaghan 1985, Mervis & Bertrand 1994, Medina, Snedecker, Trueswell, & Gleitman 2011)

ball

bear

kitty

[unknown]

"Can I have the ball?"

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bear

kitty

[unknown]

"Can I have the *zib*?"

20 months

One solution: Fast mapping

However, fast mapping is not something unique to humans. Other animals, such as dogs, are capable of doing this too.

Border collie fast mapping

[~6 minutes, up through 2:15 for demonstration of fast mapping]

(National Geographic video - no longer available)

http://www.youtube.com/watch?v=D7Tyig9Azlk

[~4 minutes, up through 1:50 for demonstration of fast mapping]

(ABC News special)

http://www.youtube.com/watch?v=_6479QAJuz8

Border collies vs. humans

Notably, however, border collies don't generalize the same way humans do (van der Zee, Zulch, & Mills 2012).

Humans have a shape bias, where they extend the meaning of new nouns based on shape first.

If object 1 is a *dax*, objects 2, 3, 4, and 5 will be *daxes* too, but objects 6 and 7 will not be.

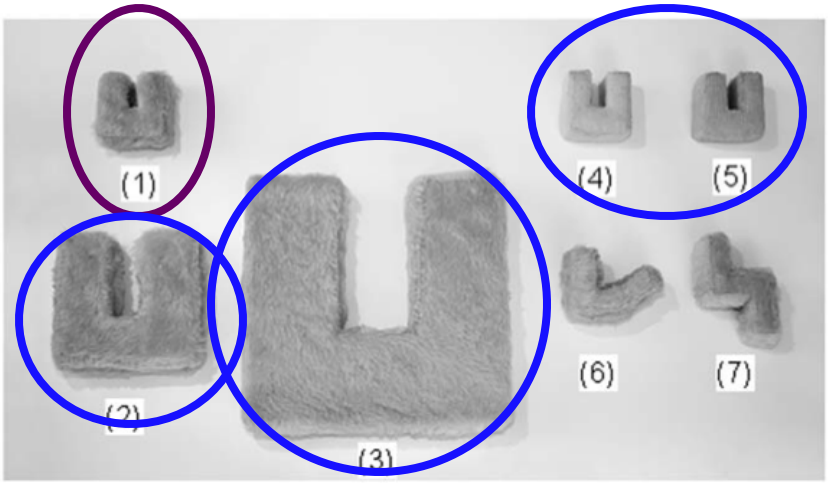


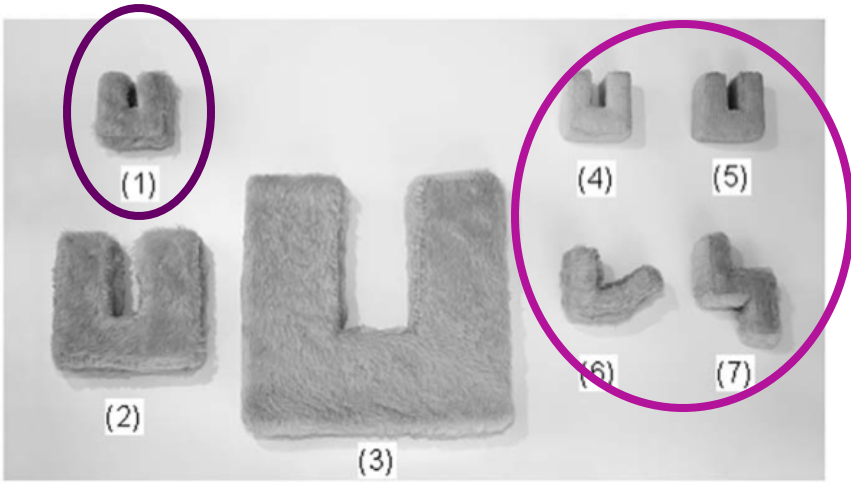
Figure 2. Objects used in experiments 2 and 4. Gable learnt to link the word *dax* with standard object 1: the DAX object (furry light blue 7.6 cm wide). He was asked to select a DAX from pairs of objects including the DAX, size changes 2 (15.2 cm) and 3 (30.4 cm), texture changes 4 (smooth) and 5 (rough), and shape changes 6 and 7.
doi:10.1371/journal.pone.0049382.g002

Border collies vs. humans

Notably, however, border collies don't generalize the same way humans do (van der Zee, Zulch, & Mills 2012).

Border collies seem to have a size bias, where they extend the meaning of new nouns based on size first if they've only just learned the new noun.

If object 1 is a *dax*, objects 4, 5, 6, and 7 will be *daxes* too, but objects 2 and 3 will not be.



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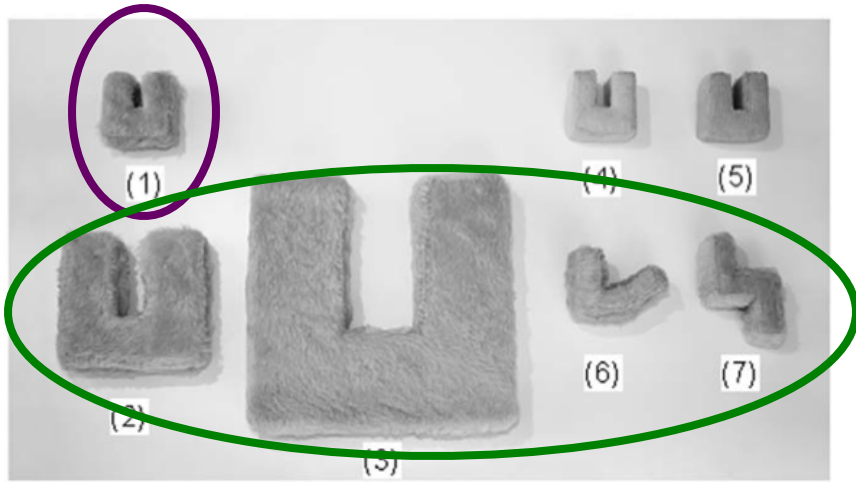
Border collies vs. humans

Notably, however, border collies don't generalize the same way humans do (van der Zee, Zulch, & Mills 2012).

Border collies also seem to have a texture bias, where they extend the meaning of nouns based on texture first if the nouns are familiar.

Setup: Border collie has been trained that object 1 is a *dax* for 39 days, so this word is now familiar.

If object 1 is (a) *dax*, objects 2, 3, 6, and 7 will be *dax(es)* too, but objects 4 and 5 will not be.



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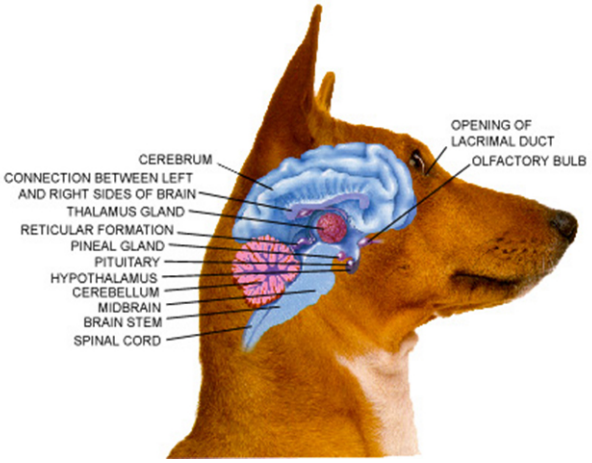
Dogs vs. humans

Interestingly, adult dogs (unlike adult humans) have more neural activation for novel words, compared with familiar words. This is another difference in word representation (Prichard, Cook, Spivak, Chhibber, & Berns 2018).

https://www.sciencedaily.com/releases/2018/10/181015120901.htm



Back to human learning…

Common mistakes children make with meaning

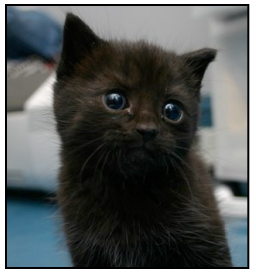
Once children figure out that words are referential, they have to figure out what range of concepts words apply to. This isn't so easy.

Underextension: using words in a narrower range.

Ex: Only siamese and Persian cats are cats.

kitty

Not kitty

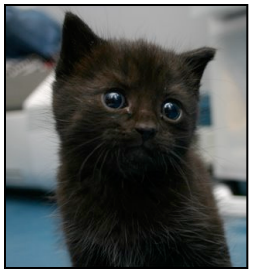


Common mistakes children make with meaning

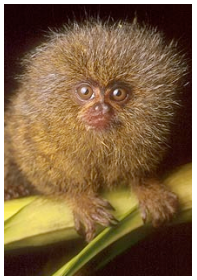
Once children figure out that words are referential, they have to figure out what range of concepts words apply to. This isn't so easy.

Overextension: using words in a wider range. (more common)

Ex: All fuzzy creatures are cats.



kitty



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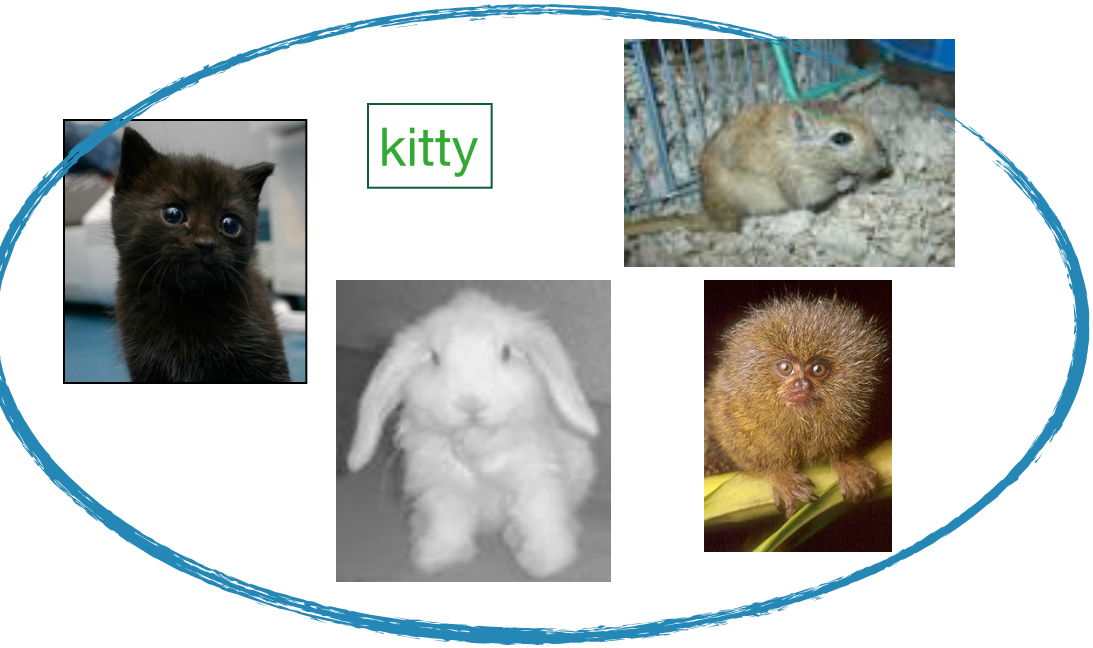
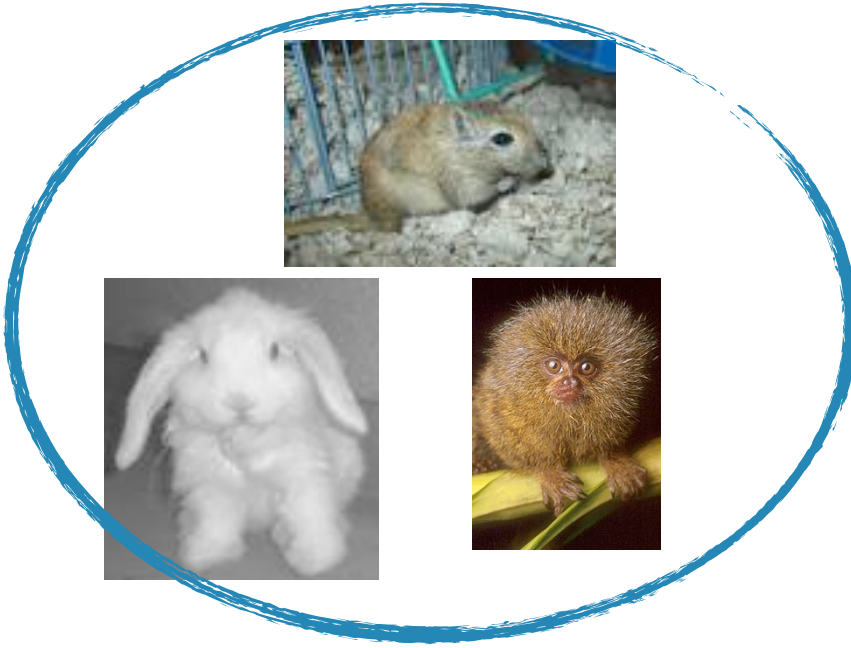
Sometimes overextension and underextension can happen at the same time.



Causes of extension errors

Underextension: perhaps the child is conservatively extending the hypothesis about what word refers to; correctable from experience with word's usage by adults.

Overextension: Likely to simply be because the child doesn't know appropriate word and uses one that's known. Overextensions tend to have some aspect of meaning in common, though. Corrected as children learn appropriate words for meanings they want to express.



Overextension errors often have semantic features in common

Thanks to Sierra Broussard for finding this.

Some more overextension examples

Ball = ball, balloon, marble, apple, egg, wool pom-pom, spherical water tank

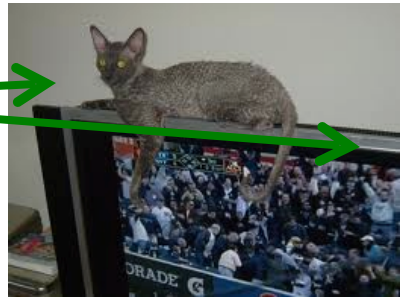
common feature = “round-ish shape”





Cat = cat, cat’s usual location on top of tv when absent

common feature = “associated with kitty”



Some more overextension examples

Moon = moon, half-moon-shaped lemon slice, circular chrome dial on dishwasher, ball of spinach, wall hanging with pink and purple circles, half a Cheerio, hangnail

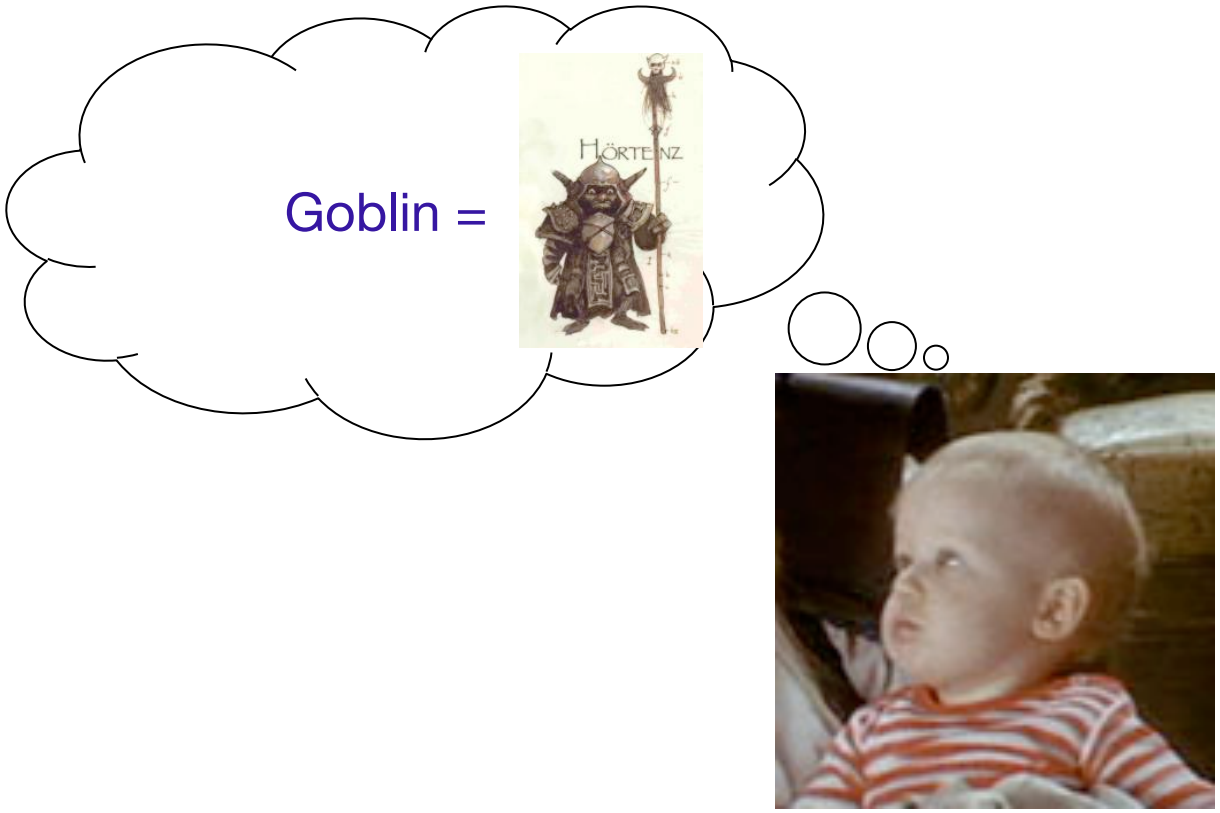
common feature = "crescent or round-ish shape"

+ a memory retrieval error?

Knowing what to guess

Lexical constraints

Whole-object assumption: new word refers to entire object, rather than some subset of it



Whole-object assumption

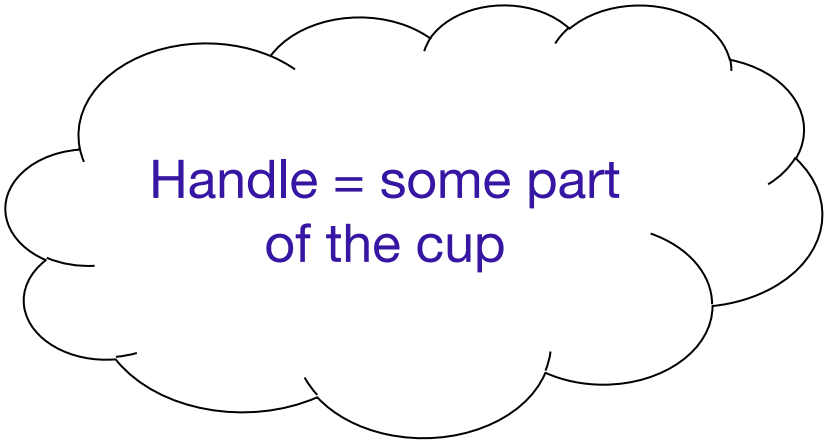
[Extra]

http://www.thelingspace.com/episode-35
https://www.youtube.com/watch?v=Ci-5dVVvf0U
2:33 - 2:58

Knowing what to guess

Lexical constraints

Mutual-exclusivity assumption: assume new word does not overlap in meaning with known word (can be used to overcome whole-object assumption)



"Look! You can see the *handle*!"

Known: cup

Mutual-exclusivity assumption

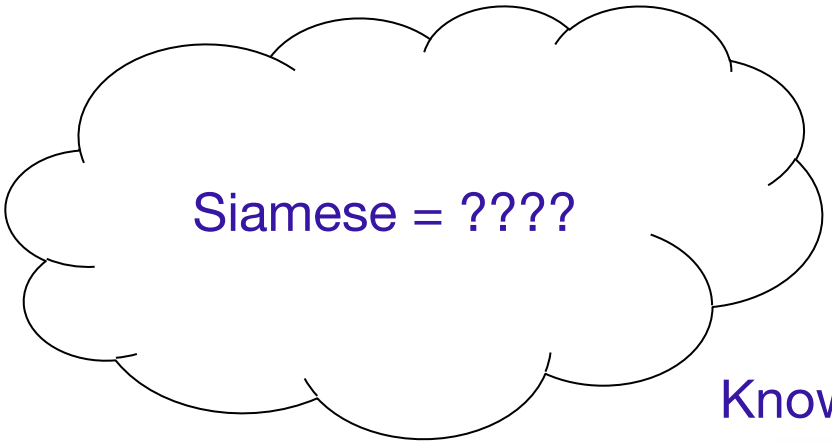
[Extra]

http://www.thelingspace.com/episode-35
https://www.youtube.com/watch?v=Ci-5dVVvf0U
4:14 - 5:06

Knowing what to guess

Lexical constraints

Mutual-exclusivity assumption: assume new word does not overlap in meaning with known word (can be used to overcome whole-object assumption)…not without its own problems (overlapping labels for the same referent)



"Look at the kitty! He's a *siamese*!"

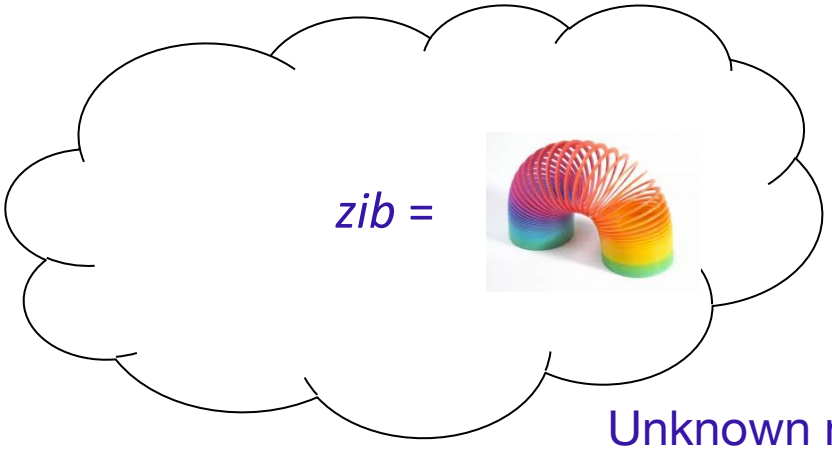
Known: kitty

Knowing what to guess

[Extra]

Lexical constraints

Mutual-exclusivity assumption: Seems to be driven by infant preference to look for novelty (relates to dislike for overlapping meaning, which would be familiar rather than novel). 22-month-olds specifically look for novel objects first when given an unfamiliar label (Mather & Plunkett 2012).



"Look at the *zib*! It's so pretty!"

Unknown name, but familiar toy

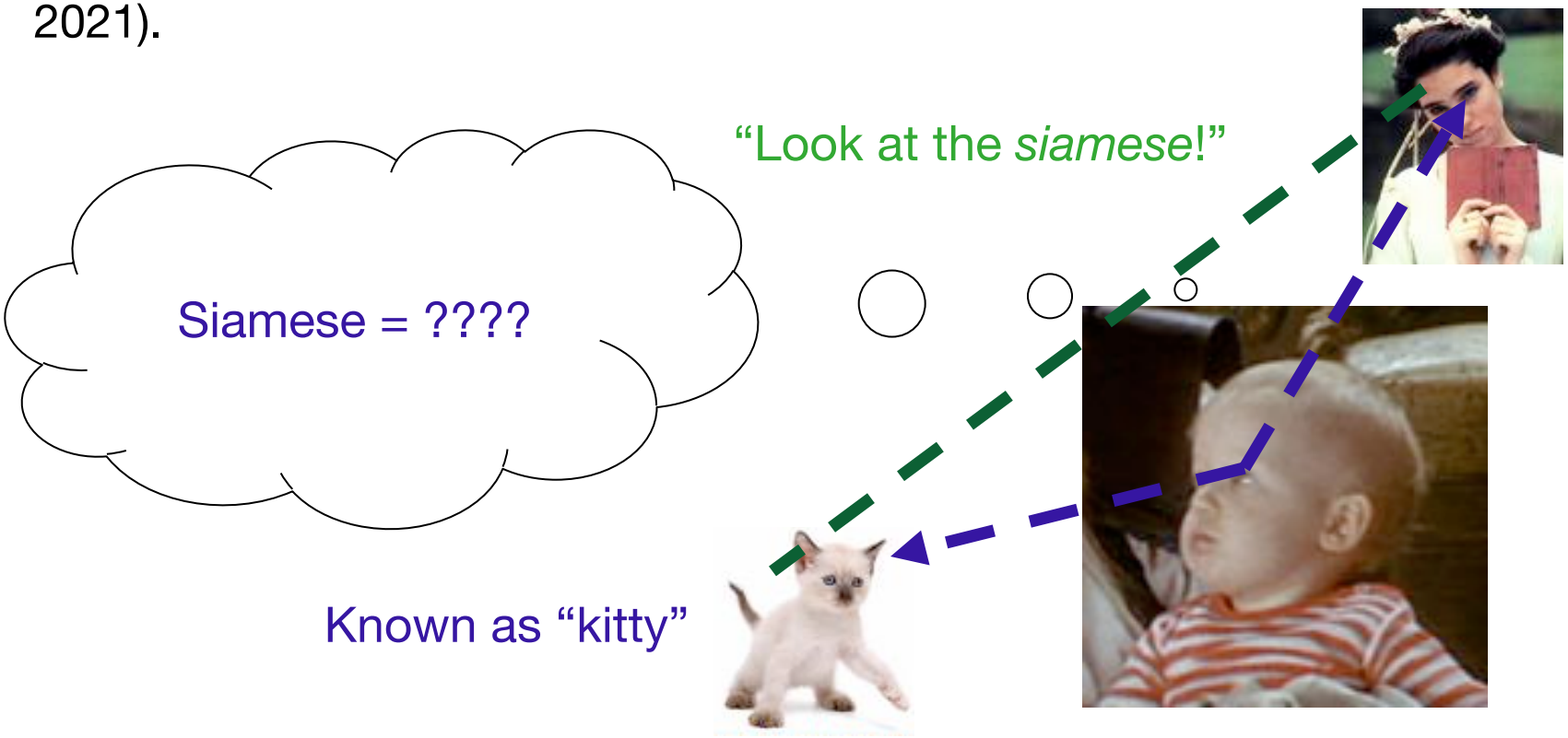
Unknown name & novel

Knowing what to guess

He & Arunchalam 2017

Social Cues

Speakers will look at the novel thing they're talking about: assume new word refers to object of speaker's gaze. Children do this by 18 months (Baldwin 1991), though the ability to successfully use a speaker's eye gaze develops over the first five years (Yurovsky, Wade, Kraus, Gengoux, Hardan, & Frank 2021).



Knowing what to guess

He & Arunchalam 2017

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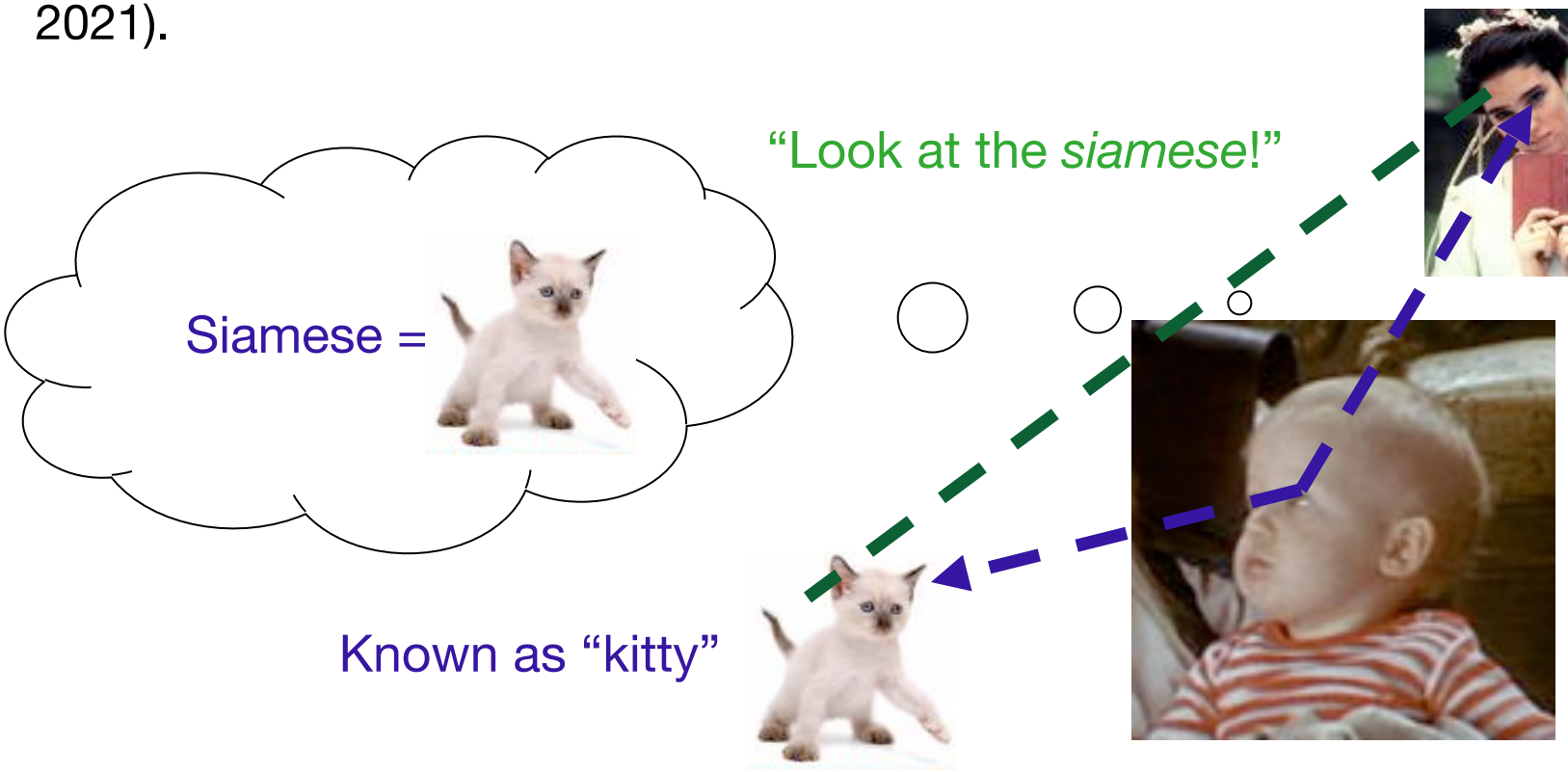
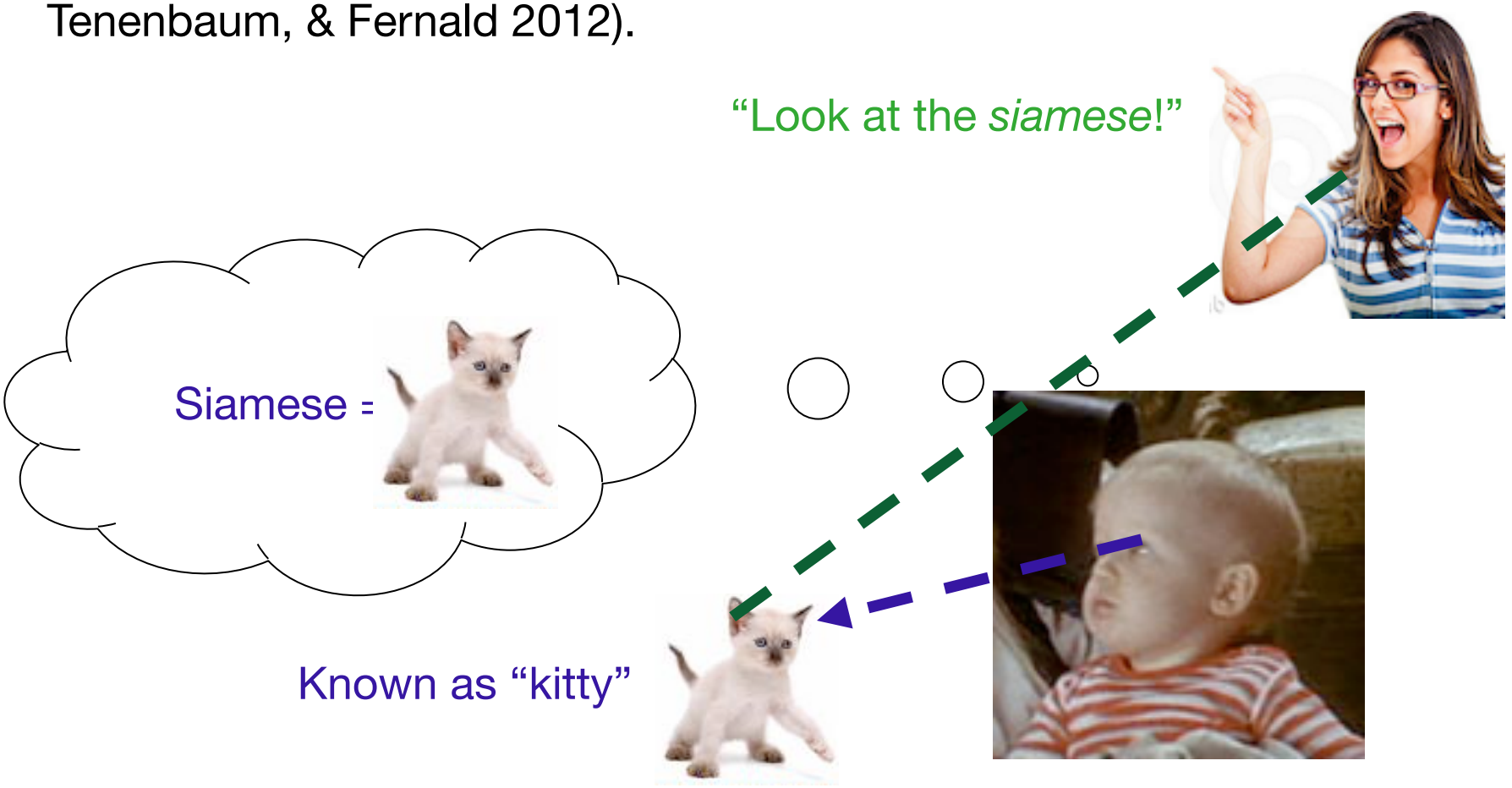


Knowing what to guess

He & Arunchalam 2017

Social Cues

Pointing is an even better cue about the intended referent (Frank, Tenenbaum, & Fernald 2012).



Knowing what to guess

He & Arunchalam 2017

Social Cues

…though Iversen, Capirci, Longobardi, & Caselli (1999) found that only 15% of parental utterances were accompanied by referential gestures like pointing.

"Look at the *siamese*!"

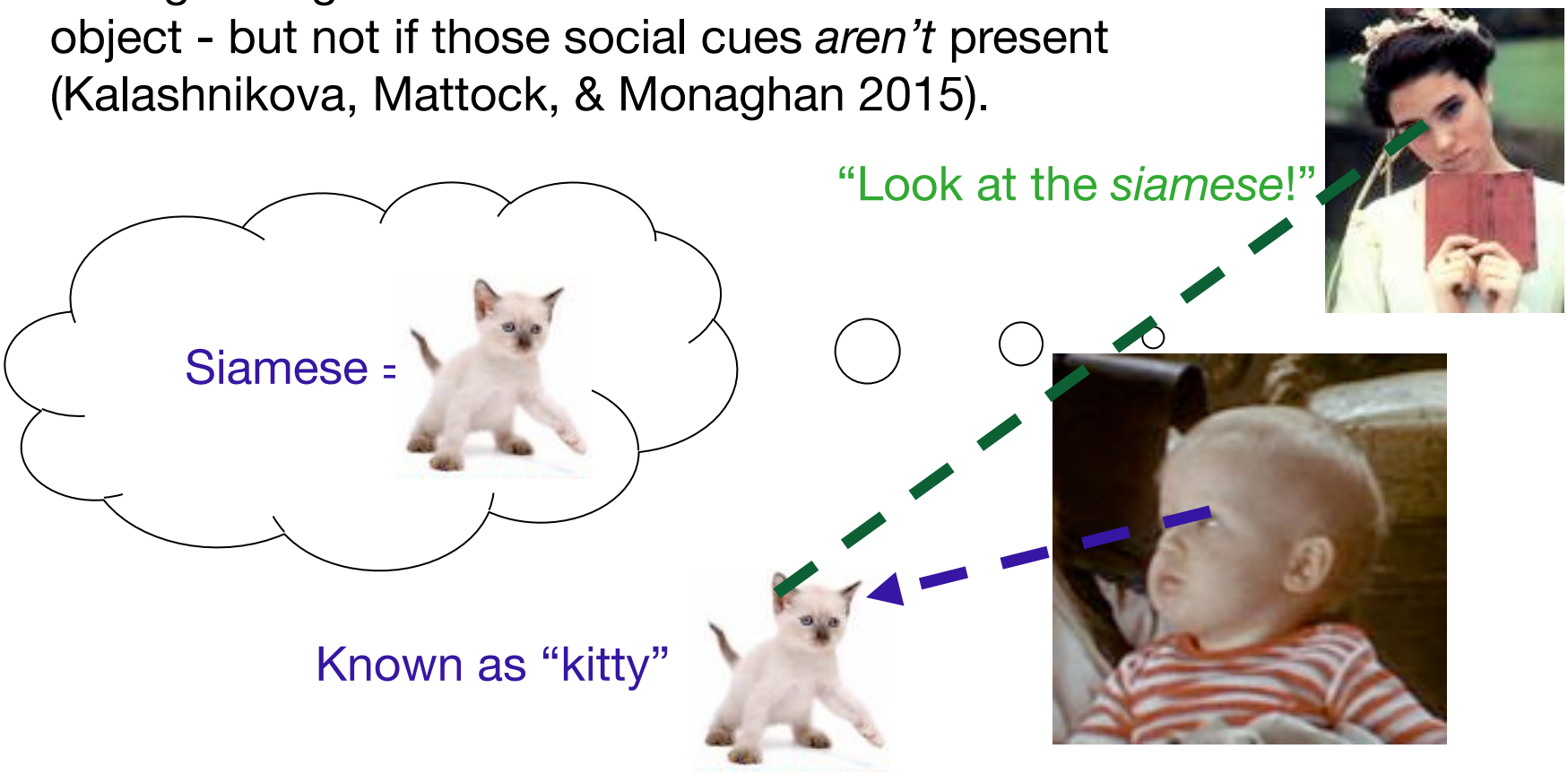
Known as "kitty"

Knowing what to guess

He & Arunchalam 2017

Social Cues

Speaker social cues are important: 4 and 5-year-olds will override mutual exclusivity when a speaker is pointing and having their gaze alternate between the child and the object - but not if those social cues *aren't* present (Kalashnikova, Mattock, & Monaghan 2015).



Knowing what to guess

He & Arunchalam 2017

Social Cues

Speaker social cues are important: Children tend pay attention to things that are in their mother's hands—this simple attentional bias can often lead them to choose items that have recently been manipulated, offered or touched.

(Yu & Smith 2013, Deák, Krasno, Triesch, Lewis, & Sepeta 2014)

Knowing what to guess

Discourse Cues

Young children prefer discourse continuity, where a label for an object is embedded between utterances about the same object (Horowitz & Frank 2013) and they learn novel object labels better this way (Schwab & Lew-Williams 2017).

"How cute he is!
Do you see the *siamese*?
Look at his soft fur."

Known as "kitty"

Knowing what to guess

Discourse Cues

Speakers generally talk to children about the here and now (Quine's problem is not nearly so serious in child-directed speech)

"Look at the *siamese*!"

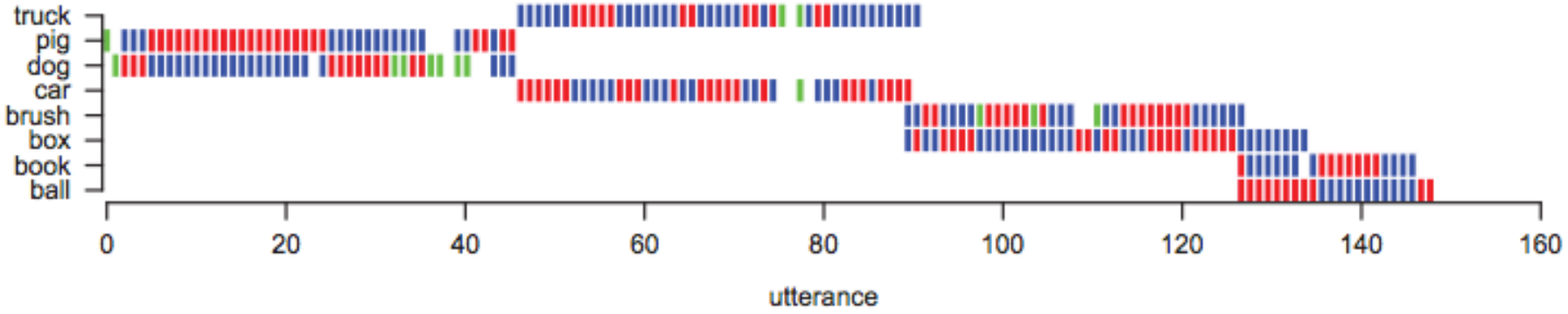
(Not "I just took her to the vet yesterday. Poor thing's been sick all of last week.")

Knowing what to guess

Discourse Cues

Speakers generally talk to children about the here and now (Quine's problem is not nearly so serious in child-directed speech). Also, they tend to talk about the same thing for awhile.

Frank, Tenenbaum, & Fernald 2012
Sample interaction between caretaker and child



Blue = object present but not mentioned
Green = object mentioned but not present
Red = object present and mentioned

Knowing what to guess

Discourse Cues

These extended discourses result in toddlers and parents exhibiting greater sustained attention on objects, and greater coordination between their behaviors.

Suanda, Smith, & Yu 2016

Knowing what to guess

Clues from the input

Highly informative environments, where it's easy for humans to guess the intended referent of the word just from non-linguistic information, involve "joint attention…and clear visual signatures….especially temporal cues indicative of causation."

Yang 2019

temporal cues indicative of causation =
an agent causes something to happen at a particular time

Knowing what to guess

Clues from the input

There's a strong correlation between the first words children learn and how often the objects these words refer to appear in children's environments (visual availability).

Clerkin, Hart, Rehg, Yu, & Smith 2016

https://www.sciencedaily.com/releases/2016/12/161206111633.htm

"…suggests visual experience is doing the heavy lifting in very early word learning."

Knowing what to guess

Clues from the input

Often there may only be a few objects in clear view of the child, as opposed to all the different potential referents an adult sees.

Pereira Smith & Yu 2014, Zhang & Yu 2016, Samuelson & McMurray 2017

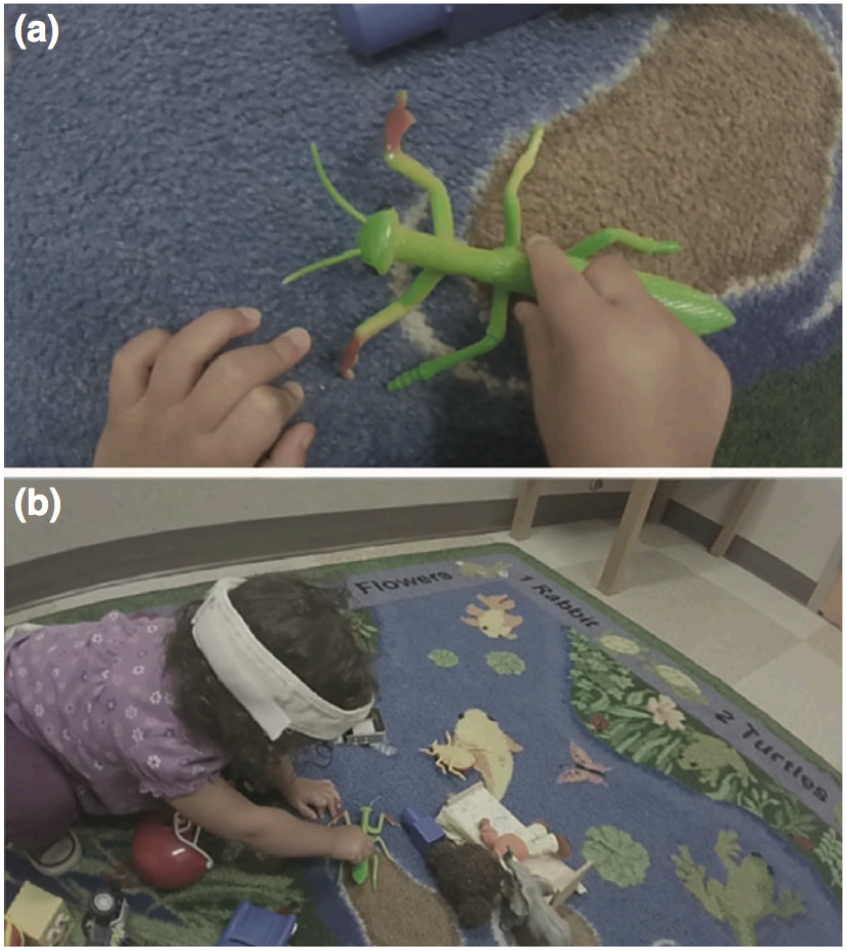
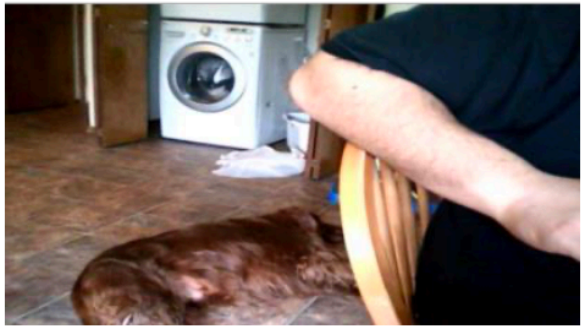
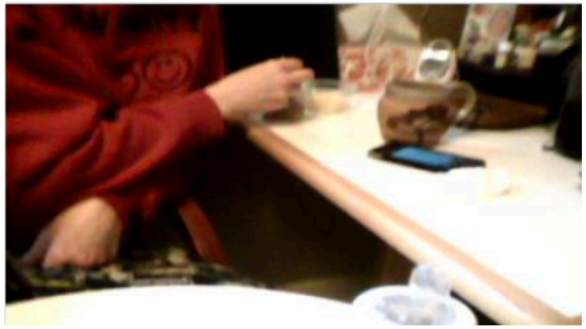


FIGURE 2 | Differences in the number of namable objects in view from the child's (a) and parent's (b) perspective.

Knowing what to guess

Clues from the input

Clerkin & Smith 2019


Also, children seem to learn the names of things that are often visually present earlier.

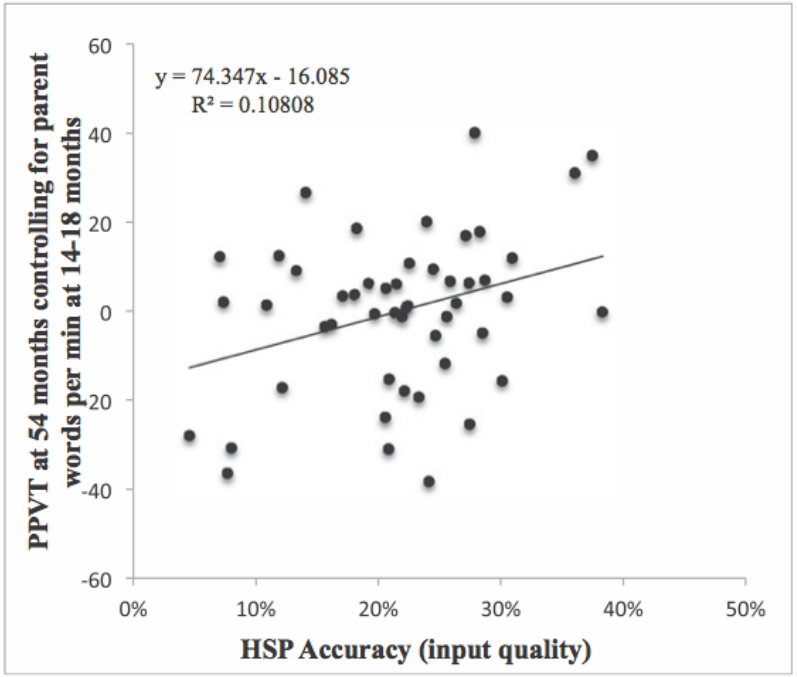
shirt *spoon* *table* *toy* *dog*

Knowing what to guess

Referential certainty

Cartmill, Armstrong, Gleitman, Goldin-Meadow, Medina, & Trueswell 2013 (the utility of talking about the here and now): How easy it is to infer the referent from the surrounding environment (using visual or social cues) predicts vocabulary size up to three years later.

Effect of quality of early input at 14–18 months on child comprehension vocabulary at 54 months. Each point represents a single family (n = 50).



Knowing what to guess

Referential certainty…and other helpful properties

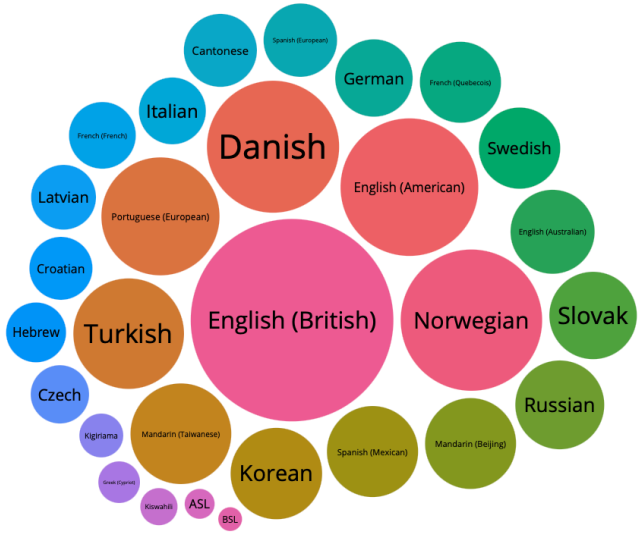
Swingley & Humphrey 2017 (on things children can see and touch):

> Comprehension (at 12 and 15 months) and production (15 months) were predicted by frequency, frequency of occurrence in one-word utterances, concreteness, utterance length, and typical duration.

Knowing what to guess

Referential certainty…and other helpful properties

Frank, Braginsky, Yurovsky, & Marchman 2017 (on things children can see and touch): Across languages, words are likely to be understood and produced by more children if they are more frequent, more frequently the only word in an utterance, shorter, more concrete, more associated with babies, more frequently the final word in an utterance, and appear in shorter utterances.



Recap: Children's lexical development

Children must figure out the lexicon of their language, including the correspondence between sounds and meaning.

Children's first words typically aren't as abstract in meaning as adult meanings of the same words.

When learning nouns, young children use fast mapping to guess an initial meaning of a word.

Often, children make mistakes by either assigning a narrower or wider meaning to a word than adults do. Eventually, through experience with the language, they home in on the correct meaning.

Children have a variety of biases that help them guess word meanings from context.

Questions?

You should be able to do up through question 13 on HW4, and up through question 20 on the lexical development review questions.