

LSci 51/CogS 56L: Acquisition of Language

Lecture 12 Lexical & morphological acquisition III

Morphological acquisition

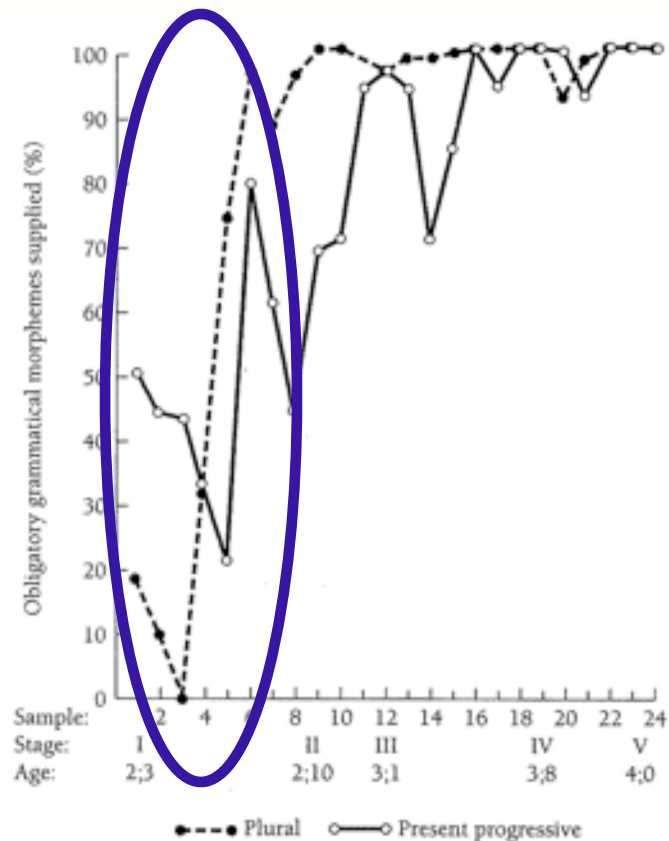


Morphological acquisition

Between 2 and 3 years old, English children begin adding in the more “grammatical” categories - in particular the bound morphemes.

Usage of bound morpheme (either -ing progressive or -s plural) when required

Development is gradual (though may have spurt-like parts), and there are large ranges - not all bound morphemes come in at the same time



THE DEVELOPMENT OF THE PROGRESSIVE AND PLURAL INFLECTIONS IN ONE CHILD'S SPEECH

Getting at children's morphological knowledge: the wug test

<https://www.youtube.com/watch?v=1Lb6phcDte4>

5:41-6:28: the wug test

6:29-7:24: interpreting the wug test



Morphological acquisition

Development is gradual: 2- to 3-year-old English-learning children sometimes use the **bare form of verbs even when they mean the past tense** (like *kiss* instead of *kissed*).

This may be because the past tense in English is a less frequent intended meaning than the present tense, and the present often is a bare form (*I kiss the kitten, you kiss the kitten, we kiss the kitten, ...*). Children have **trouble inhibiting** the more-frequently-used present (bare) form, even while they understand the past tense appropriately (Barak, Harmon, Feldman, Edwards, & Shafto 2023)



Something tricky: English has multipurpose morphology

<https://www.youtube.com/watch?v=Ts2DS0ZsTyo&feature=youtu.be>
4:31-4:52



Morphological acquisition

The order of acquisition for bound morphemes in English does appear to be similar across different children, however (even if their rates of development are quite different).

Brown (1973): three children (Adam, Eve, Sarah)

- | | |
|--------------------------------|---|
| (1) present progressive: | laughing /ɪŋ/ |
| (2) plural: | cats /s/, dogs /z/, glasses /əz/ |
| (3) possessive: | cat's /s/, dog's /z/, glass's /əz/ |
| (4) regular past tense: | touched /t/, hugged /d/, wanted /əd/ |
| (5) 3rd person singular: | laughs /s/, hugs /z/, touches /əz/ |
| (6) contracted be: | The cat's going to /s/, he's going to /z/ |
| (7) contracted auxiliary verb: | he'd like to /d/, he'll have to /l/ |

Note: Chan & Lignos (2011) describe a learning strategy that could cause English children to produce this order, based on how hard or easy it is to recognize that a derived form like “hugs” is related to a base form like “hug”.

Morphological acquisition

The order of acquisition for bound morphemes in English does appear to be similar across different children, however (even if their rates of development are quite different).

But what about development cross-linguistically? Remember, English is fairly impoverished morphologically when compared to languages like Hungarian.

English: “the goblin” = always the same form

Hungarian: “the goblin” may have up to 16 different forms, depending on what “the goblin” ’s role in the sentence is

Morphological acquisition

Important: Morphologically rich languages are not necessarily more difficult for children to learn. Regular/predictable systems are easier for children to learn than languages that have multiple exceptions (like English often does).

Regularity vs. exceptions in English (ex: past tense):

We laughed.

We hugged.

We danced.

* We **singed**. (We sang.)

* We **runned**. (We ran.)

Morphological acquisition

Other factors that help make morphology easier to learn:

- **high frequency** (more frequent morphemes are easier)
- **regularity** in form (morpheme is always the same)
- **fixed position** relative to the stem (ex: morpheme always attaches to the end of the word)
- morpheme is easy to recognize as **separate** from the stem (ex: laugh + **ing**)
- rhythm of language makes morpheme **perceptually salient** (ex: receives stress)

Morphological acquisition

Things that make acquisition easier

In Chintang, a Sino-Tibetan language spoken in Nepal, there are three different morphemes indicating **aspect** (e.g., **perfective vs. imperfective**).

The **most frequent** morpheme is acquired earliest, while **regularity**, **position**, and **separability** predict order of acquisition for the other morphemes (Mažara & Stoll 2021)



Morphological acquisition

But development is still gradual: Spanish-learning children sometimes use the **third singular present form of verbs even when they mean other things** (like *besa* (he/she/it kisses) instead of *beso* (I kiss), *besas* (you-sg kiss), or *besan* (they kiss)).

This may be because the third singular present form is **more frequent, easier to remember, or has an aspect of its meaning that's easier to remember** than the **alternative appropriate forms**.

(Barak, Echeverri, Feldman, & Shafto 2023)



Morphological acquisition recap

Children must learn how their language puts words together, and what types of meaning can be conveyed via morphology.

Not all morphology is acquired at the same time — different factors like frequency, separability, and position (among others) make some morphology easier to acquire than others.

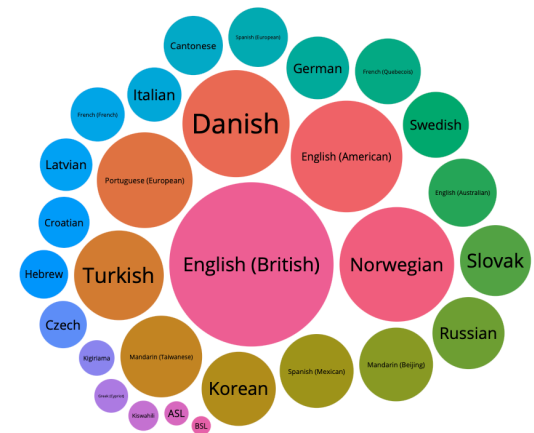
Languages of the world vary in how rich their morphological systems are. Importantly, just having more morphology doesn't make a system hard to learn: predictable systems are easier to learn than unpredictable systems, no matter how much morphology there is (or isn't) in the language.

Lexical acquisition recap:

A lot of nouns early on



Braginsky, Yurovsky, Marchman, & Frank
2015, 2017: “**over-representation of nouns**” in
early vocabularies.



Adults and older children have more variety, including more abstract nouns, as well as other syntactic categories like **verbs** (*laugh, kiss*), **prepositions** (*with, from*), **determiners** (*the, a*), and **adjectives** (*silly*).

So what about those other word types?

other syntactic categories like **verbs** (*laugh, kiss*),
prepositions (*with, from*), **determiners** (*the, a*), and
adjectives (*silly*).

How might verbs be learned?

Proposal for vocabulary development (Snedeker & Gleitman 2002):

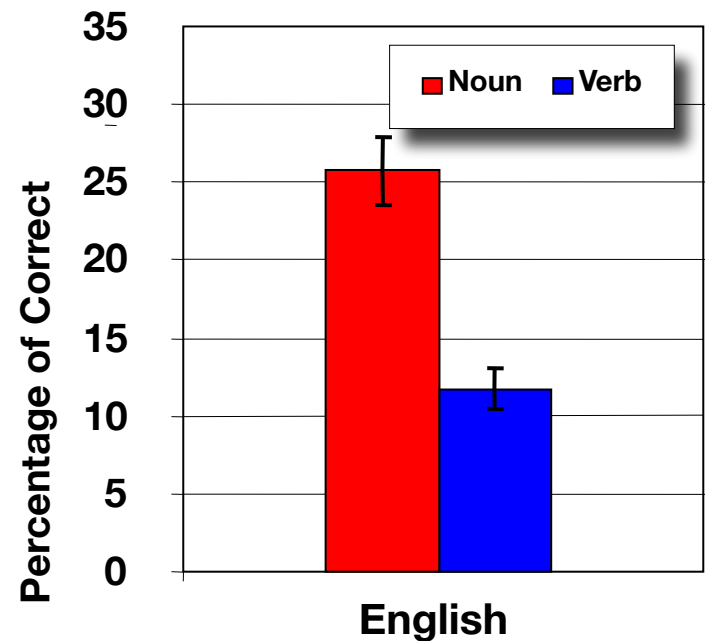
1. Learn from Scenes

- Child relies on situational context alone
- Can learn only **very concrete words: object labels**



Remember: Nouns seem to be easier to guess from context

(Snedeker, Gleitman, and Brent 1999)



How might verbs be learned?

Proposal for vocabulary development (Snedeker & Gleitman 2002):

1. Learn from Scenes

2. Learn from Nouns

- Object labels provide richer representation of linguistic context
- Utterance = set of known nouns
- Child can learn concrete relational words like spatial prepositions (ex: “near”) and many verbs

I, it, you

How might verbs be learned?

Proposal for vocabulary development (Snedeker & Gleitman 2002):

1. Learn from Scenes

2. Learn from Nouns

3. Learn from Syntactic Frames

- Learning relational words allows the child to learn the basic grammar of her language
- Utterance is represented as a syntactic structure + known words
- This representation allows the child to learn more abstract words

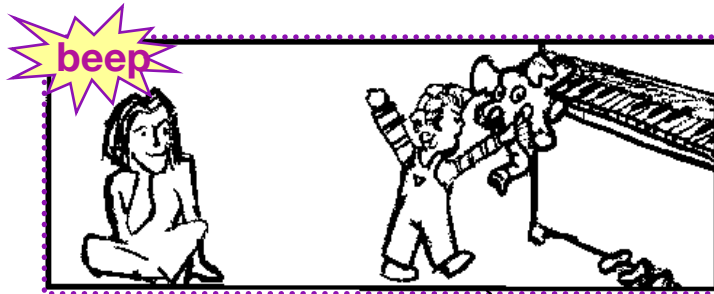
Can po SIRD while lo nirp nu?

Snedeker & Gleitman (2002)

- Targets
 - Videotaped interactions of 4 mother-child pairs
 - 24 most common **verbs** chosen as targets
 - for each target, 6 instances randomly selected
- Subjects participated in one of 7 Information Conditions
 - Scenes
 - Nouns
 - Frames
 - Scenes + Nouns
 - Scenes + Frames
 - Nouns + Frames
 - Scenes + Nouns + Frames

Scenes condition

Example “mystery verb”: “play”



Task: Subjects guess mystery verb from watching 6 instances of word use in video clips. The video clips are silent except beeps replace the moments the mystery word were uttered.

Guess word.



Guess word again.

Etc....

Final guess

On to next mystery verb

Nouns condition

Example “mystery verb”: “play”

1. elephant, piano

Guess word.

2. mommy

Guess word again.

3. I, it, you

Guess word again.

4. it, you

Guess word again.

5. drums

Guess word again.

6. music, you

Task: Subjects shown the nouns co-occurring with the mystery verb in 6 sentences, the same sentences as those in the video clips with the beeps.

Final guess

On to next mystery verb

Frames condition

Example “mystery verb”: “play”

1. Can kax SIRD the bussit?

Guess word.

2. Noggle SIRD?

Guess word again.

3. Can po SIRD while lo nirp nu?

Guess word again.

4. Lo are gonna SIRD nu?

Guess word again.

5. SIRD the neps.

Guess word again.

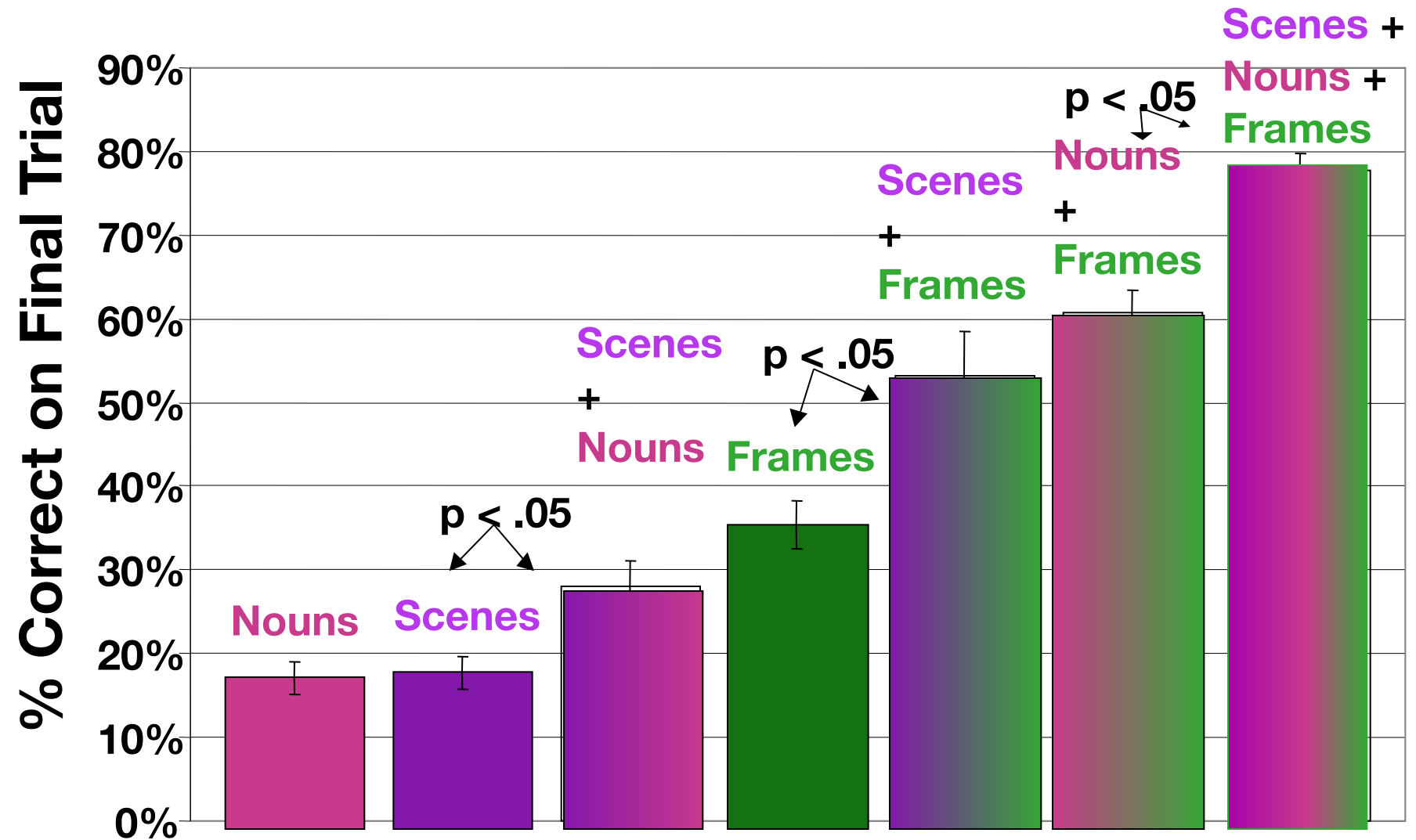
6. Lo SIRD tuggy wilm.

Task: Subjects guess the mystery verb from the 6 sentence frames. The sentence frames are constructed by replacing words in the 6 utterances with nonsense words.

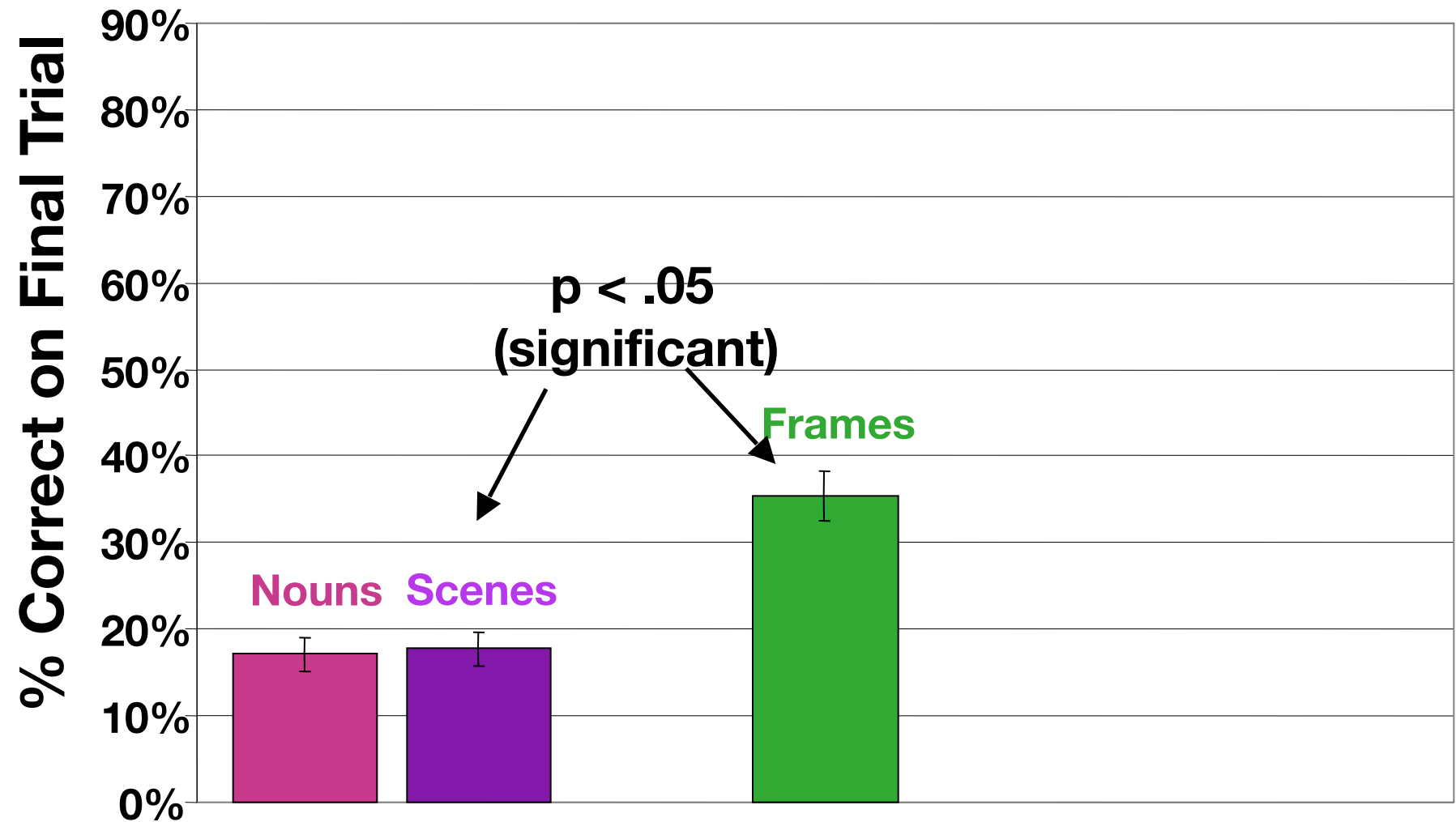
Final guess

On to next mystery verb

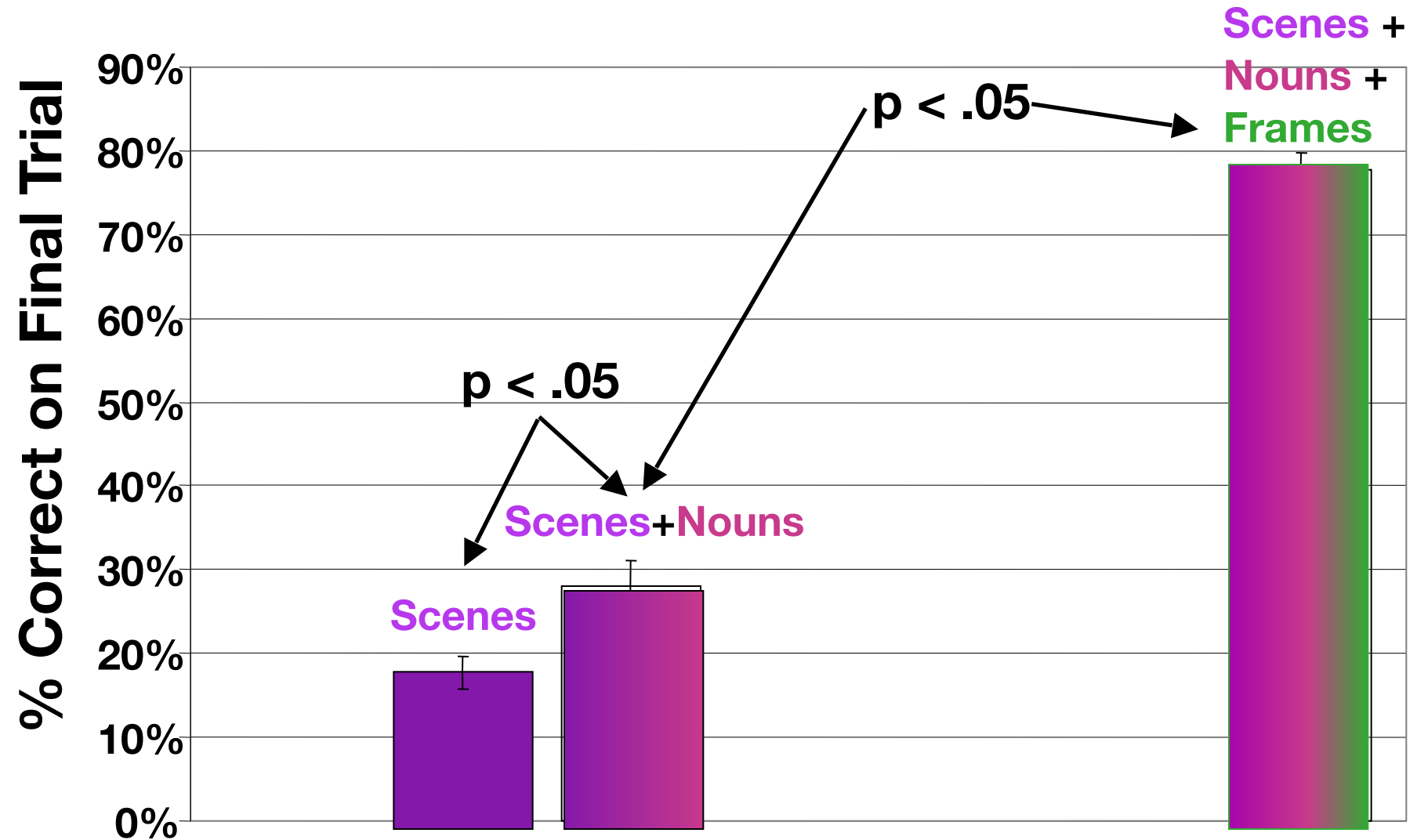
Correct identification varies with information condition



Syntactic frame information alone is
best if you only get one

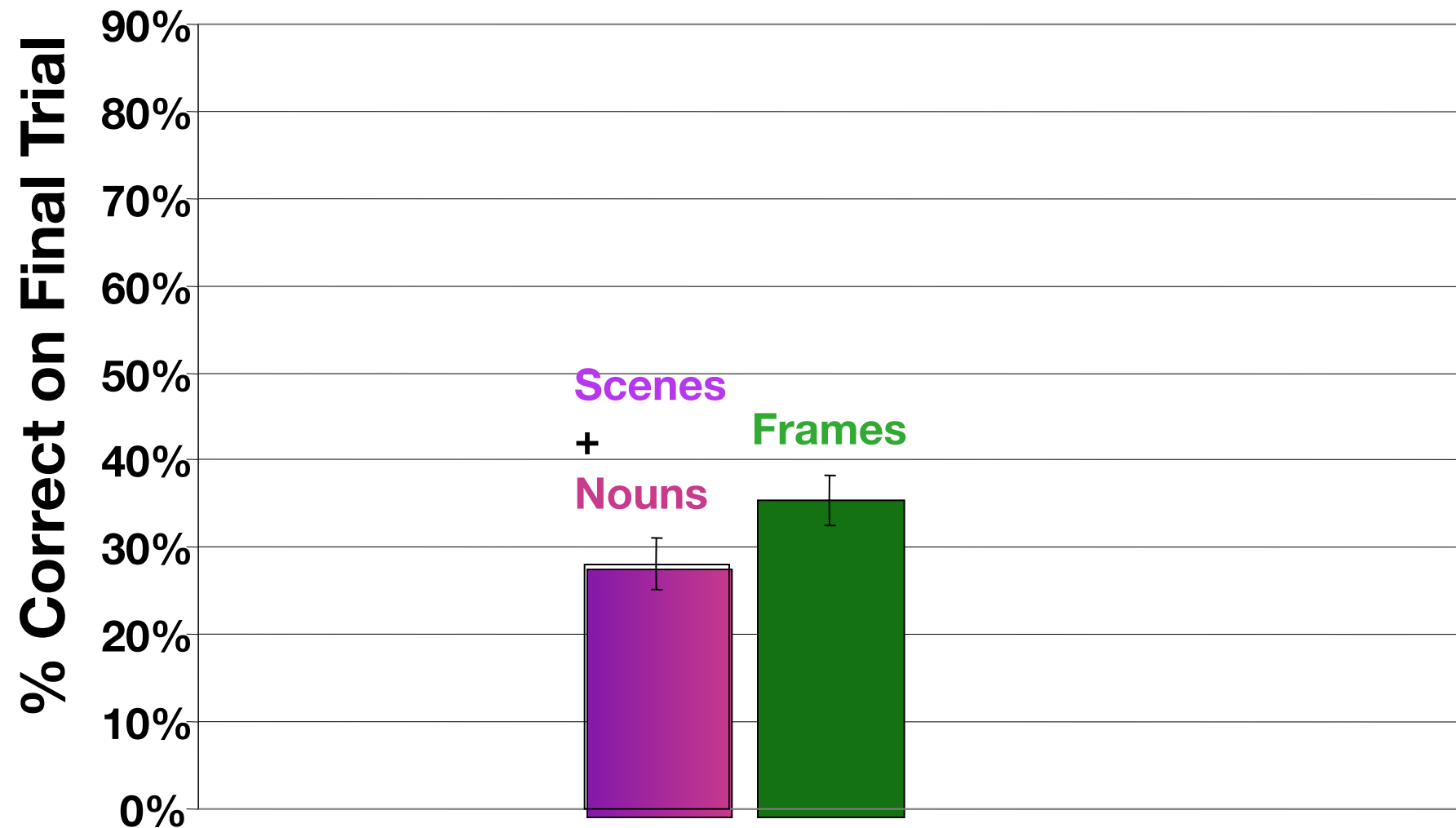


Having more information of different types definitely helps



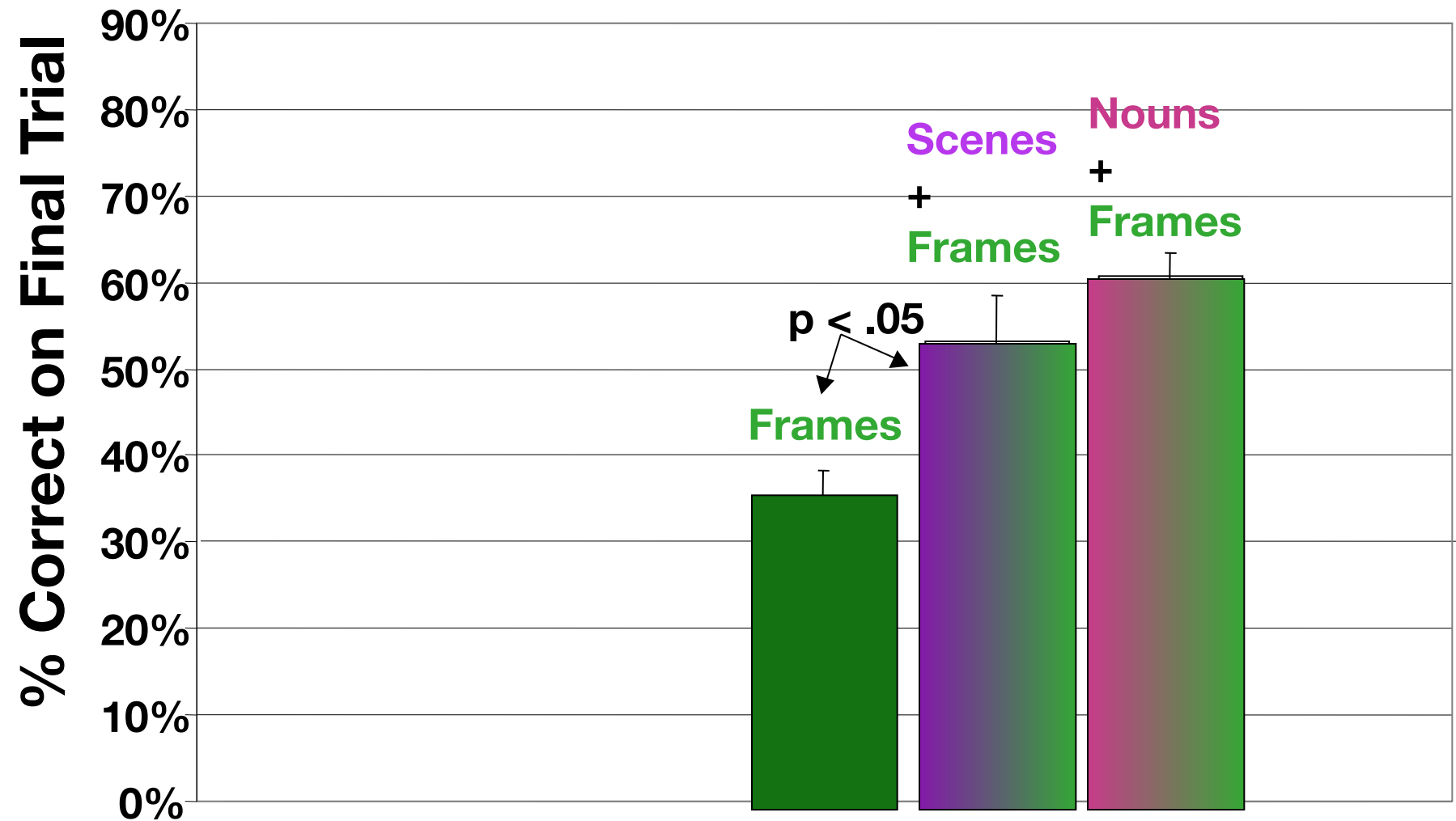
Utility of syntactic frame knowledge:

Scenes + Nouns equivalent to Syntactic Frames only



Utility of additional knowledge with Frames:

Scenes + Frames equivalent to Nouns + Frames which is better than Frames alone



So Snedeker & Gleitman (2002) have shown that maybe learning verbs isn't so bad once you have some linguistic background (like knowing some **nouns** and some **syntactic frames**) and informative situational context (**scenes**)



Additional support for this idea: **visual** information (especially from the **child's viewpoint**) + **linguistic context** information is helpful for human learners (Zhang, Amatuni, Cain, Wang, Crandall, & You 2021)

Leveraging known words

On Borovsky, Ellis, Evans, & Elman 2015:

“Children leverage their early world knowledge to help them unlock their language skills. **Knowing a few related words helps children recognize links between new word meanings**, and this could be a very useful strategy for helping children learn vocabulary early in life. This might be part of the explanation for why children begin to start 'talking up a storm' between the ages of 18-24 months.” — Arielle Borovsky



<https://www.sciencedaily.com/releases/2015/10/151012132455.htm>

Knowing what to guess

Clues from the input

27-month-olds (LaTourrette, Waxman, Wakschlag, Norton & Adriana Weisleder 2023) and 19-month-olds (Ferguson, Graf, & Waxman 2014, 2018) and can **use known words** (like the verb “crying”) to figure out unknown words.

Ferguson, Graf, & Waxman 2014, 2018

Sample test scenario, where only animate things can cry



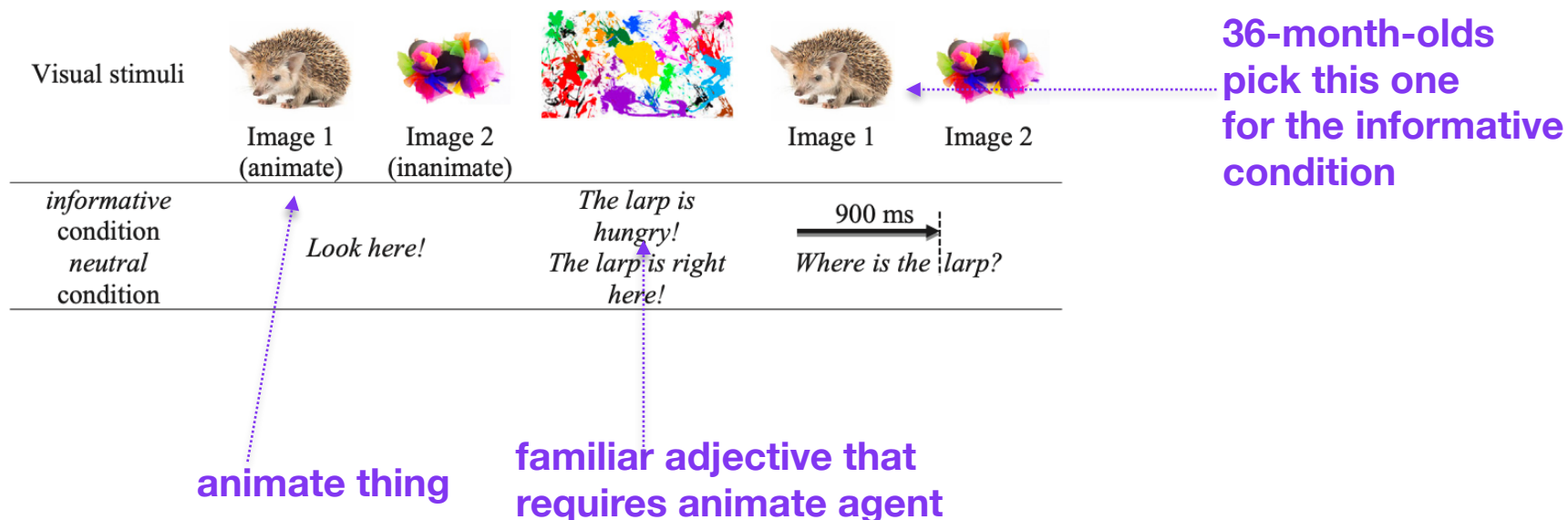
Knowing what to guess

Clues from the input

...but it's not till 36 months, that children can use **known adjectives** (like “**hungry**”) to figure out unknown words.

Syrett, LaTourrette, Ferguson, & Waxman 2019

Sample test scenario, where only animate things can be hungry



Knowing what to guess

Clues from the input: what you know helps you learn new things

Ferguson, Graf, & Waxman 2018: At both 19 and 24 months, the number of verbs infants know predicts their ability to use known verbs to learn novel nouns.



Knowing what to guess

Clues from the syntactic structure

Different syntactic categories (noun, verb, etc.) tend to have different meanings. Once children have identified some syntactic categories (after ~14 months), they can use the syntactic structure (how words appear together) as a clue to meaning.



“Those are goblins.”

goblins = noun

nouns = objects

goblins =



Using syntactic structure

[Extra]

<http://www.thelingspace.com/episode-35>

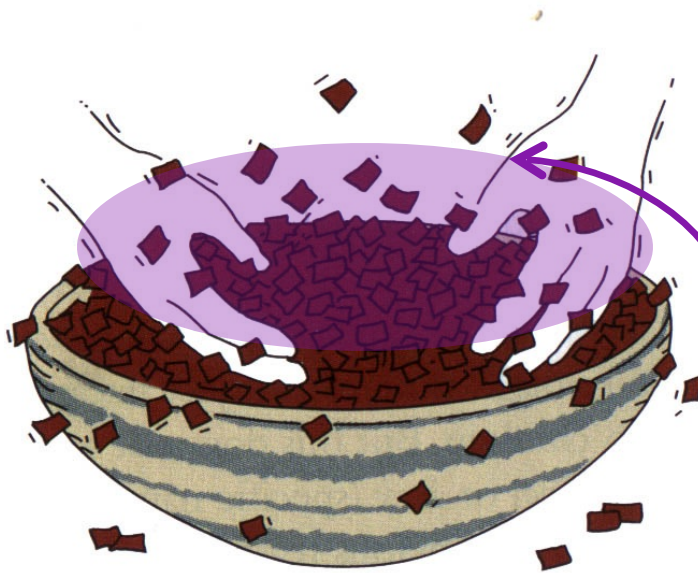
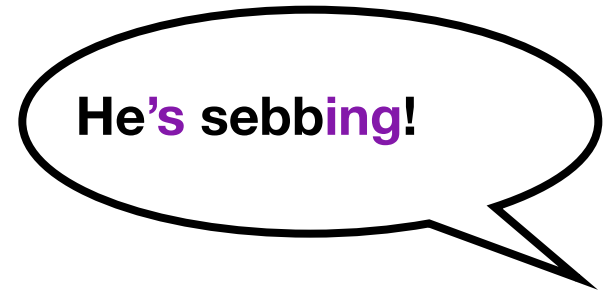
<https://www.youtube.com/watch?v=Ci-5dVVvf0U>

5:07 - 6:19



Knowing what to guess

Clues from the syntactic structure



seb = verb

verb = action

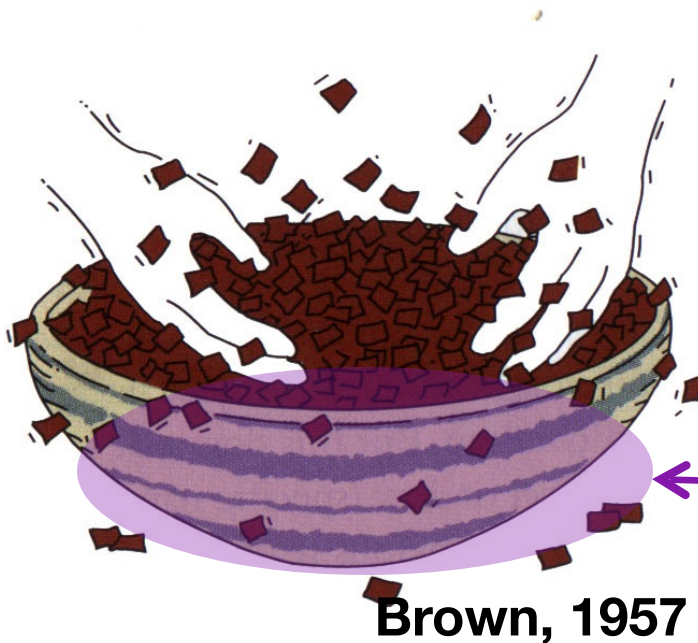
seb

Brown, 1957

Knowing what to guess

Clues from the syntactic structure

Look – **a** seb!



seb = noun with “a”

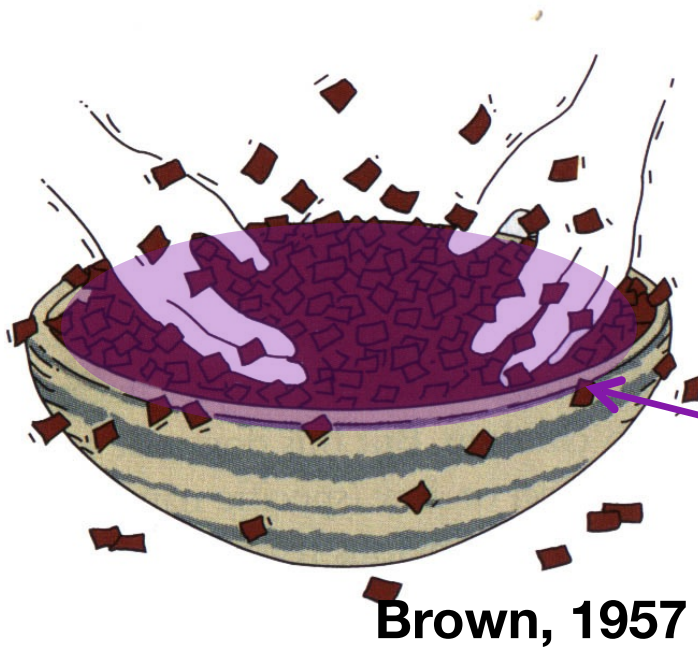
noun = countable object
like “bowl”

seb

Knowing what to guess

Clues from the syntactic structure

Look – **some** seb!



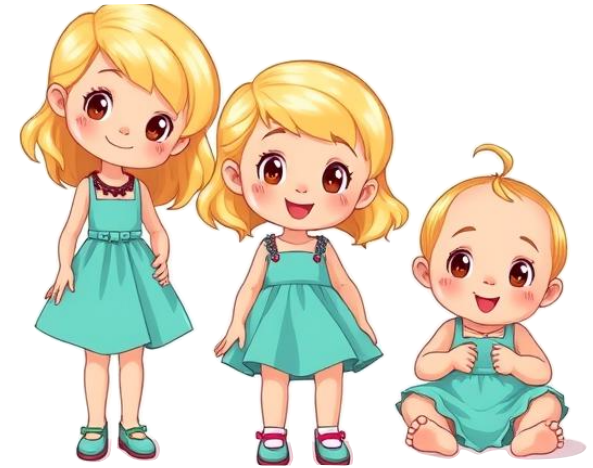
seb = noun with “some”

noun = mass substance
like “stuff”

seb

Knowing what to guess

Clues from the syntactic structure



Kids are able to do the same thing at different ages

3- and 4-year-olds: He, Kon, & Arunachalam 2019 (“The penguin **is pilking**”)

2-year-olds: Klein & Snedeker 2015 (I’**m daxing** (to) my toy” vs.)

27-month-olds: Syrett, Arunachalam, & Waxman 2014 (“It’s **gonna pilk slowly**”)

23-month-olds: Bernard et al. 2007 (“It dase**s**” vs. “**a** dase”)

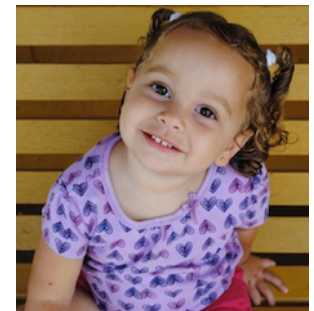
18-month-olds: He & Lidz 2017 (“it’**s** pratching”)

Knowing what to guess

Clues from the syntactic structure

Paquette-Smith & Johnson 2016: 2-year-olds already rely on some grammatical cues more than eye gaze in cases of ambiguity.

Training 1		"THESE ARE nice blicketS. Can you find the blicketS?"	
2		"Where IS the blicket_? Can you see A blicket_?"	



During training, the speaker looks at a different referent than what the grammatical cues indicate.

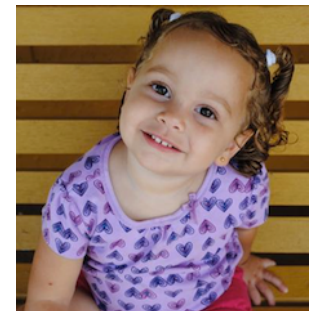


Knowing what to guess

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Training 1		"THESE ARE nice blicketS. Can you find the blicketS?"	
2		"Where IS the blicket_? Can you see A blicket_?"	



Two-year-olds prioritize the grammatical cues and figure out the right referent.

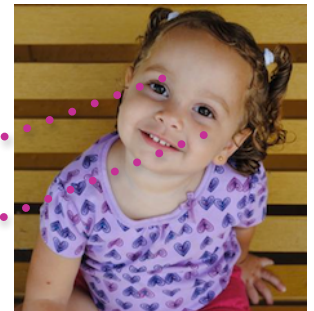


Knowing what to guess

Clues from the syntactic structure

Paquette-Smith & Johnson 2016: 2-year-olds already rely on some grammatical cues more than eye gaze in cases of ambiguity.

We can see this because they **look to the correct referent** when we test them afterwards (and the grammatical cues are again present).



Test 1		 "Look at the blicket. Do you like IT ?"	
2		 "Look at the blicketS? Do you like THEM ?"	

Knowing what to guess

Clues from the syntactic structure

Paquette-Smith & Johnson 2016: 2-year-olds already rely on some grammatical cues more than eye gaze in cases of ambiguity.

One thought on why this might be from Lidz (2019):

Children “expect words with similar meanings to have similar distributions, and so learning depends on a memory for syntactic environments. The [non-linguistic] context in which a word is used is less constrained and hence contributes less to the memories that drive word learning.”

grammatical cues = syntactic environment

eye gaze = non-linguistic context



Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

Naigles (1990): 2-year-olds can use syntactic structure to guess aspects of word meaning, including the difference between transitive and intransitive verbs



Transitive: The rabbit is **gorping** the duck.
(expectation: rabbit is doing something to the duck)



Intransitive: The rabbit and the duck are **gorping**.
(expectation: rabbit and duck doing actions separately)



Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

Yuan & Fisher (2009), Scott & Fisher (2009), Messenger, Yuan, & Fisher (2015):
2-year-olds can keep track of the syntactic structures in which a verb appears and use that to infer a verb's meaning.



Example verb: kiss

Transitive dialogue

A: Guess what? Jane blicked the baby!

B: Hmm. She blicked the baby?

A: And Bill was blicking the duck.

B: Yeah, he was blicking the duck.

Intransitive dialogue

Example verb: sneeze

A: Guess what? Jane blicked!

B: Hmm. She blicked?

A: And Bill was blicking .

B: Yeah, he was blicking.

Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

Yuan & Fisher (2009), Scott & Fisher (2009), Messenger, Yuan, & Fisher (2015):
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Causal dialogue

Example verb: melt

A: Matt dacked the pillow.

B: Really? He dacked the pillow?

A: Yeah. The pillow dacked.

B: Right. It dacked.

Unspecified-object dialogue Example verb: eat

A: Matt dacked the pillow.

B: Really? He dacked the pillow?

A: Yeah. He dacked.

B: Right. He dacked.

Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

18-month-old children recognize that **determiners** (like *the*) precede **nouns** (like *ball*) (Cauvet et al. 2014, Kedar, Casasola, Lust, & Parmet 2017, de Carvalho, He, Lidz, & Christophe 2019) and **pronouns** (like *I*) precede **verbs** (like *eat*) (Cauvet et al. 2014).



Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

Harrigan, Hacquard, & Lidz (2019, 2022): Four-year-olds can use the syntactic context to tell the (subtle) differences between mental state verbs reflecting attitudes, like *think*, *want*, and *hope*.

Jack ____s that Lily is home.

think
✓

Jack ____s to be home.

want
✓
✓

Jack ____s Lily to be home.

hope
✓
✓
✓

Jack ____s for Lily to be home.



Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

Li 2022: Mandarin also has subtle syntactic differences children could notice between mental verbs like *know* and perception verbs like *see*.



Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

Gotowski & Syrett 2023: English has subtle syntactic differences that children could track to tell the difference between subjective adjectives like **tough**, **pretty**, **smart**, **tasty**, and **tall**.

This game is ____

This dress is ____ to wear to a party.

This kitten looks ____ to me.

It is ____ for her to pet the kitten gently.

Petting the kitten gently is ____.



Knowing what to guess

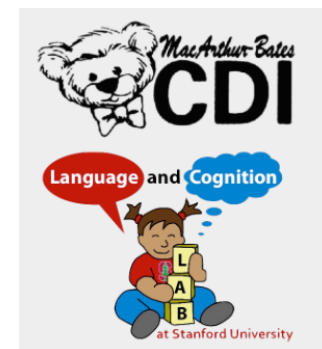
Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

Braginsky, Yurovsky, Marchman, & Frank 2016: While concreteness tends to predict the age of acquisition for nouns, **knowledge of linguistic structure is a good predictor for function words** like *how*, *why*, and *his*. This is true across seven different languages (English, Italian, Norwegian, Russian, Spanish, Swedish, Turkish) from the Wordbank database.

<http://wordbank.stanford.edu>

Wordbank

An open database of children's vocabulary development



Knowing what to guess

Syntactic Bootstrapping Hypothesis: primarily using the syntactic structure to get to meaning

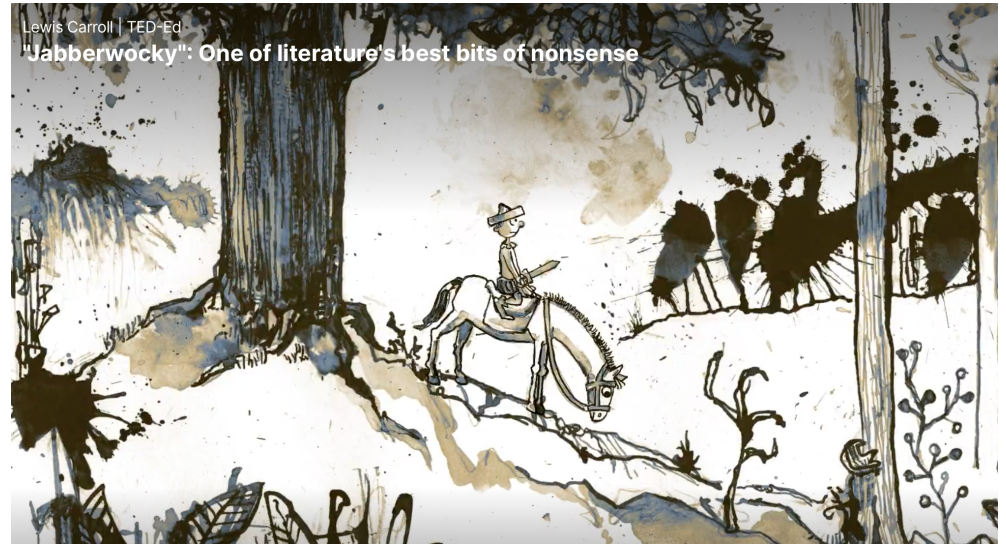
Abend, Kwiatkowski, Smith, Goldwater, & Steedman 2017: Syntactic bootstrapping may also play a part in children's **early noun bias**. The **relevant linguistic context for nouns is actually learned earlier** than the relevant linguistic context for verbs. This means nouns, in addition to being easier to pick up from the referential context (like scene information), are easier to pick up from the linguistic context.



Getting a sense of how a child might feel

Jabberwocky, by Lewis Carroll

Twas brillig, and the slithy toves
Did gyre and gimble in the wabe:
All mimsy were the borogoves,
And the mome raths outgrabe



[https://www.ted.com/talks/
lewis_carroll_jabberwocky_one_of_literature_s_best_bits_of_nonsense?
utm_campaign=tedsread&utm_medium=referral&utm_source=tedcomshare](https://www.ted.com/talks/lewis_carroll_jabberwocky_one_of_literature_s_best_bits_of_nonsense?utm_campaign=tedsread&utm_medium=referral&utm_source=tedcomshare)

Getting a sense of how a child might feel

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Did **gyre** and **gimble** in the **wabe**:
All **mimsy** were the **borogoves**,
And the **mome** raths **outgrabe**

adjectives

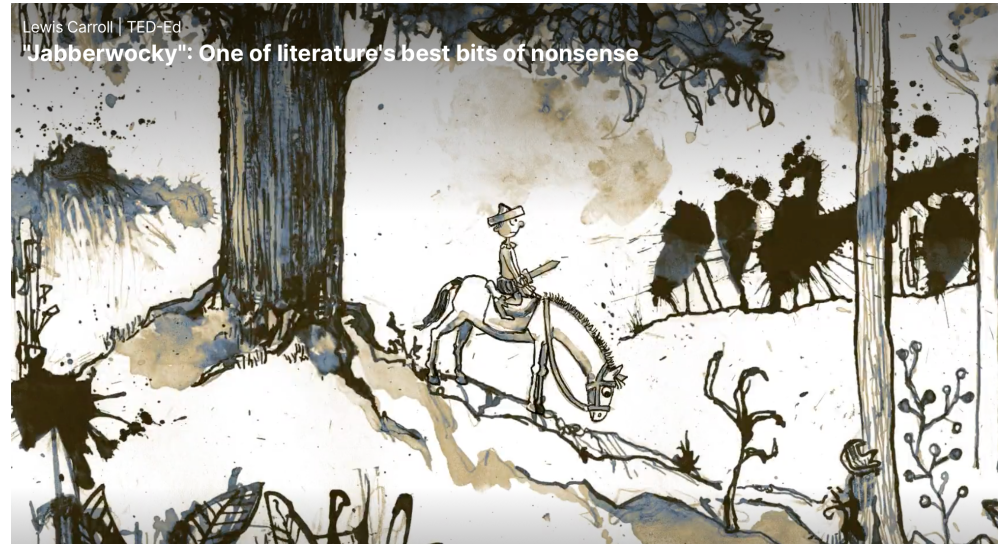
properties

nouns

*things
stuff*

verbs

actions



[https://www.ted.com/talks/
lewis_carroll_jabberwocky_one_of_literature_s_best_bits_of_nonsense?
utm_campaign=tedsread&utm_medium=referral&utm_source=tedcomshare](https://www.ted.com/talks/lewis_carroll_jabberwocky_one_of_literature_s_best_bits_of_nonsense?utm_campaign=tedsread&utm_medium=referral&utm_source=tedcomshare)

Getting a sense of how a child might feel

From *But n Ben A-Go-Go*, Matthew Fitt (2000), p.85

But his *hert cawed* him on. He *nou* had the information he had been *tryin tae jalouse* on his *ain aw* these years. Or *pairt o* it *onywey*. A *whusper*. A *hauf* truth. *An* the time had come *tae mak siccar*. He would meet with Broon *an tak fae* him *whit wis* needed.

Some contextual clues available (syntactic bootstrapping + known words).

Getting a sense of how a child might feel

From *But n Ben A-Go-Go*, Matthew Fitt (2000), p.85

But his heart called him on. He now had the information he had been trying to jalouse on his ain all these years. Or part of it anyway. A whisper. A half truth. And the time had come to make siccar. He would meet with Broon and take fae him what was needed.

Add in knowledge of “near-words” that sound close to recognizable words.

Remaining: jalouse, ain, siccar, fae?

Getting a sense of how a child might feel

From *But n Ben A-Go-Go*, Matthew Fitt (2000), p.85

But his heart called him on. He now had the information he had been trying to jalouse on his own all these years. Or part of it anyway. A whisper. A half truth. And the time had come to make siccar. He would meet with Broon and take from him what was needed.

Guess common words by their position in the sentence
(syntactic bootstrapping).

Still remaining: jalouse, siccar?

What are your guesses as to what these words mean? Why?

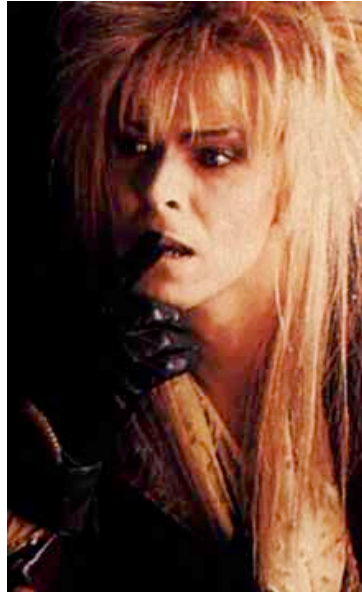
Lexical acquisition recap

Children have to figure out what concept a word refers to. Children may be able to figure out verbs by relying more on the linguistic context, including words and structures they already recognize. This is sometimes called the “syntactic bootstrapping hypothesis”.

There is a lot of evidence that young children learn to rely quickly on linguistic cues more than other types of cues (social, visual, etc.)



Questions?



You should be able to do up through 18 on HW4 and up through 28 on the review questions for lexical and morphological acquisition.