 CLASS 5

VERB LEARNING, SYNTACTIC BOOTSTRAPPING

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Gavagai!

Quine, 1960

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“The trouble is that an observer who notices *everything* can learn *nothing*, for there is no end of categories known and constructible to describe a situation.” (Gleitman, 1990)



Cues to Word Meaning

What kind of cues do kids have to help them learn word meanings?



Cues to Word Meaning (review)

- Whole Object Bias (Markman 1994)
- Taxonomic Bias (Klibanoff & Waxman 2000; Waxman & Markow 1998)
- Shape Bias (Landau, Smith, & Jones 1988, 1998)
- Mutual Exclusivity (Markman & Wachtel 1988)/Novel-name Nameless-Category (Golinkoff, Mervis, & Hirsh-Pasek 1994)
- Principle of Contrast (Clark 1987)
- Joint attention (Baldwin 1993, Tomasello 2001, Clark 2004)

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Verbs are harder to learn

- Kids don't usually hear verbs as often as nouns
- Verbs come in the middle of sentences.
- Verbs vary more from instance to instance.
- They label relations between things, not things themselves.
- They are harder to observe.



Ok, but WHY are verbs harder to learn?

- Is it because verbs label things that are hard to understand, and kids don't understand those things yet?
- Or is it because the meanings of verbs are harder to pin down than the meanings of nouns on the basis of observation?



Human Simulation Paradigm

Instructions:

- Watch each video.
- When you hear a beep, guess the word the caregiver was saying.
- You'll get two guesses for each word.



Human Simulation Paradigm

A: bag (easy noun)

Group 1: _____

Group 2: _____ it, you

Group 3: _____ Did XXX XXX XXX in the ____ ?

Group 4: _____ Did you put it in the ____ ?

Gillette, Gleitman, Gleitman & Lederer (1999)

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Human Simulation Paradigm

Learning conditions:

Group 1: cross-situational observation

Group 2: + co-occurring nouns in alphabetical order

Group 3: + syntactic frame with no content words

Group 4: + full sentence

Gillette, Gleitman, Gleitman & Lederer (1999)

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Human Simulation Paradigm

B: throw (easy verb)

Group 1: _____

Group 2: _____ it, we

Group 3: _____ Should XXX ____ XXX?

Group 4: _____ Should we ____ it?

Gillette, Gleitman, Gleitman & Lederer (1999)

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Human Simulation Paradigm

C: toy (hard noun)

Group 1: _____

Group 2: _____ we

Group 3: _____ Should XXX XXX with this ____?

Group 4: _____ Should we play with this ____ ?

Gillette, Gleitman, Gleitman & Lederer (1999)

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Human Simulation Paradigm

D: know (hard verb)

Group 1: _____

Group 2: _____ it, you

Group 3: _____ Do XXX ____ where to XXX XXX?

Group 4: _____ Do you ____ where to put it?

Gillette, Gleitman, Gleitman & Lederer (1999)

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Human Simulation Paradigm

Nonlinguistic cue to verb meaning:

- Cross-situational observation 7.7% correct

+ Linguistic cues to verb meaning:

- Co-occurring nouns 29% correct
- Syntactic frame 75% correct
- Full sentence 90% correct

Gillette, Gleitman, Gleitman & Lederer (1999)



Human Simulation Paradigm

- Observation of the nonlinguistic context is not sufficient for figuring out the meanings of many verbs.
- The more information that learners have about the linguistic context of a verb, the better they are at figuring out its meaning.

Gillette, Gleitman, Gleitman & Lederer (1999)



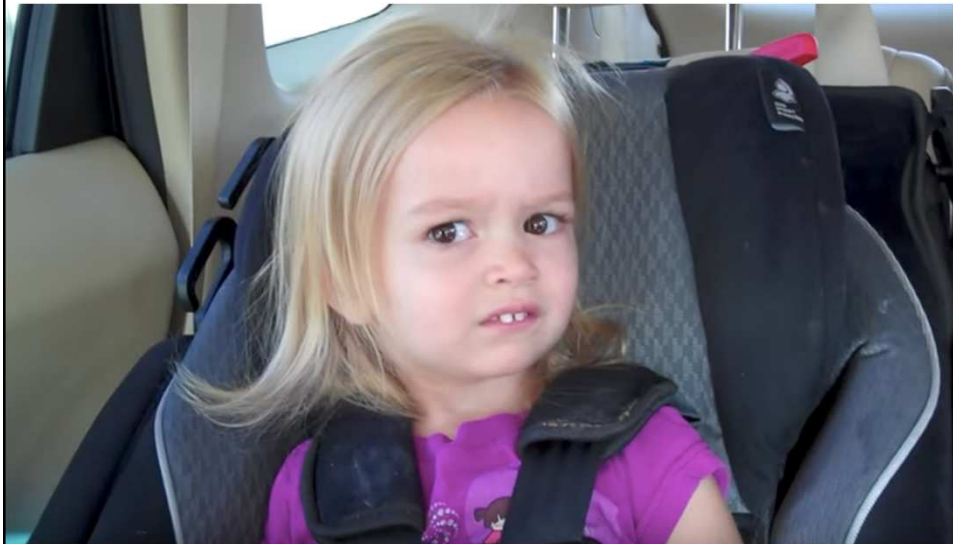
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Ok, but WHY are verbs harder to learn?

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- Or is it because the meanings of verbs are harder to pin down than the meanings of nouns on the basis of observation?





Kids can do it too!

- 7yos; Human Simulation Paradigm (Piccin & Waxman 2007)

- An noncomprehensive list:

Brown 1957; Landau & Gleitman 1985; Naigles 1990; Gleitman 1990; Fisher, Hall, Rakowitz, & Gleitman 1994; Naigles 1996; Mintz 2003; Bungler & Lidz 2004, 2006; Bungler 2006; Arunachalam & Waxman 2010, 2011; Naigles, Reynolds, & Küntay 2011; Yuan, Fisher, & Snedeker 2012; Arunachalam, Syrett, & Chen 2016



Syntactic Bootstrapping

- Children can use cues from the linguistic (morphosyntactic) context in which a new word is used to help them figure out its meaning. (Landau & Gleitman 1985)
- Children can take advantage of the fact that “surface-structural properties of sentences are well correlated with (in fact, are projections from) certain aspects of their semantics” (Fisher et al. 1994, pg. 337)



The girl is VERBing a flower to the boy.



The girl is VERBing a flower to the boy.





Jabberwocky

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



Lewis Carroll

Through the Looking-Glass and What Alice Found There, 1872

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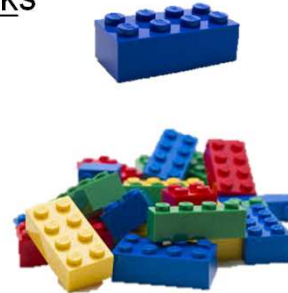


Early attention to morphosyntax

Brown 1957

- Presence or absence of a determiner and/or plural marking induces a count/mass distinction.

a blick / some blick / some blicks



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Early attention to morphosyntax

Brown 1957



Look!

A seb!

Some seb!

He's sebbing!

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Syntactic Bootstrapping

“Look up!”

See DP

Look at DP
Look, this is DP
Look, S
Look!

Blind Child



Seeing Child



Gleitman & Landau, 1985, 2013

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Verbs and Events

- Language can reveal something about our perspective on events, and reveal something to the learner about the syntax-semantics mapping.



- Almost every event of chasing is an event of fleeing.

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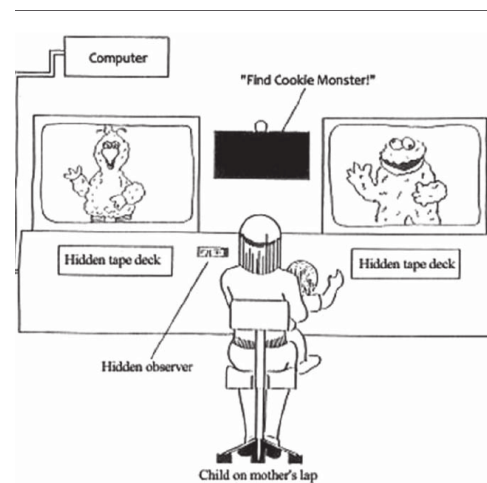
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Preferential Looking

- Videos highlight competing possible mappings from sound form to meaning
- Children's preferential looking to one video or another is measured, relative to the linguistic stimuli during key window.
- The entire session is short (ex. 2-8 minutes)

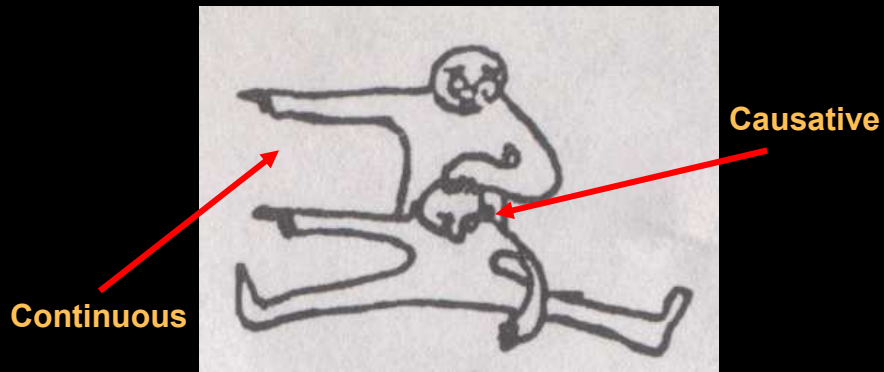


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Naigles 1990



Kids familiarized to two simultaneous events.

Familiarization



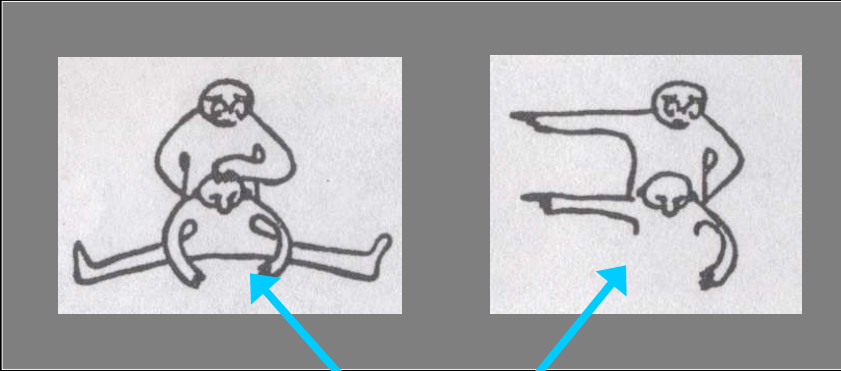
The duck is
gorping the bunny.



The duck and
the bunny are
gorping.

Test

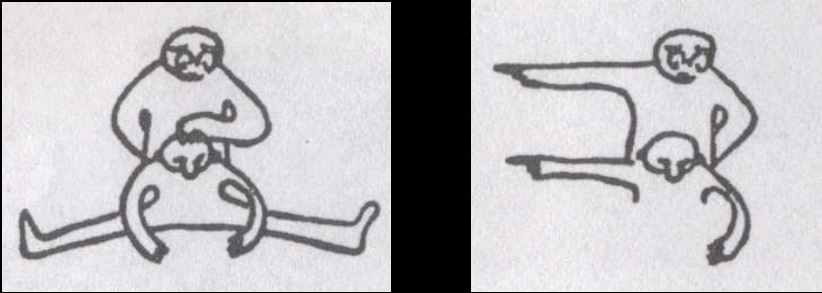
●



Find gorping!

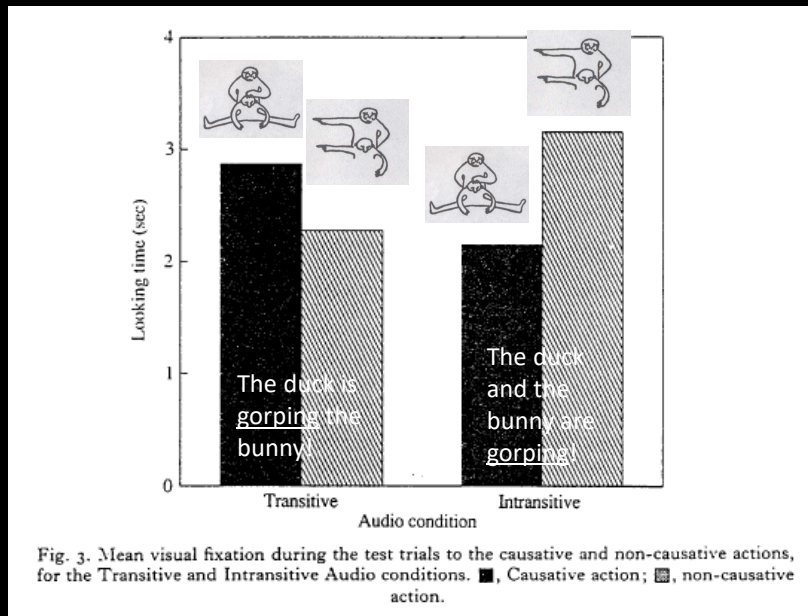
Naigles 1990

Find gorping!

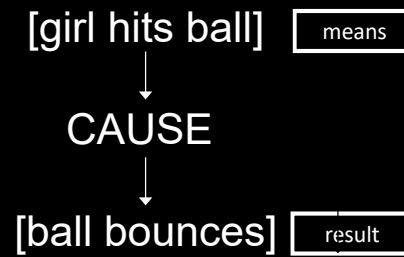


The duck is gorping the bunny!
The duck and the bunny are gorping!

Naigles 1990



Bunger 2006



Bunger 2006



The girl is licking.

The ball is licking.

The girl is licking the ball.



Syntactic Bootstrapping

- Naigles 1990: 2-year-olds can use syntactic bootstrapping to help them figure out which of two simultaneous events is being labeled by a novel verb.
- Bunger 2006: They can also use syntactic bootstrapping to figure out which subpart of a complex event is being labeled.
- Messenger, Yuan & Fisher 2005: And they can do it even when the syntactic cues do not come at the same time as the visual cues.

Messenger, Yuan & Fisher 2015

Dialogue phase:



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

A: Guess what? Jane blicked!
 B: Hmm. She blicked?
 A: And Bill was blicking.
 B: Yeah, he was blicking.

(4 4-sentence dialogue clips)

Test phase:



2-participant event



1-participant event

Same-verb condition:

"Find blicking! Where's blicking? ..."

Different-verb condition:

"Find kradding! Where's kradding? ..."

(2 8s presentations)



Semantics and Syntax

- Children can make use of regular relations between syntax and semantics to aid acquisition.
- **Syntactic Bootstrapping:** using cues from syntax to figure out word meanings (Gleitman 1990, et al.)
- **Semantic Bootstrapping:** using cues from semantics to figure out syntax (Pinker 1994)



Semantic Bootstrapping

The girl is VERBing the cat.
subject agent object patient

