24.904
Language Acquisition

Class 9: Early Syntax

Last time

- Syntactic bootstrapping

  ▸ the learner can utilize syntactic-structural information to identify meanings of words, when observational cues are un- or under-infomationve

Last time

- Preliminary evidence

  ‣ 2 year olds use "argument-structure" [# of NPs that the verb can combine with] to link a transitive novel verb to a "causal" meaning, and an intransitive novel verb to a "non-causal" meaning (Naigles et al.)

Yuan and Fisher 2009

- Can 2-year-olds extract something about a verb's combinatorial privileges (argument structure) from brief dialogues, even in the absence of any situational/ referential information?

Yuan and Fisher 2009

Experiment 1

- Participants: 16 2-year-olds; 8 per condition

- Practice trials w/ 2 familiar verbs (clap, tickle), followed by Test trials w/ novel verb, *blick* (either transitive or intransitive frame)

Yuan and Fisher 2009

Dialogue Phase

Transitive dialogues:

A: Hey...Jim is gonna blick the cat!
B: Really? He's gonna blick the cat?
A: And Mary was blicking the man.
B: Wow, she was blicking the man.
—
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 dialogues:

A: Hey...Jim is gonna blick!
B: Really? He's gonna blick?
A: And Mary was blicking.
B: Wow, she was blicking.
—
A: Guess what? Jane blicked!
B: Hmm, she blicked?
A: And Bill was blicking.
B: Yeah, he was blicking.

Event Phase 1

"Find blicking! Where's blicking? See? Where's blicking?"   **8s**

Event Phase 2

"Find blicking! Where's blicking? Find blicking! Find blicking!"   **8s**

Fig. 1. Dialogue and event phases for the novel verb in Experiment 1. Half the children heard transitive dialogues, and half heard intransitive dialogues. The transitive and intransitive dialogues were identical except for the presence versus absence of the direct-object noun phrase in each sentence. In the event phases, all children watched the same two novel events and heard the verb in syntactically uninformative sentences.

Yuan and Fisher 2009

TABLE 1

Mean Looking and Look-Away Times (in Seconds), Averaged Across the Two Event Phases, in the Test Trial in Experiment 1

Dialogue type	Looking time		Look-away time
	Two-participant event	One-participant event	
Transitive	4.82 (0.43)	2.87 (0.51)	0.31 (0.19)
Intransitive	3.33 (0.24)	4.12 (0.40)	0.54 (0.24)

- reliably longer looks to 2-participant events after hearing transitive frames

- no difference between looks to 2 vs. 1-participant events after intransitives

Yuan and Fisher 2009

- Having first heard a novel verb in a transitive frame, toddlers find it more likely later to describe a 2-participant causal event as opposed to a 1-participant non-causal event.

- Having first heard a novel verb in an intransitive frame, toddlers find it equally likely to describe a 2-participant causal event or a 1-participant non-causal event.

  ▸ what's going on here? we'll come back to it.

Counting the nouns

- Syntactic bootstrapping *sans* syntax

- The worry: for syntactic bootstrapping to get going, the child needs to have a rather sophisticated understanding of the syntax of their L1

  ▸ What do you need to know to make any use of the structures in Y&F2009?

- This is a problem if you need the verbs to learn the syntax of your L1 (e.g. to identify what is the subject)

Counting the nouns

Fisher 1996, Yuan, Fisher & Snedeker 2009, Snedeker 2020, a.o.:

- Claim: children start out with a "simple" algorithm that maps # of noun phrases to # of event participants

Counting the nouns

Assumptions:

- "I assume that **semantic structures of verbs** are **fundamentally of the same kind as the nonlinguistic conceptual structures by which we represent events** (e.g., Grimshaw, 1990; Jackendoff, 1983, 1987, 1990; Pinker, 1989; Rappaport & Levin, 1988). Both verb semantic structures and conceptual representations of events demand a division between predicates and arguments, and thus between relations and the objects they relate (c.f. Bierwisch & Schreuder, 1992; Braine, 1992)"
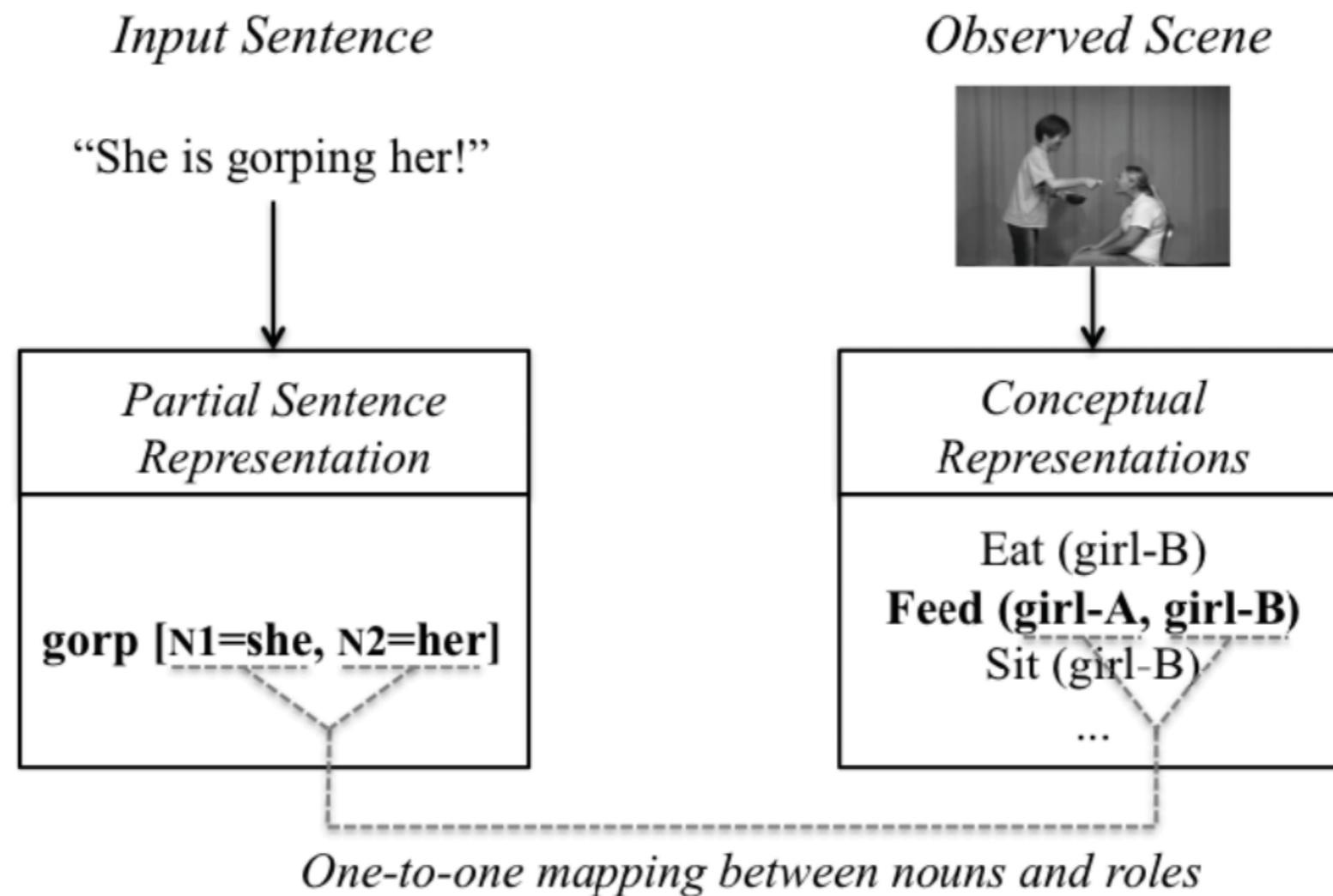
Fisher 1996, p.45

Counting the nouns

Assumptions:

- Analogic mapping between "conceptual structure" and "syntactic structure"

- "Even before the subject and object of a sentence are identified, **each sentence contains some number of noun phrase arguments**…Once children can identify the nouns in a sentence, they could assign different meanings to transitive and intransitive verbs simply by **aligning a sentence containing two noun phrases with a conceptual relation between the two named participants** and a sentence containing one noun phrase with a conceptual predicate involving the single named participant."

Fisher 1996, p.46

Counting the nouns

Yuan, Fisher and Snedeker 2012, p. 1384

a) Structure-mapping account

Input Sentence

"She is gorping her!"

Observed Scene

Partial Sentence Representation	*Conceptual Representations*
gorp [N1=she, N2=her]	Eat (girl-B) **Feed (girl-A, girl-B)** Sit (girl-B) ...

One-to-one mapping between nouns and roles

Counting the nouns

- In theory, falsifiable:

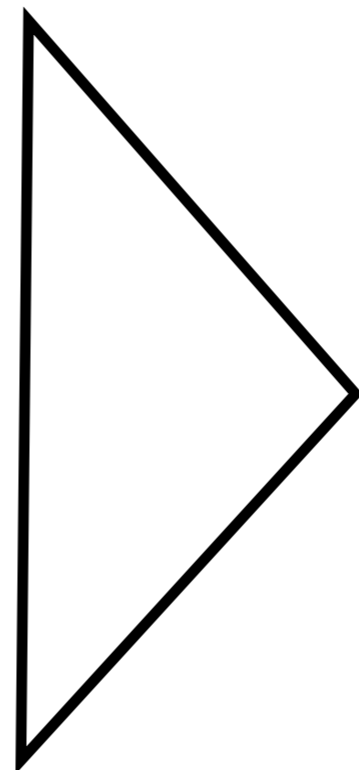 - children should not be able to meaningfully distinguish (1) from any of (2) - (5)

(1) Sue blicked Billy.

(2) Billy blicked Sue

(3) Sue blicked with Billy.

(4) Sue and Bill blicked.

(5) Sue blicked herself.

some event that relates two participants

In practice…

- Yuan, Fisher and Snedeker 2012

  ▸ "This account makes a strong prediction: The **number of nouns in a sentence** should guide very early verb learning. Via structure mapping, the **semantic significance of transitivity does not depend on prior verb learning or on much prior learning about the native-language syntax**. As soon as children can identify some nouns and represent them as parts of a larger sentence structure, **they should assign different interpretations to transitive and intransitive verbs, essentially by counting the nouns**."

Yuan, Fisher and Snedeker

- Participants: 21- (Exp 1+2) and 19- month olds (Exp 3)

- 3 Conditions: transitive, intransitive & neutral

- 2 practice trials (clap, tickle) followed by 1 novel verb in one of the 3 conditions

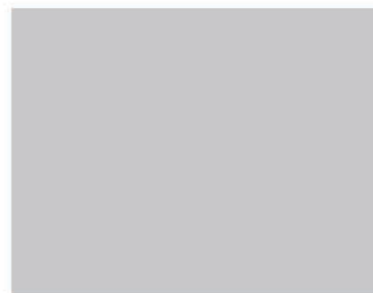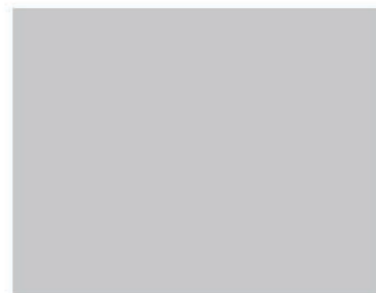# Yuan, Fisher and Snedeker

Experiment 1

Blank-Screen Interval (4s)
Watch!
He's gonna gorp (him)!

First Test Trial (8s)
He's gorping (him).
He's gorping (him).
See?
He's gorping (him).

Blank-Screen Interval (3s)
Find gorping.

Second Test Trial (8s)
He's gorping (him).
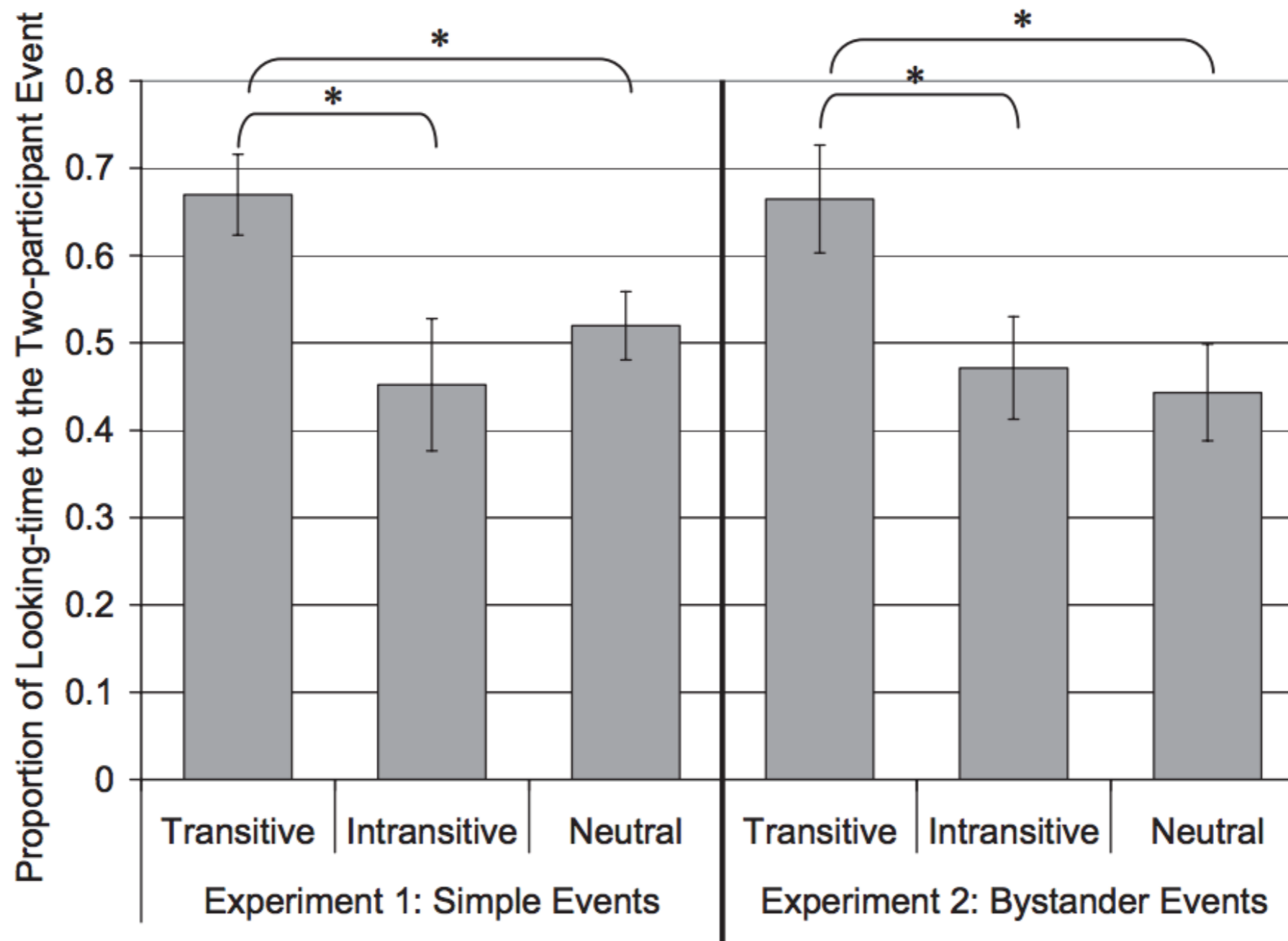Find gorping.
Find gorping.

Yuan, Fisher and Snedeker

Experiment 1 vs. 2 (bystander)

Results

Yuan, Fisher and Snedeker

- Experiment 3

  ‣ minor modifications to procedure (different practice trials, preceding Y&F-type dialogues)

  ‣ 72 19-mos split across 6 conditions (valency; +/- bystander)

Yuan, Fisher and Snedeker
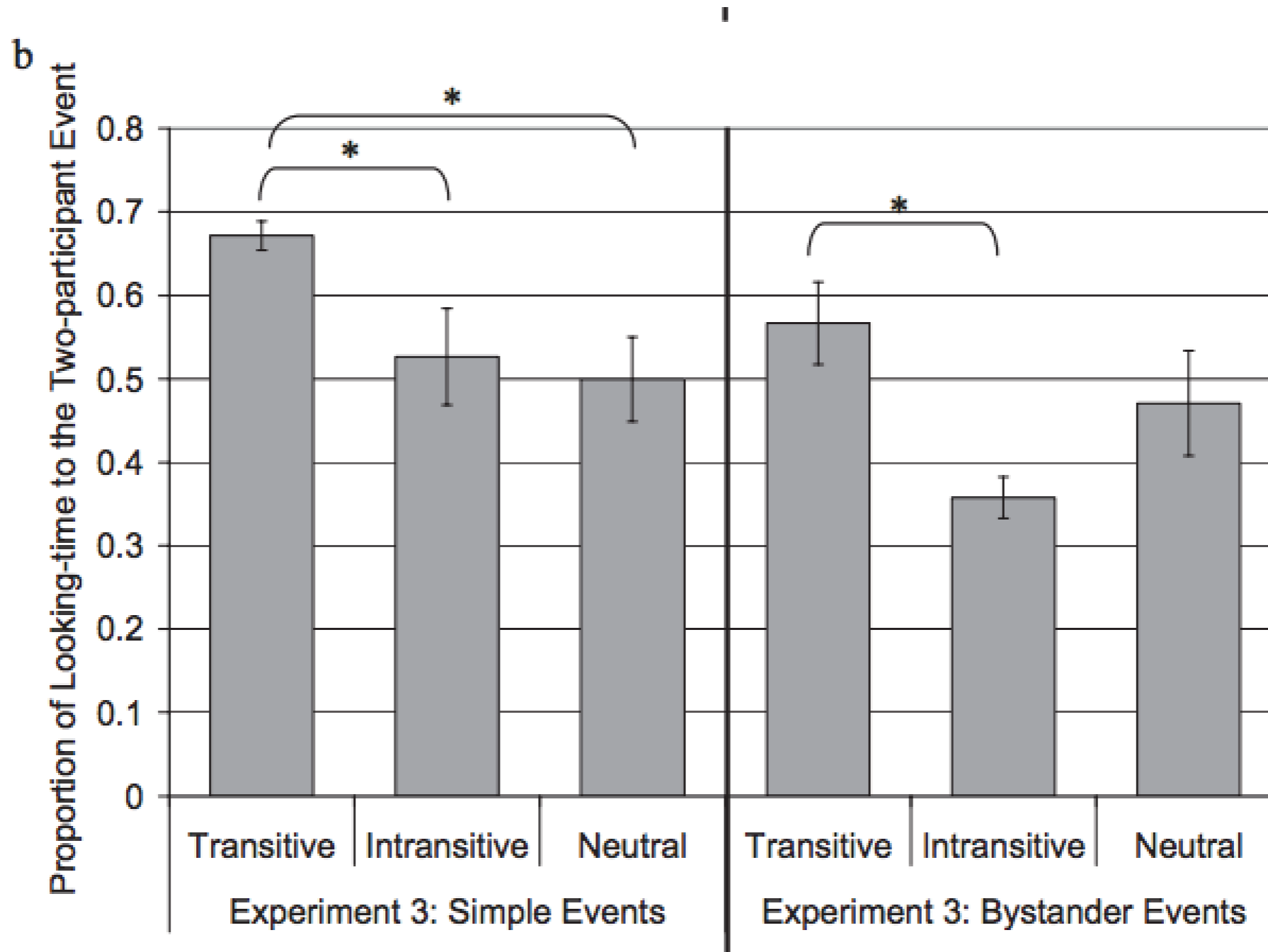
Yuan, Fisher and Snedeker

- Is "noun-counting" the only explanation of these results?

  ▸ counting the nouns, or any algorithm that *entails* noun-counting gives a partial explanation to these results (i.e. any other more sophisticated mapping procedure)

- Is "noun-counting" supported by these results?

  ▸ partially no: intransitives

Implicit auxiliary assumptions

- assumptions that doesn't follow from anything in the theory:

  ▸ 2 noun phrases: linearly 1st one is the agent

  ▸ agency translates to active behavior

- empirical assumptions:

  ▸ chair, ball, rope etc. don't "count"

  ▸ kids converge on the intended notion of "bystander" (e.g. why doesn't the right image represent "A ignores B"?

Complicating the picture

- Are the core assumptions of the theory even valid?

  ▸ In the case of verbs, one key assumption was that verb meanings are event representations and these representations map onto syntactic configurations w/ certain properties

  ▸ This assumption is not identical to — but potentially compatible with — the "projectionist" framework we discussed

  ▸ But is this how language works?

An example

1. John **killed** a bug.

   verb: *kill*

   conceptual representation:

An example

1. John **killed** a bug.

   verb: *kill*

   <u>**terminology:**</u>
   external argument: John (agent)
   internal argument: a bug (patient)

Kratzer 1996

- Extending the meaning and argument structure of "kill"? (building on arguments in Marantz 1984)

(1) kill a bug   = cause the bug to die
    kill a conversation = cause the conversation to end
    kill an evening = while away the timespan
    kill a bottle = empty the bottle

Kratzer 1996

- Why are meaning shifts asymmetrically conditioned by one of the verb's arguments?

(2) John killed a bug.
   The flood killed a bug.
   The pesticide killed a bug.
   Climate change killed a bug.
         = cause the bug to die

Kratzer 1996

- Kratzer's answer:

  ▸ The "external" argument (the doer/agent) is not an argument of the verb at all

  ▸ Rather, it is the argument of a "light verb", a functional element, which combines with the main verb to give it its final meaning

Hale & Keyser

- Hale and Keyser 1993, 1998, 2003

  ‣ Cross-linguistically, the morphological expression of certain intransitive verbs involve what looks like nouns (i.e. descriptively, they have *transitive* structures)

  (1) Jemez
     a. záae-'a "to sing"
        song-do
     b. se-'a "speak"
        speech-do

  (2) Basque
     a. lo egin "to sleep"
        sleep do
     b. near egin "to cry"
        cry   do

Hale & Keyser

▸ A systematic correspondence between such verbs and event nouns in English

▸ *to laugh, a laugh; to run, a run; to swim, a swim; to sneeze, a sneeze*

▸ Proposal: these verbs across languages are syntactically complex, involving a "light" verb + a nominal complement contributing the encyclopedic semantics

What verb? What argument structure?

- Deverbal nouns

  ‣ grow ~ growth (e.g. *the growth is slow*)
    grow ~ growing (e.g. *the growing is slow*)

- "Argument structure" of *grow*, the verb:

  (1) a. John grows tomatoes.
  　　　　　[agent grows patient]
  　　b. Tomatoes grow well here.
  　　　　　[patient grows]

What verb? What argument structure?

- Prediction if deverbal nouns "inherit" the argument structure of the verb

  (2) a. The growth of tomatoes…
  [patient grow]
  b. *John's growth of tomatoes…
  c. *The growth of tomatoes by John…
  [agent grow patient]

What verb? What argument structure?

- Prediction if deverbal nouns "inherit" only one of the argument structural variants of the verb…

  (2) a. The growing of tomatoes…

 [patient grow]

  b. John's growing of tomatoes…

 c. The growing of tomatoes by John…

  [agent grow patient]

Paradigm shift

Neo-constructionist/non-projectionist frameworks:

- Abandon the standard picture where words are simplex units that already come with category labels

- All content words are syntactically complex

  ‣ Consist of at least a category-neutral root specifying encyclopedic semantics (e.g. √grow) + some functional element that contributes category information (*v, n, adj*) and introduces arguments
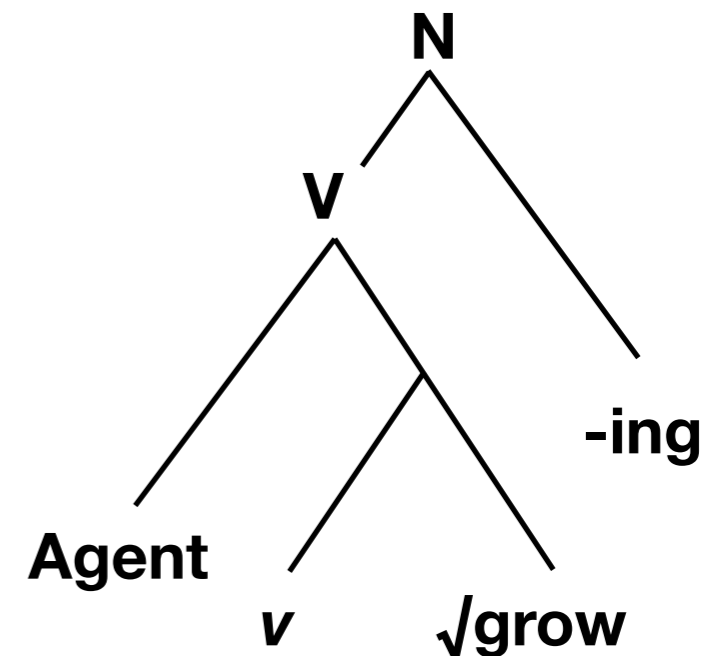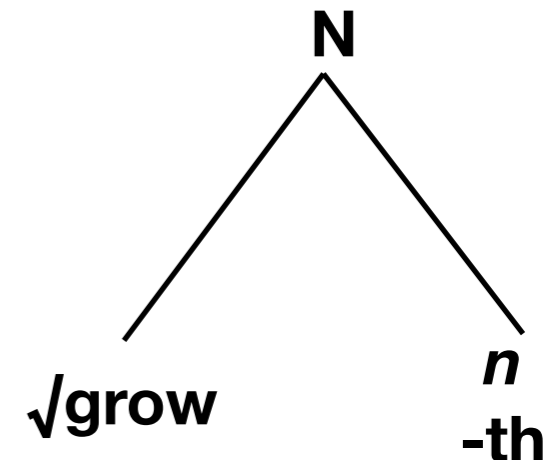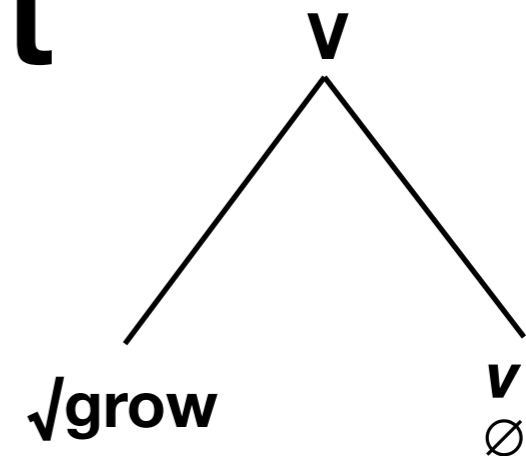
Syntactic bootstrapping in a non-projectionist framework

- What insights can be maintained?

- What has to be abandoned?

To think about

- Are these examples problematic for *syntactic bootstrapping* in the original Gleitman-ian sense?

Next week

- switching gears: early syntax