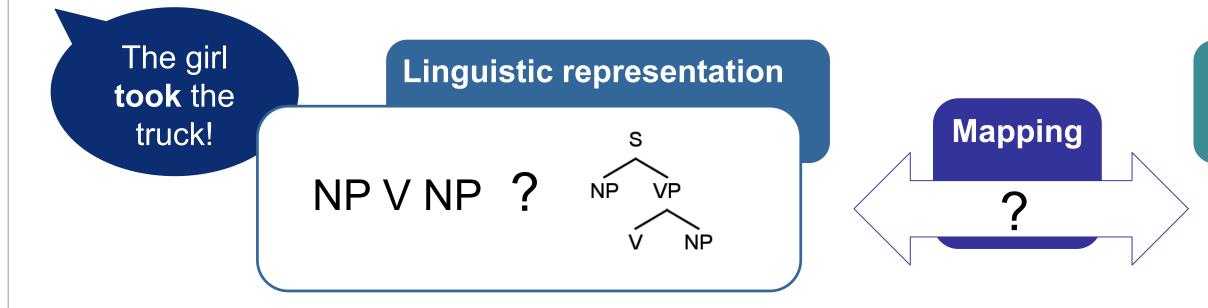


Matching Number vs. Linking Roles: Using 3-Participant Scene Percepts to Understand Infants' Bootstrapping Laurel Perkins, Tyler Knowlton, Alexander Williams, and Jeffrey Lidz

How do Infants Acquire Verb Meanings?

Infants exploit relations between linguistic and conceptual structure to infer the kinds of events a new verb can label [e.g. 1-3]

But do they exploit relations between the number of arguments and participants [2-6], or between grammatical relations and thematic **roles** [8-15]?



Counting Arguments

Children expect the **number** of clause arguments to match one-to-one the number of perceived event participants [2-6]

- Transitive clause describes 2-participant event
- Intransitive clause describes 1-participant event
- Requires only the ability to count the number of NP arguments in a clause, but does not generalize widely within or across languages
 - (1) The girl stole the truck.
 - (2) Sťáťimcets:
 - kwskwimçxen Qámt hit.with.projectile det.NAME 'Kwimçxen got beaned.' [7]



Prior Work

Preferential looking/pointing studies find different patterns of behavior for different clause types [2, 4, 5, 10]

Children prefer 2-participant events for transitive clauses Children do not reliably prefer 1-participant events for intransitive clauses

Can be explained under both **Counting** and **Thematic Linking**:

- Counting: children may perceive 1-participant events in intended 2-participant scenes (e.g. PLAYING), making them compatible with intransitive descriptions [4, 11]
- Thematic Linking: transitive clauses describe events with both agents and patients; intransitive subjects can name either agents or patients, so no preference predicted
- Prior work does not differentiate bootstrapping hypotheses

Current Goals

Differentiating number-based from role-based bootstrapping hypotheses by evaluating how infants represent scenes as events (Study 1) and how they map sentences onto those representations (Study 2) Case study: events that are plausibly viewed with 3 participants, yet are readily described with transitive clauses

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Conceptual representation TAKING(e) Moving(e) & AGENT(e, girl) & AGENT(e, girl) \mathbf{O} & PATIENT(e, truck) & PATIENT(e, truck)

Thematic Linking

& SOURCE(e, boy)

Children expect particular grammatical relations to link to particular participant roles [8-9]

- Transitive subjects name agents and objects name patients
- Clauses describing a change realize the thing being changed
- Clauses describing an action realize the agent of that action
- More robust generalization within and across languages, but requires richer clause structure representations

Arunachalam & Waxman (2010)

- (3) The boy is going to moop the girl.
- (4) The boy and the girl are going to moop.

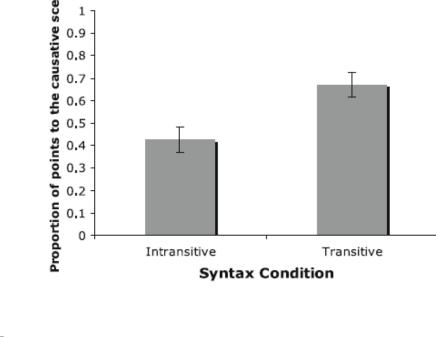


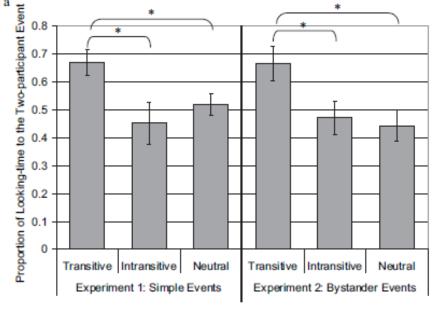
Yuan, Fisher, & Snedeker (2012)

(5) He's gorping him. (6) He's gorping.









Study 1: Diagnosing Event Representations

An event concept entails many relations. Only some of these are psychologically privileged, explicit in the structure of the representation. Call these participant relations [8]:

Entailments of TAKING

Agent	Patie	ent	Source	e	Location
Manner [Du	uration		

FAKING(e) & AGENT(e,x) & PATIENT(e,y) & SOURCE(e,z) TAKING(e) & AGENT(e,x) & PATIENT(e,y) TAKING(e) & AGENT(e,x)

► For a given stimulus scene, which relations are privileged in the concept that infants view it under?

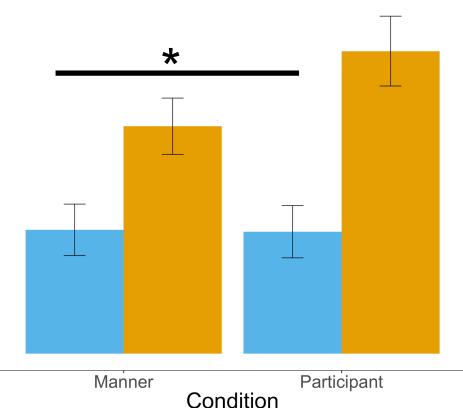
Habituation-Switch Task [12-13]

32 infants aged 9;21-12;15 (mean=10;23) habituated to a scene of a girl picking up a truck, with a boy sitting idly

• **Participant change**: girl starts taking truck from boy's grip Manner change: girl starts sliding truck instead of picking it up

Phase Habituation Test

Mean Looking Time



Results

Infants dishabituate more when the boy is added as a participant than when manner of motion is changed, even though the manner change is more perceptually salient (*F*(4,30)=5.42, *p*<.03)

Infants, like adults, view our taking scene under a concept with the boy filling a psychologically privileged role: TAKING(e) & AGENT(e, girl) & PATIENT(e, truck) & SOURCE(e, boy)

Study 2 (Ongoing): Evaluating Mapping Strategy

► If infants readily view our taking scene under a 3-participant concept, how will they map a transitive clause to that representation?

Verb Extension Task [14]

Infants aged 19;0-21;0 are familiarized to taking scene paired with a transitive clause containing a novel verb (*pim*)

Counting leads learner to conclude that *pim* must describe a 2-participant event involving only the girl and the truck, e.g. MOVE

Thematic Linking allows learner to pair *pim* with the 3-participant concept under which they readily view this scene, predicting that they will think *pim* means TAKE

At test, infants are asked to find *pimming* in context of taking video and moving video

Counting predicts no preference: both videos show girl moving the truck Thematic Linking predicts preference for taking video

Preliminary Results

Partial sample of 15 subjects (target *n*=24) suggests preference for TAKING

• Marginally significant increase in looks to TAKING compared to baseline preferences before test prompt (Wilcoxon signed rank test p < 0.08) • Control comparisons (ongoing): She pimmed the truck from him should describe TAKING, The truck pimmed should describe MOVING under both hypotheses

Full results will diagnose whether infants use **number-based** or **role-based** mapping when two strategies would lead to different inferences about verb meaning

Future Directions

▶ Will infants use the same strategy to map sentences to other 3-participant event concepts, e.g. opening with an instrument [13]? Can infants bootstrap from "non-basic" clauses, e.g. wh-object questions?





Structure of Representation

