The sticking point:
Connections between real-time point comprehension and word knowledge in infancy

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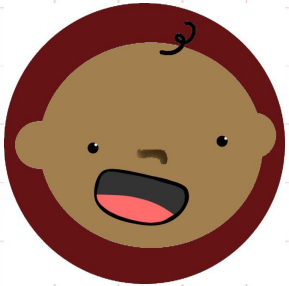


Outline

- Background
  - **Word comprehension boost**: what drives it?
  - Connections between **pointing and language** development
- Data
  - Relationship between point comprehension & vocab
  - Relationship between point comprehension & real-time word comp.
- Future directions: longitudinal evidence
  - Ordered relationship

Developmental timepoints

6 months:

Produce words
(Fenson et al., 1994)

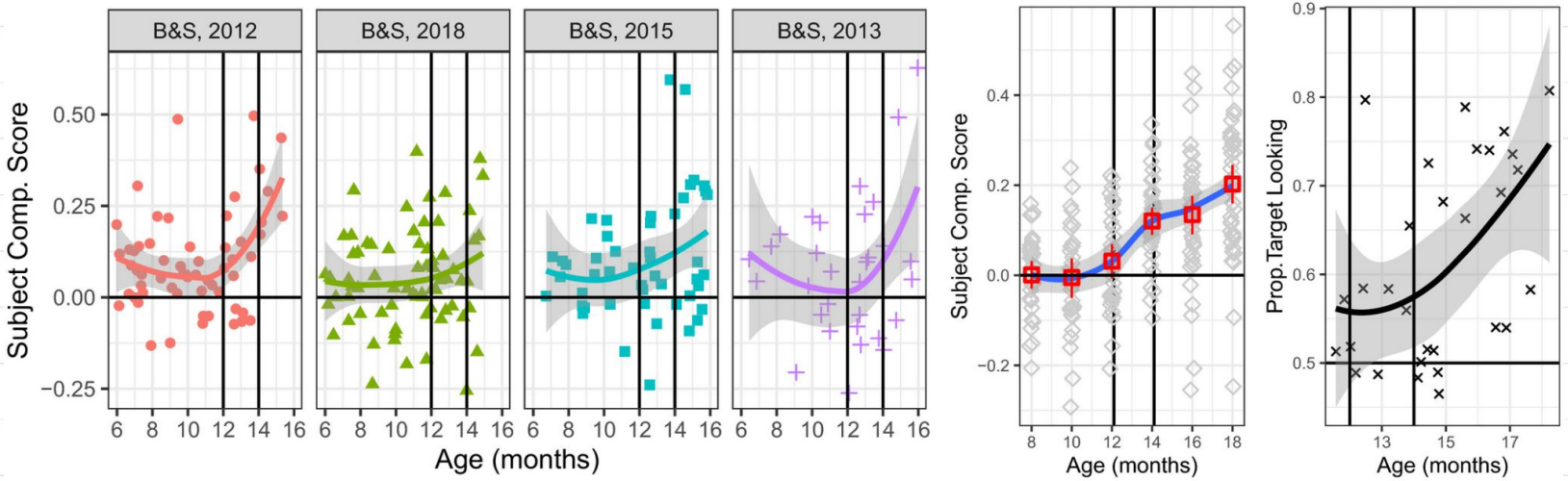
Rapid improvement in word comprehension
(Bergelson, 2020)

Two years:

~12 months

Follow and comprehend points
(Krehm, Onishi & Voloumanos, 2014;
Rüther & Liszkowski, 2020)

The word comprehension boost: ~12-14mo.



Bergelson 2016, 2020; Bergelson & Swingley 2012, 2013, 2015, 2018; Garrison et al., 2020

The word comprehension boost: what causes it?

What might **drive the change** in word comprehension early in the second year of life?

👉 Social skills

- Linguistic skills
- Cognitive skills

Pointing and language are related

👉 Infants' own pointing is tied to concurrent & later language skills (Rowe et al., 2008; Colonnesi et al., 2010; Moore et al., 2019; Perucchini et al., 2020; Kirk et al., 2022; *inter alia*)

👉 Pointing has communicative privilege over other gestures (Bertenthal, Boyer & Harding, 2014; Krehm, Onishi, & Voloumanos, 2014)

👉 Both have social and communicative functions (e.g. Tomasello, Carpenter & Liszkowski, 2007; Redcay, Velnoskey & Rowe, 2016)

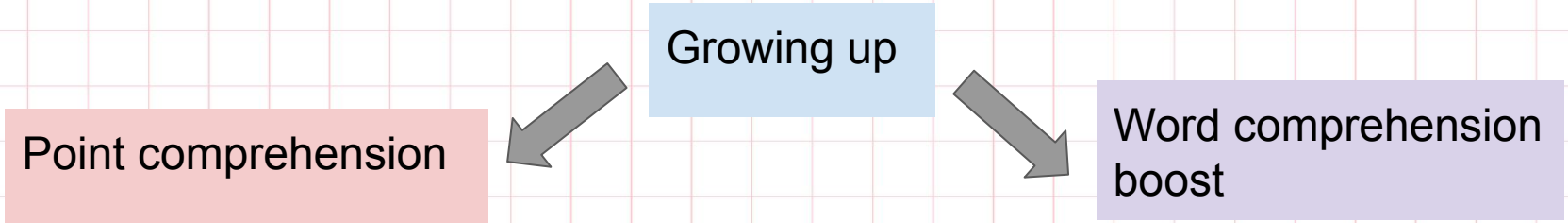
How might pointing drive the comprehension boost?

- 👉 The “royal road to language” learning? (e.g. Butterworth 2003; Carpenter, Nagell & Tomasello, 1998)
- 👉 Establish joint attention (Tomasello & Farrar 1986; Carpenter & Tomasello, 2000; Salo, Rowe, & Reeb-Sutherland 2018)
  - May be a cue to signal quality, or speaker intent(e.g. Rowe & Goldin-Meadow, 2005)
- 👉 Facilitate labeling events → early nouns (Rowe & Goldin-Meadow, 2009; Rowe, Silverman, & Mullan, 2013)
- 👉 Early nouns scaffold further language learning (Dale & Fenson, 1996; Babineau et al., 2021; Fisher, Gleitman & Gleitman, 1991; Gleitman & Trueswell 2020)

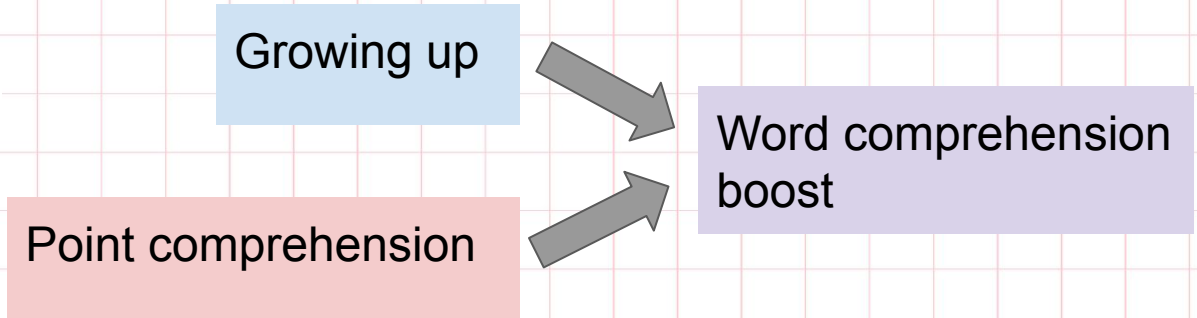
Potential Mechanisms of Change

1)

OR 2)



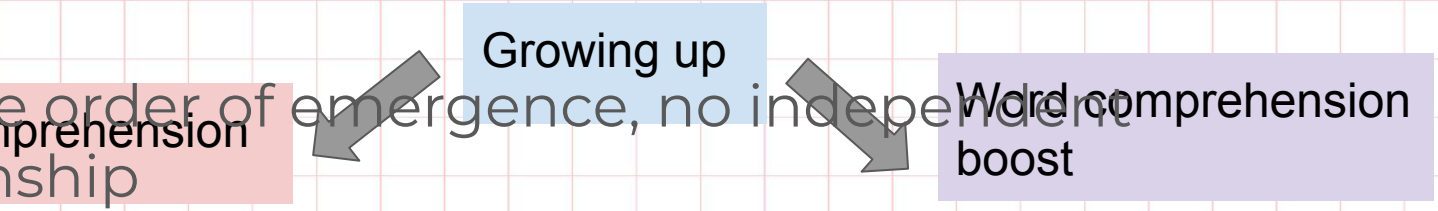
OR 3)



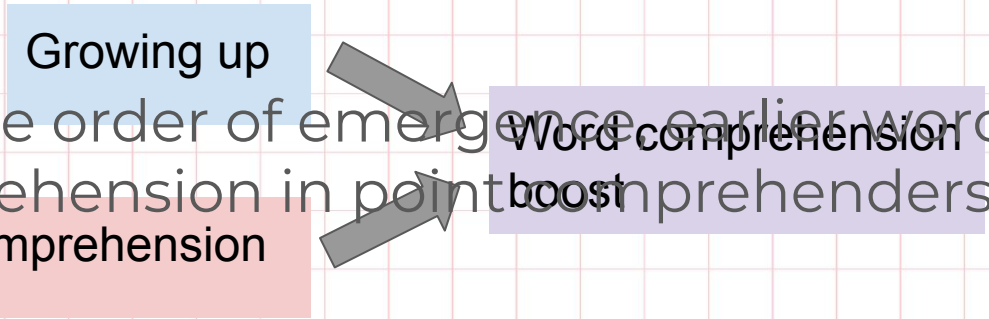
Potential Mechanisms of Change

1) Point comprehension before word comprehension, independently predicts word comprehension ability

OR 2) Variable order of emergence, no independent relationship



OR 3) Variable order of emergence, earlier word comprehension in point comprehenders



Today’s Questions

👉 What is the relationship between **point comprehension and vocabulary size?**

👉 What is the relationship between **point comprehension and real-time word comprehension?**

👉 Does point comprehension **strictly precede** the word comprehension boost?

Methods: multi-part visit

👉 **N=49 infants, 8-20 months old**

- CDI— Words and Gestures
  - Word production
  - Gesture production
- Point following
- Point comprehension (box) task
- Word comprehension: eyetracking OR forced choice

Preface

Pilot data + varying exclusions =

Low, varying sample sizes

Questions

👉 **What is the relationship between point comprehension and vocabulary size?**

- What is the relationship between point comprehension and real-time word comprehension?
- Does point comprehension strictly precede the word comprehension boost?

Point Comprehension POV

Replicating Behne, Liszkowski, Carpenter, & Tomasello, 2012

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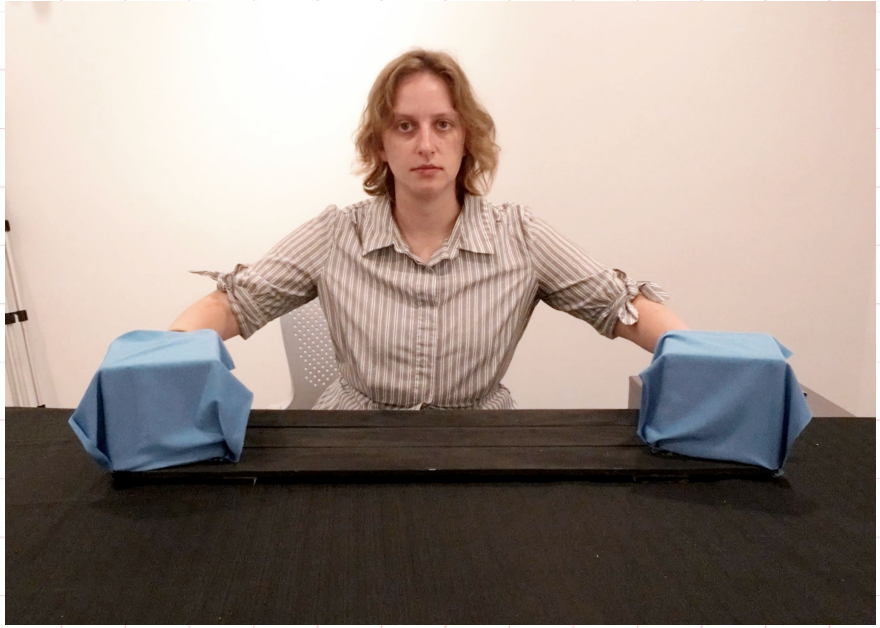

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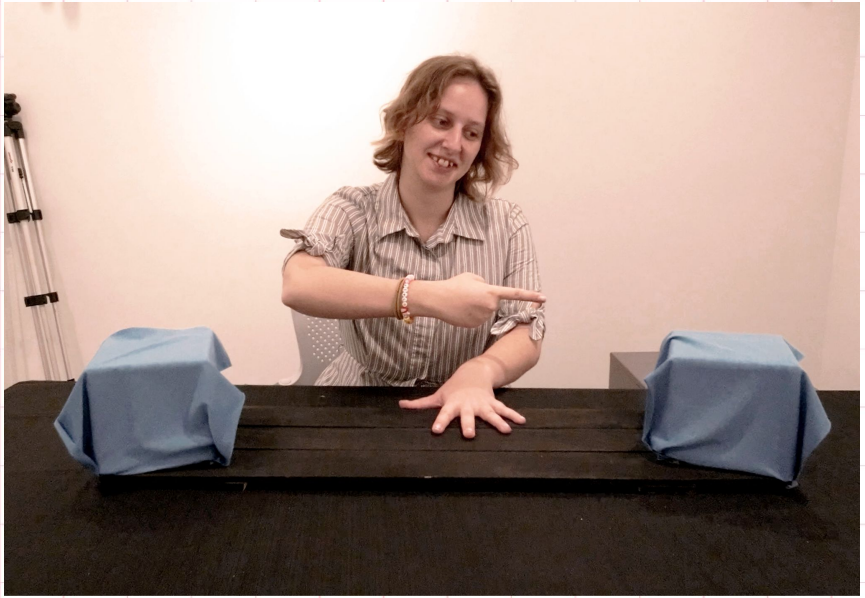

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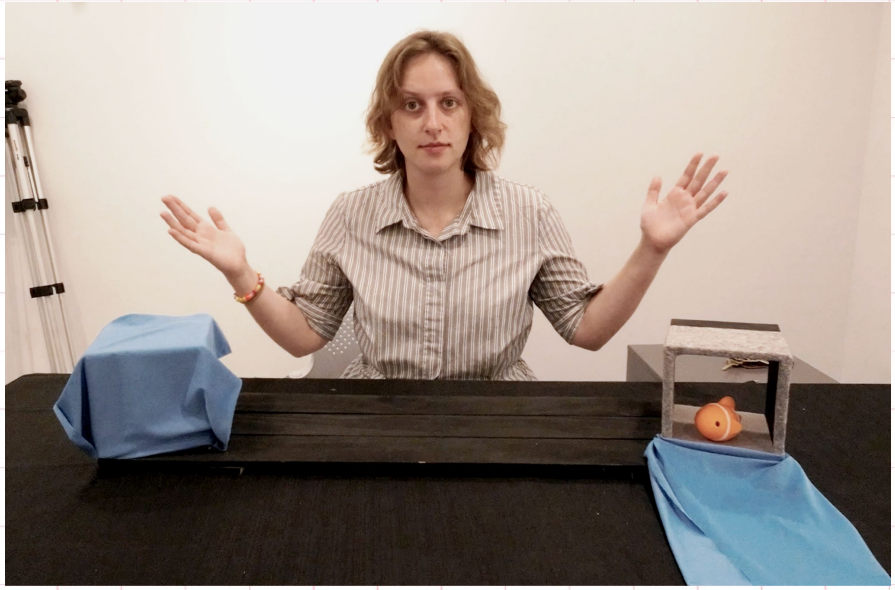
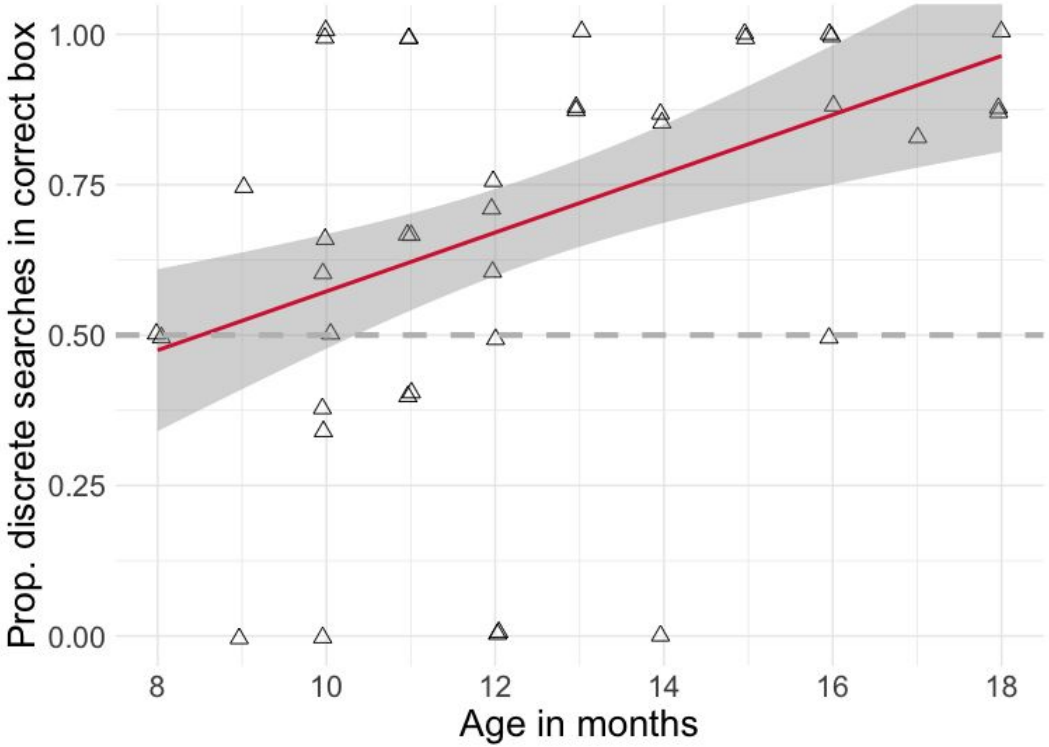


How does point comprehension relate to age?



Out of **discrete choice trials,** infants who searched at least once

N = 40 infants

***r*(38) = .42, *p* < 0.005**

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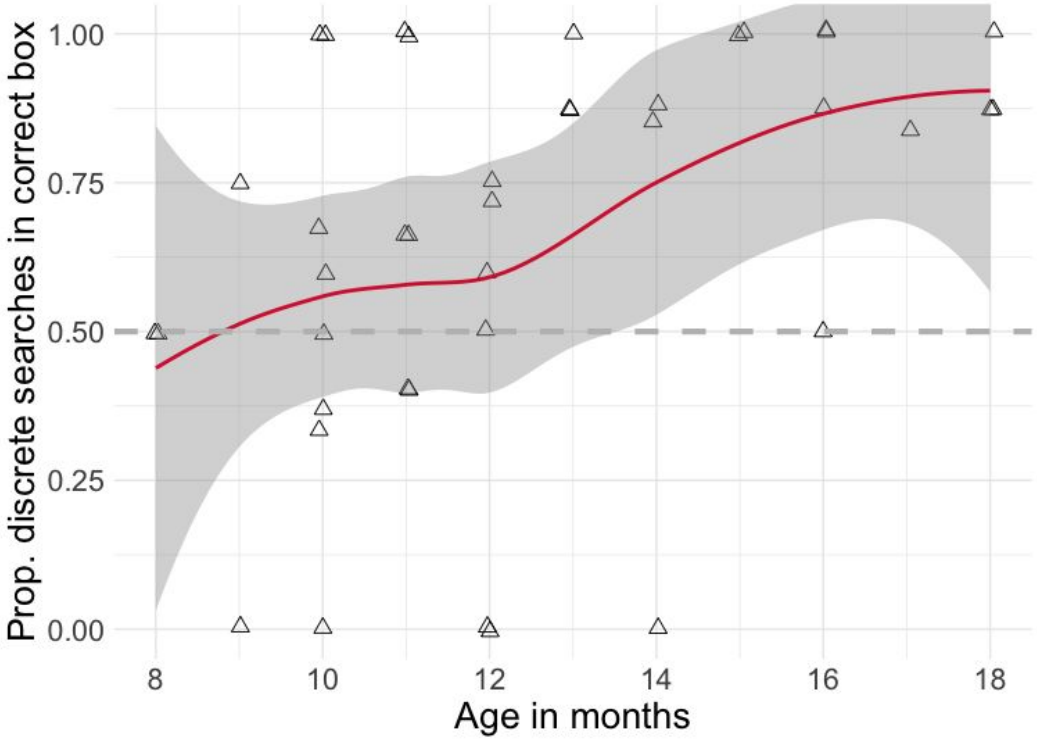

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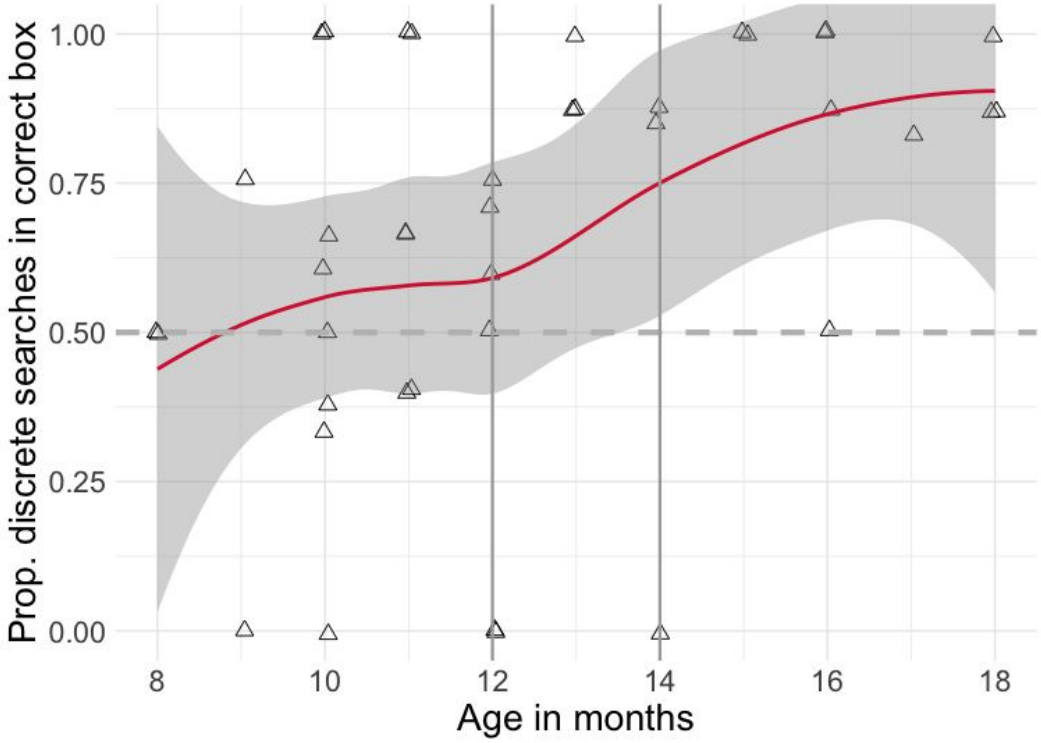


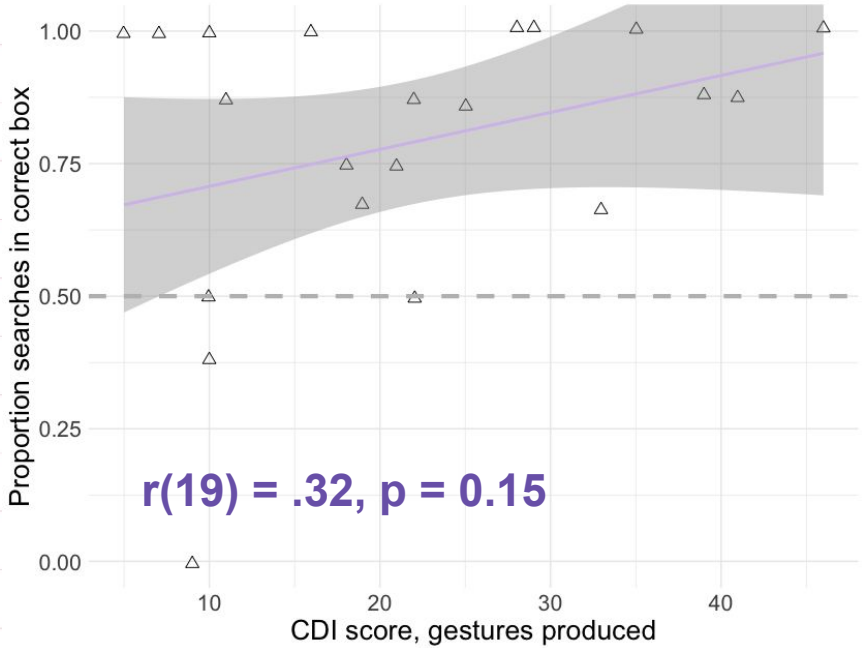
Out of **discrete choice trials,** infants who searched at least once

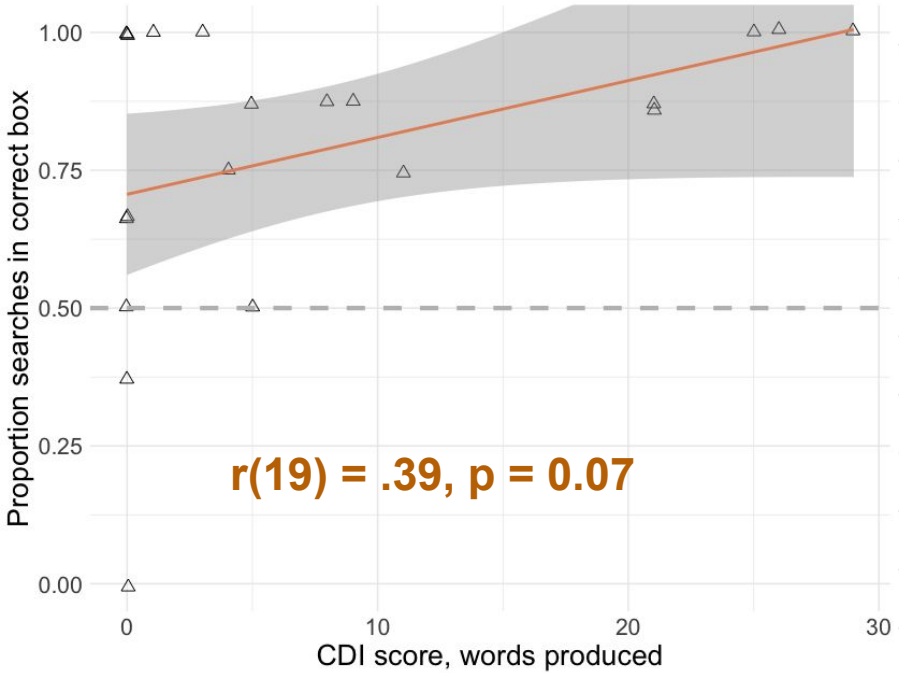
N = 40 infants

Older infants are better at it!

12 months: Rüther & Liszkowski, 2020

How does point comprehension relate to vocabulary?





n=21 CDI

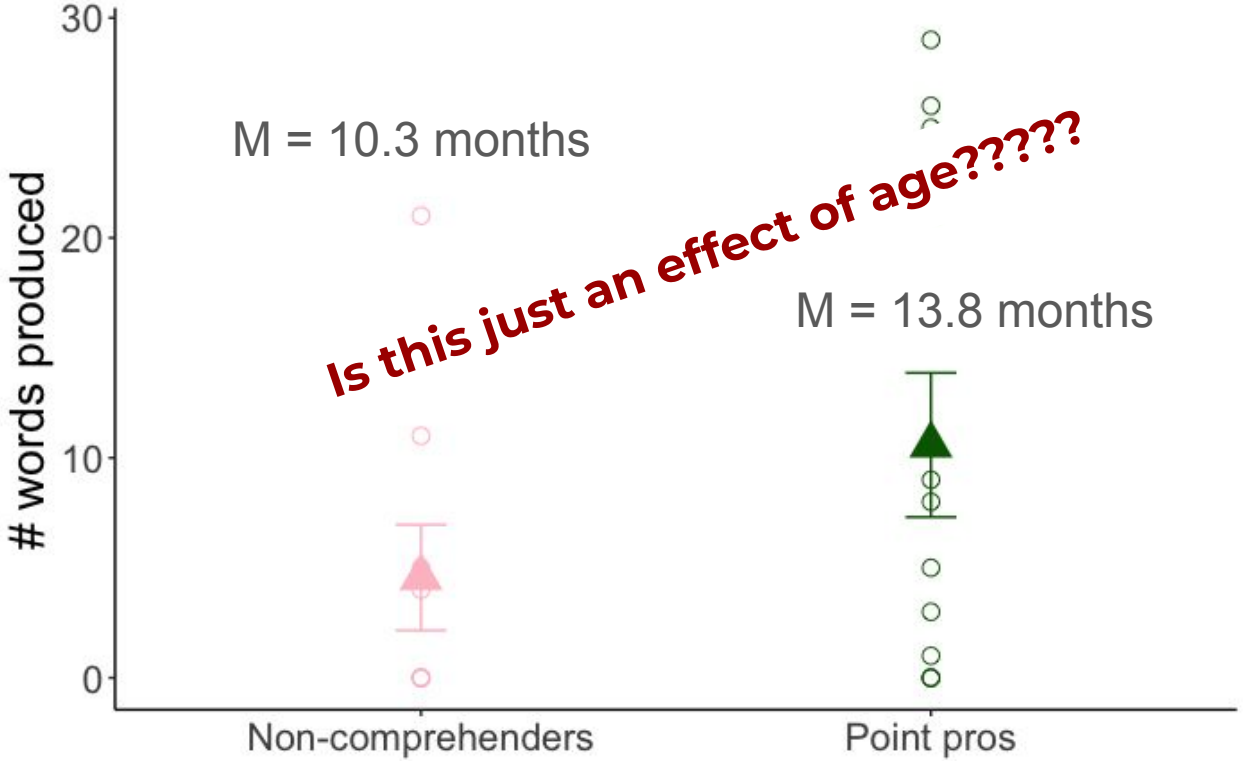
How does point comprehension status distribute over age?

N=21 infants

≥7/8 on box task & did task

Overlap in 10-12 month range

How does point comprehension status relate to vocabulary?



n=21 CDI

Does point status matter independent of age?

n=21 CDI

1. Productive vocabulary ~ age

2. Productive vocabulary ~ point comprehension

3. Productive vocabulary ~ age + point comprehension

Does point status matter independent of age?

n=19 CDI

1. Productive vocabulary ~ age ***

2. Productive vocabulary ~ point comprehension

3. Productive vocabulary ~ age + point comprehension

Does point status matter independent of age?

n=19 CDI

1. Productive vocabulary ~ age ***

2. Productive vocabulary ~ point comprehension

3. Productive vocabulary ~ age + point comprehension

Does point status matter independent of age?

n=19 CDI

1. Productive vocabulary ~ age *** R^2 = .6, F(1,19) = 27.91, p <.0005

2. Productive vocabulary ~ point comprehension

3. Productive vocabulary ~ age + point comprehension

No difference between models 1 and 3;

Productive vocab best explained by age alone!

Questions

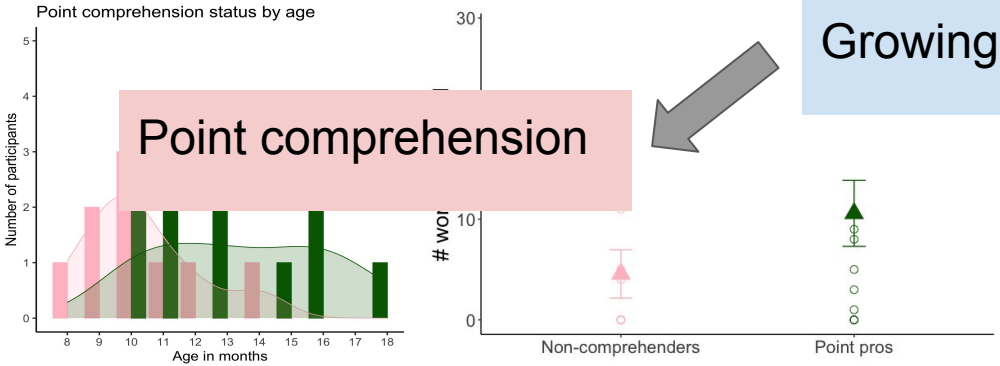
👉**What is the relationship between point comprehension and vocabulary size?**

- What is the relationship between point comprehension and real-time word comprehension?
- Does point comprehension strictly precede the word comprehension boost?

Questions

👉What is the relationship between point comprehension and vocabulary size?

Pointing pros are older; older kids produce more words.



Point comprehension

Growing up

Word comprehension boost

Questions

- **What is the relationship between point comprehension and vocabulary size?**

  Increased point comprehension is related to increasing vocabulary, indirectly through age

- 👉 **What is the relationship between point comprehension and real-time word comprehension?**

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Word comprehension: Eyetracking

Looking while listening (Fernald, Zangl, Portillo, & Marchman, 2008)

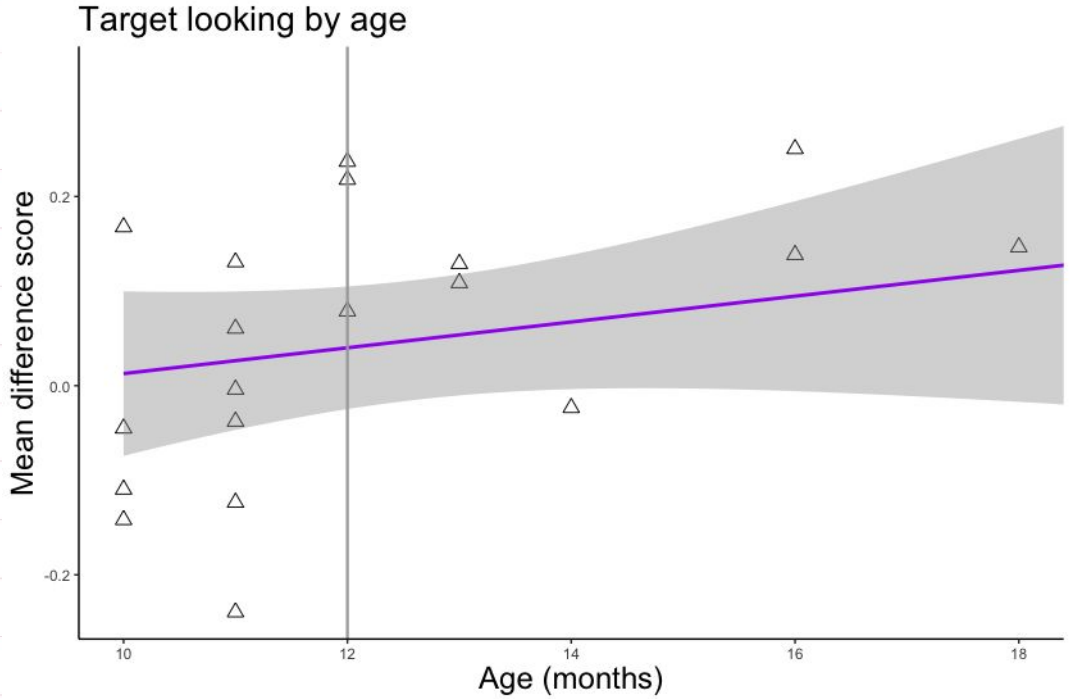
Word comprehension, yoked pairs:

book/juice

cookie/eye

foot/spoon

Does age predict target looking in real-time word comprehension?

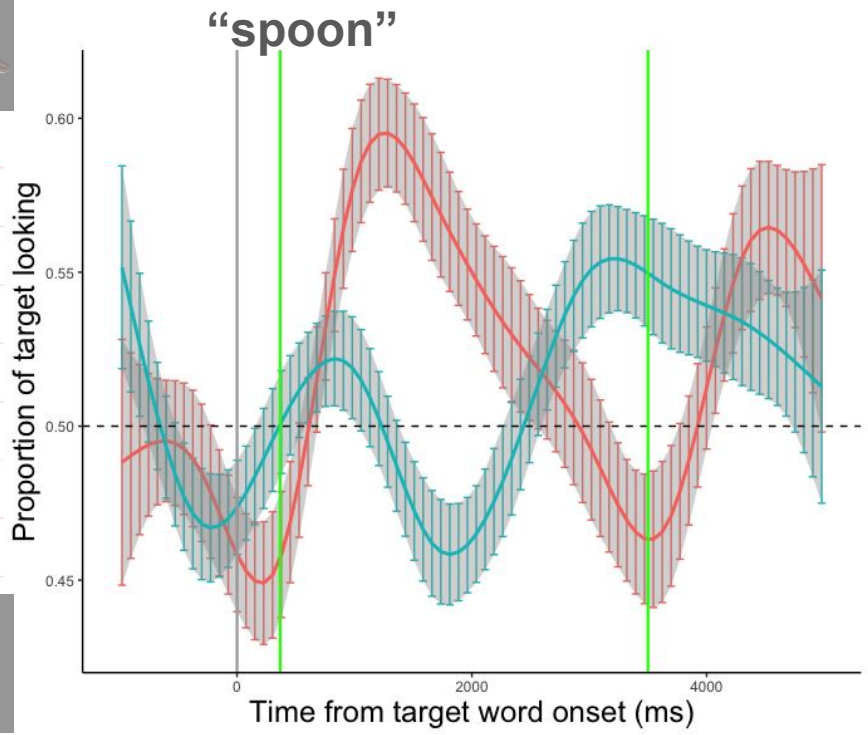


N = 22 infants;

***r*(20)=.11, *p*=.6.5**

Older trending to more target looking!

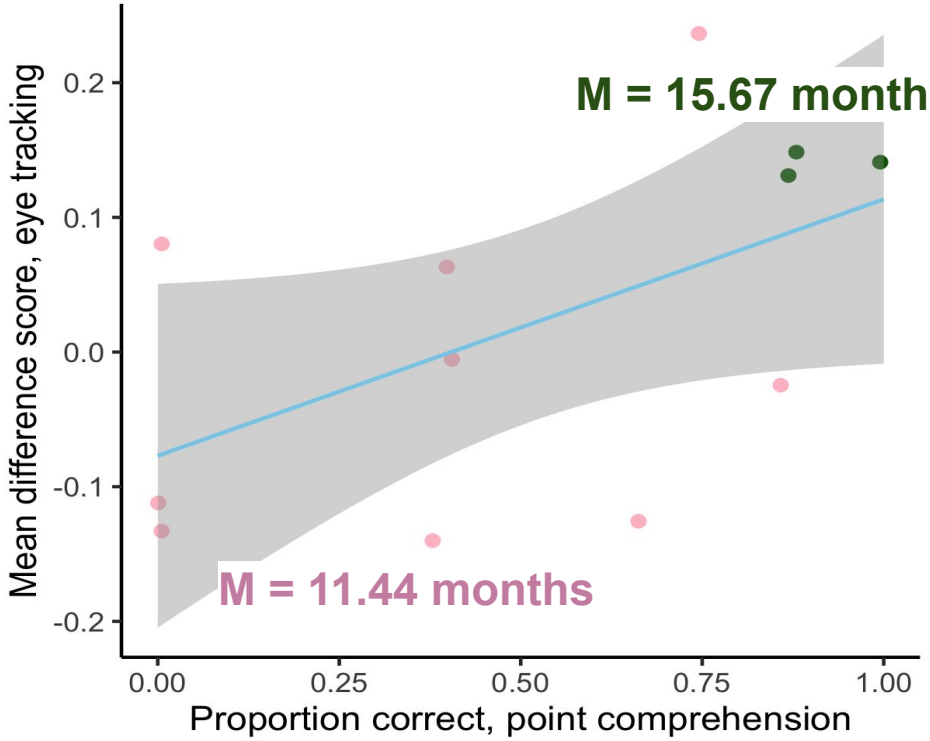
Does age predict target looking?



N = 22 infants;
Median age = 12 months

Older > younger!

How does word comprehension correlate with point comprehension?



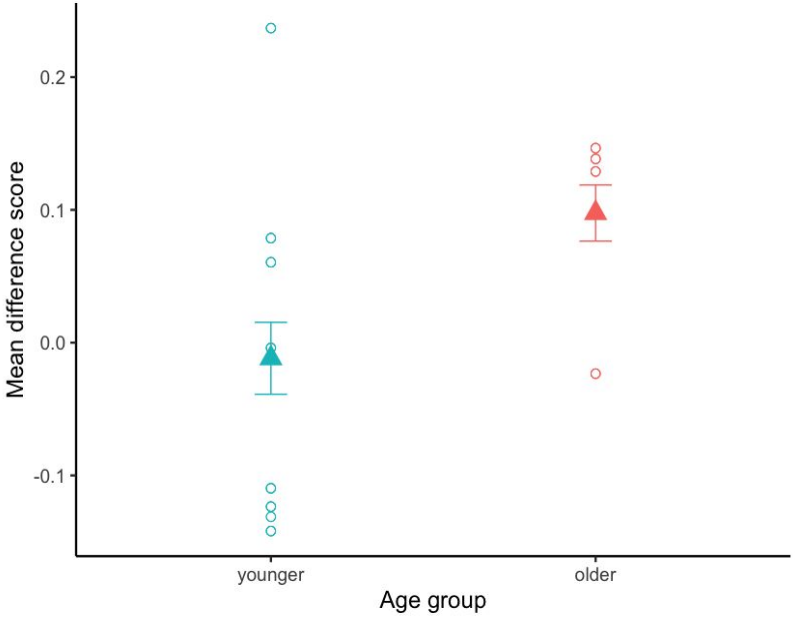
N=12 infants,
Point pros = >7/8 correct

comprehender
- Non-comprehenders
- Point pros

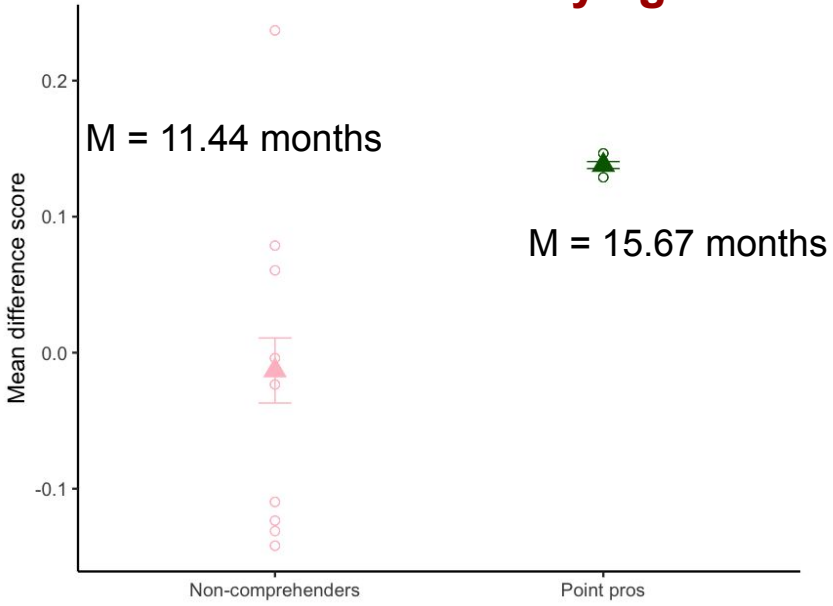
***r*(10) = 0.55, *p* = 0.062**

Trending upwards!

Do mean target looking times differ?



Yes!... by age?



Mean prop. Looking time(target) - Looking time(distractor)

How much do age and point comprehension respectively predict word comprehension?

Model Comparison

Looks to Target ~ Age (months) **$F(1,10) = 4.75, r^2 = .322, p=.05$**

Looks to Target ~ Comprehension status **$F(1,10) = 4.28, r^2 = .3, p = .067$**

Looks to Target ~ Age + Comprehension status $F(1,10) = 2.4, r^2 = .35\ p = .15$

Neither different than additive model!

No evidence that age & point comprehension are separable predictors

Questions

- What is the relationship between point comprehension and vocabulary size?

  Increased point comprehension is related to increasing vocabulary

- **What is the relationship between point comprehension and real-time word comprehension?**

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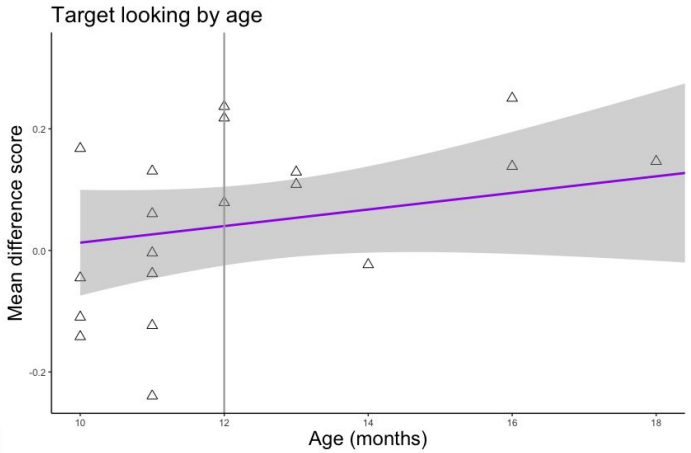
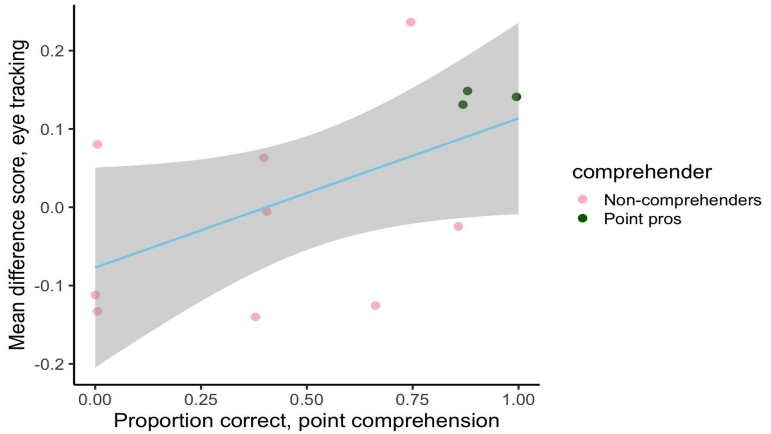
Questions

- **What is the relationship between point comprehension and real-time word comprehension?**

Pointing pros are older; older kids understand words better.
~Maybe~ pointing's role is more than just age, too soon to tell.





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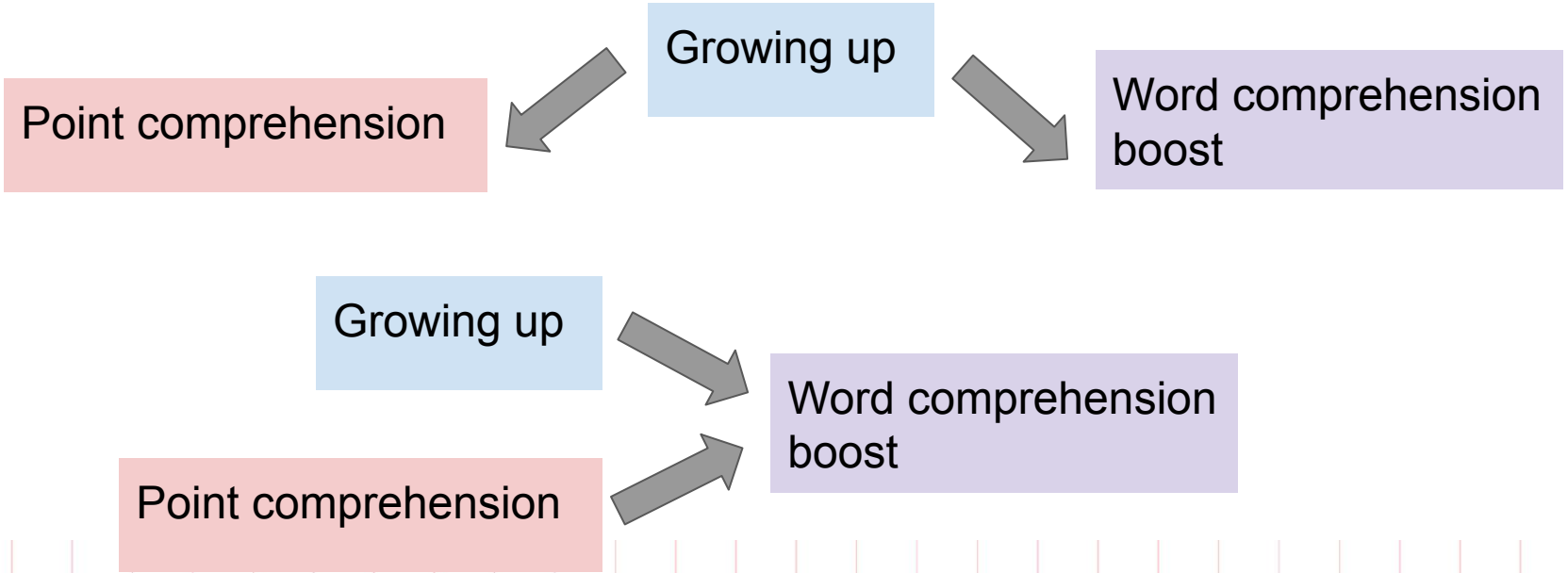


Questions

- What is the relationship between point comprehension and vocabulary size?

  Increased point comprehension is related to increasing vocabulary

- **What is the relationship between point comprehension and real-time word comprehension?**

  Indirect, through age

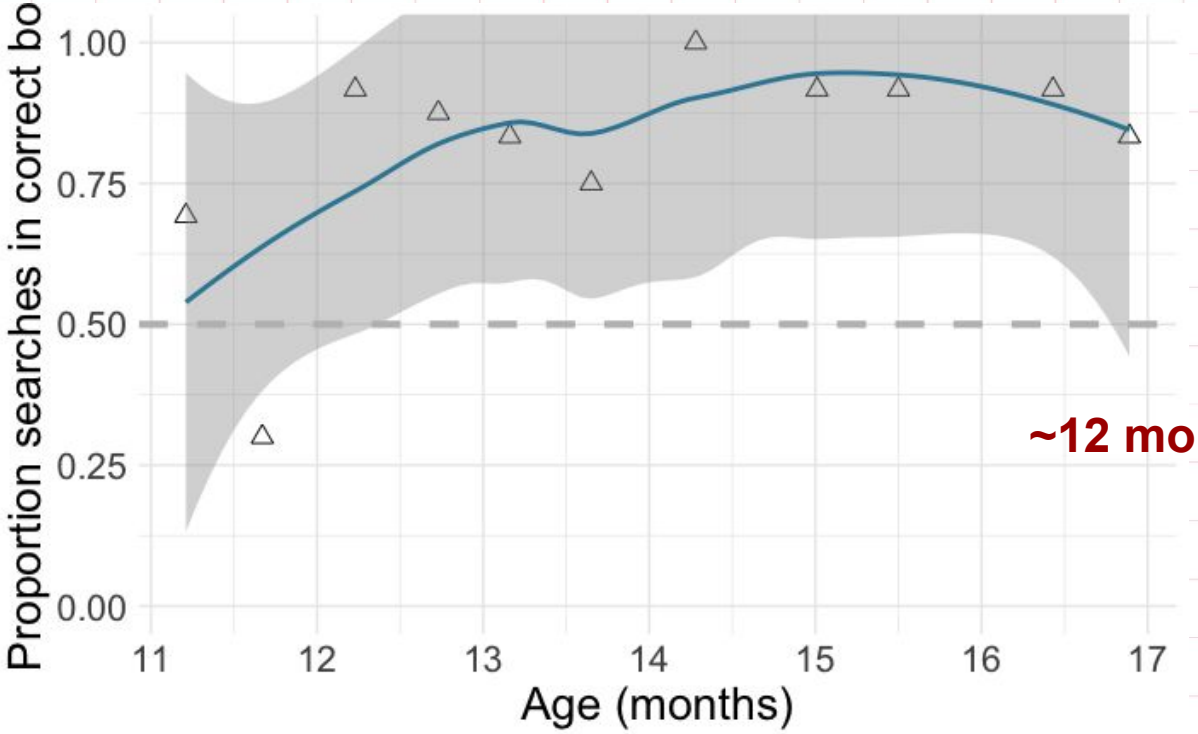
- **Does point comprehension strictly precede the word comprehension boost?**

Future directions: Longitudinal case study

1 infant, from the time she was **10 months old,** until **16 months old:**

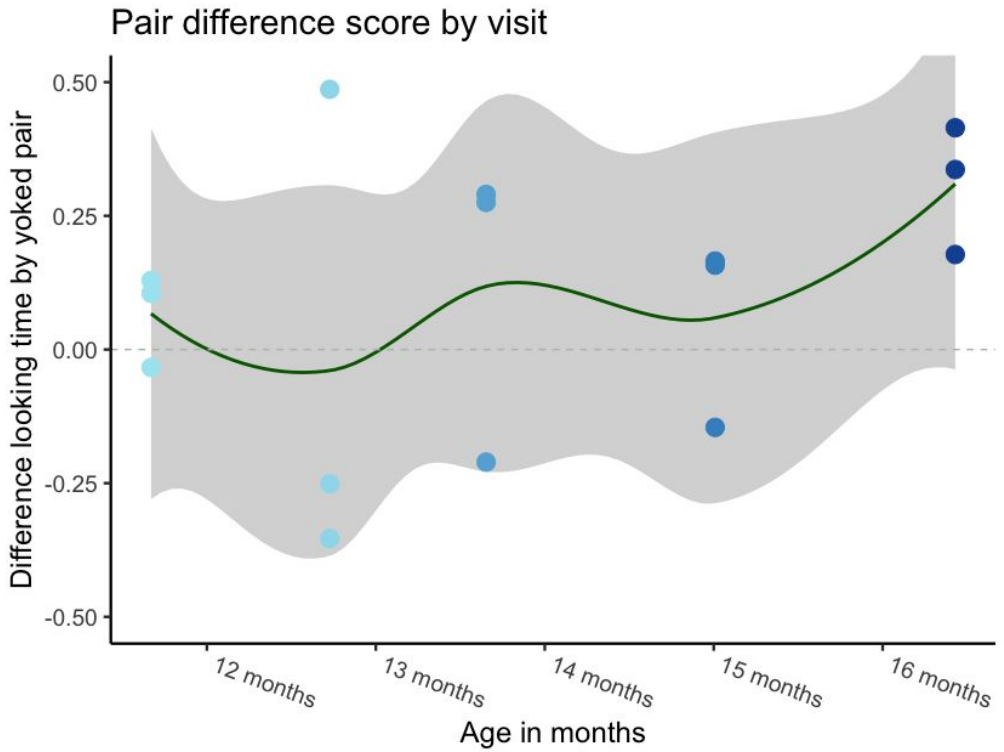
Every two weeks:

Can we capture the **point** comprehension boost in an individual learner?



~12 months!

Can we capture the **word comprehension boost** in an individual learner?



13-16 months!

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  Indirect, through age

- **Does point comprehension strictly precede the word comprehension boost?**

  Potentially!

Could point comprehension drive the word comprehension boost?

For

Similar age of emergence

Nonlinear improvement 12-14 months

Individual: point comprehension first

Against

Point comprehension predicts nothing that age doesn't

Thank you!

Grace Benkelman

Olivia O'Connell

NIH
National Institutes of Health

7R01HD107285-02 to EB