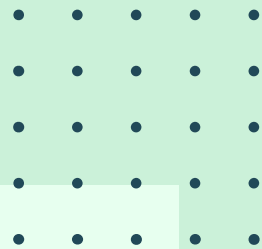


Comparing language input in the homes of blind and sighted children: Insights from daylong recordings

Erin Campbell, Lillianna Richter, Eugenia Lukin, Erika Bergelson



Why study language in blind children?



Refine theories of language and cognition:

To what extent are vision-based skills necessary for acquiring language?



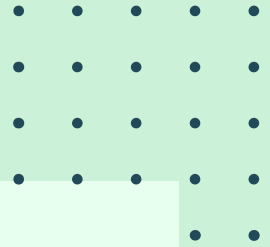
How necessary is vision for acquiring language?

- Blind infants show vocabulary delays (Campbell, Casillas, & Bergelson, *under review*)
 - Roughly 7.5 month delay on average
 - Only ~20% of blind children score above the 50th percentile for vocab.
- But ultimately they catch up to sighted peers (Röder et al., 2003)
 - *Showing that children can learn language without vision*

So how do blind infants catch up?



Language input as a source of meaning



If parents modify the input:

Parents are sensitive to the perceptual abilities of the child
Possibly compensatory

If parents *don't* modify the input:

Language input is sufficient for acquiring language in the
absence of vision



Previous studies of blind children's language input

Blind children get:

- Fewer descriptions, more directives (Kekelis & Andersen, 1984; Landau & Gleitman, 1985)
- Less interaction (Rowland, 1984; Moore, 1994; Preisler, 1991; Andersen et al., 1993; Grumi, 2021)
- Less decontextualized language (Andersen et al., 1993; Campbell, 2003; Kekelis & Andersen, 1984)

Present study: build on this literature with larger sample size and more naturalistic language sample

Methods

15 blind participants:

- English monolingual (>75% English input)
- No more than minimal light perception
- No hearing or cognitive/developmental diagnoses
- 6.4 – 30.3 mo. old; Mean = 15.7 mo.
- 7 male, 8 female

15 sighted participants, matched on:

- Age (within one month)
- Gender
- Maternal Education ± 1
- # of older siblings ± 1

Daylong audio recordings with LENA

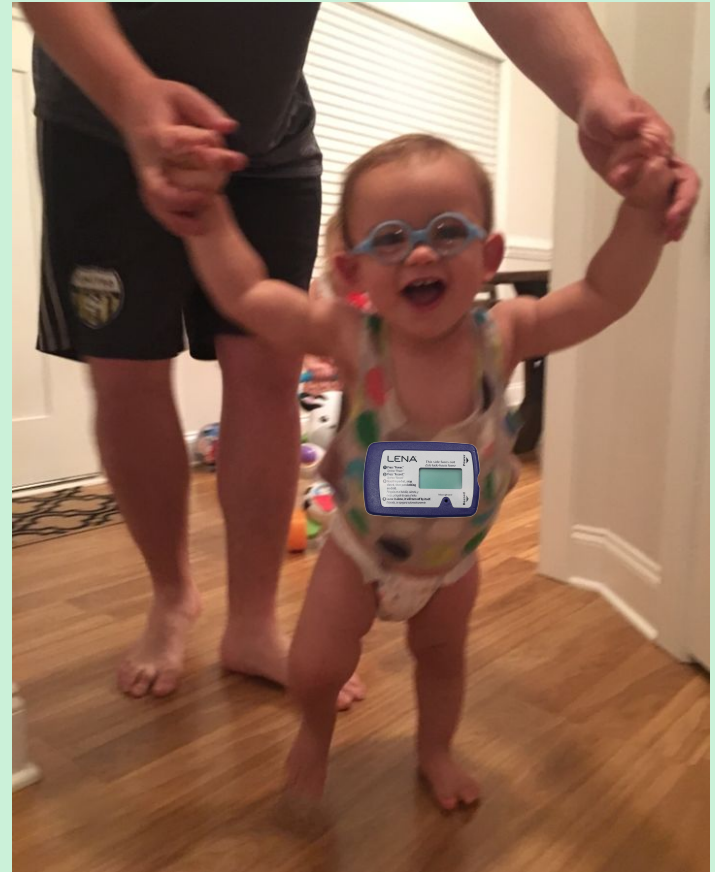


Image courtesy of parent

Methods

Daylong audio recordings with LENA



- 15 two-minute random samples
- 5 two-minute high-talk-density samples
- 40 min per kid = 1200 annotated minutes



Image courtesy of parent

Methods

Daylong audio recordings with LENA



- 15 two-minute random samples
- 5 two-minute high-talk-density samples
- 40 min per kid = 1200 annotated minutes

ACLEW Annotation:

- Utterance
- Speaker
- Addressee

File Edit Annotation Tier Type Search View Options

Grid Text S

FA1

Nr	Annotation
6	say I want to play the whole piano.
7	oh you turned down the volume.
8	I turned it back up.
9	<low> [=! sings].
10	<high> [=! sings].
11	that high or low?
12	can you tell me?

01:30:30.440 Selection: 01:30:30.4

VI_008_70...

01:30:16.000 01:30:18.000 01:30:20.000

01:30:10.000 01:30:12.000 01:30:14.000

CHI [416] dolly.

vcm@CHI [323] C

lex@CHI [236] W

mwu@CHI 1

FA1 [280] t I ask my> | <dolly> [=! <if if i

xds@FA1 [280] C C

utt@FA1 [280] D D

i@FA1 [280] B B

now out there today see any so think go show picture
one one talk look fine cut hole build top wait circle be
love honey why why do dad let go inside be big bee
why why make go really big bee afraid gone dad go
out there go proud say want more flat sound really
quick hold only diaper peek bean read say put down
washing machine just when read how strip tell put
down washing machine suppose put lot probably
cleaner put more probably put more down washing
machine know
diaper actually
smell soap now
smell play bean
need get water
laugh stop try
not hurt fall
head think want
make brain roll
bean laugh there
straight shot
much up
there think
get good



good when when walk place be funeral guy job just get
back walk bakery so only part go way down here come
back walk there warn go just really good past slow
ladder want go back cradle cab too young eat go eat
chicken tender more too busy get ready punch throat
eat go good today chicken tender want food may order
own drink want take sip then pour rest say want taste
bud way out put dining room say little weight kiss so
good around here eat go say enough go up well when

come across say
probably best
bet here tell
there go
there be
slice cake
big tall have
cake have
do have do
that well
birthday cake
terrible banana
pudding just
rather call
terrible like



Characterizing the input



1. Quantity

How much speech?

2. Interaction

How interactive is the input?

3. Linguistic Properties

How are words used and combined?

4. Conceptual Properties

Can the child perceive the referent?

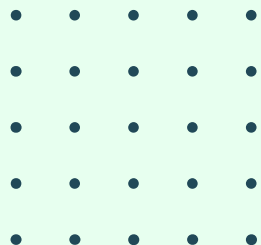
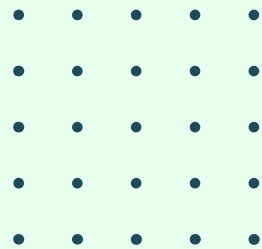
Characterizing the input: quantity

Adult Word Count:

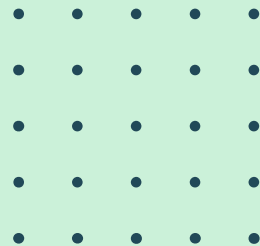
Automated LENA count of speech
tagged as nearby adult

Manual Word Count:

Number of words in the manual
transcriptions of the random
samples



Quantity



Adult Word Count

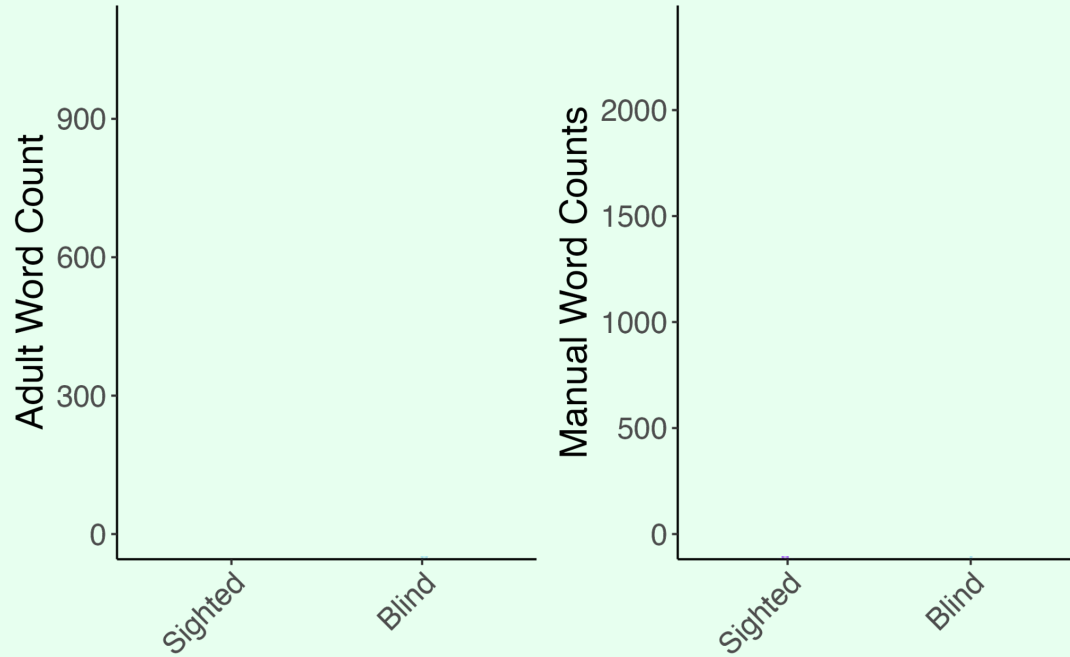
Automated LENA count of
speech tagged as nearby
adult



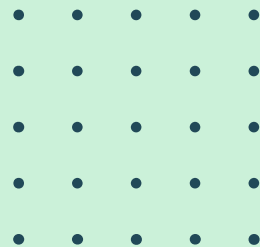
Manual Word Count

Number of words in the
manual transcriptions of the
random samples

No difference in input quantity

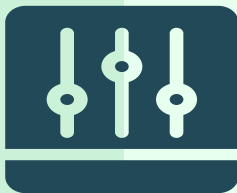


Interactiveness



Proportion of Child-Directed Speech

Proportion of utterances spoken
to children
(as opposed to adults, pets, etc.)



Conversational Turn Count

Number of switches between
child/adult speakers within 5
sec. of each other

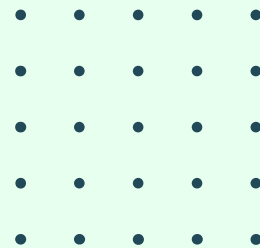
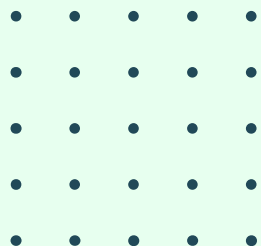
Characterizing the input: interaction

Conversational Turn Count:

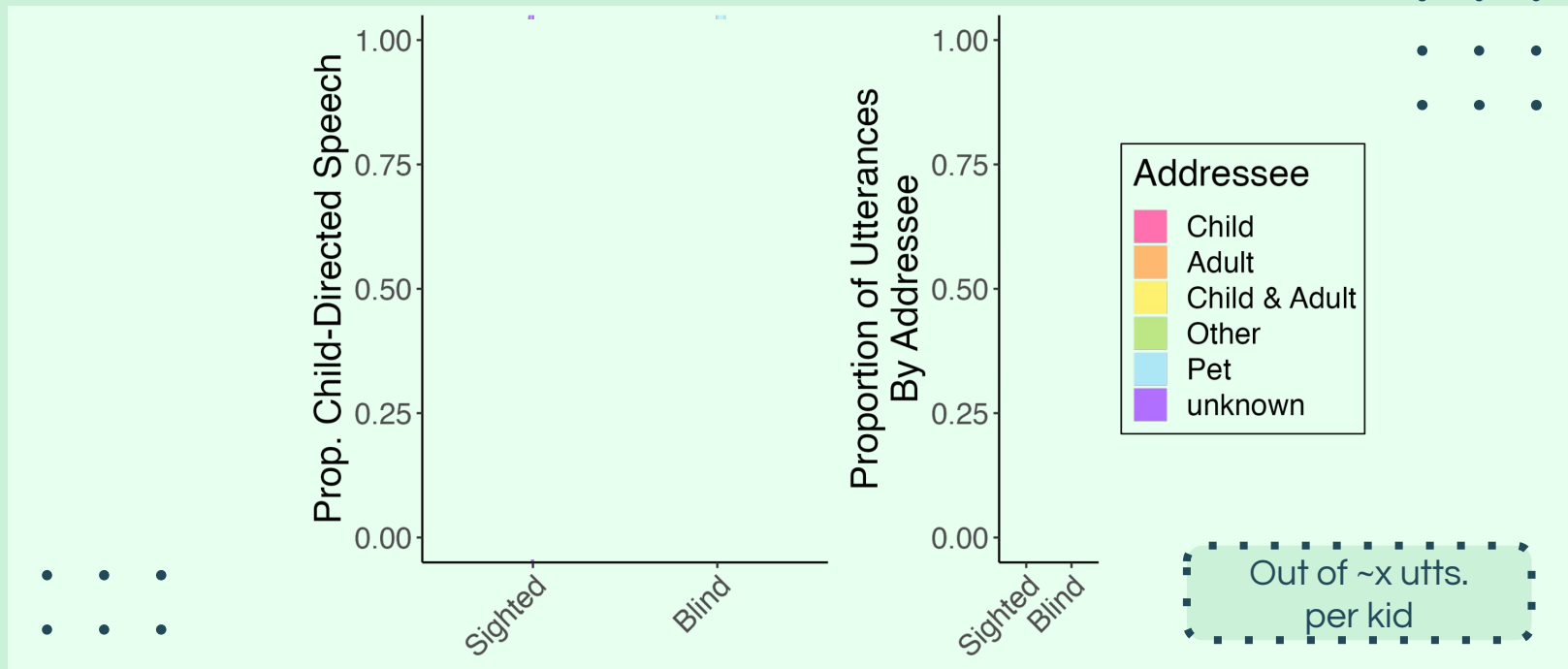
Number of switches between
child/adult speakers within 5 sec. of
each other

Proportion of Child-Directed Speech:

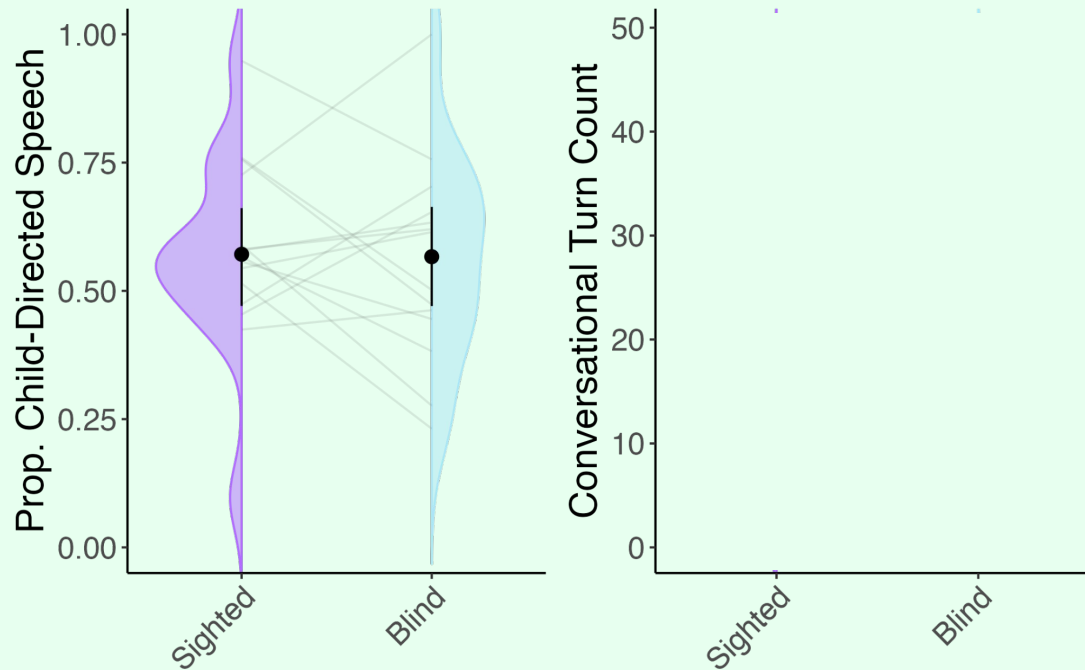
Proportion of utterances spoken to
children (as opposed to adults,
pets, etc.)



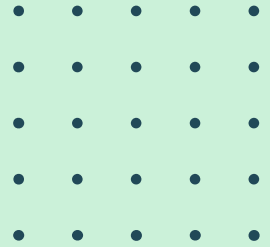
No difference in child-directed speech : : : : :



No difference in interactiviveness



Linguistic Properties



Type-Token Ratio

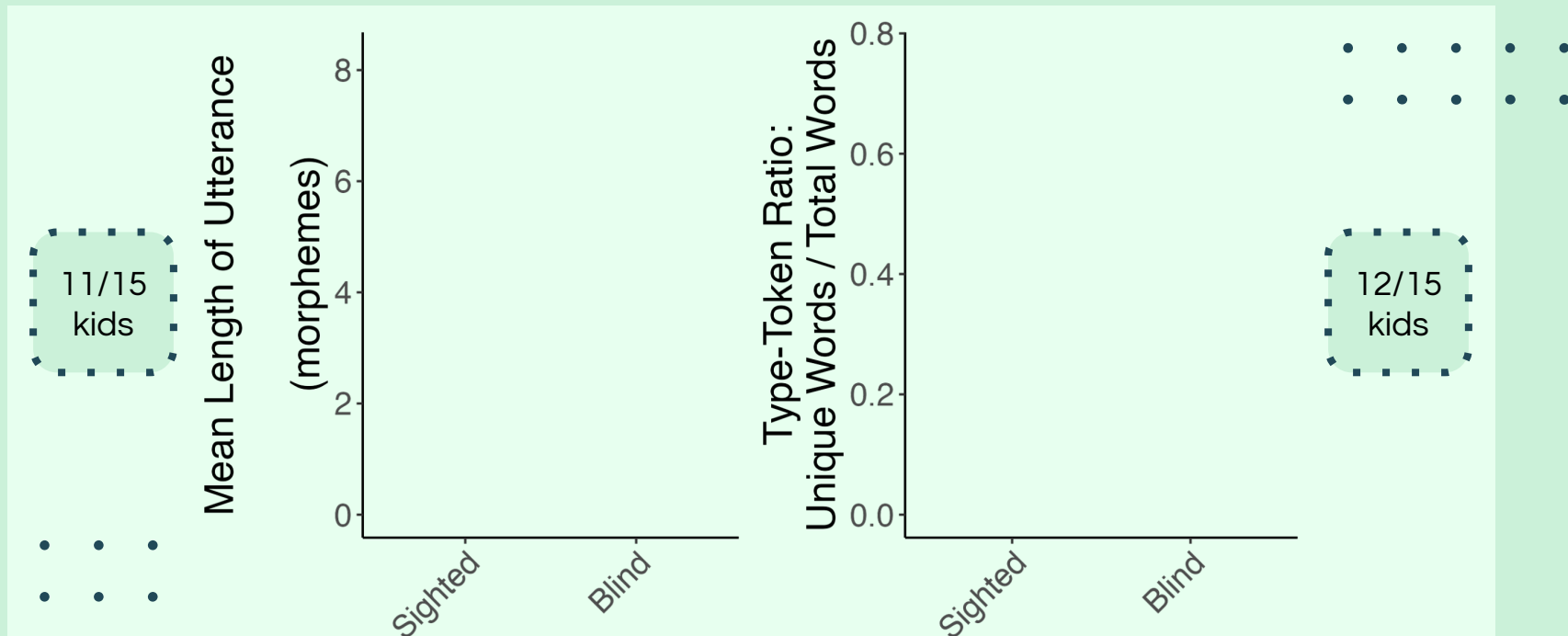
$$\frac{\text{Number of unique words}}{\text{Number of total words}}$$



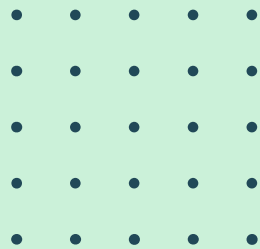
Mean Length of Utterance

Average length of utterances,
measured in morphemes

Longer, more lexically-diverse utterances



Conceptual Properties



Proportion of visual words

Lancaster Sensorimotor Norms

(Lynott & Connell, 2020)

"How visual/auditory/tactile/etc. is the word _____?"

Assign perceptual modality to each content word in each child's input:

Auditory, Visual, Gustatory, Tactile, Olfactory, Interoceptive, Multimodal, Amodal



Proportion of temporally "displaced" verbs

Categorize verbs as present or displaced:

Present: current, ongoing events

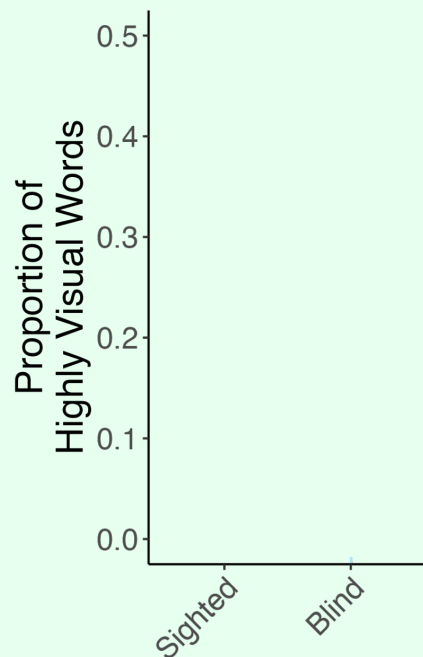
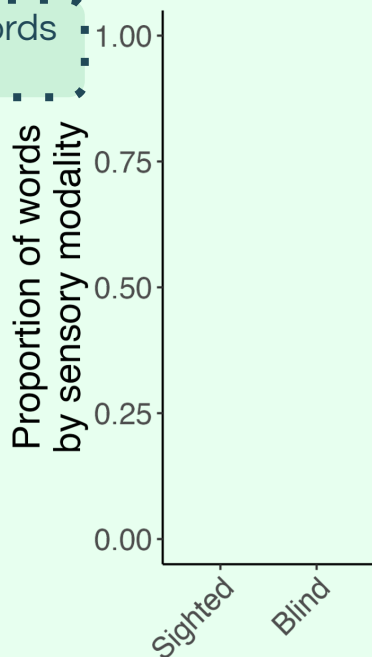
I see a seagull!

Displaced: past, future, or hypothetical

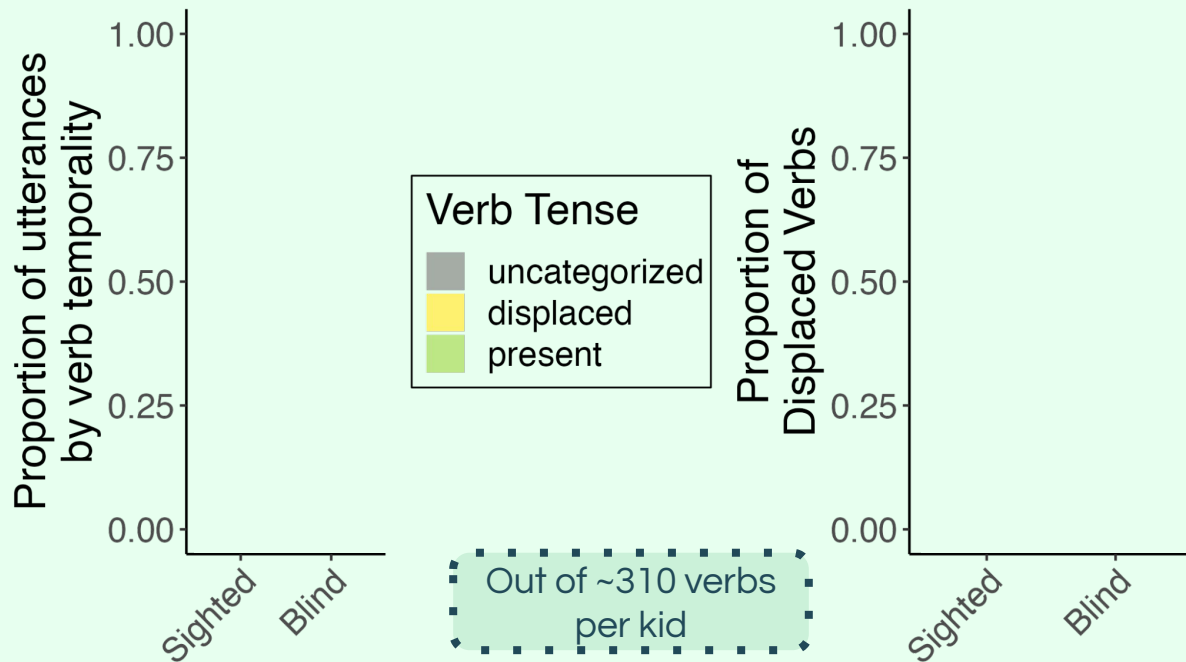
We saw a seagull at the beach last week.

No difference in amount of visual words : : : : :

Out of ~398 words
per kid



More temporally-displaced verbs



Characterizing the input



1. Quantity

similar number of words in input

2. Interaction

*similar number of conversational turns
and proportion of child-directed speech*

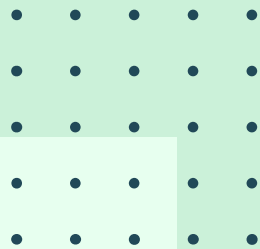
3. Linguistic Properties

*higher lexical diversity and longer
utterances*

4. Conceptual Properties

*more temporally-displaced verbs, and
similar # of highly visual words*

Summary



In many ways, similar input across groups:

- Similar quantity and parent-child interaction
- All differences small in magnitude

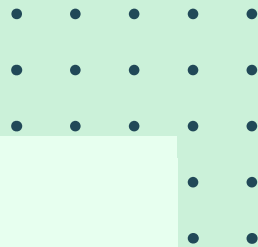
Also, evidence of differences:

Blind (vs. sighted) children hear:

- More complex speech (higher MLU and type-token ratio)
- More decontextualized language

Blind children do not receive “*deficient*” language input

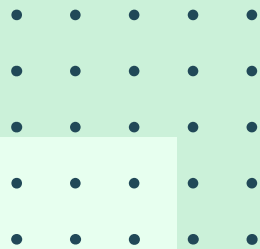
Discussion



What does it mean for blind children's language outcomes?

- In sighted children:
 - Longer utterances → larger vocab. (Anderson et al., 2021)
 - More lexical diversity → larger vocab. (Anderson et al., 2021)
 - More decontextualized speech → larger vocab. (Rowe, 2013)
- **Properties of language input may support word learning in the absence of visual input**
 - Perhaps blind children use strategies like syntactic bootstrapping to build vocab.

Future Directions



Connecting to language outcomes:

- What could additional complexity mean for language development?
 - Does this help blind children learn language without visual input?

Honing in on the “visual” words:

- Do blind individuals rate these words similarly?
- Are these used in similar ways, in similar contexts?



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Thank you

