Socioeconomic disparities in early language development: Predictors, consequences and considerations for intervention

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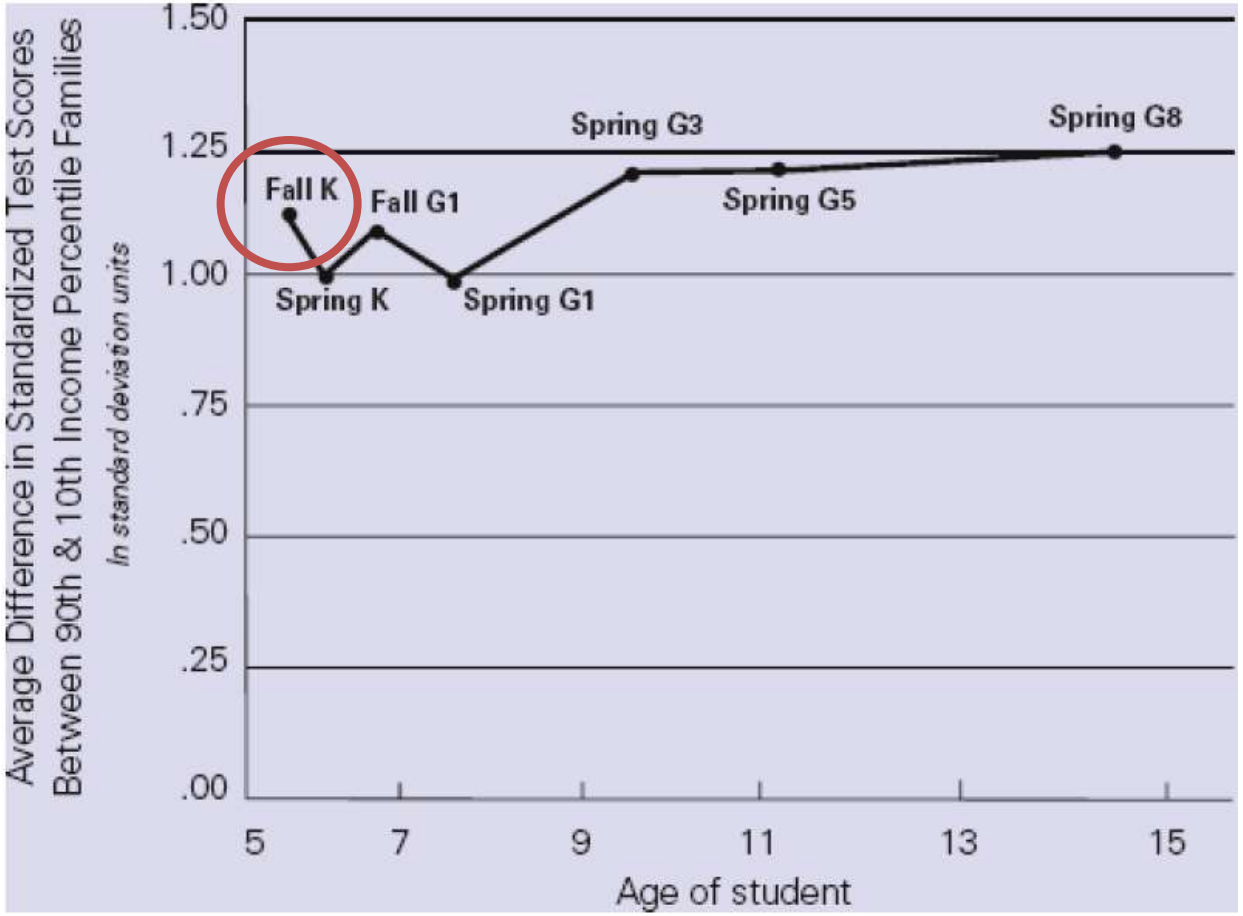
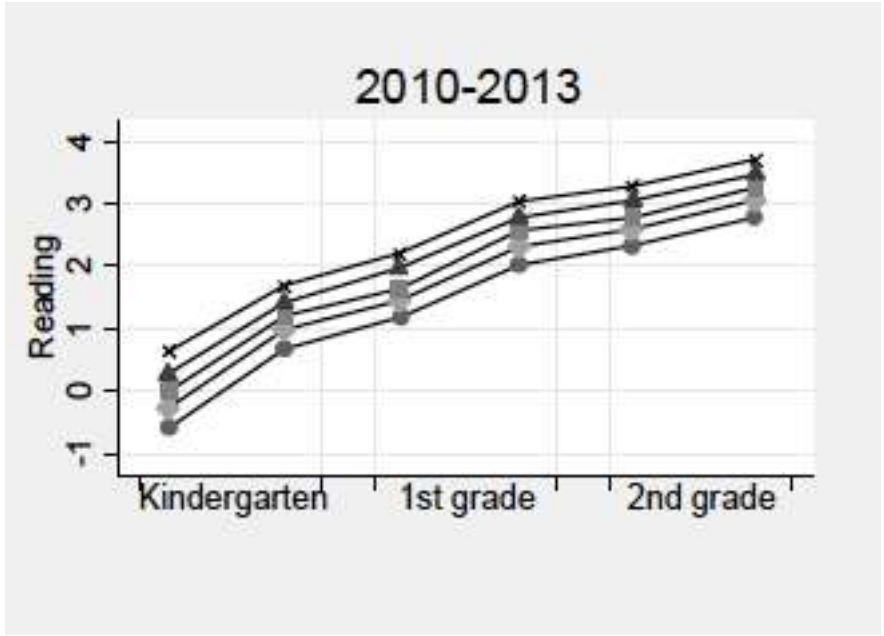
December 12th 2017

LuCiD: University of Manchester

The Problem



(Reardon, 2013)



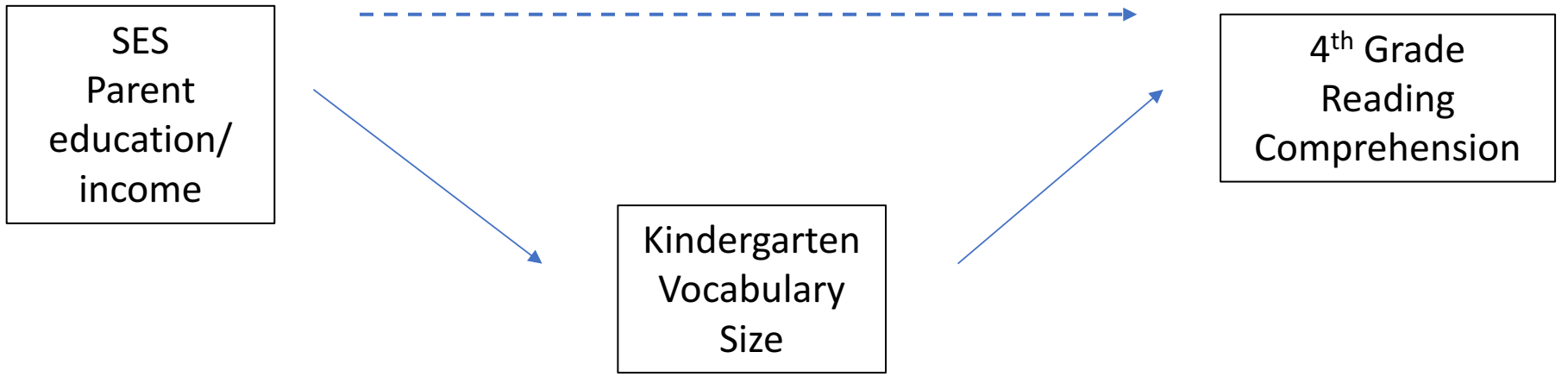
Mean scores by SES quintile

(Von Hippel, Workman & Downey, 2017)

The income achievement gap in reading grows most during first five years, then remains large.

Vocabulary is Key Indicator

Children's early ***vocabulary*** **skills** are highly predictive of learning to read and school success in general.



(Durham et al., 2007)

(e.g., Dickinson & Tabors, 2001; Scarborough, 2001; Snow, Burns & Griffin, 1998; Snow, 1999; Stanovich, 1986; Storch & Whitehurst, 2001; Walker, Greenwood, Hart & Carta, 1994)

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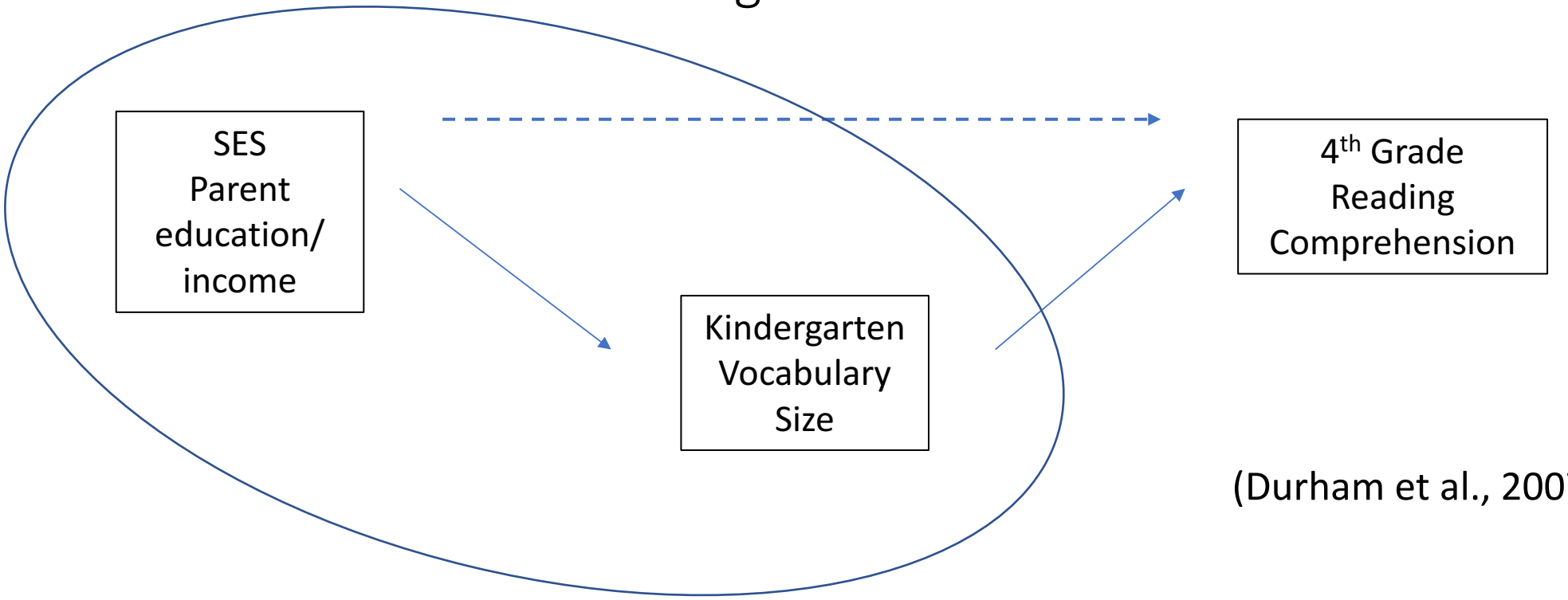

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Language Input Plays a Role in Vocabulary Growth

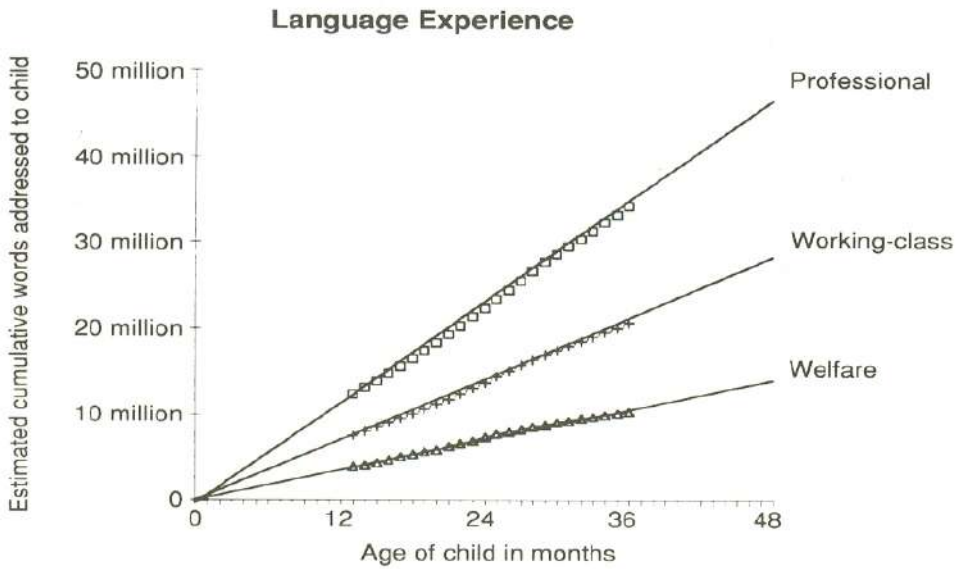

Figure 19. Cumulative number of words addressed to the child in 13 professional (squares), 23 working-class (plus signs), and 6 welfare families (triangles) extrapolated from birth to 12 months of age and from 37 to 48 months of child age. The linear regression line was fit to the actual average cumulative number of words addressed to the children per hour when they were 12–36 months old.

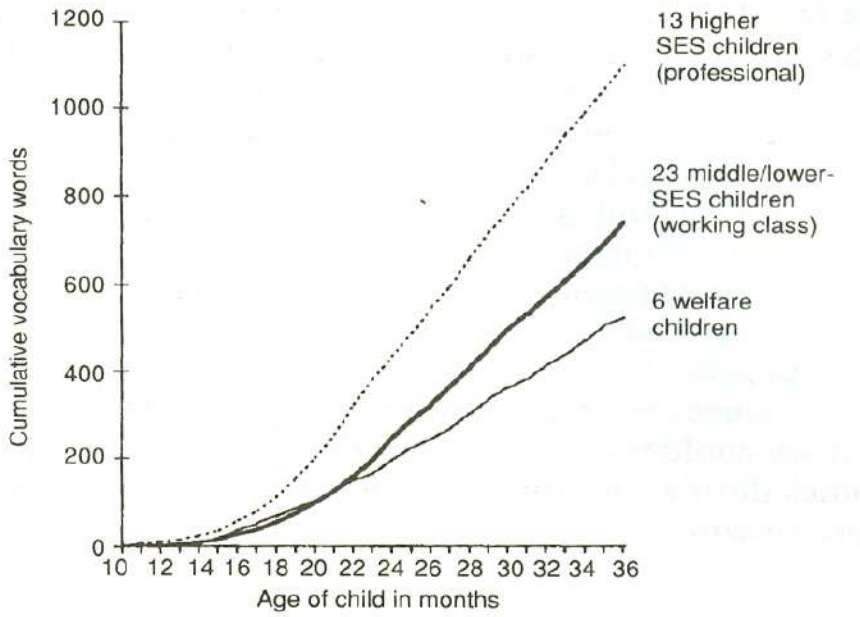

Figure 2. The widening gap we saw in the vocabulary growth of children from professional, working-class, and welfare families across their first 3 years of life. (See Appendix B for a detailed explanation of this figure.)

(Hart & Risley, 1995)

My Goals

Research/Empirical Goals

- What *proximal* factors contribute to parent input?
- What features of parent input best predict vocabulary development between child ages 0-5?
  →Help understand *mechanisms* involved

Practical Goal

- Design parent-focused interventions to improve children's early vocabulary development

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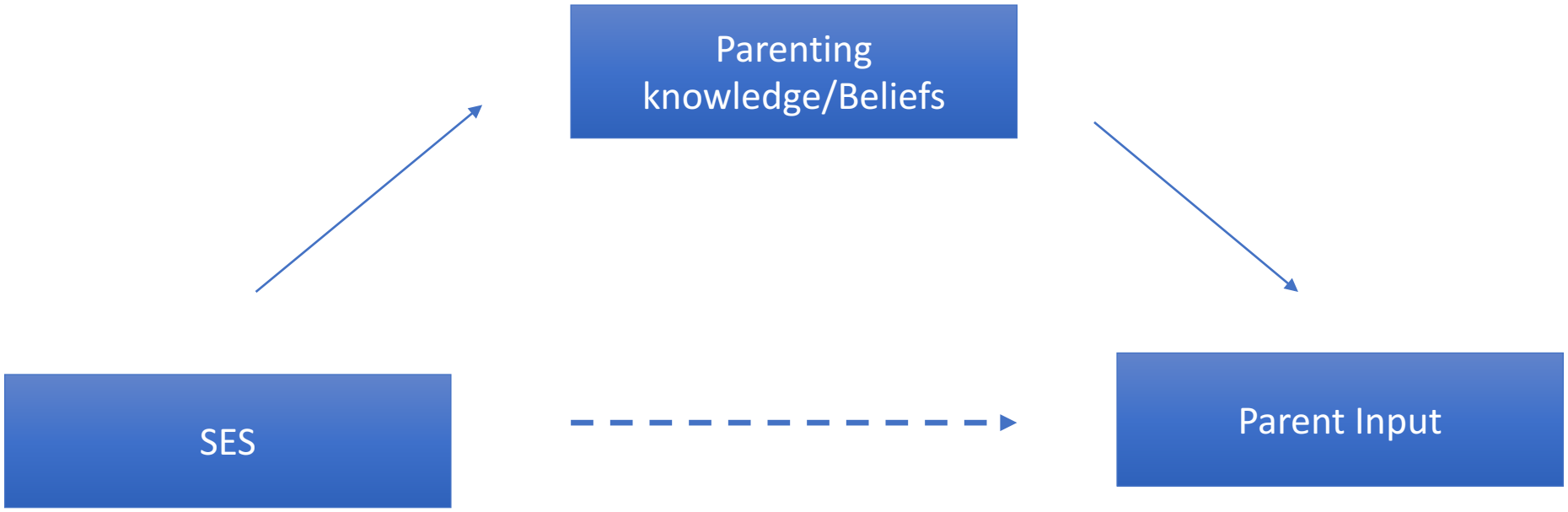
What proximal factors contribute to parent Input?

Potential malleable mechanism?

- Knowledge of child development (Rowe, 2008, Rowe et al., 2016)
- Parenting mindset beliefs (Muenks, e tal., 2015; Mueller, Rowe & Zuckerman, 2016)



(e.g., Rowe, 2008)

Proximal factors: Implications for intervention

1. Provide caregivers with information/knowledge about why parent input matters for child development
2. Help caregivers understand how much of a difference they can make, help promote growth mindset towards parenting

(Rowe, 2017)

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Features of parent input that promote vocabulary

SES → Features of parent Input → Child Vocabulary

0 1 2 3 4 5

Child Age

Features of parent input that promote vocabulary

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Responsiveness, contingent talk, fluent and connected communication →
(e.g., Tamis-LeMonda et al., 2014; McGillion et al., 2017; Hirsh-Pasek et al., 2015)

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(e.g., Cartmill, 2016; Rowe & Zuckerman, 2016)

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Gesture
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Gesture
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Diversity, Sophistication, Complexity
(e.g., Huttenlocher et al., 2010; Weizman & Snow, 2001)

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Child Age

(e.g., Cartmill, 2016; Rowe & Zuckerman, 2016)

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(e.g., Cartmill, 2016; Rowe & Zuckerman, 2016)

Features of Input: Gesture

SES → Features of parent Input → Child Vocabulary

Gesture: Methodological approach

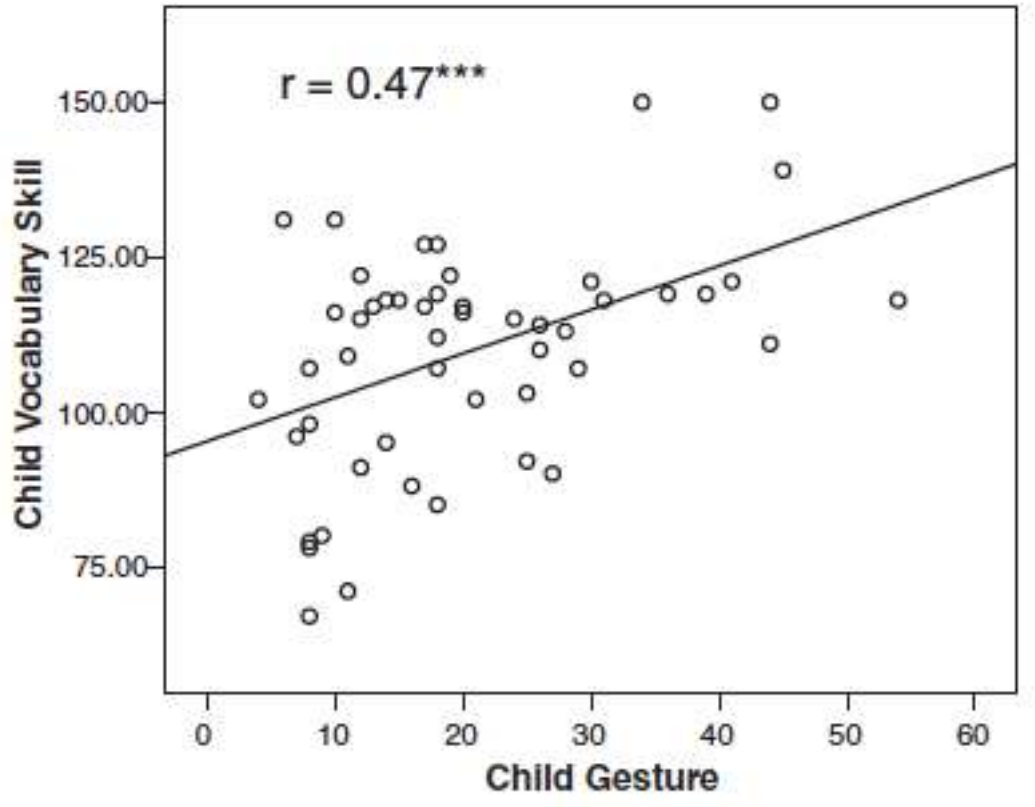
SES → Features of parent Input → Child Vocabulary

*MOT: what's a lion say?
%gpx: points to picture of lion in book
%gcd: $D:FPoint#p_lion|RE
*CHI: rawr@o.
*MOT: yeah.
*MOT: rawr@o.
*CHI: 0@b.
%gpx: points to picture of gorilla
%gcd: $D:FPoint#p_gorilla|GV
*MOT: yeah that's the gorilla.
*MOT: he's letting the lion out of the cage.
%act: turns page
*MOT: +" good_night hyena.
*MOT: +" good_night giraffe.
*CHI: 0@b.
%gpx: points to the hyena
%gcd: $D:FPoint#p_hyena|GV
*MOT: yeah is that like a doggy?
*MOT: it's like a doggy.
*MOT: you love doggies.

Gesture: Skills build upon skills

SES → Features of parent Input → Child Vocabulary

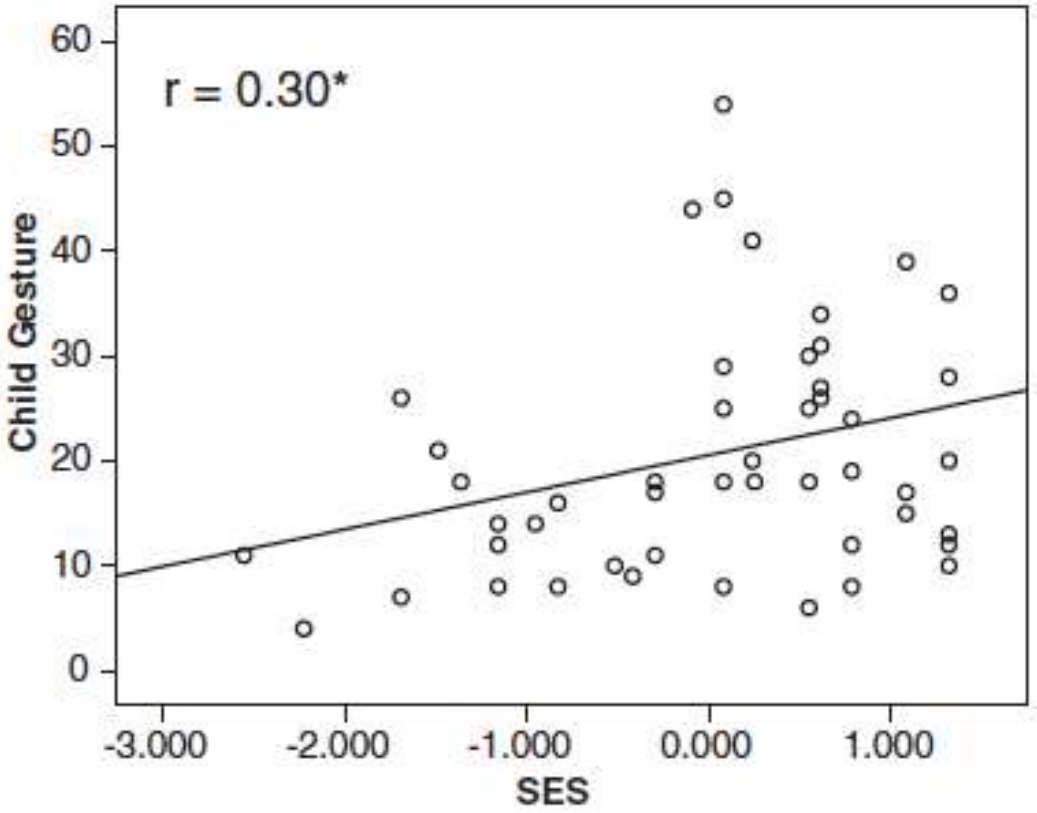
Variability in early gesture use predicts variability in later vocabulary skill (PPVT age 5)

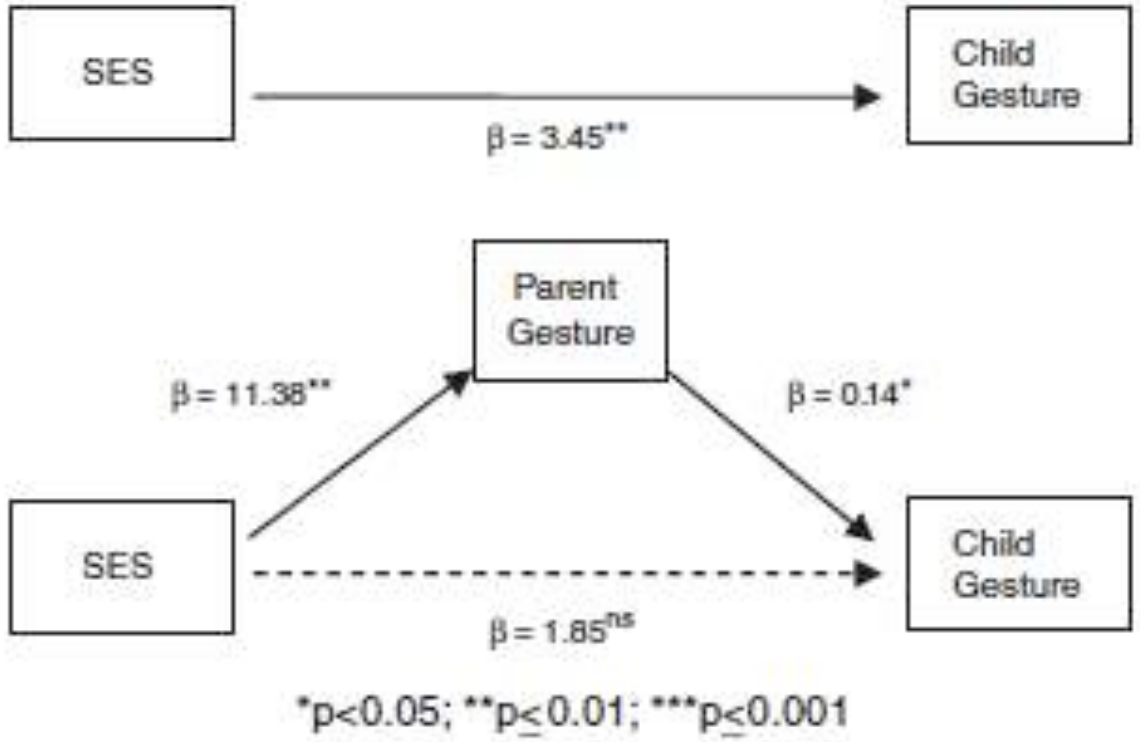


N=50
(Rowe & Goldin-Meadow, 2009)

Gesture: Parent Gesture Predicts Child Gesture

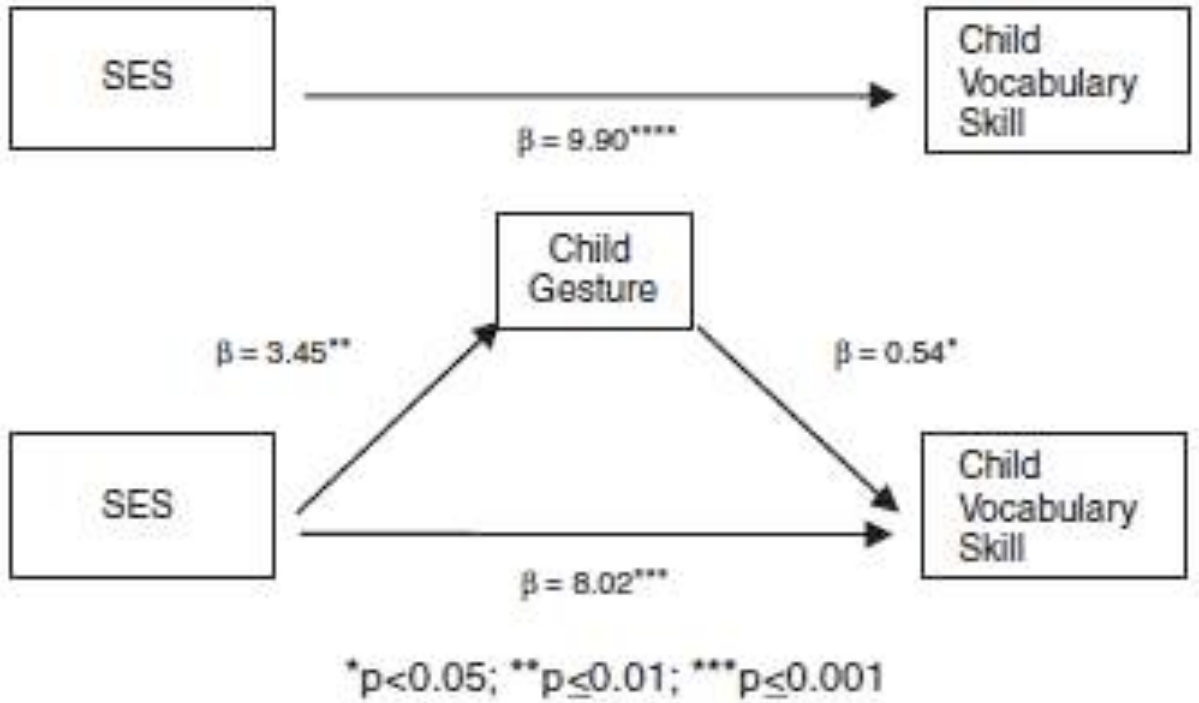
SES → Features of parent Input → Child Vocabulary





(Rowe & Goldin-Meadow, 2009)

Gesture: SES differences predict later vocabulary



(Rowe & Goldin-Meadow, 2009)

Gesture: Boosting early skills may reduce gaps

SES → Features of parent Input → Child Vocabulary

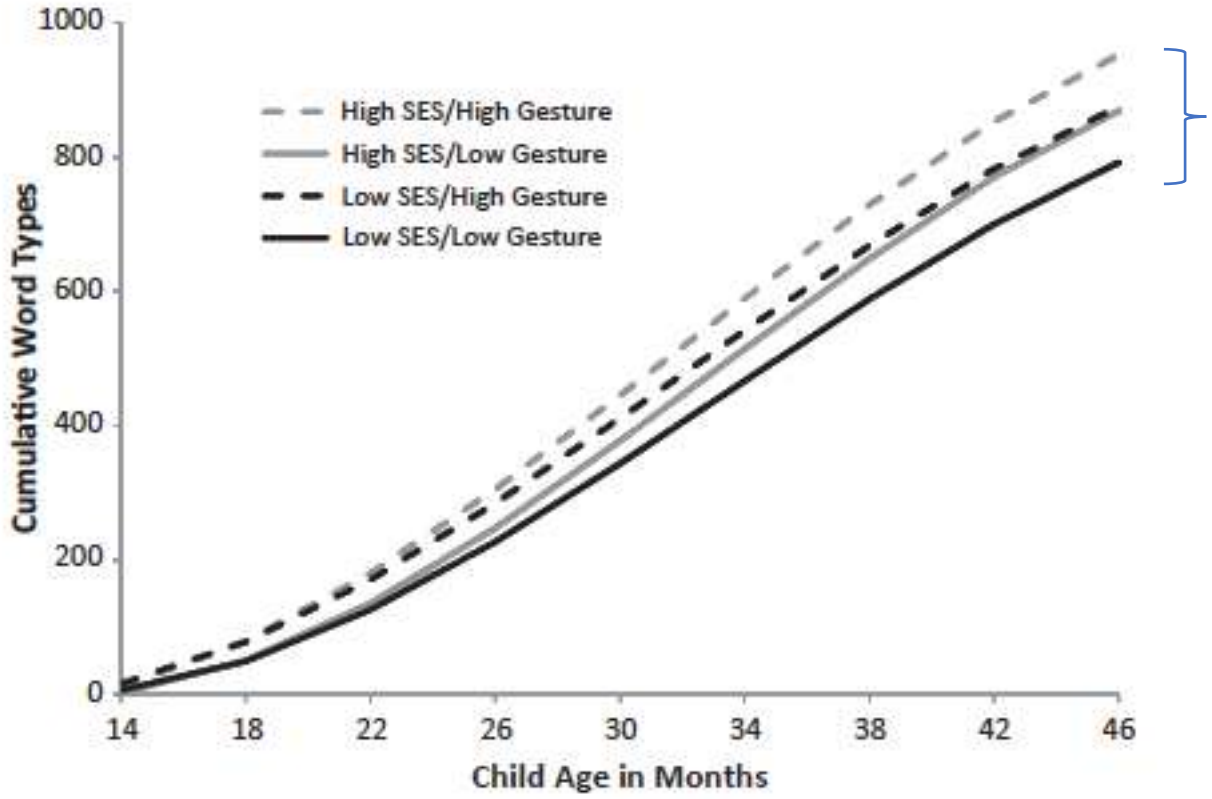


Figure 2. Effect of socioeconomic status (SES) and child gesture on cumulative vocabulary growth, holding parent input constant

SES gap is reduced if child from low-SES family is High gesturer

(Rowe, Raudenbush & Goldin Meadow, 2012)

Gesture: Mechanisms

Children learn to talk through social interactions with others (e.g., Bruner, 1981, Kuhl, 2007, Snow, 1999, Vygotsky, 1978)

→emergence and use of pointing may also be *socially mediated* (e.g., Salomo & Liskowski, 2012)

→children see parents point and do so themselves

Parents also "translate" their children's gestures into words (e.g., Goldin-Meadow et al., 2007)

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SES → Features of parent Input → Child Vocabulary

Gesture: Parent Intervention

Pointing to Success Training

POINTING to SUCCESS©

Parenting knowledge/Mindsets

Parent gesture → Child gesture → Child vocabulary Growth

NICHD: R21HD078771

Gesture: Parent Intervention

50 families recruited to our study on “Play and Development”

- Low to high SES

Initial Home Visit (10-months)

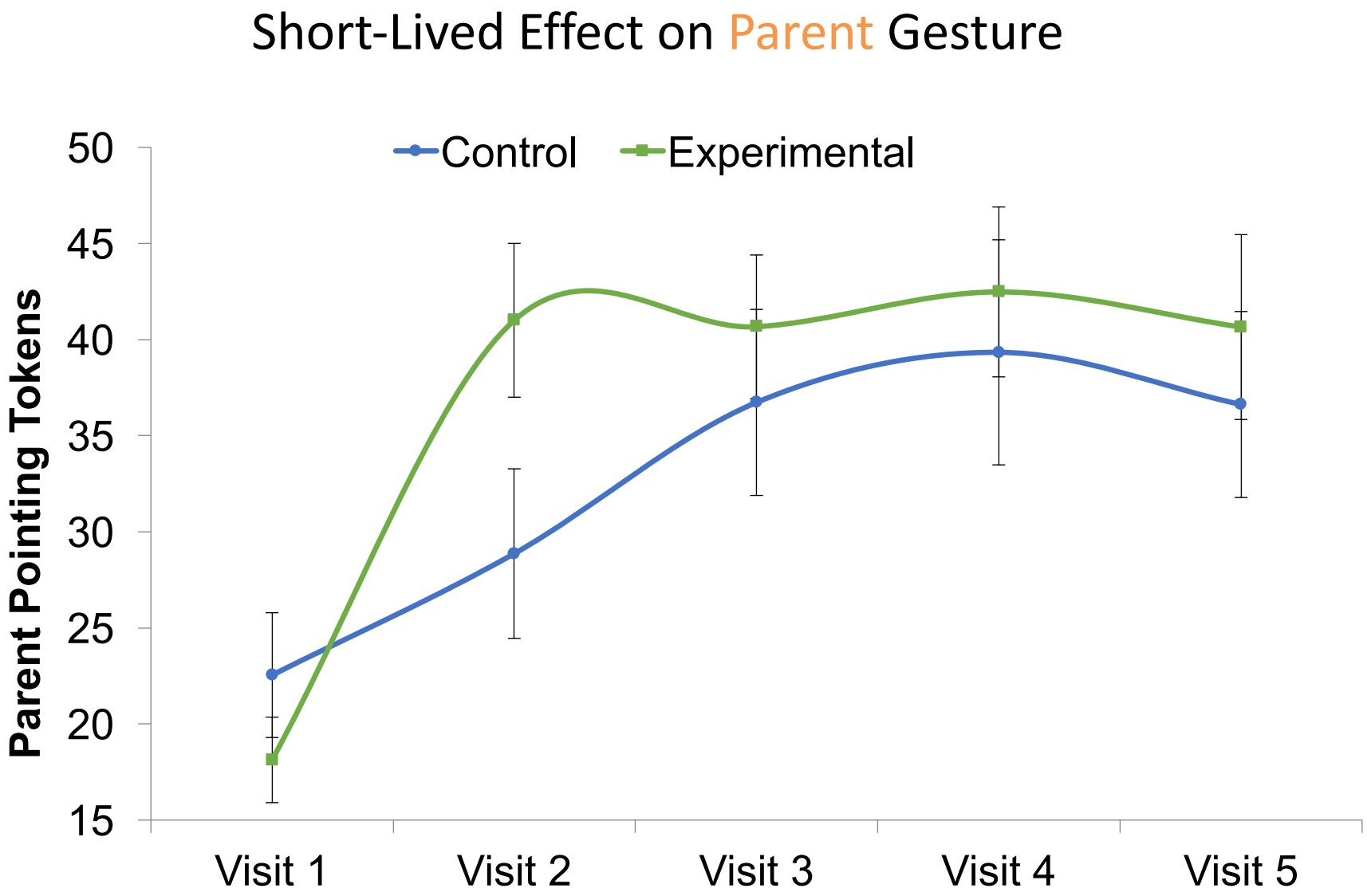
- Baseline parent and child interaction (15 mins)
- Parent questionnaires (Child Vocabulary, Parent Knowledge, Mindset)
- Random Assignment - Intervention/Training implementation
  - **5 minute video = *Pointing to Success***
  - **Focus on providing parents with knowledge and supporting growth mindset**
- Give families toys to play with – text families in intervention group once week

- Additional home visits (child ages 12, 14, 16, 18 months)
  - Recorded parent-child interactions 15 mins
  - Vocabulary

Gesture: Parent Intervention

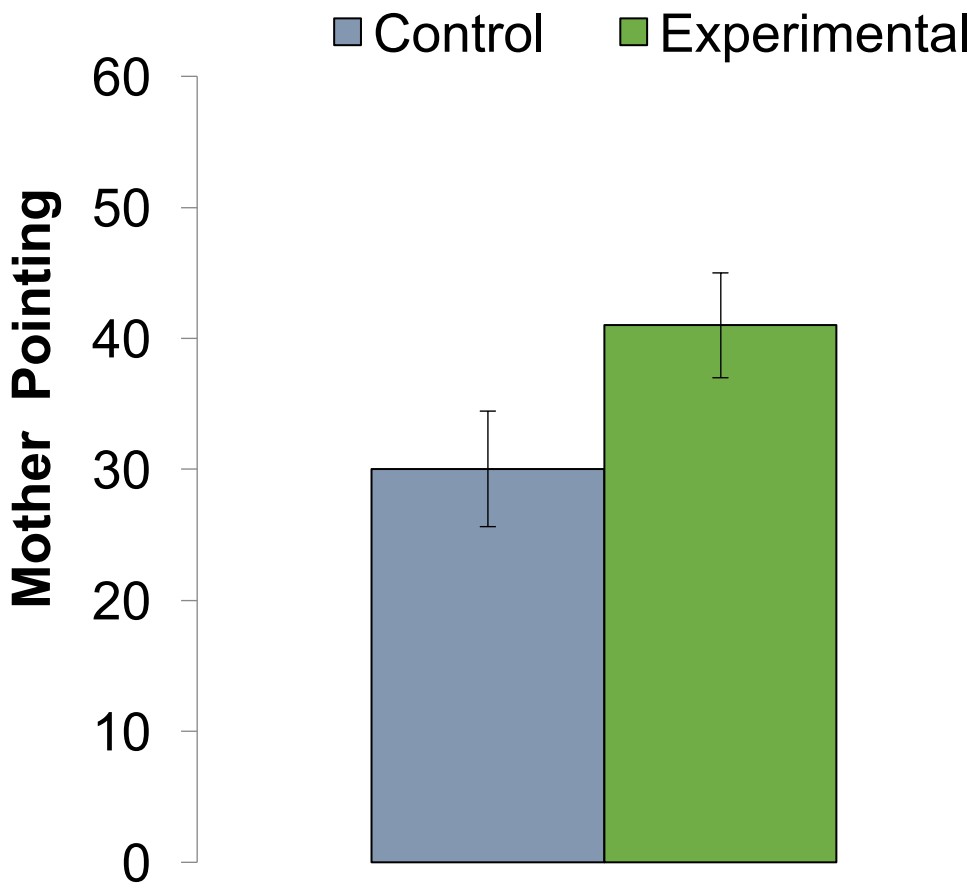
Is there an effect of the intervention on parent and child pointing?

Gesture: Parent Intervention



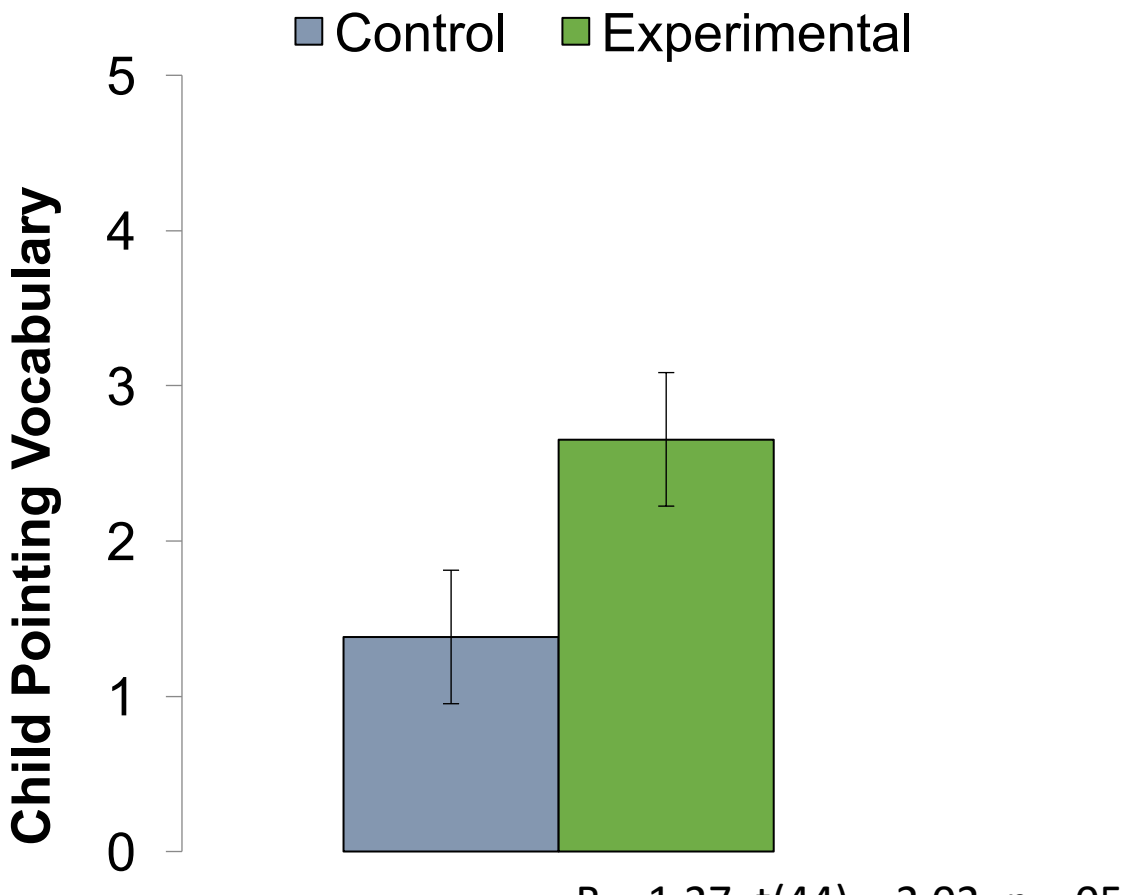
Gesture: Parent Intervention

Parent



B = 13.246, t(44) = 2.31, *p* =.026

Child



B = 1.27, t(44) = 2.02, *p* =.05

Rowe & Leech, *under review*

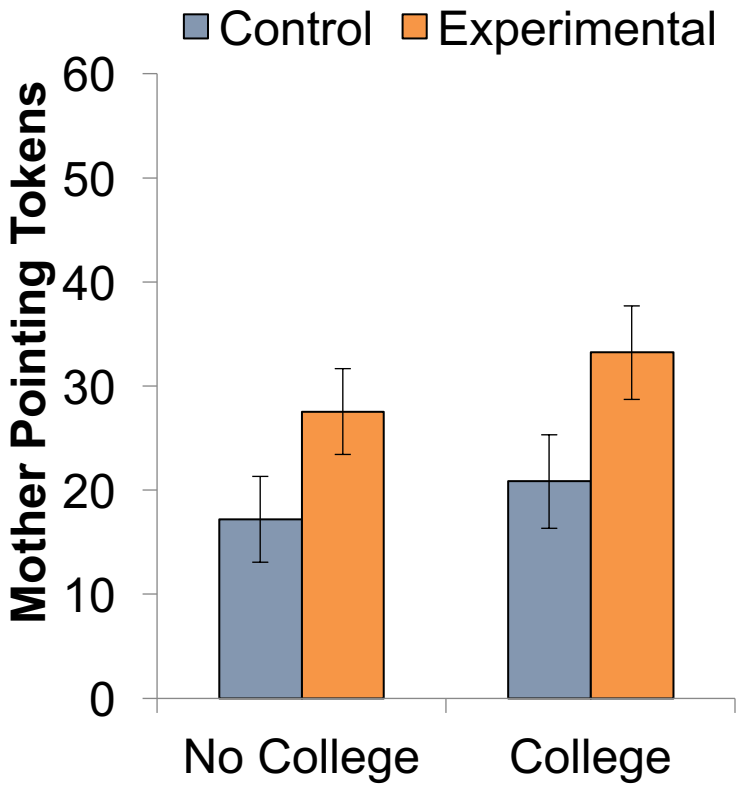
Gesture: Parent Intervention

Possible Moderators of Intervention Effectiveness

- Maternal education
- Knowledge of child language development
- Parent mindsets

Gesture: Parent Intervention

No moderating effect of parent education



Gesture: Parent Intervention

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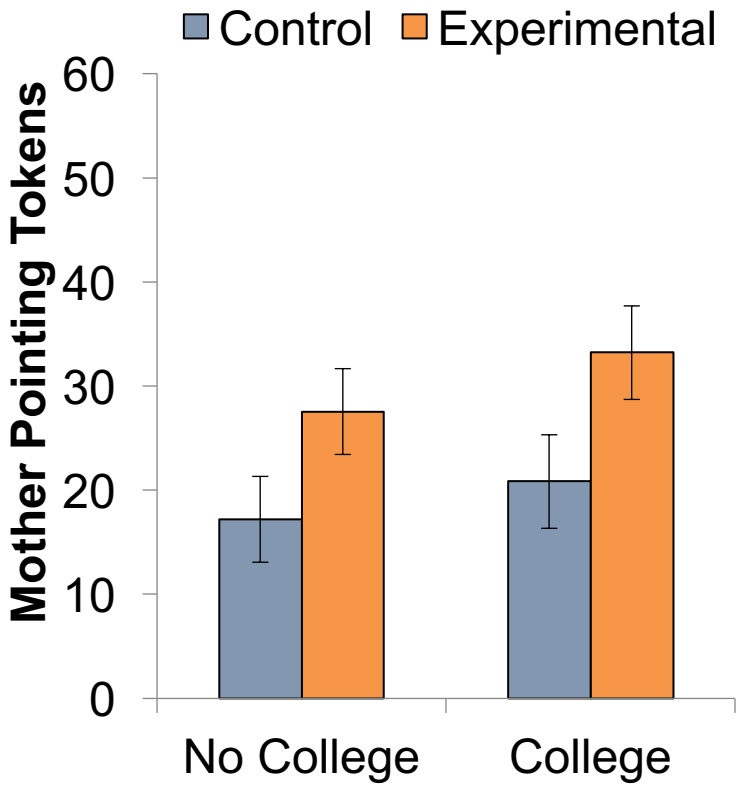
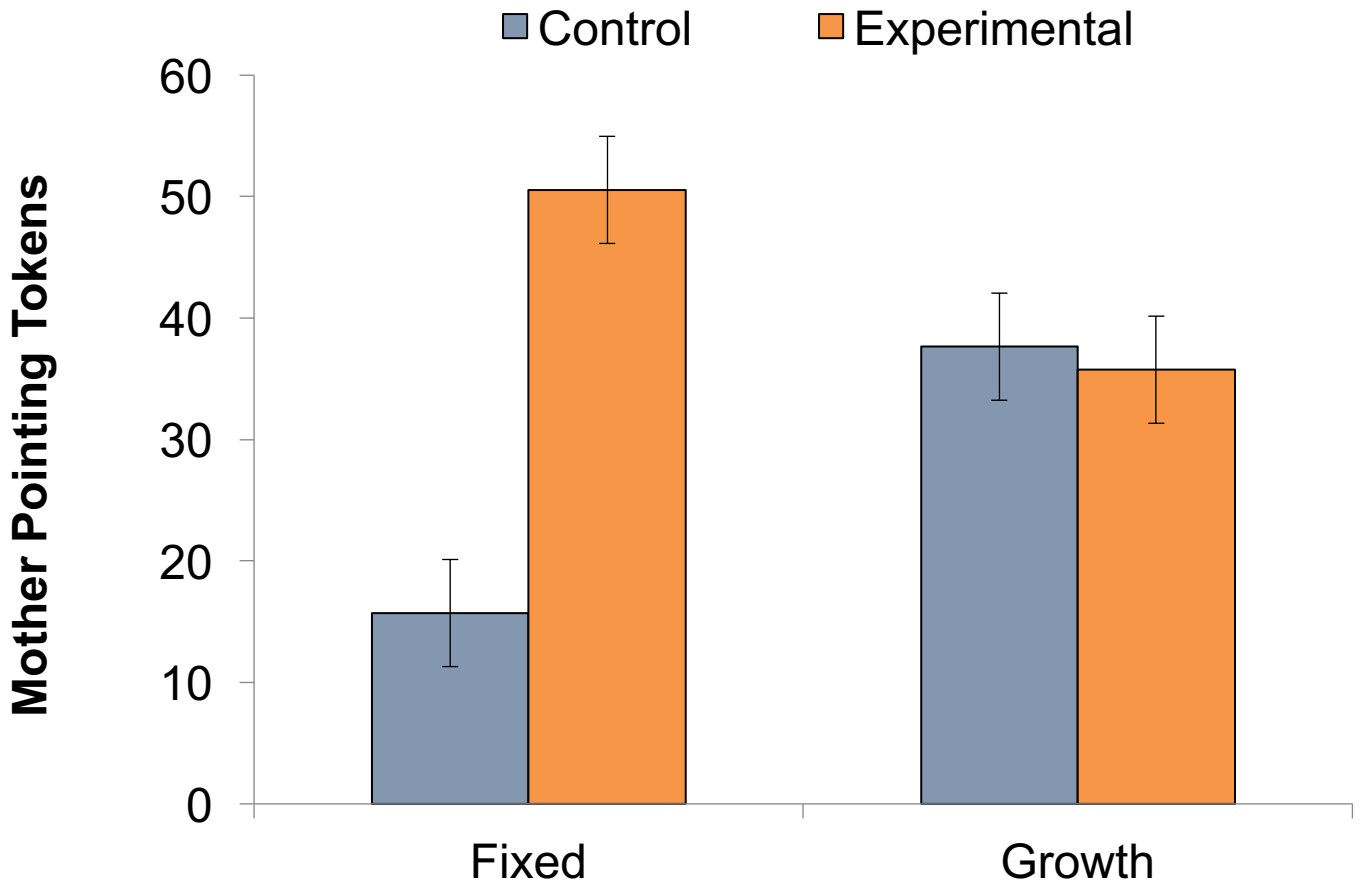


Also, no moderating effect of parent knowledge of child development

Rowe & Leech, under review

Gesture: Parent Intervention

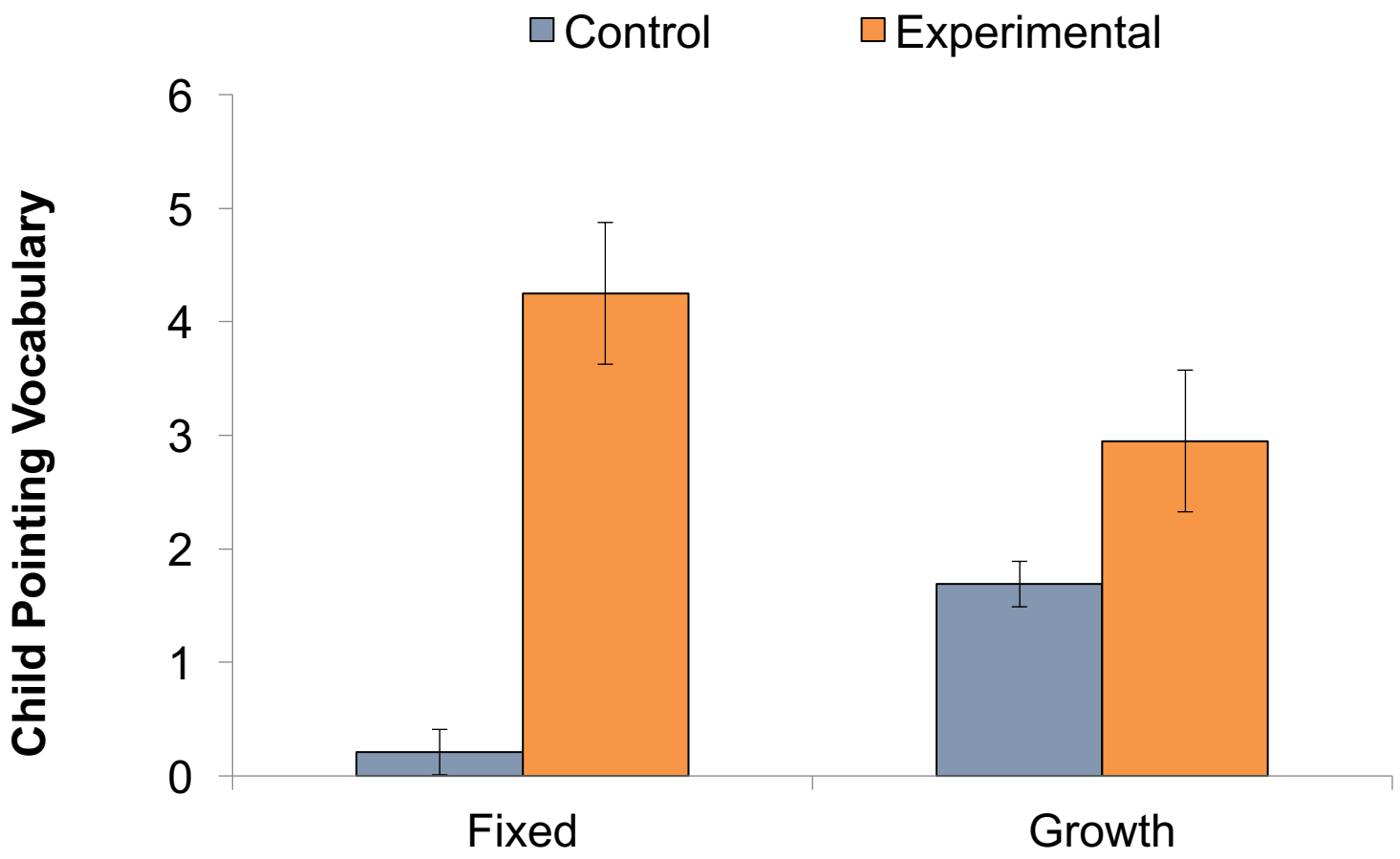


Gesture intervention had a stronger effect for parents who endorsed *fixed* mindsets at baseline

Rowe & Leech, under review

Mindset x Condition Interaction: B = 11.82, t(42) = 2.17, *p* =.037

Gesture: Parent Intervention



Intervention had a larger effect on child gesture for children of parents who endorsed fixed mindsets at baseline

Mindset x Condition Interaction: B = 1.21, t(42) = 2.03, *p* =.04

Rowe & Leech, under review

SES → Features of parent Input → Child Vocabulary

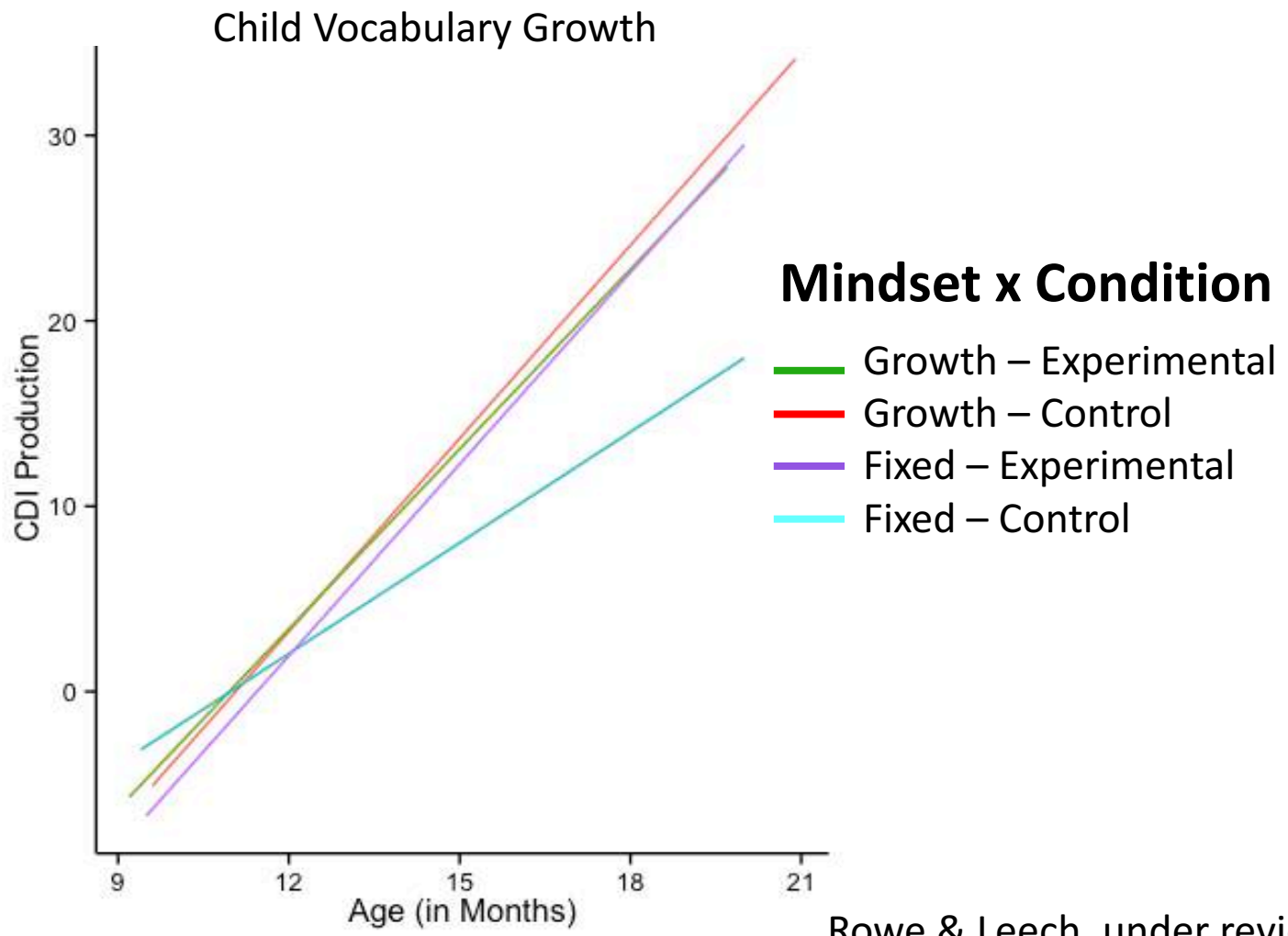
Gesture: Parent Intervention

Is there an effect of the intervention on child vocabulary?

SES → Features of parent Input → Child Vocabulary

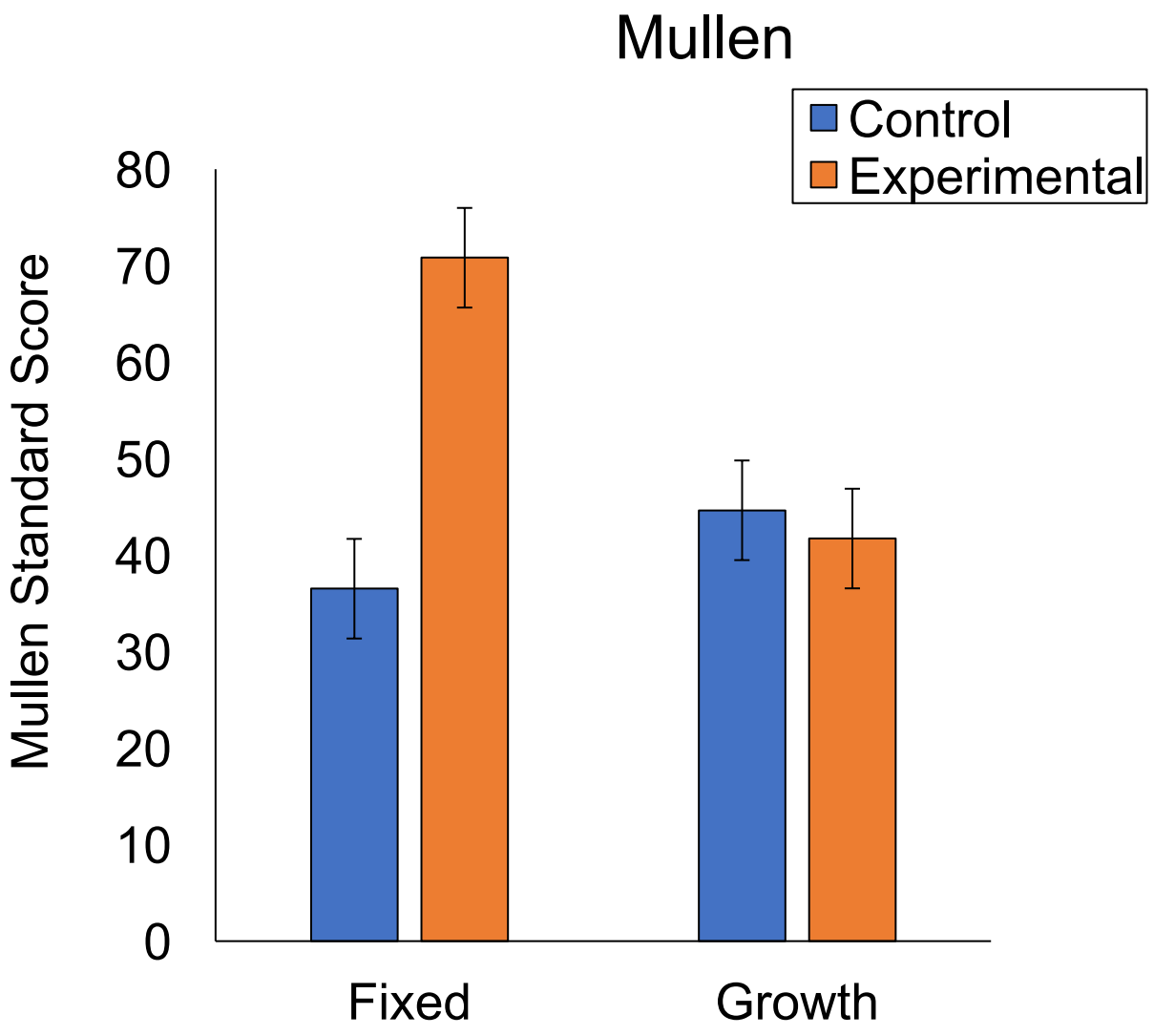
Gesture: Parent Intervention

Yes, but only for children of parents who endorsed fixed mindsets and were in the intervention group



Rowe & Leech, under review

Gesture: Parent Intervention



Interaction: B=19.71, t=2.16, *p* = .038

Correlations among child language measures at 18-months

	CDI	Types
CDI	--	
Types	.45**	--
Mullen Exp	.58***	.76***

Gesture: Parent Intervention

Conclusions

- The Pointing to Success intervention resulted in short-term effects on parent and child gesture
  → Provides some evidence for *social-mediation* theory/hypothesis

- The intervention had effects on child vocabulary *only* for families where parents endorsed “fixed” mindsets at baseline.

- Results highlight the importance of understanding what types of interventions might work for whom and why.

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Repetition of words
(e.g., Newman, Rowe & Ratner, 2015)

Gesture
(e.g., Rowe & Goldin-Meadow, 2009)

Ask challenging *wh*-questions
(e.g., Rowe, Leech & Cabrera, 2016)

Diversity of words
(e.g., Rowe,2012)

Decontextualized talk and explanations
(e.g., Rowe, 2012; Rowe, 2013)

0 1 2 3 4 5

Child Age

(e.g., Rowe & Zuckerman, 2016)

Features of Input: Decontextualized Talk

SES → Features of parent Input → Child Vocabulary

- Language that is removed from the here and now (Snow, 1990)
- Typically seen in parent-child conversations:
  - Causal explanations
  - Narrative utterances (past or future)
  - Pretense
- Relatively rare, but increases over early childhood (Rowe, 2012)
- More frequent during mealtimes (Aukrust & Snow, 1998; Beals & DeTemple, 1993)
- Remaining talk is contextualized
  - Grounded in “here-and-now”

Decontextualized Talk: Examples

Contextualized Talk

28 *CHI: I want more rice than Lizzie.
29 *MOT: you want more rice than Lizzie?
30 *CHI: is this white rice?
31 *MOT: yea it's like cheesy rice kind of.
32 *CHI: is it white?
33 *MOT: uh yea it's white.
35 *CHI: yay white rice.
36 *MOT: you have white rice?
37 *CHI: white rice.
38 *MOT: it's actually called couscous.

Decontextualized Talk

133 *MOT: yes so tomorrow daddy says if you sleep and don't wake anyone up in the morning.
138 *MOT: he'll take you out to breakfast.
140 *CHI: oh!
141 *MOT: the only tricky part about that is mommy has to go for a really long
142 run tomorrow morning.
146 *CHI: why do you have to?
148 *MOT: because I'm gonna do that race with xxxx and xxxx in a few weeks.
150 *CHI: hmm?
152 *MOT: I'm gonna run really far.
154 *CHI: where are you having it?
156 *MOT: where is the race?
158 *CHI: yea.
160 *MOT: it's in New Hampshire.
163 *MOT: it's a race that mommy does +/.
165 *CHI: am I gonna be there too cheering you?
167 *CHI: am I coming there cheering on?
169 *MOT: yep you're gonna come cheer.

Decontextualized Talk: Our Findings/Mechanisms

- Controlling for input quantity and SES, parents' use of decontextualized talk significantly predicts children's vocabulary growth from ages 3-5 (Rowe, 2012)

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- Parent decontextualized talk is more syntactically complex than contextualized talk and also predicts children's narrative & syntax skills at kindergarten entry (Demir, Rowe, Heller, Goldin-Meadow & Levine, 2015)

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- Parents who use more decontextualized talk, have children who use more decontextualized talk (Demir, Rowe, Heller, Goldin-Meadow & Levine, 2015; Rowe, 2012)
- Child decontextualized talk in preschool predicts 7th grade academic language skills, controlling for SES, parent decontextualized talk, and early child vocabulary skill (Uccelli, Demir, Rowe, Levine & Goldin-Meadow, in press)

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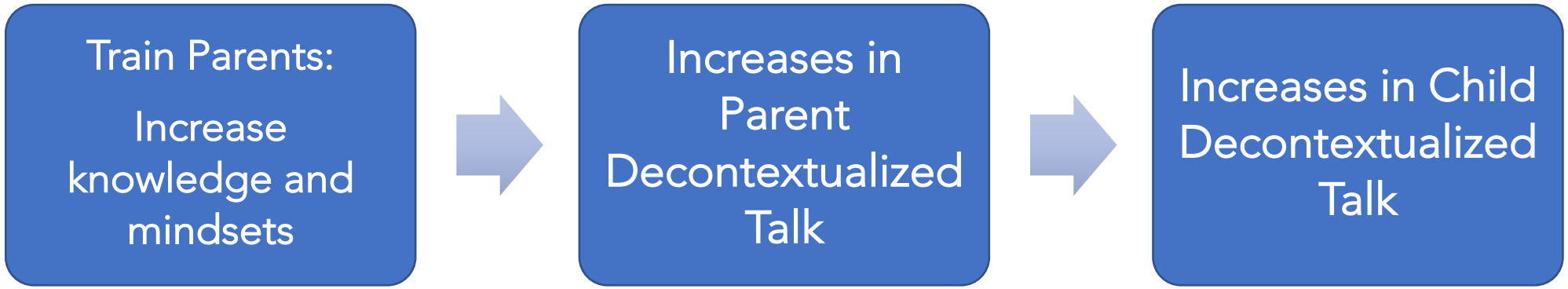
Decontextualized Talk: Parent Intervention

R.E.A.D.Y. Talk – a decontextualized language training for parents of 4 year olds to increase children's exposure to and use of abstract talk



(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk: Parent Intervention

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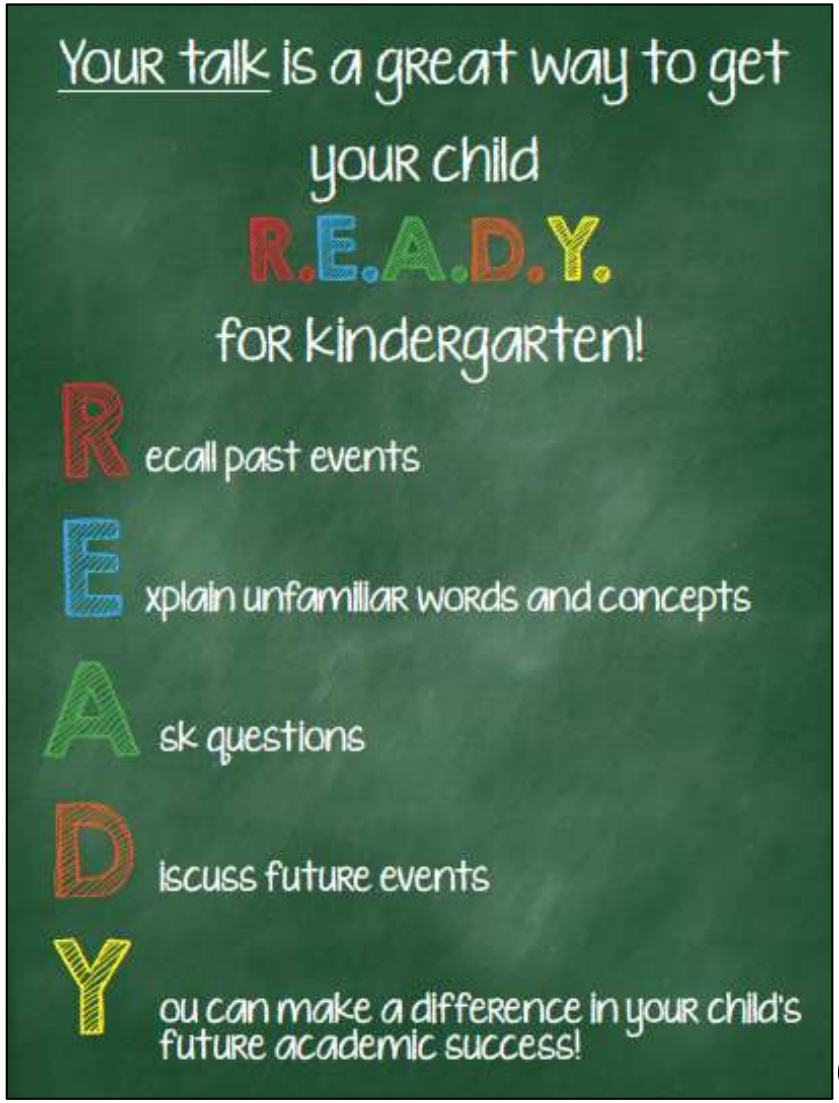


©

Kathryn Leech

(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk: Parent Intervention

- 36 parent-child dyads recruited for ”family mealtime study”
  - Four year old children; mid-high SES sample

- Visit to laboratory
  - Snack time - Baseline measure of parent and child decontextualized talk
  - Random assignment: Training implementation
    - **15 minute video = *R.E.A.D.Y***
    - **Focus on providing parents with knowledge and supporting growth mindset**

- Four measurements of parent-child conversations
  - Recorded at home during mealtimes
  - Corpus of 174 recordings nested within 36 dyads

(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk: Parent Intervention

R.E.A.D.Y. Category	Example
PAST EVENTS	• You gave that shirt to me last Fathers' Day.
EXPLANATIONS	• She can't have chocolate because she's a little baby.
FUTURE EVENTS	• I wonder who the parent helper's gonna be today at school.
QUESTIONS:	• And then <u>what</u> did we do with the stuffed animals? • <u>Why</u> you gonna have lunch with Candace?

Composited to yield total number of decontextualized utterances

(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk:
Parent Intervention

SES → Features of parent Input → Child Vocabulary

Is there an effect of the intervention on parent and child use of decontextualized talk?

Decontextualized Talk: Parent Intervention

SES → Features of parent Input → Child Vocabulary

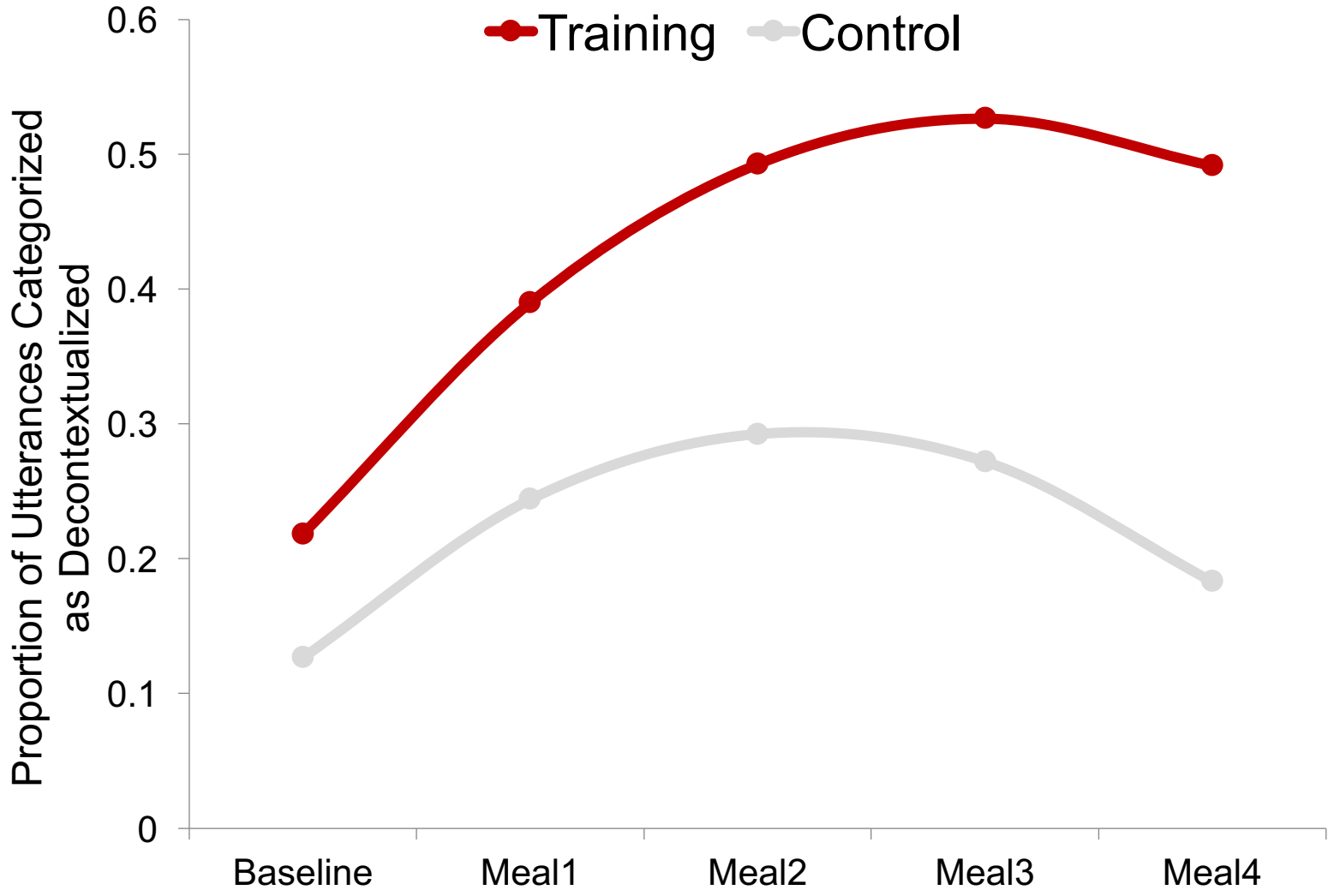
Means (Standard Deviations in Parentheses) of Proportion of Parent and Child Utterances Coded as Decontextualized at Each Time Point

		Parents				Children			
Time	Dyad (*n*)	Total sample	Control	Training	*p*	Total sample	Control	Training	*p*
Baseline	35	.15 (.14)	.13 (.15)	.18 (.13)	.27	.12 (.15)	.12 (.18)	.12 (.11)	.91
Meal 1	35	.34 (.21)	.26 (.22)	.42 (.18)	.03	.36 (.22)	.30 (.25)	.42 (.18)	.11
Meal 2	35	.42 (.21)	.29 (.15)	.54 (.19)	<.001	.37 (.23)	.21 (.20)	.52 (.15)	<.001
Meal 3	36	.35 (.24)	.21 (.18)	.48 (.23)	<.001	.31 (.25)	.20 (.22)	.41 (.22)	.006
Meal 4	33	.37 (.20)	.23 (.13)	.50 (.17)	<.001	.32 (.19)	.21 (.16)	.42 (.16)	.001

(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk:
Parent Intervention

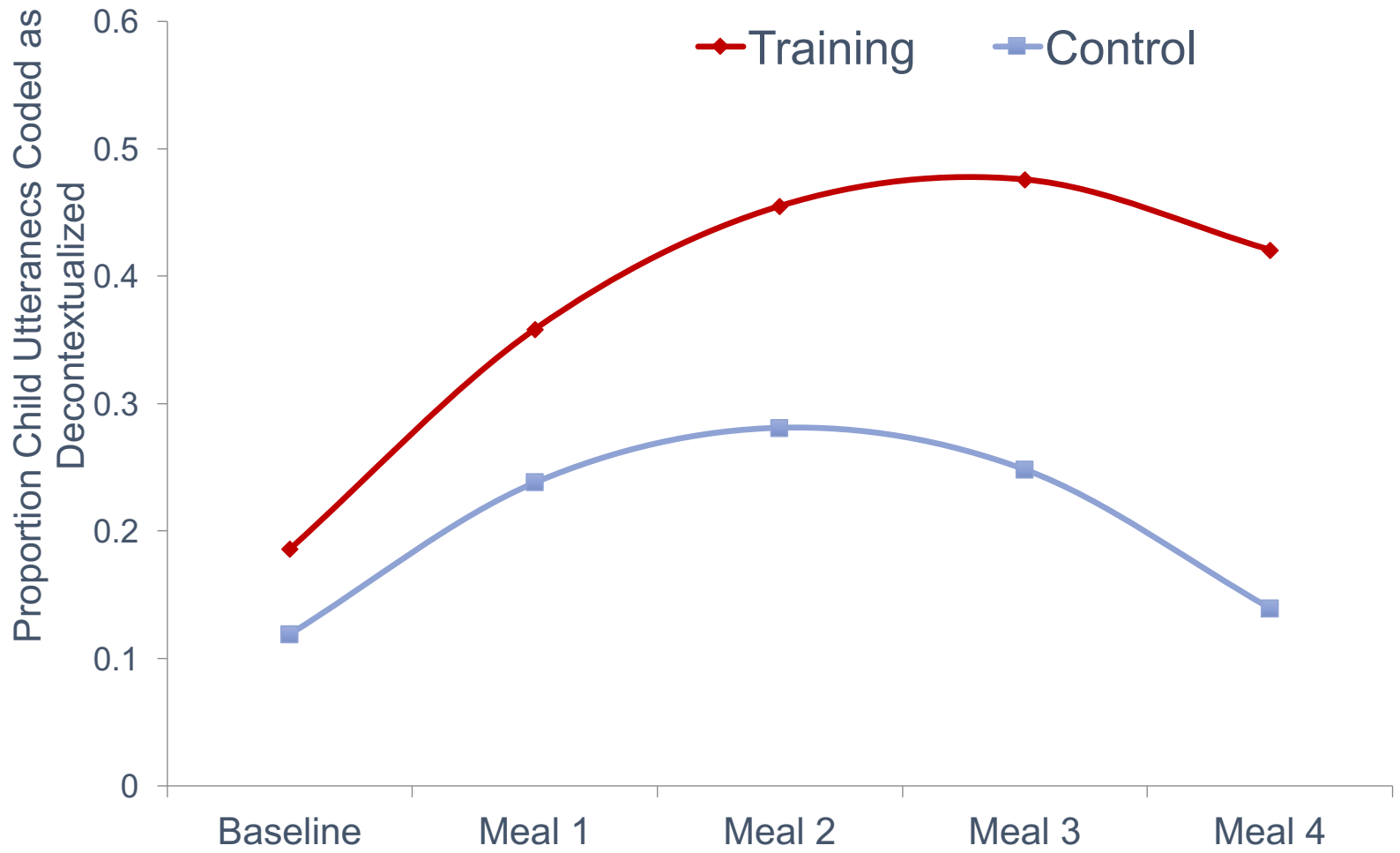
SES → Features of parent Input → Child Vocabulary



(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk: Parent Intervention

SES → Features of parent Input → Child Vocabulary



(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk: Parent Intervention

SES → Features of parent Input → Child Vocabulary

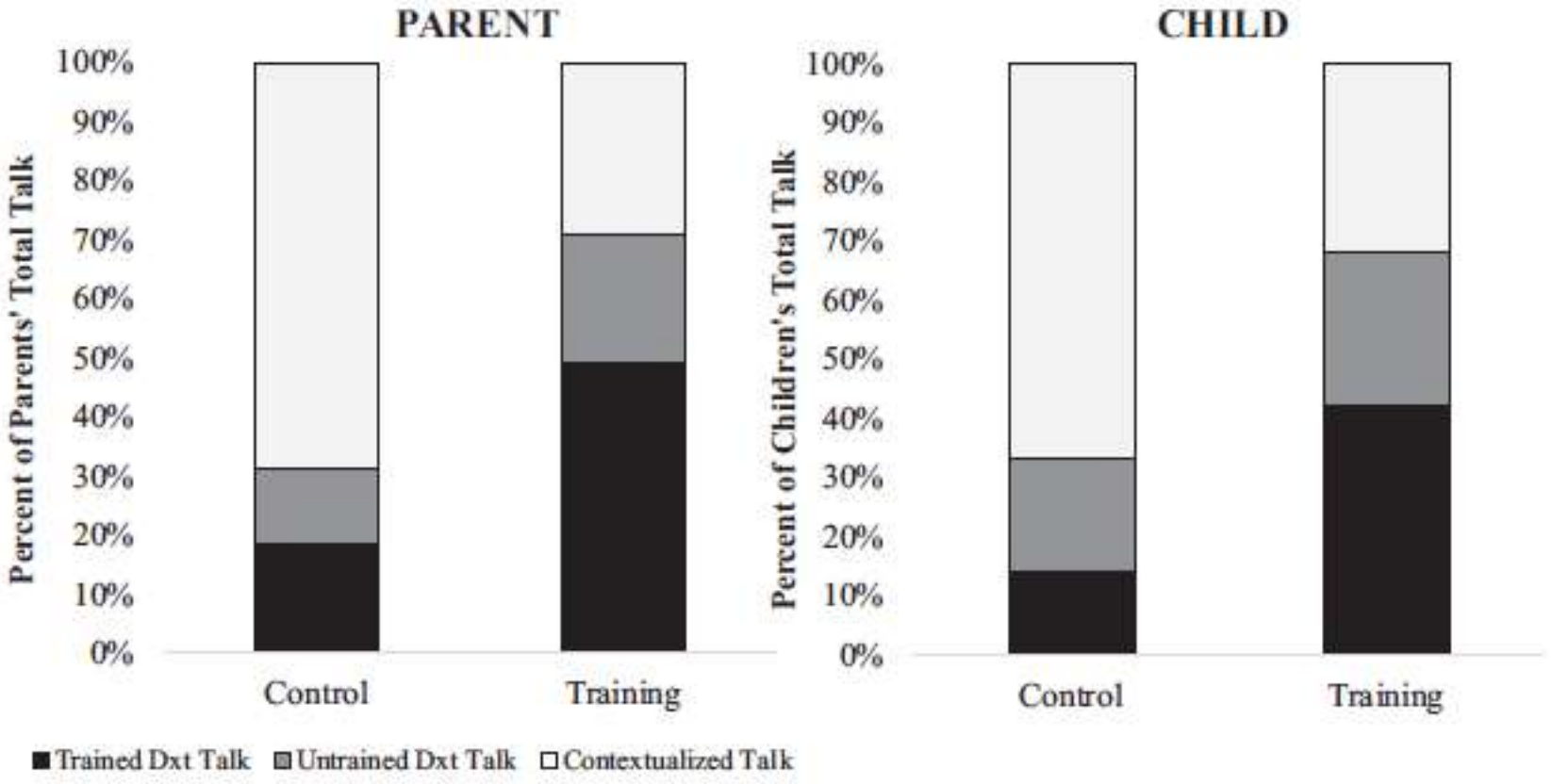


Figure 3. Breakdown of trained decontextualized language, untrained decontextualized language, and contextualized language at mealtime 4 for parents in the control and training conditions. Left panel displays parents' conversational content and right panel displays children's.

Parents in the training group used significantly more trained and *untrained* decontextualized talk.

Untrained = scripts, routines, generics, hypotheticals, etc.

(Leech, Wei, Harring & Rowe, 2017 *Developmental Psychology)*

Decontextualized Talk: Parent Intervention

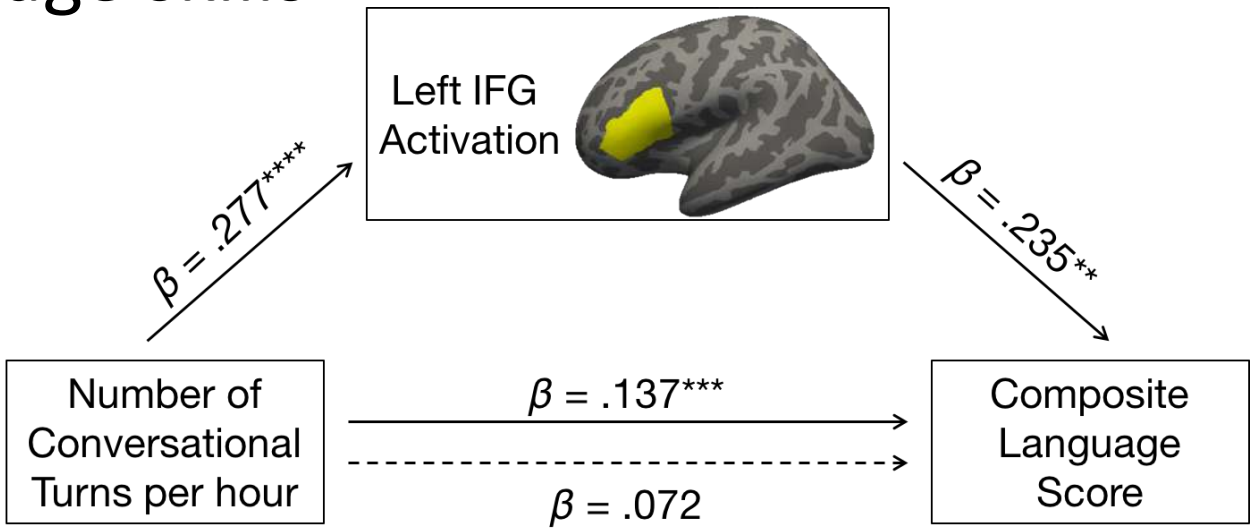
Conclusions

- It is possible to increase parent use of decontextualized language, even with a brief one-time training session
- Increasing parent use of decontextualized language results in an increase in children's use of this type of language
- In future work, we need to determine longer-term child outcomes, and whether these results would transfer to other, more diverse populations.

The Power of CONVERSATIONS:

SES → Features of parent Input → Child Vocabulary

4.5 – 6 year olds olds who engage in more conversations (*not more talk*) with adults showed more brain activation when processing language which contributed to greater language skills



(Romeo et al., in press, *Psychological Science*)

Conclusions

To reduce income-achievement gaps in vocabulary/reading:

- Understand that disparities linked to SES **appear early** and are due, at least in part, to children's communicative conversational experiences
- Targeting specific features/qualities of input through parent focused interventions may help prevent or reduce SES-related gaps in early language development
- Challenge – figuring out whom these interventions might work for and why, and how to do this at scale

Thank You!

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	Parent Pointing Tokens		Parent Pointing Vocabulary		Child Pointing Tokens		Child Pointing Vocabulary	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Baseline Pointing	0.50*	0.31	0.49~	0.38	0.42***	0.36**	0.79***	0.65***
	[0.005, 0.99]	[-0.20, 0.82]	[-.03, 1.02]	[-0.15, 0.91]	[0.19, 0.65]	[0.13, 0.59]	[.41, 1.17]	[.27, 1.03]
Condition	8.80	12.52*	3.22	5.15*	1.51	1.98*	0.98	1.27*
	[-9.11, 26.71]	[1.06, 23.99]	[-3.78, 10.22]	[0.56, 9.74]	[-1.10, 4.11]	[0.24, 3.72]	[-.98, 2.94]	[-.001, 2.54]
Education	0.17		-0.16*		-0.50		-0.10	
	[-3.86, 4.19]		[-1.76, 1.45]		[-0.62, 0.52]		[-.53, 0.33]	
Mindset		-7.07~		-2.31		-0.28		-0.32
		[-15.55, 1.41]		[-5.62, 1.00]		[-1.50, 0.93]		[-1.19, 0.55]
ConditionXEducation	8.56		3.84		0.95		0.50	
	[-15.51, 32.63]		[-5.67, 13.35]		[-2.50, 4.38]		[-2.10, 3.08]	
		11.82*		3.08		1.09		1.21*
ConditionXMindset		[0.77, 22.86]		[-1.21, 7.38]		[-0.51, 2.69]		[0.06, 2.35]
R^2 (%)	20.5	26.6	18.5	21.7	38.9	41.4	42.1	49.7

~p < .10; *p <.05; **p <.01; ***p<.001

	Comprehension		Production	
	Model 1	Model 2	Model 3	Model 4
Fixed Effects				
Intercept	20.71	30.69	1.89	5.09
	[14.61, 26.82]	[16.72, 44.67]	[-1.53, 5.31]	[-3.59, 13.79]
Linear (in months)	5.92	7.84	1.52	2.56
	[5.43, 6.39]	[6.10, 9.57]	[0.81, 2.23]	[0.96, 4.19]
Quadratic (in months)			0.36	0.38
			[0.21, 0.51]	[0.22, 0.53]
Condition	2.47	-17.47	1.11	-2.48
	[-5.88, 10.82]	[-35.75, 0.80]	[-3.33, 5.56]	[13.69, 8.41]
Intelligence Mindsets		-4.35		-1.16
		[-9.83, 1.13]		[-4.51, 2.19]
Linear Age X Condition		-2.40		-1.64
		[-4.66, -0.13]		[-3.57, 0.29]
Linear Age X Mindsets		-0.84		-0.64
		[-1.51, -0.18]		[-1.23, -0.06]
Condition X Mindsets		8.51		1.01
		[1.38, 15.64]		[-3.23, 5.25]
Linear X Condition X Mindsets		1.14		1.04
		[0.26, 2.07]		[0.28, 1.79]
Random Effects				
Sigma01	12.99	11.92	6.31	6.17
	[0.87, 16.32]	[8.73, 14.68]	[4.45, 8.23]	[4.11, 7.87]
Sigma	10.13	10.01	8.48	8.38
	[9.08, 11.33]	[8.85, 11.11]	[7.58, 9.44]	[7.40, 9.26]

Table 3
Output of Mixed Effects Models for Estimating Parent and Child Proportion of Decontextualized Language

Parameter	Notation	Parent Model 1	Child Model 2
Fixed effects			
Intercept (centered)	π_{0i}	.18 (.04)***	.14 (.04)**
Linear time	π_{1i}	−.12 (.03)***	−.15 (.04)***
Quadratic time	π_{2i}	−.03 (.008)***	−.04 (.008)***
Training	γ_{01}	.31 (.05)***	.28 (.05)***
Training × Linear	γ_{11}	.05 (.02)**	.05 (.02)***
Random effects			
Level 1			
Within-person	σ^2	.03 (.003)***	.03 (.004)***
Level 2			
Intercept (centered)	τ^2	.003 (.002)†	.006 (.003)*
Goodness of fit			
−2LL		−.117.3	−.89.5

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.