THE THIRTY MILLION WORDS PROJECT: A RANDOMIZED CONTROLLED PILOT

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OUTLINE

- Background: defining the disparity
- The Thirty Million Words mission
- Thirty Million Words pilot study results
- Next steps: scale up

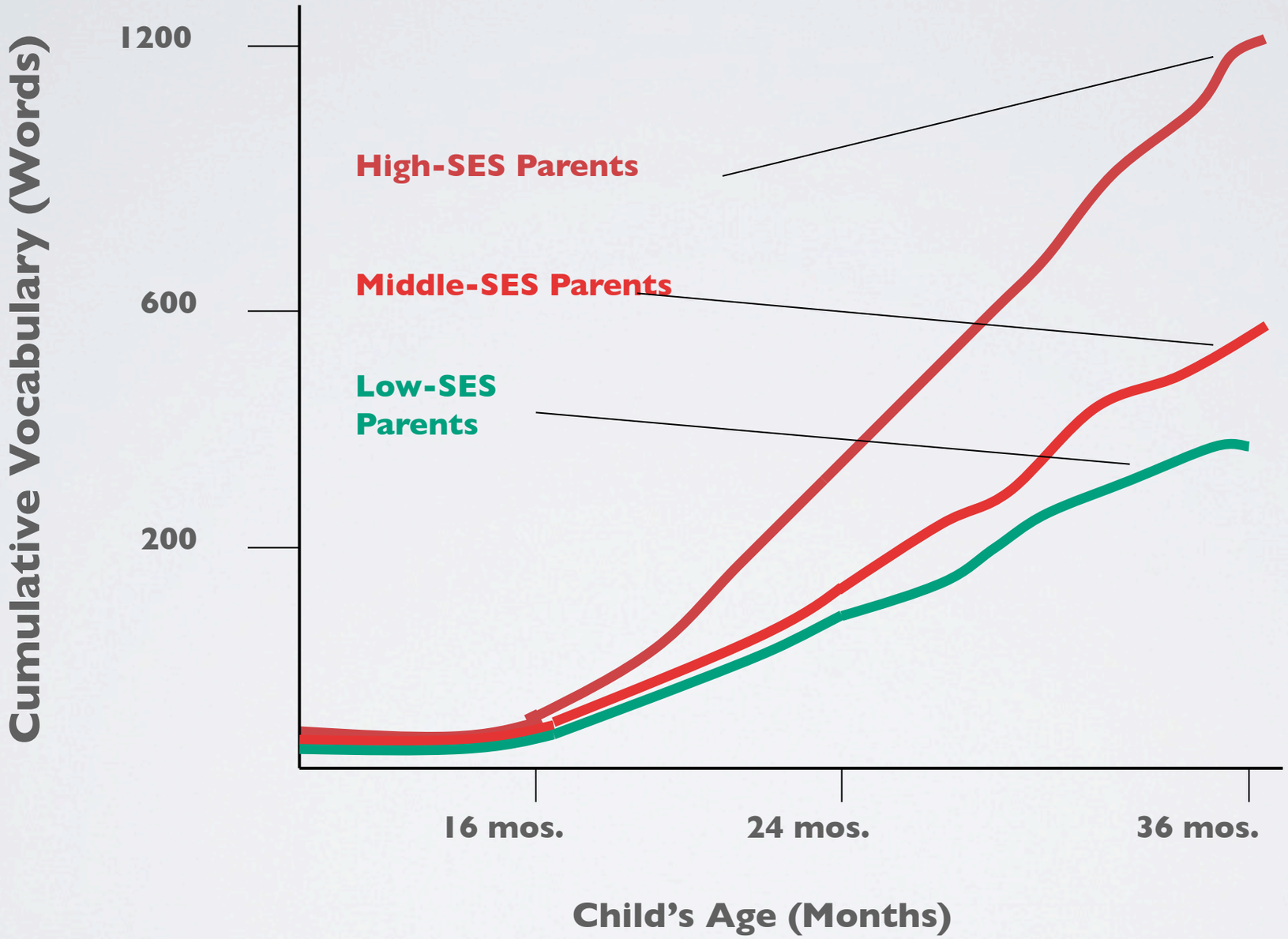
- We are all familiar with the staggering achievement gap seen in children from low socioeconomic status (SES) in the United States

  - Only 48% of low-SES children are school-ready by age 5

  - 80% or more of African-American and Latino public school students can't read or do math at grade level in 4th, 8th, and 12th grades

(Isaacs, 2012; The state of America's children, 2011)

CHILD VOCABULARY DEVELOPMENT



(Hart & Risley, 1995)

THIRTY MILLION WORD GAP

- Hart + Risley:
  - High-SES children: 45 million words by age 3
  - Low-SES children: 13 million words by age 3
- This 30 million word gap profoundly impacts children's vocabularies, test scores, and IQs

(Hart & Risley, 1995)

DISPARITIES IN EARLY LANGUAGE ENVIRONMENTS

- Both quantitative and qualitative
- Inequities in parents' language input include:
  - significantly less talk and gesture
  - shorter and less complex phrases
  - less use of open-ended questions
  - greater use of directives

(Hammer, Tomblin, Zhang, & Weiss, 2001; Hoff & Tian, 2005; Huttenlocher, Haight, Selzer, & Lyons, 1991; Reilly et al., 2010; Rowe, 2008; Rowe & Goldin-Meadow, 2009; Hoff, 2012)

DISPARITIES IN EARLY LANGUAGE ENVIRONMENTS

- Decreased parental language input leads to significant disparities in children's development of:
  - vocabulary
  - grammar
  - narrative skills
  - early literacy skills
- Disparities in language skills are seen from infancy through high school, and the gap widens with age

(Hoff, 2012; Fernald, Marchman, & Weisleder 2012; Hoff & Tian, 2005; Huttenlocher, Waterfall, Vasilyeva, Vevea, Hedges, 2010)

- The impact of early language environments is pervasive

- But at the heart of early language environments lies a very tangible and ultimately modifiable variable: parent talk

- Parents have the power to profoundly impact their children's development and ultimate trajectories through their words

- So we asked: can the disparity in child outcomes be addressed through a parent-directed intervention targeting the qualitative and quantitative aspects of parent talk?

THIRTY MILLION WORDS PROJECT

- Parent-directed intervention designed to enrich children's early language environments

Population-level impact

City-wide initiative

Community-based rollout

Intervention pilot

Quantitative linguistic feedback testing

THIRTY MILLION WORDS INTERVENTION

- Most central aspect: parents
  - Parent-directed
  - Parent-developed
  - Parent-tested
  - Parent-implemented

THIRTY MILLION WORDS PROJECT

- Thirty Million Words intervention unites two essential elements: education and feedback
  - Education is key: child-directed speech is mediated by knowledge of child development
  - Feedback: critical for sustained behavior change

(Hoff, 2003; Rowe, 2008)

Population-level impact

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QUANTITATIVE LINGUISTIC FEEDBACK

- Biofeedback behavior change strategy
- Allows parents to monitor and track their language input with their children
- Uses LENA measures
  - Adult Word Count (AWC)
  - Conversational Turn Count (CTC)
  - Television Time (TVT)

QUANTITATIVE LINGUISTIC FEEDBACK

- Tested quantitative linguistic feedback in proof-of-concept feasibility trial with 17 nonparental caregivers of young children, 2009
  - 31.6% increase in AWC during intervention, $p < .01$
  - 24.9% increase in CTC during intervention, $p < .01$

(Suskind et al., 2013)

Population-level impact

City-wide initiative

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THIRTY MILLION WORDS INTERVENTION

- Theoretically-driven, multimedia program translating cross-disciplinary science into easy-to-understand and easy-to-apply concepts

- Standardized, computer-based curriculum designed for future scalability

- Education component combines animation and real parent video with social marketing and behavior change techniques to make strategies easily accessible to parents

THIRTY MILLION WORDS INTERVENTION

- Iterated quantitative linguistic feedback component to incorporate more goal setting and behavior change strategies
- Both quantitative and qualitative goal setting
- Goals tailored to individual family needs and routines

THIRTY MILLION WORDS RCT

- 8-week intervention delivered via one-on-one home visiting
- 26 families on SouthSide of Chicago

THIRTY MILLION WORDS RCT

- Treatment group received Thirty Million Words intervention during 8 weekly 1-hour home visits

- Control group received nutrition intervention (with no quantitative linguistic feedback) during 8 weekly brief 5-10 minute home visits

- All participants completed 14 LENA recordings, completed pre-, post-intervention, and followup measures to evaluate sustainability

INTERVENTION TIMELINE

Pre-intervention
baseline
Rec 1-3

Intervention
weekly home visits
Rec 4-10

Post-intervention

Rec 11-14

enrollment

pretest assessment

8 week intervention period

immediate posttest measurement

4-month followup measurement

OUTCOME MEASURES

- Knowledge of child language development
  - Developed and standardized questionnaire
- LENA recordings
- Parent-child natural play video coding

Variables	**Control**		**Treatment**	
	Baseline (n=19)	Completers (n=11)	Baseline (n=21)	Completers (n=15)
Child Characteristics:				
Mean age in months (*SD*)	23.5 (5.6)	25.2 (5.5)	28.0 (5.3)	29 (4.3)
Female (%)	36.8	36.4	38.1	40
Male (%)	63.2	63.6	61.9	60
Language Score[a] (SD)	34.2 (21.0)	39.8 (22.6)	36.1 (30.7)	36.3 (29.3)
Mother characteristics:				
Mean age in years (SD)	27.2 (5.5)	28.4 (5.3)	26 (5.3)	26.9 (5.5)
Race				
Black (%)	89.5	90.9	85.7	86.7
White (%)	10.5	9.1	14.3	13.3
Household income below $15,000 (%)	68.4	72.7	61.9	66.7
Graduated 4-year college (%)	10.5	18.1	19	26.7
Single-parent households (%)	68.4	81.8	90.5	93.3
IQ[b] (SD)	92.8 (16.1)	92.7 (17.4)	96.4 (13.2)	97.4 (13.1)
Literacy[c] (SD)	10.9 (2.9)	11.6 (2.2)	10.5 (2.8)	11.2 (2.2)
Depression[d] (SD)	5.3 (4.2)	5.5 (4.2)	6.3 (3.3)	6.8 (3.2)
Parent Stress[e]	41.2	47.4	35	39.7

Note: The only characteristic in this table that does not balance for the "completers" group is the mean age of the children.

[a] This is from the McArthur test, which measures the language proficiency of the child. In the baseline sample, only 14 observations in control and 16 observations in treatment had scores for this test. In the completers sample, there were 9 observations in control and 11 in treatment.

[b] WASI IQ score used. In the baseline sample, only 13 observations in control and 17 observations in treatment had scores for this test.

[c] Star-grade score used. In the baseline sample, only 16 observations in control and 20 observations in treatment had scores for this test.

[d] CESD 10 Score used.

[e] Stress Index % score used.

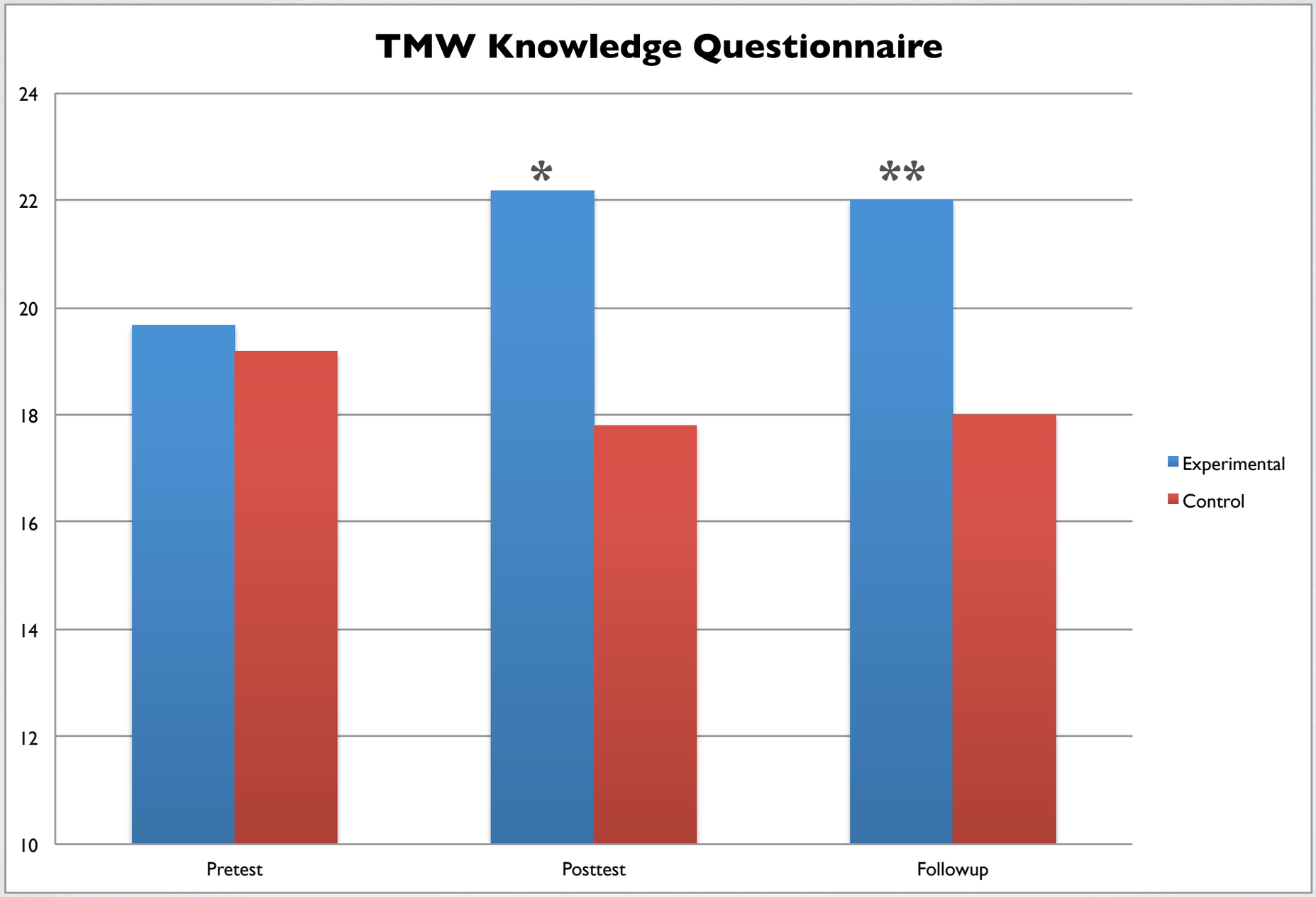
[f] Use total score from the OSPAN test. In the baseline sample, only 17 observations in control and 18 observations in treatment had scores for this test.

RESULTS

PARENT KNOWLEDGE OF CHILD LANGUAGE DEVELOPMENT

- Treatment group participants demonstrated a significant, sustained increase in knowledge of child language development post-intervention

PARENT KNOWLEDGE OF CHILD LANGUAGE DEVELOPMENT



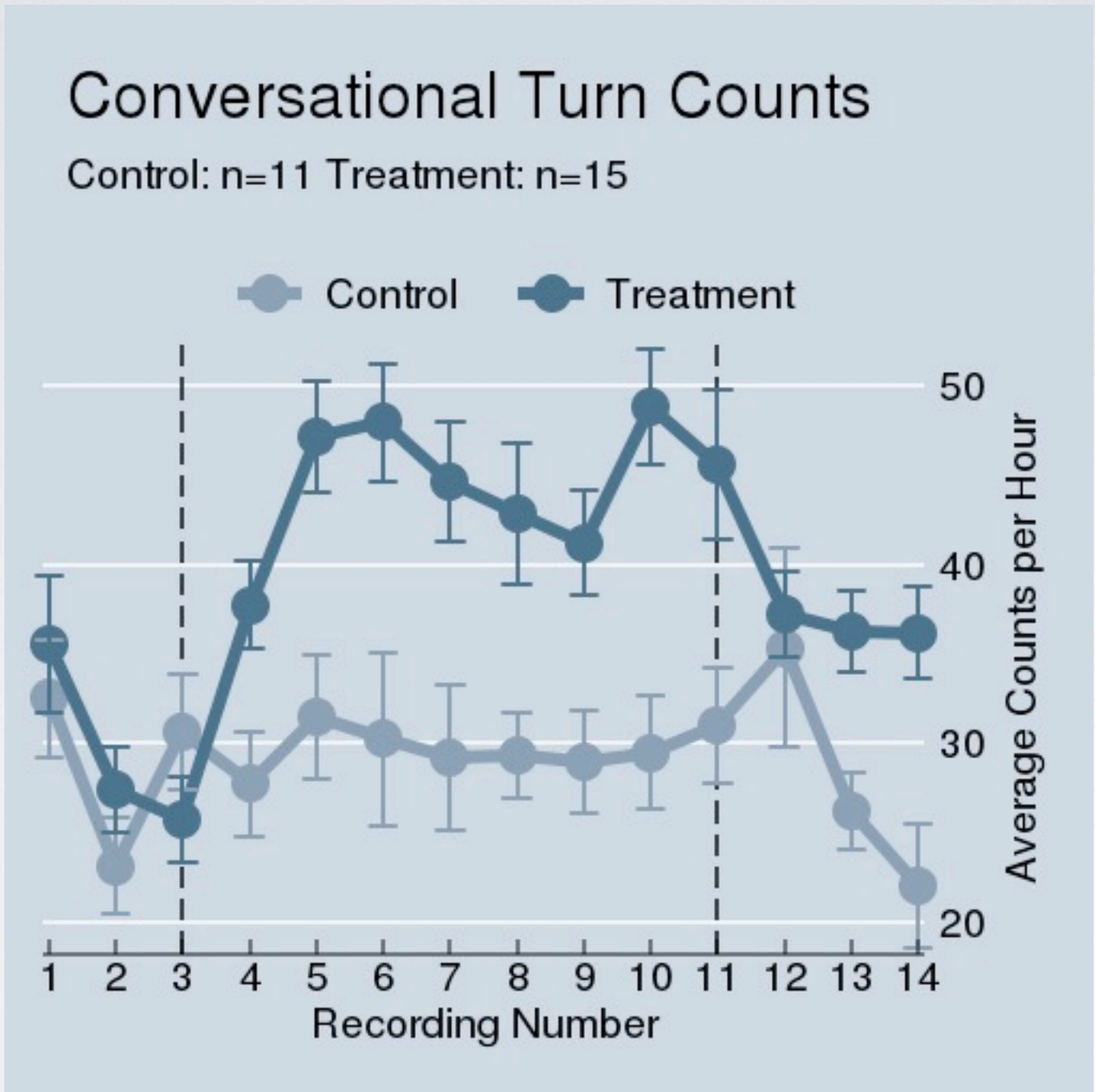
*p < 0.05
**p < 0.01

MEANS AND STANDARD DEVIATIONS FOR LENA MEASURES OVER STUDY PERIOD

	Pretest *M* (*SD*)	During intervention *M* (*SD*)		Follow-up *M*(*SD*)	
	Recordings 1-3	**Recordings 4-10**	**% change from baseline**	**Recordings 11-14**	**% change from baseline**
Experimental group (*n* = 15)					
Adult world count (per hour)	748.90 (439.64)	1001.33 (469.84)	33.7%*	893.95 (472.20)	19.4%
Conversational turn count (per hour)	29.52 (20.70)	44.30 (22.22)	50.2%*	38.80 (20.64)	31.5%**
Child vocalization count (per hour)	125.50 (86.02)	164.09 (75.99)	30.8%*	163.89 (73.84)	30.6%**
Control group (*n* = 11)					
Adult world count (per hour)	861.70 (413.00)	809.91 (437.66)	-6.0%	808.93 (396.62)	-6.1%
Conversational turn count (per hour)	28.73 (15.29)	29.46 (16.54)	2.8%	28.64 (18.67)	-0.3%
Child vocalization count (per hour)	117.39 (58.86)	126.28 (66.17)	7.6%	123.91 (73.82)	5.5%

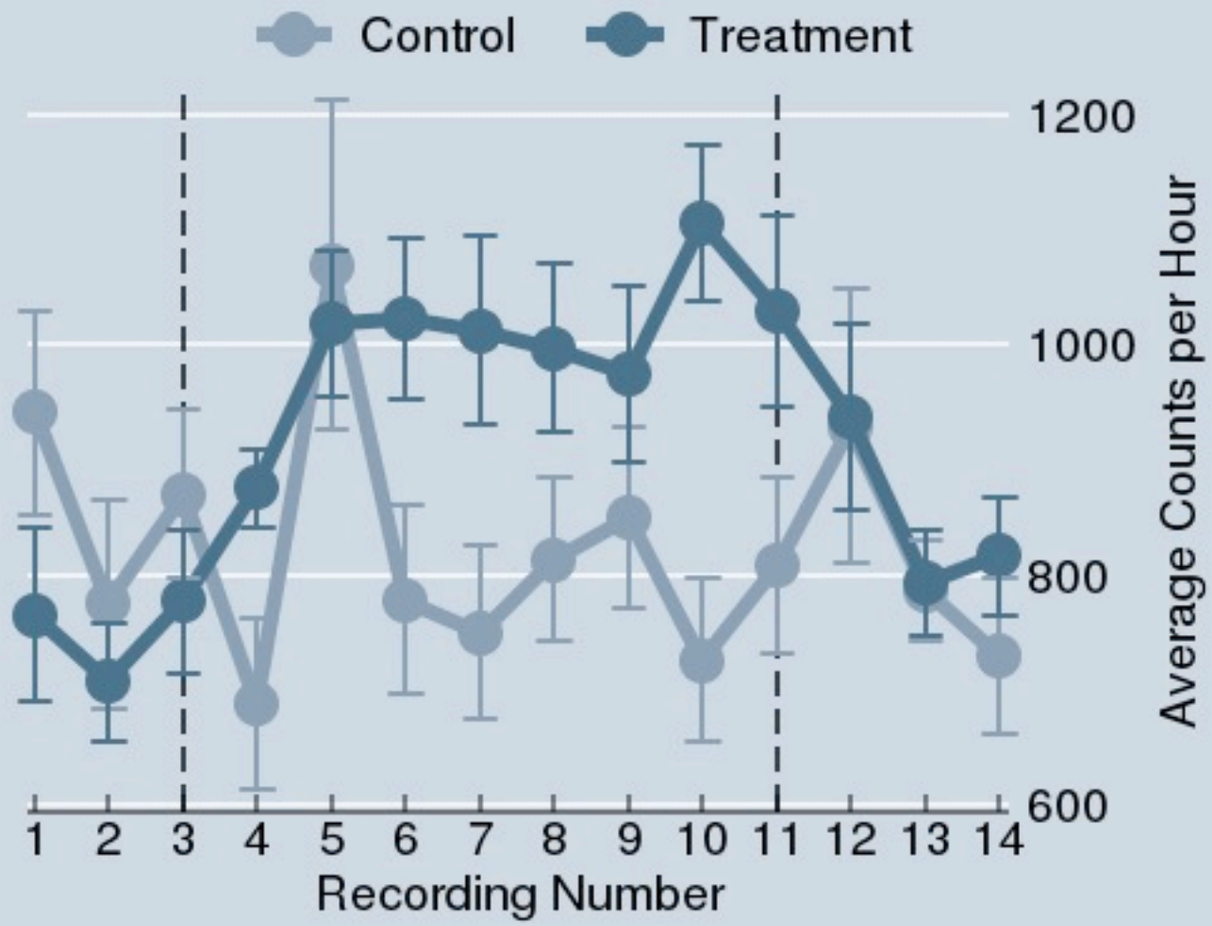
* $p<0.01$

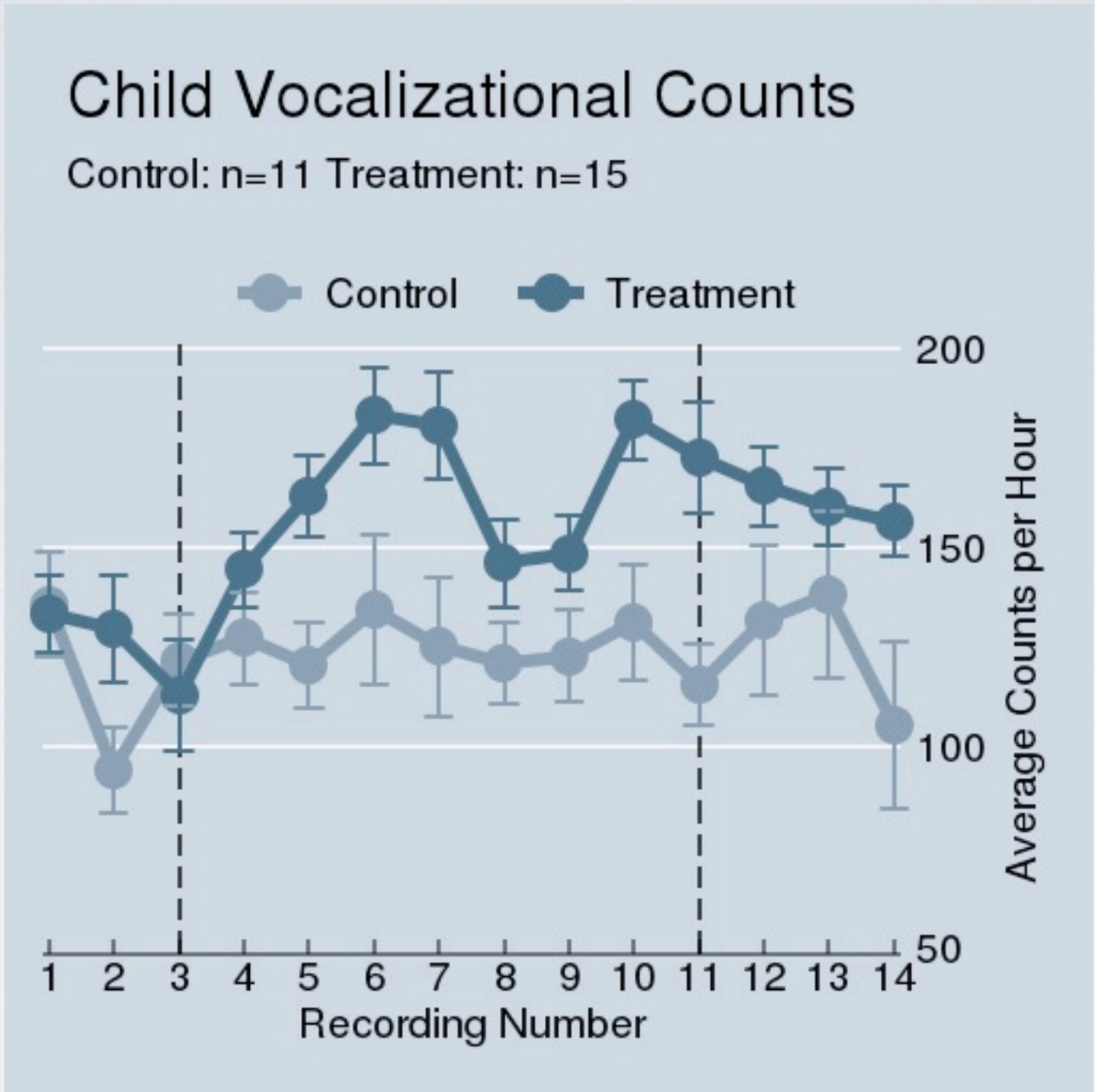
** not significant post intervention


Conversational Turn Counts
Control: n=11 Treatment: n=15
Control
Treatment
50
40
30
20
Average Counts per Hour
1 2 3 4 5 6 7 8 9 10 11 12 13 14
Recording Number

Adult Word Counts

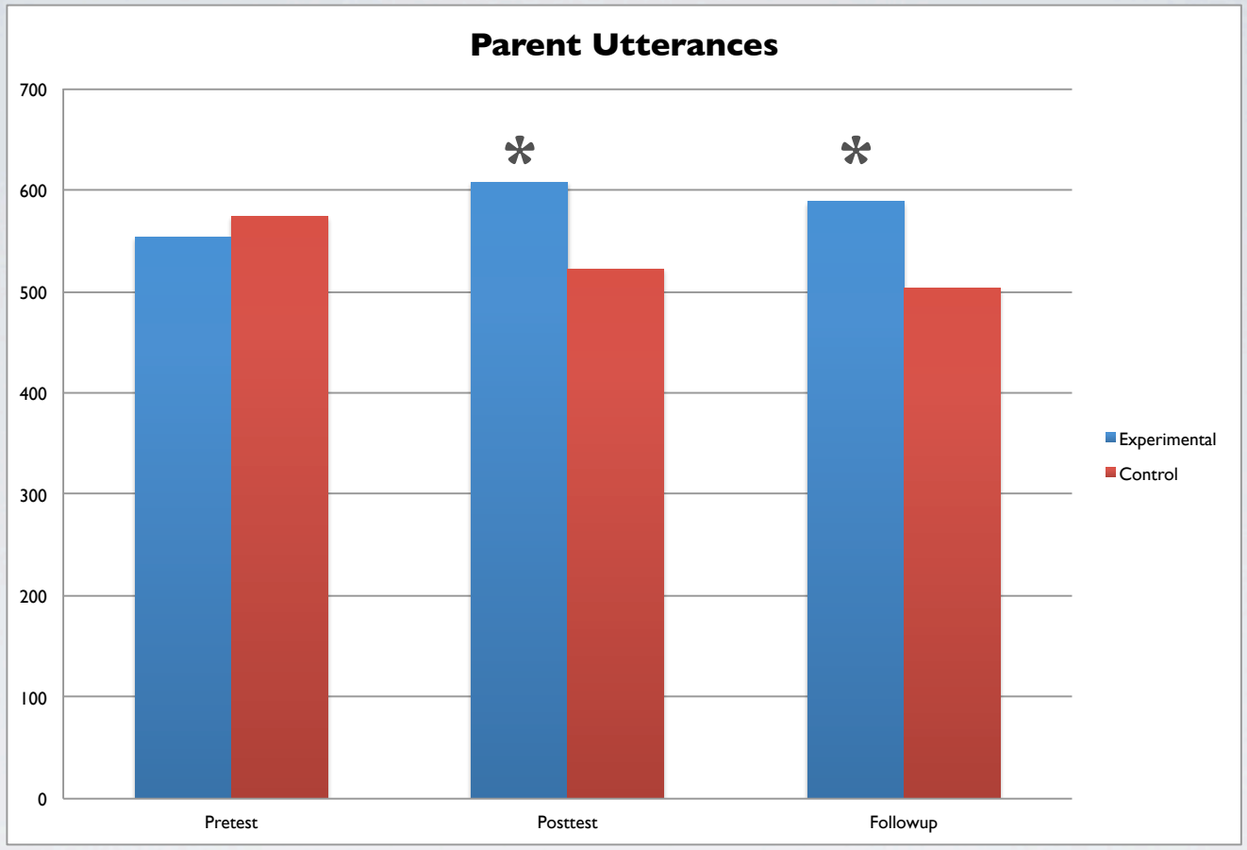
Control: n=11 Treatment: n=15



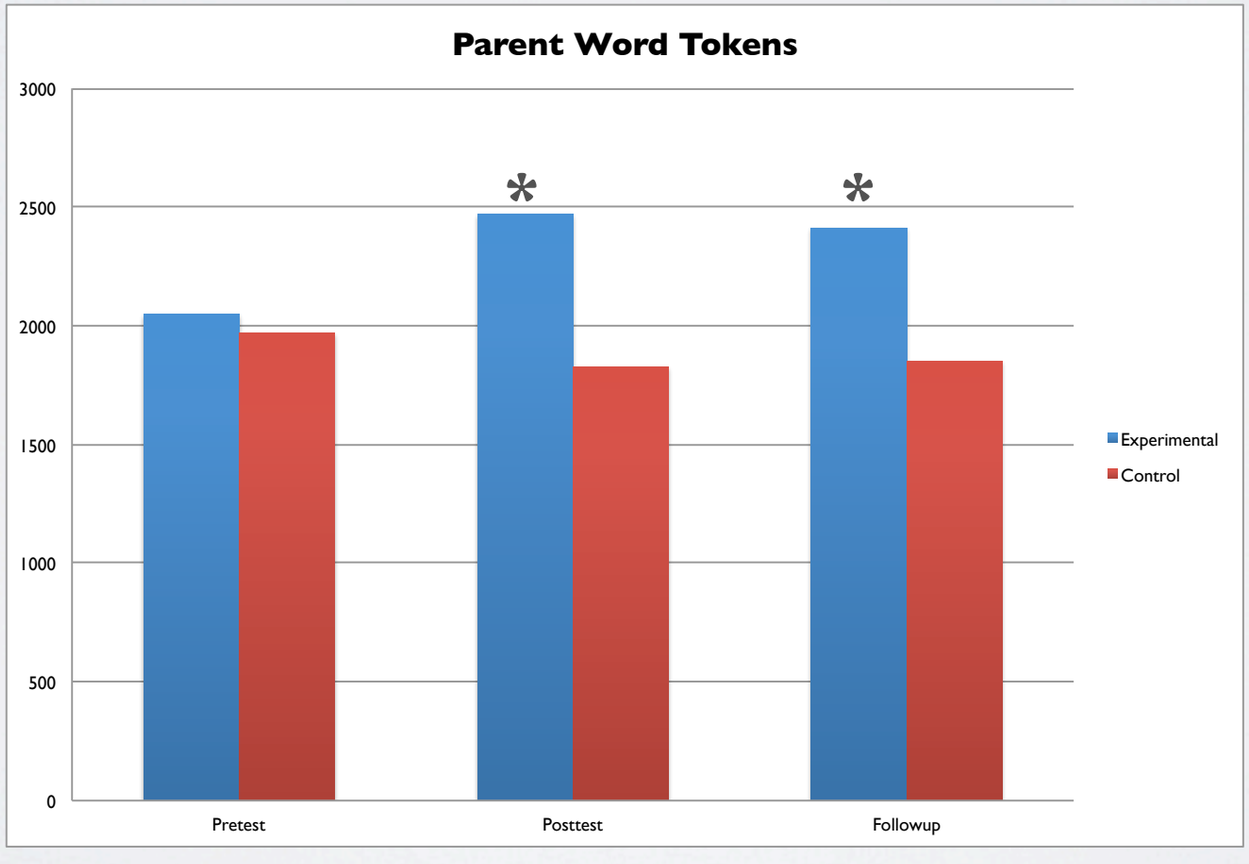

Child Vocalizational Counts
Control: n=11 Treatment: n=15
Control
Treatment
200
150
100
50
Average Counts per Hour
1 2 3 4 5 6 7 8 9 10 11 12 13 14
Recording Number

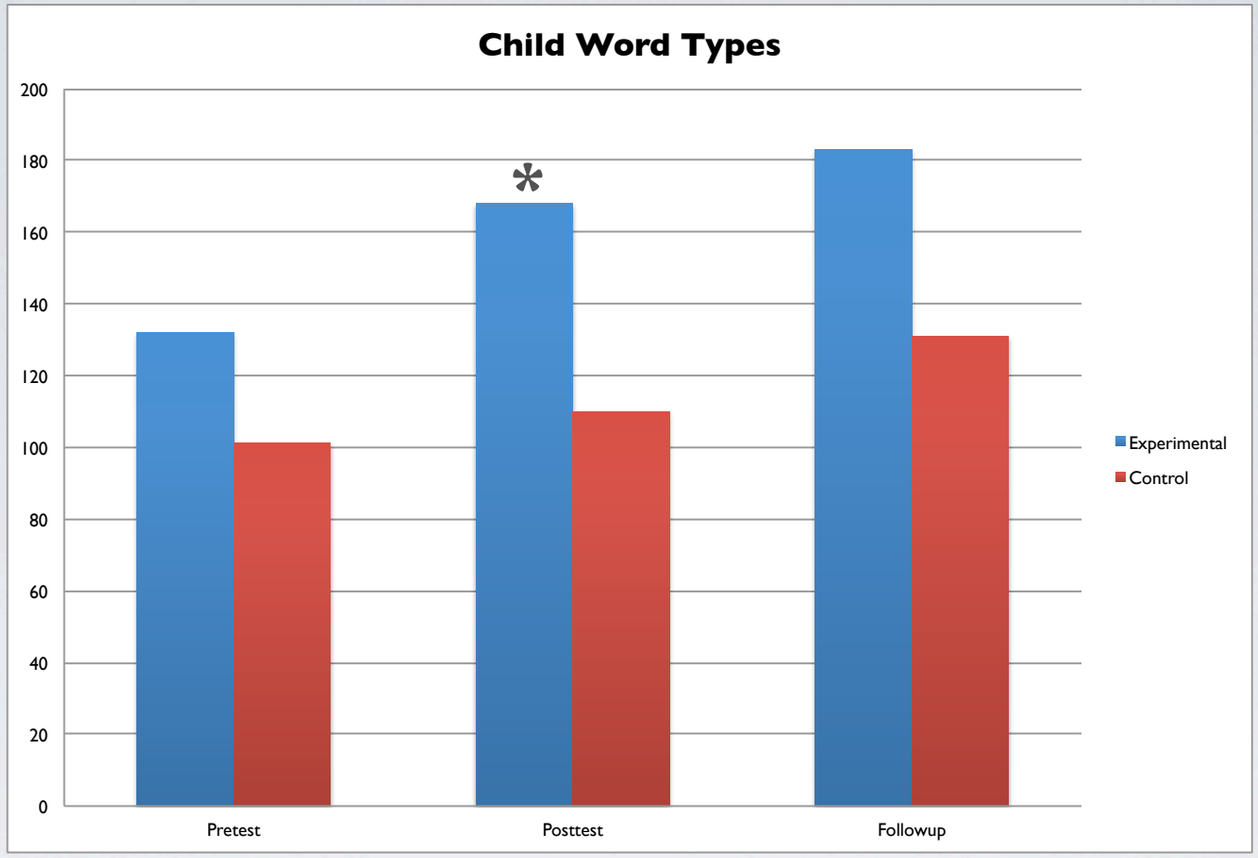
PARENT-CHILD NATURAL PLAY

- Parent and child language were also assessed with traditional measures via video coding of parent-child natural play

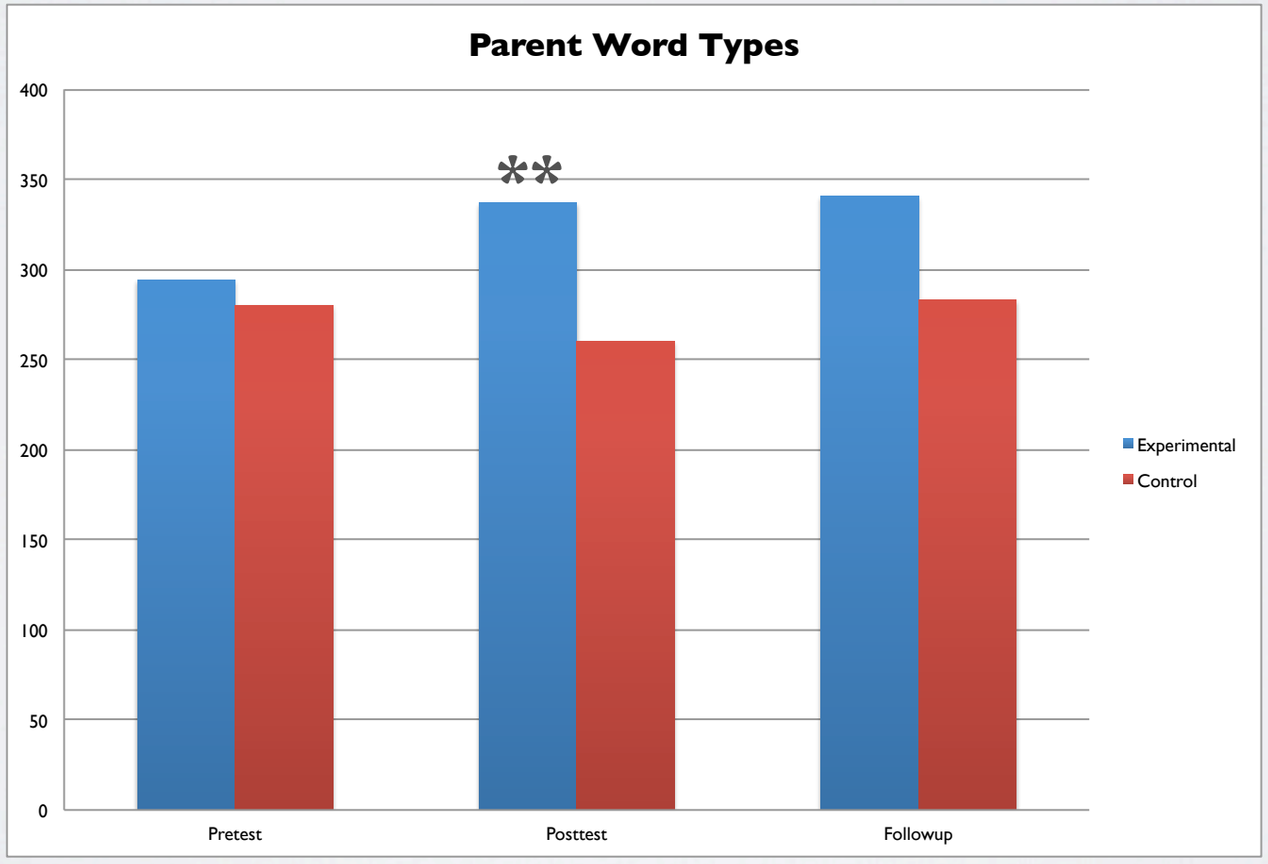

Parent Utterances
700
600
500
400
300
200
100
0
*
*
Pretest
Posttest
Followup
Experimental
Control

*p < 0.05


Parent Word Tokens
3000
2500
2000
1500
1000
500
0
*
*
Pretest
Posttest
Followup
Experimental
Control


Child Word Types
200
180
160
140
120
100
80
60
40
20
0
*
Pretest
Posttest
Followup
Experimental
Control

*p < 0.05
**p < 0.01


Parent Word Types
400
350
300
250
200
150
100
50
0
**
Pretest
Posttest
Followup
Experimental
Control

LIMITATIONS

- Small sample size limits understanding of nuances of intervention uptake
- Post-intervention drop off in AWC, CTC suggest need for further sustainability measures
- Short post-intervention follow up period limits measurement of impact on child outcomes

NEXT STEPS

- Ongoing formative testing and iterative development have informed curriculum expansion to increase educational dosage
  - Additional modules focus on child behavior, executive function
  - Group sessions to harness and magnify social capital
  - Post-intervention booster sessions with quantitative linguistic feedback
- Working toward center-based delivery combining one-on-one home visits and group sessions to harness social capital
- Incorporating parents on yet another level: parent-graduates as interventionists
  - Key in ultimate sustainability: community-based participatory research

Population-level impact

City-wide initiative

Community-based rollout

Intervention pilot

Quantitative linguistic feedback testing

COMMUNITY-BASED ROLLOUT

- Partnership with Urban Education Institute and Centers for New Horizons allows tracking of families beyond school entry for longitudinal data collection

- Expand intervention to include providers to for truly wrap-around milieu enrichment

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CITY-WIDE INITIATIVE

- Coordinated, multi-level public awareness campaign
- Adapt TMW for various communities in Chicago - translate to Spanish, Polish
- Partner with existing community-based organizations
- Leverage social media

SCALABILITY OF TMW

- Easy to understand, 'made-to-stick' message with profound public health impact
- Computer-based, scripted curriculum lends to many implementation models (e.g. one-on-one home visiting, web-based, group delivery, DVD, mobile app, cloud-based)
- Parent talk is free: untapped and unharnessed energy of words has endless benefit for child
- Universal, culturally-sensitive approach makes curriculum adaptable and flexible
- Standardized curriculum facilitates fidelity of implementation

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