



Early Parental Knowledge and Parent-Child Conversations Promote Preschool Language Skills: A Randomized Controlled Trial

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ABSTRACT

OBJECTIVE: This randomized controlled trial examined the long-term impact of the 3Ts-HV intervention on preschool-aged children's language skills through promoting parental knowledge and parent-child conversational turns during toddlerhood among families from low-socioeconomic status backgrounds, controlling for parental education level, parental language skills, and child's age.

METHODS: Ninety two parent-toddler dyads of low socioeconomic status were randomized to receive either the 3Ts-HV intervention (n = 46) or Healthy Lifestyle control (n = 46) curriculum from 14 to 20 months. Parental language skills were assessed at 14 months; parental knowledge was assessed at 14 and 26 months; parent-child conversational turn count was assessed at 14 and 38 months; children's language skills were assessed at 50 months.

RESULTS: A significant serial mediation effect ($\beta = 0.05$, 95% CI [0.002; 0.13]) revealed that the 3Ts-HV intervention increased parental knowledge at 26 months, contributed to more

frequent parent-child conversational turns at 38 months, and in turn promoted children's language skills at 50 months.

CONCLUSIONS: The present study provides empirical evidence illustrating the underlying longitudinal processes from increasing parental knowledge and enriching parent-child linguistic interactions during toddlerhood, to promoting children's language development at preschool age. These findings point to a significant path to supporting families who face socioeconomic challenges early in life to promote equity in children's early language experiences and narrow disparities in children's developmental outcomes.

KEYWORDS: conversational turn; home-visiting intervention; parental knowledge

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WHAT'S NEW

The empirical finding of this randomized controlled trial illustrates the longitudinal processes from increasing parental knowledge and enriching parent-child linguistic interactions during toddlerhood to promoting children's language development at preschool age among families from low-SES backgrounds.

PROMOTING CHILD LANGUAGE VIA KNOWLEDGE AND CONVERSATIONAL TURNS: A RANDOMIZED CONTROLLED TRIAL

According to Bronfenbrenner's ecological systems theory,¹ children are active agents whose development is shaped by bidirectional interactions between the children and their proximal caregivers in the context of systems. Communicative interactions in the early years lay a foundation for children's cognitive growth, language learning, and long-term developmental outcomes. Research shows frequent

conversational exchanges with adult caregivers promote young children's later preliteracy skills,² language and vocabulary skills,^{3,4} cognitive performance,³ and brain function and structure.^{1,2,5,6} However, young children facing socioeconomic disadvantages often do not have as ample exposure to enriched language environments as their affluent peers.^{7,8} Disparities in early language experience set young children of low socioeconomic status (SES) behind in language and literacy development, which contributes to later academic achievement gaps.^{9,10} Importantly, research shows that adult-child conversational experience is positively associated with young children's neural language processing over and above socioeconomic status.⁵ Moreover, studies with families from low-resourced backgrounds have revealed that parents who have more knowledge about early brain and language development are likely to provide more cognitive stimulation and engage in more conversations with their children as early as the first year of life.^{11,12}

To address disparities in early language input, one intervention approach to increase parent-child communications/

interactions is to focus on supporting parents with information about the critical importance of engaging their young children in conversations. For example, the 3Ts Home Visiting (3Ts-HV) intervention introduced three key behavior change strategies, ie, *Tune In*, *Talk More*, and *Take Turns*, to promote parental language inputs for young children. This parent-directed curriculum showed immediate efficacy in enhancing caregiver knowledge and caregiver-toddler linguistic interactions.¹³ In addition, Providence Talks helped caregivers learn about the importance of speaking with their children at an early age. This city-wide initiative showed positive impacts on caregiver-child conversational turns.¹⁴ Likewise, Small Talk, a community-based parent education intervention found positive effects on parent knowledge of early cognitive and language development as well as parent conversations with their infants and toddlers.^{15,16} Furthermore, another intervention provided parents with linguistic feedback to foster parental use of parentese speech and parent-child contingent back-and-forth exchanges. This parent coaching promoted parent-child conversational turns between 6 and 18 months. Increased conversational turns were positively correlated with child vocalizations during the same period and child language and communication skills at 18 months.¹⁷

Despite the above intervention efforts to promote equity in children's early learning environments, these studies focused on the immediate intervention impacts on parent knowledge and/or parent-child conversational turns, without considering whether the impacts were sustained over time. Recent empirical evidence indicated that the 3Ts-HV intervention impacts on the quantity and quality of language input were sustained among mothers facing socioeconomic disadvantages.¹⁸ Mothers who received the intervention continued to provide their young children with enriched language input without showing significant declines 18 months after the initial post-intervention increases. However, more research is needed to investigate whether increasing parental knowledge would enrich early parent-child linguistic interactions, which in turn promote young children's later language skills. Thus, the present longitudinal randomized controlled trial aims to fill the gap by examining the long-term impact of the 3Ts-HV intervention on children's language skills at preschool age through promoting parental knowledge and parent-child conversational turns during toddlerhood among families from low-SES backgrounds. We hypothesize that the 3Ts-HV intervention would enhance parental knowledge at 26 months, which in turn would increase parent-child conversational turns at 38 months, and subsequently promote children's language skills at 50 months.

METHODS

Participants were recruited through postings at childcare centers, health clinics, local stores, public transportation, and community organizations serving underrepresented populations in the Chicago metropolitan area. Eligibility criteria required that parents were the primary caregiver

of a 13–16-month-old child born without significant cognitive or physical impairments, spent at least 2 days/week with the child, were ≥ 18 years old, spoke primarily English, received $\leq$ a 4-year college education, and had a household income $\leq 200\%$ of the federal poverty line. Enrollment was conducted between December 2014 and December 2017.

Signed consent was obtained from parents before they completed the baseline assessment at 14 months. Parents reported demographics and their receptive vocabulary skills were assessed using the Peabody Picture Vocabulary Test Fourth edition.¹⁹ Parent-child dyads were randomized into either Intervention or Control conditions. A matched pairs randomization procedure was used to ensure baseline equivalence on child age and conversational turn count (CTC) across conditions. Parents in the Control condition received an analogous curriculum about healthy lifestyles to control for the potential attentional effect experienced by parents in the Intervention condition. Parents were blind to the alternative condition. A 6-month curriculum (Intervention or Control) was implemented in a sequence of 12 modules on a bi-weekly basis. To provide parents with continuous support, four booster sessions were implemented over 18 months post curriculum.

Post-curriculum assessments were conducted at 20, 26, 32, 38, and 50 months; see prior publications for details of the study design and intervention.^{8,13} Parents completed the Survey of Parent/Provider Expectations and Knowledge²⁰ at 14 months ($\alpha = .77$) and 26 months ($\alpha = .83$) to assess their knowledge of young children's cognitive and language development. Moreover, parents were trained to use the Language ENvironment Analysis (LENA) device to complete audio recordings with their children. Each recording must last at least 8 hours, take place on a day typical to the child's routines, and be completed during everyday activities at home. Audio data were analyzed using the LENA software to generate an estimate of the CTC at 14 months and 38 months. CTC was the total number of vocal exchanges between an adult and the target child. Child sleep and/or nap times were excluded from the LENA analysis.²¹ Furthermore, children's receptive language skills were assessed by a trained research assistant using the Preschool Language Scale Fifth edition²² at 50 months. Participants received monetary compensation for their time. This randomized-controlled trial (NCT02216032, registered at clinicaltrials.gov) was approved by the Biological Sciences Division Institutional Review Board at the University of Chicago Medicine (IRB#14-0895).

To examine whether the two conditions were balanced, chi-square tests and independent sample *t*-tests were conducted using SPSS 27 to compare demographic characteristics, parental vocabulary skills, and parental knowledge at baseline across conditions (Intervention vs Control). Pearson correlation analyses were conducted to examine the associations between the core study variables including parental knowledge, CTC, and children's language skills. A serial mediation model hypothesizes a causal chain linking the mediators in a specified order. Thus, this model allows testing our hypothesis

that the 3Ts-HV intervention would enhance parental knowledge, which in turn would increase CTC, and subsequently promote children's language skills. Using the SPSS Macro Process 4.2, a serial mediation model was conducted to test the indirect effect of the intervention on children's language skills through parental knowledge and CTC. Nonparametric bootstrapping procedures with 5000 samples were applied with a 95% bias-corrected Confidence Interval (CI) estimated around the indirect effect.

RESULTS

The sample included 92 parent-child dyads (46 Intervention and 46 Control) who completed all the assessments, representing an evaluable response rate of 24%

(391 possible dyads); see the consort diagram in Figure 1. Sociodemographic characteristics, parental vocabulary skills, and parental knowledge at baseline were not significantly different across the two conditions (see baseline demographics in Table). Parental knowledge was positively associated with CTC ($r = .35$, $P < .01$) and children's language skills ($r = .23$, $P < .05$). Likewise, CTC was positively associated with children's language skills ($r = .35$, $P < .01$).

In support of the hypothesis, results revealed a significant indirect effect of the 3Ts-HV intervention on children's language skills through parental knowledge and CTC ($\beta = 0.05$, 95% CI [0.002; 0.13]), accounting for 27.78% of the total effect; see serial mediation model in Figure 2. Compared to their Control counterparts, parents

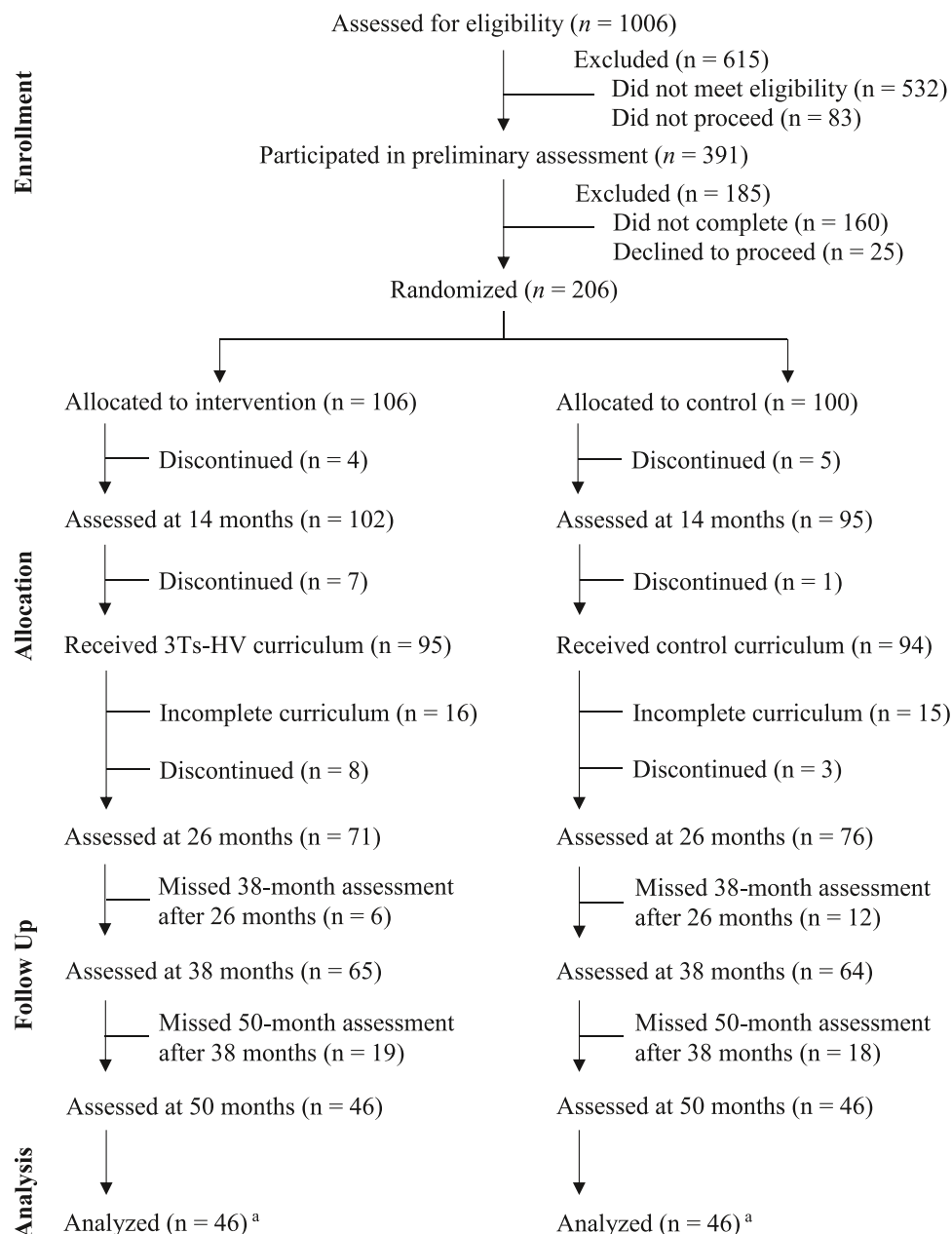


Figure 1. CONSORT flow diagram illustrating each stage of the randomized controlled trial. ^a Given the possibility that some data might be missing not at random, in the present study, only complete data were analyzed rather than using multiple imputations to reduce bias.

Table. Demographic Characteristics of the Intervention and Control Group

	Intervention (n = 46)	Control (n = 46)
<i>Mother characteristics</i>		
Age, mean (SD), year	29.91 (6.66)	30.19 (8.41)
Ethnicity, no. (%)		
European American, non-Hispanic	2 (.04)	2 (.04)
African American, non-Hispanic	38 (.83)	38 (.83)
Hispanic	0 (.00)	2 (.04)
Prefer not to answer or no response	6 (.13)	4 (.09)
Relationship to the child, no. (%)		
Mother	45 (.98)	41 (.89)
Other female relative	1 (.02)	3 (.07)
Father	0 (.00)	2 (.04)
Marital status, no. (%)		
Single	30 (.65)	31 (.67)
Married or civil union	9 (.20)	10 (.22)
Living with partner	6 (.13)	2 (.04)
Divorced or separated	1 (.02)	3 (.07)
Education level, no. (%)		
Some high school	4 (.09)	2 (.04)
High school graduate or GED completed	11 (.24)	14 (.30)
Postsecondary non-degree program	2 (.04)	3 (.07)
Some college credit but no degree	18 (.39)	13 (.28)
Two-year associate degree	4 (.09)	8 (.17)
Four-year bachelor's degree	7 (.15)	6 (.13)
Employed, no. (%)	21 (.46)	23 (.50)
LINK or WIC recipient, no. (%)	38 (.83)	41 (.89)
Medical card recipient, no. (%)	41 (.89)	40 (.87)
PPVT language skills, mean (SD)	85.43 (11.05)	84.89 (13.92)
<i>Family characteristics</i>		
Housing, no. (%)		
No permanent home	1 (.02)	1 (.02)
Living with friends or relatives	17 (.37)	21 (.46)
Residing in a shelter	0 (.00)	0 (.00)
Currently homeless	0 (.00)	1 (.02)
Family size, mean (SD)	4.50 (1.77)	4.48 (1.49)
<i>Child characteristics</i>		
Age, mean (SD), year	1.16 (0.09)	1.19 (0.11)
Female, no. (%)	23 (.50)	24 (.52)
Had older sibling(s), no. (%)	23 (.50)	29 (.63)
Attended day care or preschool, no. (%)	13 (.28)	9 (.20)
Enrolled in Early Head Start, no. (%)	7 (.15)	12 (.26)

LINK indicates Illinois Link program; GED, General Educational Development; PPVT, Peabody Picture Vocabulary Test; WIC, Women, Infants and Children program.

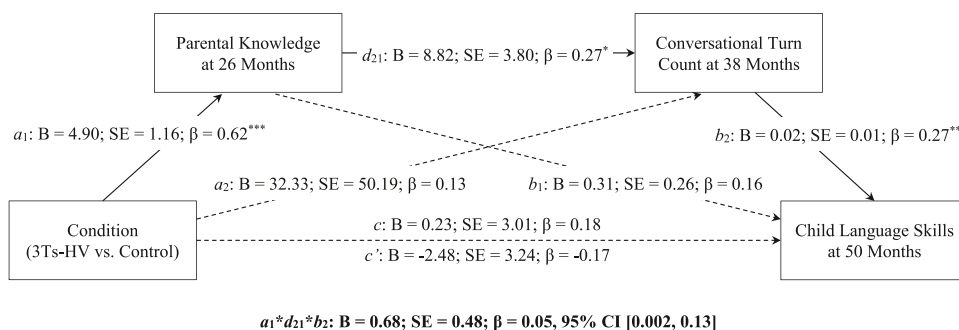


Figure 2. Serial mediation model testing the indirect effect of the intervention impact on children's language skills at 50 months through parental knowledge at 26 months and CTC at 38 months. Parental education level, parental language skills, and child's age at corresponding time points were examined as the covariates. The intervention impact on knowledge (a_1 path), the intervention impact on CTC (a_2 path), the impact of knowledge on CTC (d_{21} path), the impact of knowledge on children's language skills (b_1 path), the impact of CTC on children's language skills (b_2 path), the total effect of the intervention on children's language skills (c path), the direct effect of the intervention on children's language skills, controlling for knowledge and CTC (c' path), and the indirect effect of the intervention on child language skills through knowledge and CTC ($a_1 * d_{21} * b_2$ path) were estimated. Unstandardized betas (B), standard error (SE), and partially standardized beta (β) were reported for each path of the model. The indirect effect was statistically significant when the 95% CI did not contain zero. $^*P < .05$. $^{**}P < .01$. $^{***}P < .01$. CTC indicates conversational turn count.

who received the 3Ts-HV intervention showed increased knowledge of young children's cognitive and language development at 26 months ($\beta = 0.62$, $P < .01$); their increased knowledge contributed to more frequent conversational turns with their children at 38 months ($\beta = 0.27$, $P < .05$), which in turn promoted higher language skills in their children at 50 months ($\beta = 0.27$, $P < .01$).

DISCUSSION

The present study illustrates the underlying longitudinal processes from increasing parental knowledge and enriching parent-child linguistic interactions during toddlerhood to promoting children's language development at preschool age. When parents know more about early language development, they better understand their role in promoting their young children's learning; they are more motivated to enrich their children's early language environments and engage their young children in communicative interactions.^{8,10} Parent knowledge may be one of the essential elements fostering sustainable changes in parental language input behaviors. Engaging young children in back-and-forth conversations, in particular, has been associated with children's positive language and early literacy outcomes.¹⁻³ Advancing a public health approach, the present empirical findings speak to the critical importance of supporting families who face socioeconomic challenges early in life in an effort to promote equity in children's early language experiences and narrow disparities in children's developmental outcomes.

Nevertheless, parents from low-resourced backgrounds often encounter other socioeconomic difficulties that negatively hinder the quality of their language input.²³ Future intervention research addressing language disparities should also consider the potential impact of SES-related stressors. Moreover, the current sample did not include non-English-speaking, bilingual, or multilingual families. The generalizability of the present findings might be, therefore, limited to English-speaking families. Although a Spanish version of the 3Ts-HV intervention has shown a positive impact on parental beliefs about young children's development,²⁴ more work is needed to further understand how the intervention may benefit families who do not primarily speak English. Despite these limitations, the present study has significant implications. It sheds light on the potential of implementing/scaling the intervention in pediatric health care as well as early childhood education settings. More importantly, it helps inform community agents, early childhood educators, pediatric and family medicine practitioners, and policy stakeholders of the long-term benefits of supporting parents with evidence-based knowledge and strategies to engage their young children in conversations through early intervention.

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AUTHORSHIP STATEMENT

All authors also affirm that Dr Leung carried out all analyses, drafted the initial manuscript, and reviewed and revised the manuscript; Dr Suskind conceptualized and designed the study, and critically reviewed the manuscript for important intellectual content. All authors approved the final manuscript as submitted and agreed to be accountable for all aspects of the work.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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