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Lessons Learned and Recommendations for Conducting Research on the Effects of a Child Neglect Prevention-Focused Parent-Child Interaction Module (SafeCare PCI) on Home Language Environment and Toddler Expressive Language

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ABSTRACT

By age 3, children in low socioeconomic status homes are estimated to have heard 30 million fewer words than children in higher socioeconomic homes (Hart & Risley, 1995). Children who hear fewer words at home, as compared to those who hear more talk, are significantly likely to exhibit language delays (Hart & Risley, 1995). In addition to low socioeconomic environments, children who have experienced neglect often lack appropriate stimulation from parents and caregivers, leading to delays in language development (Hart & Risley, 1980). This disparity, in the amount of early talk that children hear, leads to early language delays, which incur risk of academic failure, social exclusion, behavioral and emotional difficulties, and being bullied (Lee & Burkum, 2002; Conti-Ramsden et. al., 2009; St Clair et. al., 2011). SafeCare is the only evidenced-based child neglect prevention intervention (Lutzker & Chaffin, 2012; Guastaferro et al 2012). However, there are no published studies to date that have examined whether a child neglect prevention-focused intervention, which target general parenting skills, are effective in improving specific parent talk practices with their toddlers.

The purpose of this capstone project was to generate recommendations for developing an informed research plan to examine the effects of the SafeCare PCI module on the language environment and expressive communication of toddlers in low socioeconomic homes. A summary of an applied research experience is presented as a foundation for highlighting challenges, lessons learned, and recommendations for future research on the effectiveness of child neglect prevention focused interventions for addressing the 30-million-word gap and improving child language outcomes.

My applied research experience involved piloting research procedures for a case study of a child neglect prevention focused intervention, the SafeCare Parent Child Interaction (PCI) module. Research procedures included preassessment, implementation of the SafeCare PCI module, intervention related data collection and postassessment. A multi-method assessment approach was used, which included pre- and postmeasures of direct observation of child expressive language, and home-based recording of parent and child talk, and parent report of child language as well as chaos in the home.

Eight lessons learned emerged from observed research challenges. These lessons summarize piloted procedures that did not work well, such as the lack of training and implementation fidelity, unrealistic demands on participants, and limited comparable data. Lessons learned also include procedures that worked well such as the utilization of a standardized toy and timed interaction for SafeCare PCI skills assessment.

Recommendations for future research include: the establishment of standardized recording procedures, documentation of parent reported life changes, procedures to send consistent reminders to participants, continuation of using a standardized toy and timed play interaction when administering the SafeCare PCI skills assessment, and ensuring comparable data by repeating preassessment procedures at postassessment of parents interacting with their children.

Key Words: low socioeconomic status, early language development, SafeCare®, LENA, ECI

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Author's Statement Page

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I. Introduction

Brain growth is guided and sustained by children's experiences of nurturing interactions with caregivers (Allen & Kelly, 2015). As the vast majority of brain growth occurs before age three, a stimulating home learning environment, characterized by positive and nurturing interactions with parents, is crucial to children's cognitive, socioemotional, physical, and language development (Bruner, Floyd, & Copeman, 2005). By age 3, children in low socioeconomic status (SES) homes are estimated to have heard 30 million fewer words than children in higher SES homes (Hart & Risley, 1995). This differential experience of parent talk represents a substantial opportunity gap for children in low SES homes to acquire language skills (Hart & Risley, 1995). As compared to children in language rich environments, children who experience disadvantaged home language environments demonstrate significantly lower rates of language acquisition, evident within the first three years of life (Rowe, 2012; Hoff & Naigles, 2002; Hart & Risley, 1995). This gap in child language acquisition widens over time, leading to language delays (Ramey & Ramey, 2004). Children with language delays are more vulnerable to academic failure, social exclusion, behavioral and emotional difficulties, and being bullied (Lee & Burkum, 2002; Conti-Ramsden et al., 2009; St Clair et al., 2011); therefore, language delays are an important public health concern.

Children in low SES homes are also more likely than their higher income peers to experience child neglect (IOM & NRC, 2014). Children who experience neglect often lack appropriate stimulation from parents and caregivers, leading to delays in language development (Hart & Risley, 1980). One evidence-based model, SafeCare®, is designed to teach parenting skills aimed at preventing child neglect (Lutzker & Chaffin, 2012). One SafeCare module, Parent-Child/ Infant Interaction, teaches parents to engage in positive parenting skills such as

praising desired behaviors during activities with their children (Lutzker & Chaffin, 2012; Guastaferro et al 2012). However, there is a near absence of studies that have examined the effects of the SafeCare parenting module on language environments and child expressive language. One recent thesis study sought to examine the language environment of infants following parent participation in the SafeCare Parent-Infant Interaction module. Beck (2015) showed that parents (N=3) who received SafeCare demonstrated a pre- to postincrease in bonding behaviors (e.g., looking, talking, touching, and smiling); however, the study was limited to infants under 12-months old. To date, there are no published studies of the effects of the SafeCare (Parent-Child/ Infant Interaction) on the language environment and expressive language of children 18- to 36-months old.

The current applied research experience sought to build on the prior work by piloting procedures to collect data on the language environment and child expressive communication of toddlers prior to and following implementation of SafeCare PCI with one mother-child dyad. The purpose of conducting this pilot was to document lessons learned and generate recommendations for informing future research on the effects of the SafeCare PCI module on the home language environment and toddler communication among low SES families. It is important to understand this vulnerable population to implement effective interventions for addressing the word gap by increasing parent talk to support toddler communication development.

II. Review of Literature

A. The Language Environment

An important contribution to early language development is the quantity of language to which children are exposed (Rowe, 2012). Parent-child conversations are an essential aspect of children's language development. Parents who communicate more frequently with their children

enhance their children's vocabulary growth (Zimmerman, Gilkerson, Richards, Christakis, Xu, Gray, & Yapanel, 2008). The quantity as well as the quality of parent talk contributes to child language development: parents who talk more frequently typically introduce an extensive vocabulary to their children (Hoff & Naigles, 2002). An enriched early language environment involves both the interplay of language and responsive parenting behaviors (Suskind et. al., 2015), such as the usage of warm and accepting behaviors to respond to children's needs (Landry, 2012).

From the earliest stages of child language development, there is variability between vocabulary size and the rate of development among children (Fenson et. al., 1994). In their seminal observational study, Hart and Risley (1995) estimated that by age 3 children from lower SES homes compared to children from middle- to high-SES homes will have heard 30 million fewer words. This opportunity gap to hear parent talk leading to a delay in language acquisition emerges within the first year of life; differential vocabulary and language processing efficiency is seen as early as 18-months, and by 24-months there is a 6-month gap in processing skills critical to language development (Fernald, Marchman, & Weisleder, 2013).

Twenty-nine children from the original 1995 Hart and Risley observational study were followed for approximately 10 years (Hart & Risley, 2003). When compared with children from low SES households, children from high SES heard on average 30 million more words at home during the first 3 years of life. As a result, larger vocabularies and better test scores among children from higher SES were observed compared to children from lower- SES families during the 10-year follow-up study. This opportunity gap of language acquisition persists throughout students' academic careers and predicts lower high-school graduation rates and economic opportunities (Ducan & Murnane, 2011; Pakulak & Neville, 2010), which reflects the potential

lifetime impact of the early language environment.

Assessing the Language Environment. Inspired by the work of Hart and Risley (1995), the Language Environment Analysis (LENA) was developed to electronically quantify the natural language environment. Hart and Risley (1995) directly observed, tape recorded, transcribed, and analyzed by hand more than 1,300 hours of parent-child interactions. The coded hours from this study were the first of their kind to produce data representing the language environment of typically developing children based on population; however, this method of assessing parent-child interactions was not sustainable. LENA electronically captures and analyzes the language environment in a naturalist technique, similar to the Hart and Risley methods, without requiring an observer to be present to record parent and child talk. The LENA technology has been useful for measuring aspects of the of the language environment (e.g., number of adult words spoken to children and conversational turns that adults take with children). LENA also provides a count of child words spoken.

Identifying and enhancing environmental factors such as parenting behaviors (Landry, Smith & Swank, 2006) to encourage early language development is essential to lessening the growing opportunity gap in language development for children in low income home environments (Duncan & Murnane, 2011). Parents who are responsive, engaging, and present with their children, provide a healthy language environment (Snow, Powell, & Sanger, 2012). In contrast, early adverse childhood experiences, such as child neglect, can interfere with language development.

Child Neglect in the United States. In 2015, approximately 683,000 children in the United States (US) were determined to have experienced child abuse and neglect (U.S. Department of Health and Human Services [DHHS], 2017). The majority (75%) of reports were

attributed to neglect specifically (DHHS, 2017). Child neglect involves the failure to act by a caregiver that results in the imminent risk of serious harm or death of a child (Gilbert et. al., 2009).

Child neglect is predictive of expressive and receptive language delays among preschool children compared to children without a history of neglect (Allen & Oliver, 1982; Culp et. al., 1991; Gowen, 1993). A case-control study of 60 children demonstrated, when controlling for SES, children who did not have a history of neglect or abuse exhibited higher levels of cognitive, language, and behavioral functioning compared to children who experienced neglect (Spratt, et. al., 2012).

Risk Factors for Neglect. In addition to more general risk factors for child maltreatment (CM; e.g. income, education, family size, mobility, and stress), specific risks for child neglect include: child social competence; parent-child relationship (e.g., parent-child interactions and/or child attachment to parent behaviors); parent perceives child as problem (e.g. unwanted or unplanned pregnancy and parental stress regarding parenting); parent's level of stress, anger, and self-esteem (Stith et al, 2009). Three key risk factors specific to child neglect prevention include: caregiver depressive symptoms, parenting stress, and everyday stress (DePanfillis & Dubowitz, 2005).

B. Interventions for Child Neglect Prevention

Evidence-based programs (EBP) are approaches to prevention or treatment that are validated by some form of documented scientific evidence and include research findings established through controlled clinical studies and other validated methods (DHHS, 2011). One of the most prominent approaches used by EBP to prevent CM, including child neglect, is home visiting (Sweet & Appelbaum, 2004). Home visiting is a method of delivering family support

services within the home thus, providing a support system for families (Sweet & Appelbaum, 2004). Families receive services through scheduled routine home visits from a home-based provider. This delivery of services eliminates barriers to program completion such as: need to arrange transportation, childcare, and/or time off from work (Sweet & Appelbaum, 2004; Peacock, Konrad, Watson, Nickel, & Muhajarine, 2013), thus allowing for personalized service training and program efficacy. There are numerous evidence-based home visiting programs within the United States with a similar goal of CM prevention (e.g. SafeCare, Parents as Teachers, Nurse Family Partnership, and Healthy Families America); however, SafeCare is the only evidence-based intervention that directly targets child neglect prevention (Lutzker & Chaffin, 2012; Guastaferro et al 2012).

SafeCare. SafeCare is an evidence-based behavioral parenting model delivered through home visiting. SafeCare consist of three modules: parent-child/infant interactions, home safety, and child health, and is delivered to families with children birth-to-five that are at-risk or reported for CM. One large research project demonstrated the effectiveness of SafeCare in preventing CM and improving targeted skills that can lead to CM through a statewide randomized controlled trial (Chaffin, Hecht, Bard, Silovsky & Beasley, 2012). A provider typically delivers the SafeCare curriculum to families over the course of 6 sessions per module (18 total sessions) in 60-90 minute in-home sessions. Providers teach parents skills using the explain, model, practice, feedback framework (Bigelow & Lutzker, 1998; Guastaferro, Lutzker, Graham, Shanley, & Whitaker, 2012). Parents must demonstrate mastery of skills for each module before proceeding to the next skill set. Mastery knowledge is determined by demonstrating skillset behaviors consistently and with ease.

The parent-child/infant interaction module is one of the two SafeCare modules that target the improvement of parenting behaviors that may lead to child neglect at two distinct developmental periods (birth to 18-months and 18-months to 5- years old). The Parent-Child Interaction (PCI) module, the focus of the current applied research experience, is delivered to parents with ambulatory children 18-months to 5-years old (Biglow & Lutzker, 2000). In PCI, parents are trained to: learn positive interaction skills; improve parent-child interactions; use an organized process for all activities; engage children in appropriate activities; and practice incidental teaching (e.g., recognizing and naming colors, shapes, animal sounds, action words etc.) to encourage child language. PCI also reviews developmental milestones and provides suggestions for age-appropriate play activities. This module teaches parents that they are their children's first teachers. They model many social exchange processes and reinforce positive parent-child interactions that promote children's positive psychological development.

The PCI module skill set is delivered through 10 Child Planned Activities Training (cPAT) steps designed around the periods before, during, and after planned activities (Table 1). cPAT training is delivered over the course of four intervention sessions that are preceded and followed by one assessment session.

Table 1. Operational Definitions of Planned Activities Training Skills Taught in the SafeCare Parent-Child Interactions (PCI) Module

Order of Activities	**Skills**
Before Planned Activity	Prepare in advance • Get supplies/ toys ready in advance (includes items already present) • Informs child activity is going to happen Explain the activity • Gets the child's attention • Explains the activity Say what you expect and what will happen • Gives 1+ positivity stated rule

	• Gives 1+ positive consequence
During Planned Activity	Talk about what you and your child are doing • Talks warmly about activity • Uses incidental teaching Use good physical interaction skills • Gets on child's level • Use good eye-contact Give choices • Lets child have 2+ choices during activity Praise desired behaviors • Uses 2+ labeled praises Redirect misbehaviors • Redirects child when misbehaving Follow through • Follows through with positive and/or negative consequences as appropriate
After Planned Activity	Wrap-up and transition • Informs child activity is ending • Describes what child did well and what to do better next time (if applicable) • Transition to next activity

C. Early Language Development Interventions

Parent-focused language specific interventions such as the Thirty Million Words (Suskind, 2015) and Play and Learning Strategies (Landry, Smith & Swank, 2006) have been successful in addressing disparities of early language development by enhancing the language environment. Specifically, the Play and Learning Strategies intervention emphasizes parent responsiveness as well as specific parent strategies that scaffold child language development within parent-child interactions (Landry, Smith & Swank, 2006). While SafeCare is not an early language development intervention per se, similarly it does focus on building positive parent-child relationships in general. However, the effects of PCI on the early language environment and child communication outcomes have not been explored.

D. Hypotheses and Research Questions

The home language environment (e.g., the amount of parent talk addressed to the child and conversational turns) and child expressive communication (e.g., gestures, vocalizations, single words, and multiple words) is hypothesized to improve following parent participation in SafeCare PCI module.

1. *Primary Issues of Interest.*

- What is the quantity of parent talk and conversational turn taking with toddlers during routine activities at prior to implementation of the SafeCare PCI module?
- What is the quantity of expressive communication of toddlers prior to implementation of the SafeCare PCI module?
- Does amount of parent talk and conversational turn taking with toddlers increase from pre to postassessment with implementation of the SafeCare PCI module as compared to pre to postassessment without SafeCare PCI module?
- Does toddler expressive communication show similar pre to post growth trends with and without SafeCare PCI module implementation?

2. *Secondary Issues of Interest.*

- What is the CHAOS score of the home environment mothers endorse at pre- and postassessment with and without PCI module implementation?

E. Original Analytic Plan

The analytic plan was to address the home language environment (e.g., the amount of parent talk addressed to the child and conversational turns) and child expressive communication (e.g., gestures, vocalizations, single words, and multiple words) following parent participation in SafeCare PCI module, consists of pre- and postassessment observational and parent report measures. The analytic plan was proposed to measure the quantity and the hypothesized pre- to postassessment change of parent talk addressed to the child, conversational turns, and child expressive communication. Also assessed was parent perception of household chaos pre- and postassessment.

III. Applied Research Experience

The following research procedures outline the original methods for this capstone effort. The research experience involved a case study of SafeCare PCI module and included preassessment, intervention implementation, intervention related data collection, and postassessment. Assessments included measures of direct observation of child expressive language, home-based recording of parent and child talk, and parent report of child language as well as chaos in the home. A summary of these procedures is presented to highlight challenges, lessons learned, and recommendations for future research on addressing the 30-million-word gap.

A. Participants & Setting

This research experience was approved by the Georgia State University Institutional Review Board. Participants were recruited from an early education and family center in the Metro Atlanta area. The center delivers childcare and comprehensive family support services to lower income families. To be considered for services, families must complete an application and are eligible for enrollment if their child is less than 4 years old on or before September 1st of the current

school year and the household income meets Federal Income Guidelines based on the number of family members. Verification of address, income, family size, and age is required.

Inclusion Criteria. Parents eligible for participation in the current project were over the age of 18 with a child between 18-months and 36-months old, who were enrolled in a child care center designed to support lower income families. This age range was established as inclusion criteria to target parent talk and support child language development at the earliest developmental age relevant for the PCI module. The PCI is designed for use with children as young as 18 months. Given the rapid pace of typical language development between 18 and 36 months, 36 months was selected as the upper age limit for inclusion to best describe parent talk and child language growth during this period. Parent-child dyads were selected for participation contingent upon meeting the inclusion criteria and being the first few to respond to the recruitment flyers and informational sessions held at the center by the primary researcher (hereafter referred to as researcher). Four mothers responded with interest in participating. However, only two mothers signed a consent form and scheduled a preassessment meeting). The option to abstain from participating in the intervention module training sessions was presented due to the lack of participation and effort to schedule and commit to meetings with the researcher. One mother received the four SafeCare PCI intervention training sessions (hereafter referred to as Intervention Mother). The other mother served as a control and did not receive the four intervention training sessions (hereafter referred to as Nonintervention Mother).

Demographics. Both mother-child dyads were recruited from the same child care center; however, there were observed demographic differences between dyads. The Intervention Mother had more than one child, was married, reported having an advanced degree and reported a household income above $30,000. The Nonintervention Mother had one child, was single,

reported her highest level of education was high school or equivalent degree and reported a household income of $3,999 or less. Both dyads were African American mothers within the age range of 26 to 35 years. In addition to the demographic characteristics outlined in Table 2, the study mothers self-disclosed household characteristics and interest in participating in the current study.

Table 2. Demographic Characteristics of Intervention and Nonintervention Mothers (N=2)

	Intervention Mother	**Nonintervention Mother**
Age	34	27
# of biological children	3	1
Target child's Age/ Sex	32 months/ M	29 months/ F
Race/ Ethnicity	Black/ African American	Black/ African American
# of individuals in household	5	3
Marital Status	Married	Single
Highest Level of Education Attainment	Graduate Degree	High School diploma/ or equivalent (GED)
Annual Household Income	$30,000 and above	$3,999 or less
Current Employment Status	Full-time & Student	Unemployed and looking
Prior participation in parenting intervention	None	Not Reported

Intervention Mother (IM). The IM and her 32-month-old son lived in a house with her husband and two older school-age sons. The IM expressed interest in participating due to a "documented delay" in her child's expressive communication, which was disclosed to the researcher at recruitment. The IM shared her son was currently receiving professional assistance at school to help improve his diction; however, she wanted to gain knowledge on ways to improve home interactions. At recruitment, the IM mentioned starting a new job after being a stay-at-home mother following the birth of her youngest son. Mid-way into the study, the IM started an additional evening/weekend job. On several occasions, the IM discussed working 80-hour weeks which prevented much interaction with any of her children and hired a babysitter to manage home responsibilities during her late evening hours at work. Due to the IM's demanding

schedule, two of four module training sessions occurred at the children's grandparents' home and another two of six sessions that were delivered within the IM's home were modified to accommodate time limitations of the IM. Modifications to the sessions included the delivery of two sessions within one visit and the duration of a few sessions did not last up to 90 minutes, but were shortened to 45-minute sessions. These modifications are not suggestive intervention procedures and have implications to potentially tarnish intervention fidelity. Each session occurred in the living room or kitchen area of either home location. While IM verbally expressed interest in the study, she self-disclosed her lack of a consistent schedule and evening work hours made practicing skills on her own difficult during study intervention.

Nonintervention Mother (NIM). The NIM and her 29-month daughter lived in an apartment with two other unidentified, adult family members. The NIM expressed interest in participating as a result of noticing her daughter's inability to communicate verbally in an understandable manner; NIM stated her daughter "doesn't talk right. You can't understand what she saying." At recruitment, the NIM self-reported being unemployed and looking; however, throughout the duration of her involvement in the study, the NIM mentioned going to work during the evening third shift hours at a local stadium. The NIM's living arrangement was inconsistent (e.g., she mentioned staying overnight at other locations besides the apartment with the unidentified family members). The lack of consistency in living arrangement caused difficulty in scheduling meetings; thus, the option of being a nonintervention participant was presented and accepted. The baseline preassessment meeting was held at her apartment, while other study related visits were held at public locations including a local pediatric hospital waiting area, the recruitment center, and an outside bench near a local adult medical center.

B. Design

This was a case study designed research experience describing child expressive communication and the language environment of children 18 months to 36 months with and without implementation of the SafeCare PCI module for the purpose for documenting lessons learned and generating recommendations for future research. Pre-post study design was attempted with two mother-child dyads; one IM receiving SafeCare PCI module training and the other NIM receiving no SafeCare PCI module training. The independent variable was the implementation of the PCI module and the dependent variables of interest were child expressive communication and the language environment. Child expressive communication was defined as a parent-report of child receptive and expressive communication behaviors, an observational total weight of child gestures, vocalizations, single words, and multiple words during dyad interaction, and child vocalization counts (CVC). The language environment was defined by two discrete variables: adult word count (AWC) and conversational turns (CT).

C. Applied Research Experience Procedure

Overview. Research experience procedures for both dyads are illustrated in Table 3. Following recruitment, the researcher obtained consent, collected demographic information. The researcher assessed parent perception of household chaos, and assessed parent-report of child expressive communication at the first meeting. At the closing of the first meeting, the dyads were instructed to record the audio language environment over multiple days using the Language Environment Analysis (LENA) system's Digital Language Processor (DLP); the audio recording from the DLP was considered baseline preassessment. The researcher retrieved the device from study mothers at the conclusion of the recording days, returned to the office to confirm minimal recording hours (i.e. four hours over the course of two days) by connecting the device to a computer that ran the LENA system Pro language processing software, ensured sufficient audio

recordings, collected information regarding activities that took place during the recording, and completed baseline preassessment observational child expressive communication and preassessment observational SafeCare PCI module skills demonstration (as described in Table 1).

Following baseline preassessment, the IM received four PCI training sessions outlined by the module curriculum (Table 3). The NIM did not receive PCI module training sessions, as described previously; however, she received all PCI module materials at the closing of baseline preassessment. Following intervention for the IM and intervention time lapse for the NIM, all preassessment measures were repeated with the exception of the demographic information. Dyads were instructed to use the DLP to record postassessment audio language environment in the days following the postassessment visit with the researcher and researcher collected information regarding activities that took place during the recording. The study concluded once the researcher retrieved the device from study mothers and ensured sufficient audio recordings on the device by connecting the device to a computer that ran the LENA system language processing software. Participants were compensated up to $135 for their participation over the duration of the study: $25 was provided following the baseline preassessment and postassessment language assessment and $10 following each intervention module session (six sessions).

Table 3. Research Experience Procedure for the Intervention and Nonintervention Mother

Session Type	Procedure
Baseline Preassessment	Demographic Information Parent perception of household chaos Parent-report child expressive communication Audio language recording using DLP Observational child expressive communication

	SafeCare PCI Module Session 1: baseline preassessment of skills; no training
Intervention *(Intervention Mother Only)*	SafeCare PCI Module Session 2: Training SafeCare PCI Module Session 3: Training SafeCare PCI Module Session 4: Training SafeCare PCI Module Session 5: Training
Postassessment	SafeCare PCI Module Session 6: postassessment of skills; no training Observational child expressive communication Parent perception of household chaos Parent-report child expressive communication Audio language recording using DLP

Baseline Preassessment Procedures. Following recruitment, the researcher met with both dyads, depending on each mother's schedule, to complete baseline preassessment. During the first meeting with the consented mother-child dyads, the researcher collected demographic information, parent perception of household chaos, and parent-report of child expressive communication with the completion of three questionnaires by the mothers. At the closing of the first meeting, the researcher delivered detailed instructions on how to use the DLP. The researcher trained mothers to use the DLP by watching a 6-minute training video with mothers, then modeled proper handling and proper recording using device. DLP training concluded with an accurate role play of mothers recording the language environment using the device followed by feedback from the researcher. At this time, the researcher and study mothers identified time blocks within their schedule to record the audio language environment (e.g., in the home during a time where dyads would naturally interact with one another). The researcher also provided explicit instructions to record 24 hours of the audio language environment over the course of three days (i.e., 8-hour recordings per day). Because the DLP can record up to 16 hours of continuous audio language environment, the mothers were instructed to record two 8-hour

recordings over the course of two days (i.e., 8-hour recordings per day) and were told that the researcher would pick up the two days of recording. In exchange, the researcher would deliver an empty device to the mother to complete the third 8-hour recording to complete a total of 24 hours of audio language environment over the course of three days. Recording days did not have to be consecutive. Following the first meeting, the study mothers began recording the audio language environment using the device. During this time, study mothers expressed difficulty in finding time to record 24-hours of the language environment using the device over the course of three days. Mothers returned the device with recordings shorter than 16 hours or delayed recording days due to the inability to record 8 full hours within one day when both the study mother and child were home and able to interact with one another. In light of the recording challenges midstream, when it was observed that mothers were not making the 24 hour recordings as asked, the time duration was reduced to 4 hours over a two-day period. This mid-assessment change was not initially instructed but was the result of what the mothers collected at preassessment. When the researcher retrieved the LENA device for baseline preassessment, mothers were asked to describe the day in which the recording occurred (i.e., what activities took place during recording hours, who was home during recording, and if anything extraordinary happened in the home during recording). Ability to recollect the day varied by mother and the lapse in time between recording days and when researcher posed questions inquiring about the setting of recorded days. The researcher returned to the office to confirm minimal recording hours (i.e. 4 hours over the course of two days) by connecting the device to a computer that ran the LENA system Pro language processing software. If a mother's recordings were shorter than the minimum recording criterion, they were asked to rerecord. Following the retrieval of the device and confirmation of recorded hours, the researcher began implementation of SafeCare PCI

module sessions. The first PCI module session served as baseline preassessment observational child expressive communication and SafeCare PCI module skills demonstration. During this time, the NIM received all intervention module materials without any training or further explanation of resources.

Intervention Procedures. Prior to implementation of the SafeCare PCI intervention module, the researcher was trained to administer PCI. Researcher training consisted of completing a two-day didactic and interactive training session administered by a National SafeCare Training and Research (NSTRC) training specialist. Researcher training content of PCI was first explained and then modeled by the training specialist. The researcher then practiced and participated in monitored role play of PCI sessions. Researcher training concluded with demonstration of mastery knowledge of administering and assessing PCI determined by the NSTRC trainer. Mastery was defined as demonstration of the majority of skills behaviors consistently and with ease.

The SafeCare PCI module consists of six sessions; sessions 1 and 6 are designed as formal baseline preassessment and postassessment of skills (no training); sessions 2 through 5 are training sessions of module skills. During each training session the researcher was present to implement PCI module training, lasting 60 to 90 minutes per session with the IM. Each training session included an informal assessment of module skills.

Intervention Materials. The PCI materials utilized by the researcher included: the Daily Activities Checklist (DAC) and Fisher-Price barn (with animals). The DAC is a checklist used in typical PCI implementation to understand parent challenges, if any, while engaging in interactive home activities (e.g., getting your child dressed, toileting, and bath time) and other activities (e.g., when the parent has visitors, running errands, and leaving your child with someone else).

Perceived challenges of listed activities on the DAC are identified as needing either "no change", "very little change", "some change", or "a lot of change." Per the PCI manual, the DAC was completed with the IM prior to PCI module training sessions to identify two interactive home activities needing the most change to use for assessment and training. The Fisher-Price barn was used during the standard play activity for the IM-child dyad. Additional materials used by the researcher included dolls as a demonstration aide during PCI training sessions when the IM's child was momentarily unavailable.

PCI materials distributed to the IM throughout the course of the PCI intervention and to the NIM at the end of the baseline assessment included: cDevelop Cards, PCI Cards, cActivity Cards, and cPAT Overview. The cDevelop Cards are a packet of developmental milestones specific to age and phase of development for children birth-to-five years old. These cards were used as an additional resource for mothers expected developmental behavior specific to their child's age. The PCI Cards contained reference materials such as: description of common daily family routines (e.g., mealtime, bath time, playtime, reading time, and bedtime), facts about child behavior, and ways to reduce challenging behavior (e.g., tantrums, toilet training, and bedwetting). The PCI Cards reinforce information covered within the PCI curriculum sessions. The cActivity Cards offers additional ideas for low cost parent-child interaction activities (e.g., sock matching, pretend cooking, and exploring books). The cPAT Overview is a reference tool for the PCI skills illustrated in Table 1.

IM specific procedures. The researcher met with the IM once or twice per week, depending on the mother's schedule during implementation of PCI module training. The researcher used the DAC for assessment purposes. In PCI module sessions two through five, the mother received instructional information to build 10 skills (Table 1) to improve parent-child

interactions and create structure during activities with child. Throughout PCI module the mother received all PCI materials: cDevelop Cards, PCI Cards, cActivity Cards, and cPAT overview. The final module session, session six, approximately 10 weeks following baseline preassessment, the researcher met with the IM as postassessment and a formal assessment of observational child expressive communication. Due to the mother's observed frustration with child during postassessment session, the mother opted out of completing postassessment observation of PCI module skills demonstration. Therefore, PCI session two informal demonstration of mother-child interaction within play activity with the Fisher-Price Barn was used as postassessment demonstration of PCI module skills.

NIM specific procedures. Although the NIM elected to not receive the PCI training, she did receive the intervention materials, just as the IM, which included: cDevelop Cards, PCI Cards, cActivity Cards, and cPAT Overview. The final session, approximately five weeks following baseline preassessment, the researcher met with the NIM as postassessment and a formal assessment of observational child expressive communication and demonstration of PCI module skills.

Postassessment Procedures. At the closing of the final PCI module session for both study mothers, the researcher collected postassessment parent perception of household chaos and parent-report of child expressive communication with the completion of two questionnaires following the same preassessment procedures. The researcher reoriented study mothers on how to use the DLP and together identified time blocks that correlated with the baseline preassessment recording to record the audio language environment. Following re-training on the DLP, the researcher delivered explicit instructions on using the DLP to record a minimum of 4 hours of the language environment over the course of two days (based on the feasibility of

recording hours during baseline preassessment in which a minimum of 4 hours was recorded for both study mothers). The researcher then received the DLP with recorded audio language environment. Mothers were asked to describe the day in which the recording occurred (i.e., what activities took place during recording hours, who was home during recording, and did anything extraordinary happen in the home during recording); following the same preassessment procedures at postasessment. Ability to recollect the day varied based on the mother and time lapse between recording and when researcher posed questions inquiring about parameters of recorded days. The researcher returned to the office to confirm minimal recording hours (i.e., 4 hours over the course of two days) and this concluded study procedure.

Measures

Primary outcome measures included the Early Communication Indicator (ECI; Luze, Linebarger, Greenwood, Carta, Walker, Leitschuh, & Atwater, 2001) and the Language Environment Analysis (LENA) System (LENA Foundation, 2014), which includes the Language Developmental Snapshot (LDS) and the recordings done through the DLP. These measures assessed the two dependent variables of interest: child expressive communication and the language environment. A secondary outcome measure, the Confusion, Hubbub, and Order Scale Short Form (CHAOS; Petril, Pike, Price, & Plomin, 2004), was used to assess parent perception of household chaos. The Child Planning Activities Training (cPAT) Assessment, previously known as Planned Activities Training (Bigelow & Lutzker, 1998), assessed outcomes of the the SafeCare PCI implementation.

Early Communication Indicator (ECI) Observational Measure. The ECI was administered to measure the observational expressive communication of children. The ECI is designed to monitor progress in expressive communication development of infants and toddlers

between the ages of 6-months and 36-months (Luze et al., 2001). It is an observational measure of child communication behavior during a brief six-minute standardized play activity between a familiar caregiver and child. One standardized toy sets (i.e., the Fisher-Price barn) is provided and the occurrence of four communication behaviors, known as *key skills*, are recorded during the play period (Walker & Carta, 2010). These key skills include gestures, vocalizations, single words, and multiple words as defined in Table 4. Occurrence of key skills are recorded over a six-minute period to produce a frequency count. The ECI software program produces a computer-generated total weighted communication rate that is based on an algorithm of total key skill frequencies divided by six minutes (Greenwood, Carta, & Walker, 2005).

Table 4. Operational Definitions of Early Communication Indicator (ECI) Key Skills

Skill	Definition (Luze et. al., 2001)
Gesture	Any physical movement made by the child in an attempt to communicate with the partner (e.g., showing, giving an object or toy, pushing away or rejecting a toy, reaching for a toy, pointing to a person or object, nodding or shaking his/her head to indicate "yes" or "no").
Vocalization	Non-word utterance voiced by the child to a partner (e.g., laughing, making animal sounds, sounds that appear to be unintelligible words).
Single Word	A one-word intelligible utterance used in isolation (e.g., not part of a long intelligible utterance).
Multiple Word	An intelligible utterance of two or more words understood by the observer.

Psychometric properties of the ECI have been reported across numerous studies showing reliability and validity. The initial norming sample for establishing ECI benchmarks included 1,400 children (Greenwood et al., 2006). The ECI was positively correlated (r = .62) with the Preschool Language Scale-3 (Zimmerman, Steiner, & Pond, 1992), a standardized measure of early receptive and expressive communication skills, and (r = .51) the Caregiver Communication Measure (Walker, Hart, Linebarger, & Parsley, 1998), a parent communication rating measure

(Luze et al., 2001). An estimate of the interobserver agreement on the scoring of ECI total communication was 90% (Greenwood et al., 2006).

Before the present study began, the researcher and RO completed ECI certification with an ECI training Specialist. Training consisted of operational administration fidelity and videotaped coding to the standard. To complete ECI certification the researcher and RO independently scored additional pre-recorded certification videos, then discussed and compared ECI frequency scores until a minimum of 85% interobserver reliability for ECI total weighted communication was achieved. Interobserver reliability was calculated using the formula: (agreements/ agreements + disagreements) * 100. Interobserver reliability of a minimal 85% was confirmed by an ECI training specialist. To conclude the certification process and grant permission to both the researcher and RO to administer and implement ECI, the researcher submitted a videotape of the researcher administering ECI; the videotape was approved by an ECI training specialist.

During preassessment ECI administration, the researcher set up the materials in an appropriate position to accommodate the videotaped assessment and instructed study mothers to play with child for a timed 6-minute play session using the Fisher-Price Barn toy. Once the video camera was set up, the researcher instructed the mother to begin the play interaction and at the 6-minute interval the researcher instructed the mother to end the play interaction by stating, “you may begin wrapping up”. Each assessment was videotaped to obtain interobserver reliability and for scoring purposes. Following ECI administration within the study, the researcher and RO returned to their offices to independently tally the frequency of the four skills described above on the ECI assessment form for videotaped baseline preassessment. The researcher and RO also met to ensure a minimal 85% agreement for ECI total weighted communication occurrences for each

assessment. If the minimal percent agreement criterion was not met, the two observers discussed discrepancies among key skills, viewed the videotaped assessment again, and separately re-tallied the frequency of the four skills without discussion. This was repeated until an 85% agreement criterion was met. Key communication skill frequencies of the researcher were entered into the ECI online data system for electronic calculation of the total weighted communication score. ECI interobserver agreement for total weighted communication at preassessment was 91% and 96.9%, which met the reliability criterion.

Preassessment administration procedures were repeated with the notable exception that for the postassessment observational ECI among the Intervention Mother was an interaction between the researcher and the Intervention Mother's child instead of Intervention Mother-child dyad interaction. This is a study limitation that is addressed within the lessons learned section of this paper; however, the procedure is within protocol in which the researcher is certified to administer ECI, and the play activity is permitted to be conducted with a familiar play partner. ECI interobserver agreement for total weighted communication at postassessment between the researcher and RO was 85% and 98.2%, which met the reliability criterion.

The Language Environment Analysis (LENA) System. The LENA system (LENA Research Foundation, 2009) provided a direct measure of the frequency count of adult words spoken (AWC), conversational turns (CT), and child vocalizations (CVC), as defined in Table 5, to approximate child expressive communication and the language environment. The LENA system's DLP is a digital audio device designed to record the talk that the child hears during the day. The LENA software system applies research-supported, computer-generated speech processing algorithms that incorporate pattern recognition and speech signal processing technology to code the audio files into sound categories (i.e., distinguishing human speech

activity from other environmental sounds such as television and other electronic background noise; Xu, Yapanel, & Gray, 2009; Xu et al., 2008).

Table 5. Operational Definitions of LENA Digital Language Processor Key Variables

Variables	Definition (LENA Foundation, 2009)
Adult Word Count (AWC)	Number of adult words spoken within a 10-foot radius of the child wearing the audio device.
Conversational Turns (CT)	Number of alternations within a conversation between clear, speech-related adult and target child vocalizations. A conversation was defined as a sequence of vocalizations bounded by at least 5 seconds of non-vocal material, based in part, on the rules suggested by Hart & Risley (1995).
Child Vocalization Count (CVC)	Number of expressive speech-related vocalizations produced by the child wearing the audio device.

Psychometric properties of the LENA system have been documented in several studies. The reliability of the LENA computer-generated speech processing was demonstrated by comparing 70 hours of LENA recorded data and computer-generated coding to human transcription and coding. Human transcription was similarly coded to computer-generated coded adult talk segments in 82% of cases and computer-generated coded child talk segments in 76% of cases (Xu, Yapanel, & Gray, 2009; Xu et al., 2008). Additionally, only 16% of human-coded segments of child nonvocalization were misclassified by the system as vocalizations. Moderately high test-retest reliability of LENA were demonstrated (Gilkerson et al., 2016). Averaged daily AWC varied approximately 12% between the first (M_1= 13, 626, SD = 6,494) and second (M_2= 12,006, SD = 4,575) recording days, $t(51) = 2.38$, $p = .02$; CT (M_1 = 382, SD_1 = 259; M_2 = 387, SD_2 = 206) differed by 1% $t(51) = 0.14$, $p = .89$; and CVC (M_1 = 1,557, SD_1 = 807; M_2 = 1,723, SD_2 = 828) differed only marginally between days $t(51) = 1.80$, $p = .08$. Generated language estimates correlated (r=.32) with a standardized measure of early receptive and expressive communication skills (Preschool Language Scale-4; Gilkerson et al., 2016).

During pre- and postassessment, the mothers enrolled in the present study were instructed to secure the device in the specified clothing vest, dress the child, and continue with their typical daily routines; thus, the DLP measures the naturalistic environment of the child. The mothers were asked to activate the DLP when the mother-child dyads were together and awake (i.e., not while the child was sleeping or while the mother was away at work). The researcher then asked mothers to describe the day in which the recording occurred (i.e., what activities took place during recording hours, who was home during recording, and did anything extraordinary happen in the home during recording). If a mother's recordings were shorter than the minimum recording criterion, they were asked to rerecord.

LENA Developmental Snapshot (LDS). The LDS was administered to measure the parent-report expressive communication of children. The LDS is designed to provide a monthly progress monitoring measure to help parents recognize child language milestones (Gilkerson & Richards, 2008). The 52-item, paper and pencil questionnaire assesses parent perceptions of their children's expressive and receptive language skills (e.g., "Does your child understand location words such as "in", "on", and "out"?; "Does your child combine two or more words together to form simple phrases?"; "Does your child have at least a 50-word-spoken vocabulary?"). Response options were "Yes" or "Not Yet." Parents were instructed to stop answering questions after five "not yet" responses in a row. The LDS raw score is the total number of "yes" responses before the five-in-a-row "not yet" threshold is reached. The LDS scoring software system provided a raw score that was transformed into a developmental age, standard score, and percentile rankings. The generated standard score represents an estimate of the child's language developmental age (in months) at each assessment.

Prior studies have demonstrated reliability and validity the LDS. Items were formulated by a linguist and speech-language pathologist, and were selected based on the review of standard language and cognitive assessments such as the Preschool Language Scale-4 (Zimmerman, Lee, Steiner, & Pond, 2002), the Receptive-Expressive Emergent Language Test-3 (Bzoch, League, Brown, 2003), and the Child Development Inventory (Ireton & Thwing, 1992). Questionnaire items are arranged in developmental sequence (e.g., 0-12 months, 13-24 month, and 25-36 months) and are consistent with expected major milestones (e.g., first word around 12-months, vocabulary burst around 18 months, two-word sentences around 24 months, etc.). The LDS is significantly correlated with child chronological age, r (306) = .92, p<.01 (Gilkerson, Richards, Greenwood, & Montgomery, 2016), and early language assessments (r = .93, $p < 0.01;$ Gilkerson & Richards, 2008), and demonstrates 3-month test-retest reliability of .93 - .97 (Gilkerson & Richards, 2008).

Confusion, Hubbub, and Order Scale (CHAOS) Short Form. The CHAOS is a six-item, paper and pencil parent report questionnaire that assesses parent perceptions of the household routine, noise, and general environmental confusion (Matheny, Wachs, Ludwig, & Phillips, 1995; Petril, Pike, Price, & Plomin, 2004). Sample items include: “I have a regular bedtime routine;” “You can’t hear yourself think in our home;” “We are usually able to stay on top of things;” and “It’s a real zoo in our home.” Questionnaire items are rated on a 5-point Likert scale (1 = "definitely untrue," 3 = "neither untrue nor true," and 5 = "definitely true"). A total CHAOS score was generated by summing the responses to each item as per the developer. Three of the six questions are reverse scored, such that higher scores indicate greater household chaos (Wang, Deater-Deckard, Petrill, & Thompson, 2012). Possible CHAOS scores range from 6 to 30.

Empirical studies demonstrated the validity of the CHAOS and assessed the parent perception of household routine, noise, and general environmental confusion (Coldwell et. al., 2006, $\alpha = 0.56$; Pike et. al., 2006, $\alpha = 0.63$). Construct validity of questionnaire items were reported by comparing mother reports on the CHAOS with observers' assessments of the home environment (Matheny, Wachs, Ludwig, & Phillips, 1995). Higher ratings of environmental confusion by parents were associated significantly with observers coding homes as noisier, more crowded, and having a higher ''traffic pattern''.

Child Planning Activities Training (cPAT) Assessment. The cPAT assessment was used to measure parent implementation fidelity of the PCI Module skills (Bigelow & Lutzker, 1998) as shown in Table 1. The cPAT assessment is a 10-item behavioral checklist completed by a trained cPAT observer during observation of parent-child interactions such as play. Each checklist item is rated on a 3-point scale or as not applicable: (0) behavioral skill not demonstrated; (1) behavior needs improvement in ease and/or consistency of behavior; or (2) behavior was demonstrated consistently with ease. A percent occurrence score is calculated based on the total points possible excluding items that were not applicable (e.g., redirecting misbehavior may not be necessary during interaction). While there are no published validation studies of the cPAT, adequate interobserver agreement has been documented in prior research (Bigelow & Lutzker, 1998). Interobserver reliability is calculated using the formula: (agreements/ agreements + disagreements) * 100. Interobserver reliability is met when a minimal 85% has been reached.

Prior to beginning the current study, the researcher and RO completed SafeCare PCI Module training with an NSTRC Training Specialist. PCI Module training consisted of cPAT administration fidelity and videotaped scoring to the 3-point rating scale, described above.

Additionally, the researcher and RO separately scored pre-recorded certification videos, then discussed and compared cPAT ratings until a consensus was achieved. Consensus was achieved with a general agreement on ratings instead of a reliability calculation between independent ratings from the researcher and RO.

During the current study, the researcher and RO separately completed the cPAT assessment after viewing the preassessment ECI video of the mother-child play activity with the Fisher-Price Barn. The RO relied on the videotapes. Following individual ratings, the researcher and the RO met and discussed any discrepancies in skill ratings to establish a final consensus score. At postassessment, preassessment administration procedures were repeated with the Nonintervention Mother; postassessment was completed followed by the viewing of the postassessment ECI video consisting of the mother and child interacting in play with the Fisher-Price Barn. Because postassessment ECI for the Intervention Mother was completed with the researcher and child, a separate informal play activity of the mother and child interacting with the Fisher-Price Barn was observed and scored as cPAT postassessment.

IV. Lessons Learned

This applied research experience was the first of its kind to pilot procedures to understand the language environment and child expressive communication for children 18-36 months following the participation of SafeCare's PCI module. In the process of piloting procedures, several challenges which provided opportunities for learning emerged. These challenges and corresponding lessons learned are detailed in the following sections.

Challenges.

- Home visits in which mothers were trained on how to use the DLP and actual use of the DLP to record the audio language environment was separated by several weeks (Lesson 1).
- The audio language recording requirement of 24 hours over the course of three days changed mid-assessment to 4 hours over the course of two days (Lesson 2).
- Mothers did not keep a journal of activities recorded audio language, although this was requested at preassessment (Lessons 3).
- The IM and NIM did not record the audio language environment during the same times of day for the same lengths of time at pre- and postassessment (Lesson 3).
- The NIM was selectively treated similar to a control because of the mother's lack of consistent work schedule and consistent rescheduled meetings (Lesson 4).
- The IM self-disclosed her lack of skills practice between intervention sessions (Lesson 5).
- The IM was unable to complete ECI postassessment in the same procedures as preassessment because the mother expressed frustration with child during postassessment session and expressed exhaustion from long hours at work (Lesson 7).

- Intervention implementation fidelity was not assessed. (Lesson 8).

Lesson 1: Training mothers to use the DLP without establishing training and implementation fidelity created potential misuse and unreliable audio language environment data. A fidelity assessment of the mother's recording of the language environment was not completed. Mothers were trained on how to use the DLP and demonstrated proper use of device functions. However, the researcher did not observe mothers using the device to record

hours of the audio language environment. Only observational assessment of the mothers using the device to record the audio language environment provides assurance the mothers recorded the intended language environment sufficient for data analysis.

Lesson 2: Mothers were unable to record the instructed 24 hours over the course of three days. A 24-hour language recording hour was originally selected based on prior literature showing that 12-hour recordings were feasible to provide an adequate language samples (Greenwood, Thiemann-Bourque, Walker, Buzhardt, and Gilkerson, 2011). In addition, multiple day samples were of interest to eliminate an atypical day of language recording. In hindsight 24-hour recording were not feasible recordings. Although many studies such as Greenwood, Thiemann-Bourque, Walker, Buzhardt, and Gilkerson (2011) obtained 12-hour long recordings, the longest recording obtained in the current research experience was 8 hours over the duration of 3 days and on average daily recording length was much shorter (2 hours).

The 24-hour recordings were substantially reduced mid-assessment to 4-hour recordings over the duration of 2 days (2 hours per day for 2 days). Available time blocks within each day were identified by the researcher and study mothers, yet adherence to reduced timeframes at postassessment was not followed because mothers did not implement the recording procedures as instructed (i.e. mothers were instructed to record the same time of days for the same time length of preassessment at postassessment) and no additional implementation supports were provided. Thus, the pre- and postassessment audio language recording for each study mother were not comparable.

Lesson 3: Mothers did not use the DLP to record the audio language environment during times of morning routine activities (e.g. waking, dressing, and breakfast) and evening routine activities (e.g. dinner, bath time, and bedtime) as requested. Utilizing the

LENA system has advantages in which the system allows for noninvasive recording of the naturalistic language environment. However, the LENA system creates challenges regarding adherence to recording hours and sufficient recording of the audio language environment for data analysis and creates the opportunity for multiple adult voices to be included in the audio language recording making it difficult to isolate a direct connection between the intervention participation and the home language environment of the child. Study mothers were instructed to record the audio language environment during times when the mother and child would typically interact such as during morning routine activities (e.g. waking, dressing, and breakfast) and evening routine activities (e.g. dinner, bath time, and bedtime). The mothers were also instructed to inform the researcher of the activities that took place during the recording regarding who was home during recording, and if anything extraordinary happened in the home during recording; however, this procedure was loosely standardized. This procedure lacked timeliness in which there is the potential mothers might have forgotten what took place during the recording based on when the researcher posed these questions.

Lesson 4: Mothers reported multiple changes in jobs and inconsistent weekly schedules; however, these changes were not systematically documented. Based on observation from the researcher and statements from mothers, these disruptions made it difficult for mothers to engage in planned interactions with their children throughout the duration of the study.

Lesson 5: Mothers did not receive consistent reminders of upcoming scheduled visits or visual reminders to practice intervention skills, which interfered with intervention implementation. Due to multiple schedule changes, intervention sessions did not occur once or

twice weekly per the standard implementation. Some sessions were cancelled and rescheduled weeks apart.

Lesson 6: Use of the standardized toy and during the SafeCare cPAT observational assessment. Typical SafeCare cPAT does not require a standardized toy to assess play interaction between mother and child. However, standardizing was particularly helpful for ensuring comparability of the play context at preassessment and postassessment for both mothers.

Lesson 7: Postassessment data of ECI was not comparable because postassessment procedures did not repeat preassessment procedures. The baseline preassessment of ECI consisted of the IM and child interacting during a play activity using the Fisher Price barn while the postassessment of ECI consisted of the researcher and Intervention Child interacting during a play activity using the Fisher Price barn. The change in child play partner from preassessment (i.e., mother) to postassessment (researcher) was a major limitation, which may have systematically affected the child's behavior.

Lessons 8: Resources were not available through this research experience to hire and train a data collector to assess interventionist implementation fidelity. Without data on implementation fidelity, is impossible to empirically establish whether high quality SafeCare PCI was implemented.

Throughout the major challenges demonstrated within the research experience, lessons learned emerged surrounding the implementation of interventions with at-risk families. The sample size (N=2) of the current research experience does not permit generalization; however, the above lessons learned regarding the applied research experience is worth consideration for future research adaptations.

V. Key Recommendations for Implications for Future Research

To address lessons 1 through 3 regarding training and implementation fidelity of the DLP, recording the audio language environment using the DLP, and documenting requested activities that occurred during recordings, future research should establish revised, standardized recording procedures. Future research should establish the following audio language training and recording procedures for using the DLP: Once the researcher has concluded with the DLP training procedures (as implemented during this piloted research experience, the researcher should identify recording days and times with the participant. This identification of days and times will occur at the closing of the first visit with the participant. Researchers should provide effective instruction, practice and written reminders for participants to record during agreed upon times of day when parent and child talk is most likely to occur (e.g. early morning beginning at 7am and in the late afternoon- early evening; .Greenwood, Thiemann-Bourque, Walker, Buzhardt, & Gilkerson, 2011).

The researcher should then meet with the participant just prior to the first identified recording day and time. The researcher should reorient participants of recording setting (e.g. recording should occur when the participant and child will be interacting) and should deliver a recording fidelity checklist as a reminder for using the device, activities during recording, and recording length. A brief standardized interview should be conducted following each recording for the purpose of documenting parent report of individuals present in the home, parent and child activities, and time of day. These recommendations have the potential to increase adherence to scheduled recording times, ensure proper use of recording device, reduce barriers around recording and provide information about the times of day and activities during recording.

To address lesson 4, of undocumented changes in jobs and inconsistent weekly schedules in which mothers were able to interact with their child at home during the study, future research should establish a standard document in which parents are able to report these changes, identify if they were able to interact with child, and report household chaos. Researchers should complete this documentation at the beginning of each visit with participants. This documentation and reported change between visits has the potential to bring insight to the researcher and allow for proactive problem-solving.

To address lesson 5, of providing consistent reminders to upcoming scheduled visits and practice intervention skills which prevented intervention effectiveness, future research should establish procedure to send consistent reminder calls and/or text messages (depending on preferred method of contact) to participants. Consistent weekly reminders to incorporate skills with daily activities has the potential to increase the effectiveness of the intervention skills despite the influence changes in weekly schedules. This also allows the researcher to proactively identify potential barriers to practice time of intervention skills outside of intervention sessions and generate solutions with the participant. Consistent weekly reminders and daily visual reminders to use intervention skills during daily activities may have increased intervention skill implementation despite the influence changes in weekly schedules. These reminders have the potential to promote intervention compliance.

To address lesson 6, the utilization of a standardized toy and timed interaction to assess SafeCare PCI, future research should establish a standard toy and time for play interaction when administering assessment of intervention skills. The current research experience utilized the ECI standardized toy (i.e., Fisher Price barn) and timed 6-minute interaction with mother and child as the formal assessment of the demonstration of the

intervention skills. The standardized toy and timed interaction created continuity between study dyads and has the potential to enhance reliability of demonstrated skills based on toy chosen for intervention assessment of play. The researcher recommends the continuation of a standard toy and timed interaction and the creation of a standard script the assessor would implement to prompt the mother to begin and end the play interaction with child. This recommendation has the potential to create a standard that would allow for pre- and postassessment comparisons and comparisons between study dyads.

To address lesson 7, of not having comparable preassessment to postassessment ECI data, the parent should serve as the child play partner during both ECI administrations. ECI standardization allows the ECI to be administered by the parent or a familiar adult. In the current research experience though the researcher was a familiar adult to the child during postassessment, for the purpose of reliability and assessing interaction with the parent and child, preassessment procedures should have bene maintained at postassessment.

To address lesson 8, of not having implementation fidelity on SafeCare PCI, future research should implement intervention fidelity procedures. To establish intervention implementation fidelity, future research should establish implementation fidelity. To do so, the interventionist should complete an implementation fidelity checklist following each PCI session. In addition, a trained independent assessor should observe at least 20% of intervention sessions and complete a PCI implementation fidelity checklist.

These provided recommendations from this piloted research effort has provided insight for future endeavors for exploring the language environment and expressive communication of toddlers.

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Appendix

A. Glossary

Adult Word Count *(AWC)*
Child Maltreatment *(CM)*
Child Planned Activities Training *(cPAT)*
Child Vocalization Count *(CVC)*
Confusion, Hubbub, and Order Scale *(CHAOS)*
Conversational Turns *(CT)*
Daily Activities Card (DAC)
Digital Language Processor *(DLP)*
Early Communication Indicator *(ECI)*
Evidence-based practice *(EBP)*
Intervention Mother (*IM)*
Language Developmental Snapshot (*LDS)*
Language Environment Analysis *(LENA)*
National SafeCare Training Resource Center *(NSTRC)*
Nonintervention Mother *(NIM)*
Parent-Child Interaction *(PCI)*
Reliability Observer *(RO)*
Socioeconomic status *(SES)*