GRAMMATICAL INPUT DIFFERENCES REMAIN SIX-MONTHS FOLLOWING TOY TALK INSTRUCTION

BY

ZORA MCFARLANE-BLAKE

THESIS

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Master's Committee:

Associate Professor Pamela Hadley, Chair
Assistant Professor Matthew Rispoli
Assistant Professor Marie Channell

ABSTRACT

Parents' use of lexical noun phrases (NP) in the subject position of declarative sentences is rare, occurring in less than 3% of parents' child-directed utterances, but diversity in this input variable is a significant predictor of young children's grammatical growth (Hadley et al., 2017). Hadley and colleagues demonstrated that brief instruction (~ 3½ hours) in responsive interaction strategies and two toy talk strategies – *talk about the toys* and *give the items its name* increased parents' frequency and diversity of lexical NP subjects (e.g., *The penguin is fast*.) immediately post-instruction. This study examined whether parents who received toy talk instruction (n = 19) when their children were between 21 and 24 months of age maintained use of lexical NP subjects during play-based parent-child interactions six months later compared to parents in a control group (n = 19) who did not receive the instruction. Results indicated that the frequency and diversity of lexical NP subjects decreased from 24 to 30 months for treatment parents; however treatment parents continued to use significantly more lexical NP subjects than the control parents. Production of lexical NP subjects continued to remain low for the control group over time, documenting the need for instruction to alter this input variable. Future research should consider including periodic, ongoing instruction for parents to maintain use of toy talk strategies.

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CHAPTER 1

INTRODUCTION

Children receive an important foundation for early language development through the language input they receive from their parents (Suskind et al., 2016). This can be best understood by considering how a child learns and what influences their learning. Hoff (2006) argued for the need to combine models of both language acquisition and child development. The model of language acquisition focuses on how the child mentally processes the input from the environment to produce the output. In contrast, the child development model examines how the social contexts in which children live shape their interactions with the world. Social contexts can include one's culture, socioeconomic status, ethnicity, as well as the schools, child care settings, and peer groups to which they belong. Together, the study of internal mechanisms and external contexts can improve our understanding of how the child acquires language and how social contexts influence the language development process.

Parents are an important part of their child's social context, because most serve as the primary source of input to their young children (Suskind et al., 2016). The parent's role within the social context can be examined by considering the parenting behaviors exhibited, the child's engagement with the parent, and the language used by the parent when speaking to the child (Kwon, Bingham, Lewsader, Jeon, & Elicker, 2013). These elements are then considered and modified, when designing parent-implemented language interventions. Parenting behaviors such as maintaining joint attention with the child have been observed to influence language learning (Hoff, 2006) as well as parent input that uses responsive strategies to facilitate the child's

vocabulary and expressive abilities (Fey, Cleave, Long, & Hughes, 1993; Girolametto Weitzman, Wiigs, & Pearce, 1999; Tamis-LeMonda, Bornstein, & Baumwell, 2001).

Forget-DuBois, Dionne, Lemelin, Pérusse, Tremblay, and Boivin (2009) found that family prevention programs which target children's development are beneficial environmental influences present prior to the preschool years. Successful intervention programs that focus on improving young children's language development prior to entering school have been shown to be positive influences for early school success (Forget-Dubois et al., 2009). Designing interventions that focus on the parent-child interaction within the home environment also align with the goals of the Individuals with Disabilities Education Act of 2004, which require that young children participate in interventions within their natural environments (Roberts & Kaiser, 2011).

In recognizing the influence parental input provides to children as they are developing language, an increased number of parent-implemented interventions have been designed to provide children, specifically those experiencing language delays, with additional language support within their natural contexts on a daily basis. Parent implemented language interventions typically involve examining the parent-child interaction within the home environment and/or natural contexts, then evaluating ways to modify parental behaviors that have been shown to influence child development that parents can implement. The importance of parent-implemented interventions continues to be recognized, leading to the development of more of these interventions.

It is well established that parents are able to learn language interventions strategies (see Roberts & Kaiser, 2011 for a review and meta-analysis). However, rarely is the maintenance of parents' strategy use examined. If one of the main goals of parent-implemented interventions is

to modify parents' responsive interaction and language input to their children, then it is important to know whether these changes are sustained over time. The current study will examine whether parents maintained use of toy talk, a novel language modeling strategy, six months after the instruction period concluded. Parent maintenance of toy talk is important to examine to inform future intervention design modifications, specifically whether ongoing instruction is needed to maintain this type of language modeling.

CHAPTER 2

LITERATURE REVIEW

This literature review has been organized in the following way. First, common design elements of parent-implemented language interventions will be reviewed. This will include three important components: the parent's use of responsive strategies when interacting with their child, modifying parent input to facilitate the child's language development, and increasing parent knowledge of child language development. Second, a review of five existing parent-implemented language intervention programs will be presented. Third, a comparison of the existing parent-implemented interventions will be provided as they relate to the three components of parent-implemented interventions being discussed. The literature review concludes with the purpose of the study.

Core components of parent-implemented language interventions

This literature review will examine three components to be considered when designing parent-implemented interventions. These common components of language interventions have been demonstrated to modify the parent-child interaction in ways that facilitate the child's language development.

Responsivity. Parent responsivity refers to prompt, contingent, and appropriate responses to child behavior (Farrar, 1990; Girolametto et al., 1999; Hoff, 2006; Kaiser & Roberts, 2013; Paul & Elwood, 1991; Tamis-LeMonda et al., 2001; Roberts & Kaiser, 2012; Suskind et al., 2016). This dimension is often examined in studies of parent interaction and child outcomes (Girolametto et al., 1999; Paul & Elwood, 1991), and has also been incorporated into parent-

implemented interventions (Girolametto et al., 1999; Kaiser & Roberts, 2013; Roberts & Kaiser, 2012; Suskind et al., 2016). According to the responsivity hypothesis, linguistic input that is semantically contingent on the child's vocal or verbal utterances or responsiveness to the child's attentional focus, facilitates language learning (Girolametto et al., 1999). Responsive language behaviors include: parent imitation, interpreting the child's vocalizations, labeling objects based on the child's attentional focus, expanding the child's words into phrases, and recasting the response to a child's utterance by adding new information while maintaining the basic meaning expressed in the child's utterance (Cleave, Becker, Curran, Van Horne, & Fey, 2015; Girolametto, & Weitzman, 2002).

Responsivity instruction teaches parents to focus on and provide relevant input that matches the child's attention. Optimal opportunities to learn language occur when adult speech is relevant to the child's attention and interest (Tamis-LeMonda et al., 2001). Parents' responsiveness to their children's activities encourages self-efficacy, motivation, and verbal responsivity. Parents' responsiveness to their child's communication attempts has been shown to influence children's language development (Girolametto et al, 1999; Hoff, 2006; Suskind et al., 2016; Tamis-LeMonda et al., 2001). Frequent verbal responses from parents not only provide children with contingent input relevant to their interests, but also provide children with more language models compared to parents that provide infrequent responsiveness. Responsivity is a necessary foundation for parents to expand or recast the child's previous utterances. These strategies have been identified as input predictors of children's language growth (Hoff, 2006).

The effect of adult responsivity instruction on young children has been examined in a number of studies (Conti-Ramsden, 1990; Girolametto et al., 1999, 2002; Tamis-LeMonda, 2001). In one parent-implemented intervention, Girolametto et al. (1999) examined the

relationship between language in mothers' input and language development in late-talking toddlers with expressive vocabulary delays. Mothers participated in The Hanen Program for Parents over an 11-week period. Mothers were taught child-centered techniques that promoted interactions and modeled language at the child's level. Responsive techniques included interpreting sounds and word approximations, labeling objects the child was attending to, and imitating or expanding the child's preceding utterance. There was a significant correlation between mothers' use of imitations and expansions and children's language development, but the use of responsive labeling did not influence children's language.

Structural Input. Interactive models of language intervention also propose that when adults talk to children using child-directed speech, this unique register has beneficial properties for promoting language development (Girolametto et al., 1999; Hoff, 2006). Compared to adult-directed speech, child-directed speech is shorter, more intelligible, has fewer declaratives, more questions, and has fewer clauses within an utterance (Hoff, 2006; Valian, 1999). As discussed by Paul and Elwood (1991), child-directed speech also includes reductions in sentence length, use of repetitions, concrete vocabulary, exaggerated pitch changes, changes in stress and intonation patterns, as well as topics restricted to present time. These differences are proposed to support young children's engagement, language comprehension, and participation in conversational interactions. As such, a general principle of interactive models of language intervention is to provide language input that is just one step above the child's abilities by simplifying the complexity of semantic and syntactic input and using a slow rate of speech (Girolametto et al., 1999). Girolametto et al. tested this hypothesis, referring to it as the structural hypothesis. Girolametto and his colleagues examined the extent to which structural measures of parent input predicted language outcomes for late-talking toddlers in comparison to the previously discussed

responsivity measures. Structural measures included total utterances, total words per minute, mean length of utterance (MLU), and type-token ratio (TTR). In contrast to measures of responsivity, none of the structural measures were positively related to language outcomes for the late-talking toddlers. Girolametto et al. concluded that the structural hypothesis was not supported; however, it should be noted that the structural measures used in this study were limited to global measures of amount of talk, utterance length, and lexical diversity, not specific measures of language structure.

Hoff-Ginsberg (1986) provides a stronger example of investigating the relationship between structural properties of maternal input and children's language development. In this descriptive study, Hoff-Ginsberg examined ten structural properties of maternal speech and their relations with typically developing toddlers' language development 2, 4, and 6 months later. In addition to a general measure of MLU, Hoff-Ginsberg computed several measures of syntactic complexity: mean number of verb phrases (VP) per utterance, mean number of noun phrases (NP) per utterance, mean number of auxiliaries per VP, and mean number of words per NP. Five measures of sentence form were also included (e.g., declarative, yes-no questions). Mothers' mean number of NPs per utterance was found to be a significant predictor of children's syntactic growth 4 and 6 months later, and the mean number of words per NP was found to be a significant predictor of children's growth 6 months later. These predictors show that structural properties of input had a positive effect on the toddlers' language growth. However, it should be noted that 180 correlations were conducted. This raises concerns about whether the positive correlations identified were the result of chance. With the exception of the correlation between parent NPs/utterances and child NPs/utterances, no other correlation occurred at more than one measurement point. The excessive number of correlations examined in this study highlights the

need to test specific hypotheses about how structural properties of input properties are expected to impact children's grammatical development (Hadley et al., 2017; Lidz & Gigliardi, 2015; Valian, 1999).

In a recent study, Hadley et al. (2017) designed a parent-implemented language intervention to modify one specific structural property of language input, specifically parents' use of lexical NPs in subject position of declarative sentences. Hadley et al. demonstrated that exposure to noun subjects was rare in child-directed speech during play. They hypothesized that increased exposure to a variety of noun subjects in parent input would highlight the constituent boundary between subject NPs and VPs in the input and strengthen children's representation of the subject constituent in clause structure, leading to children's use of more diverse subject-verb combinations. Following parent education and coaching sessions, parents in the treatment group increased the frequency and diversity of NPs in their language input. Also, the number of different noun subjects parents used when their children were 24 months old was a significant predictor of linear growth in children's production of subject-verb combinations at 27 months of age and overall acceleration from 21 to 30 months of age. The findings of this study demonstrate that one specific and theoretically-motivated structural property of parent input can be modified, exerting a facilitative effect on children's grammatical growth.

Parent knowledge. It is also important to address parents' knowledge of child development when designing parent-implemented interventions. This was clearly demonstrated by Rowe (2008) in a study of parent language input and children's vocabulary outcomes. In this study, Rowe (2008) found that general properties of child-directed speech to children were associated with levels of socioeconomic status as measured by parent education and income level, and that these input properties at age 2;6 accounted for differences in children's

vocabulary abilities one year later. However, Rowe also found that parent knowledge of child development mediated the relation between socioeconomic status and child-directed speech. Essentially, the link between socioeconomic status and language input was explained by parents' knowledge of child development. Parents who knew more about child development used more diverse vocabulary, longer utterances, and fewer directives in their child-directed speech which led to a positive effect on vocabulary abilities at 3;6. Given that parents' knowledge about child development has the potential to influence the way parents talk to their children, it is important to educate parents on language development and explain their potential to impact their child's language development as part of parent empowerment efforts within parent-implemented language interventions. This may also increase the likelihood of sustaining the behavioral changes needed to facilitate their children's language abilities (Roberts & Kaiser, 2011; Suskind et al., 2016).

The design and efficacy of parent-implemented language intervention programs

When evaluating parent-implemented interventions, it is important to examine how parent education on responsivity, language input, and language development have been incorporated into existing interventions. These components are examined in five parent-implemented interventions: The Hanen Program for Parents (Girolametto, Pearce, & Weitzman, 1996), Focused stimulation (Cleave & Fey, 1997; Fey, Cleave, Long, & Hughes, 1993), Enhanced Milieu Teaching (Kaiser & Roberts, 2013; Roberts & Kaiser, 2012), Toy talk (Hadley et al., 2017), and the Thirty Million Words home visiting curriculum (Suskind et al., 2016). Although the treatment outcomes, intervention procedures, and populations vary, each approach instructs parents on strategies designed to improve parent responsivity to children's focus of

attention and communicative messages. On the other hand, the selected studies differ in the instructional approaches to modification of parent input and the participant populations. Four studies involving children with identified language delays teach parents to use focused stimulation to promote vocabulary growth (Girolametto et al., 1996, Kaiser & Roberts, 2013; Roberts & Kaiser, 2012) and grammatical growth (Fey et al., 1993). The other two studies involving slow typically developing children and children from low income homes teach parents to use general stimulation strategies to promote vocabulary growth (Suskind et al., 2016) and grammatical growth (Hadley et al., 2017). Only the Thirty Million Words project directly assessed changes in parents' knowledge of language development and the importance of parental input to language development (Suskind et al., 2016).

Girolametto et al. (1996) examined parents' use of focused stimulation techniques. Parents participated in The Hanen Program for Parents and were taught to use specific target words when speaking to toddlers with expressive vocabulary delays. Participants included 25 mother-child dyads and children ranged in age from 23-33 months at the beginning of the intervention. Participant dyads were randomly assigned to either the experimental group which immediately received treatment or the delayed-treatment group which received treatment after the experimental group's intervention concluded. The Hanen Program was an 11-week intervention consisting of eight 2.5-hour evening group parent education sessions and three individual home visits. Parent education sessions provided video-modeling of techniques, lectures, role-playing and focused discussions. Parents learned about the different stages of communication that occur as a child develops language. This early development of communication can be divided into four stages that the child progresses through beginning with the child being a discoverer, then a communicator, first word user, and eventually a word

combiner (Pepper & Weitzman, 2004). During home visits mothers' interactions with their child during free play were recorded, reviewed, and feedback was provided. Parents were taught to incorporate ten target words into daily routines, how to use the words when responding to child, and how to create new routines to use target words in different contexts.

Girolametto et al. (1996) measured mothers' outcomes by the amount of talk (i.e., number of utterances, number of words per minute), utterance length (i.e., MLU), lexical diversity (i.e., TTR) and use of target words (i.e., number of target words used, number of focused targets). Children's outcomes were measured by parent reported vocabulary size, number of different words, number of different target words, and number of different control words. Mothers in the experimental group reduced the number of words produced per minute and used a greater number of target words in their play interactions and a higher density of target words in short stretches of discourse (i.e., focused targets) compared to mothers in the control group. At conclusion of the intervention, children in the experimental group were found to have larger vocabularies, used a greater number of different target words, and learned more of the untreated, control words compared to children in the control group.

Similar to Girolametto et al. (1996), Fey et al. (1993) examined the effectiveness of a parent-implemented focused stimulation intervention designed to facilitate grammatical development in preschoolers with language impairments (LI). There were 29 parent-child dyads. Children were between the ages of 3;8 and 5;10 and identified as having expressive language difficulty primarily with morpho-syntactic deficits.

In the parent condition, parents attended education sessions which consisted of 12 weekly 2- hour group sessions, then two monthly group sessions during the remaining 2-months of the intervention. During the parent education sessions parents were taught to use focused stimulation

techniques to increase use of sentence recasts. Parents were provided handouts with examples of focused stimulation techniques, reviewed videotapes demonstrating use of the techniques, and participated in role-playing. It was not explicitly stated whether an overview of child language development was provided or if sessions solely focusing on learning the techniques. Parents and their children also visited the clinic to receive individualized feedback based on their recorded use of the techniques (Fey, Cleave, & Long, 1997).

At the conclusion of the program Fey et al. (1993) compared the use of recasts by parents in the parent-implemented treatment subgroups to the use of recasts by parents of the children in the clinician-implemented treatment subgroups. No significant differences were found in the use of recasts by parents in either group prior to the treatment. After treatment, parents in the parent-implemented groups produced significantly more recasts compared to parents in the clinician-implemented groups. Importantly, measures of grammatical development for children in the parent-implemented condition did not differ from those in the clinician-implemented condition following treatment, although children's outcomes appeared to be more consistent in the clinician-implemented condition compared to children in the parent-implemented group.

Following conclusion of the intervention Fey et al. (1997) conducted a follow up study five months after phase 1 of the intervention concluded. Phase 2 included 18 participants from the original study and the same group assignment was maintained from the first phase of the study. Phase 2 also included 10 participants from phase 1 that received the delayed-treatment and for phase 2 this group did not receive an additional intervention, therefore only the effects of maintenance from phase 1 were examined. Results found that the children in phase 1 that continued to receive intervention from parents, DSS scores continued to increase with modest improvements on the main verb scores and sentence points scores, though neither of the

increases were found to be statistically significant. Children that did not receive intervention were found to experience minimal to no gains during phase 2 compared to their phase 1 results. Parents in the parent-implemented intervention continued to use significantly more recasts than parents in the clinician-implemented group and parents' use was significantly correlated with their child's gains on DSS scores.

More recently, Roberts and Kaiser (2012) examined the efficacy of parent-implemented EMT for children with language impairment. EMT focuses on responsive interaction strategies, language modeling, as well as strategies to cue and prompt child turns within naturalistic conversational interactions. Fully individualized parent instruction and the use of explicit prompting procedures differentiate EMT from the previous focused stimulation approaches. In this study, there were 62 parent-child dyads and children between the age of 24-42 months, and 32 of the children were identified as having LI. The children with LI were randomly assigned to the LI-treatment group (n = 16) or the LI-control group (n = 18). The 28 children without language impairment served as a typically-developing control group. Parents in the EMT experimental group received individual parent training which consisted of four 1-hr workshops and 24 1-hr practice sessions, 12 sessions occurred in the clinic and 12 in the home. EMT strategies were taught in four phases: setting the foundation for communication, modeling and expanding, time delay strategies, and prompting strategies. Parents progressed to the next phase once they met the criterion level of 80% use of the target skills. This intervention is unique in requiring parents to achieve a specific criterion level before continuing to the next phase, allowing parents to progress at their own pace and resulting in a higher degree of individualization.

The workshops provided parents with a definition of the EMT strategy, rationale for the strategy's use, descriptions, video-models, and the therapist answered questions relating to use of the strategy. The practice sessions in the clinic involved a review of the EMT strategies, the therapist modeling EMT strategies with the child, the parent practicing use of strategy with the child, the therapist providing feedback to the parent and recapping the session. The practice sessions that took place at home also included the therapist modeling strategies during play routines and the parents practicing use of strategies while reading, eating, and completing a task in the house.

Parent outcomes were measured based on specific EMT strategies, specifically matched turn-taking, responsiveness to child's verbal turns, talking at the child's level, expanding the child's utterances, use of time delay strategies, and use of prompting. Children's outcomes were based on PLS-4 scores, MLU, number of different words, and total number of words. Compared to parents in the LI-control group, parents in the LI-treatment group significantly increased their use of all EMT strategies. Compared to parents in the typical development group, parents in the LI-treatment group also exhibited significantly higher rates of using EMT strategies with all but one strategy. No significant difference was found for use of prompting. Thus, parent training led to changes in use of responsivity and language modeling strategies. More importantly, children in the EMT intervention benefitted from the parent training. At the conclusion of the intervention, children in the LI-treatment group demonstrated significant differences on PLS-4 total standard scores and total number of words, compared to children in the LI-control group. In addition, measures of growth over time revealed that children with LI in the EMT intervention demonstrated similar rates of language growth for total number of words compared to the

younger children in the typically developing group; however, children in the LI-control group were unable to maintain comparable growth in rate of word use.

Kaiser and Roberts (2013) also examined the effects of EMT when intervention was provided via therapist only (n = 38) compared to a combined therapist plus trained parent condition (n = 39). There were 77 parent-child dyads and children were between the ages of 30 and 54 months. All children were identified as having LI co-occurring with intellectual disabilities (i.e., nonverbal IQs between 50 and 80). Families were assigned to one of the two experimental conditions and were assessed at four different measurement points: prior to intervention, immediately following intervention, 6-, and 12-months following intervention. There was moderate attrition after each phase and only 78% of the families were available 12-months post-intervention. Participants in the therapist only condition received 36 intervention sessions, 24 in the clinic and 12 at home. The 20-min clinic sessions involved two therapists using all EMT strategies with the child, and the parent did not observe these sessions. The 20-min home sessions involved one therapist implementing EMT with the child during four routines using items available within the home during play, clean-up, snack, and book activities. Participants in the parent and therapist condition also received this training as well as an added parent training component. Parent training involved parents attending a 2-3 hour interactive workshop which included information about language development, behavior, play, environmental arrangement, and routines involved in the EMT intervention. Following the workshops, parents received EMT training similar to what was provided for parents in Roberts and Kaiser (2012). Trained parents were found to have used EMT strategies significantly more than untrained parents. Trained parents' strategy use was lower at follow-up, but trained parents use the EMT strategies at higher than pre-training levels.

In these four studies, parents learned focused stimulation techniques to provide children with language delays and/or impairments with a high number of specific language targets in a variety of semantic and pragmatic contexts. These intervention studies demonstrate that parents can learn and implement responsive interaction and focused stimulation techniques to facilitate children's development of both expressive vocabulary and grammar.

Turning to general stimulation approaches, Hadley and Walsh (2014) developed toy talk as a type of language modeling designed to increase the frequency and diversity of third person sentence subjects in adult input. Toy talk was designed to increase the grammatical richness of adult input to facilitate children's grammatical growth. Adults are taught two simple strategies: (a) *talk about the toys* that the children are playing with and (b) *give the object its name*. The first strategy, encouraging adults to describe objects in the environment during conversational interactions, was expected to increase input sentences containing third person subjects and the overt marking of tense and agreement morphemes associated with other-focused descriptive sentences (see Fitzgerald, Hadley, & Rispoli, 2013). The second strategy, encouraging adults to give the object its name, was expected to increase nouns (as opposed to pronouns) in the sentence subject position. Together, the strategies were expected to increase the number of and diversity of nouns in subject position in adult input.

Hadley et al. (2017) examined the early efficacy of the toy talk strategies as part of a parent-implemented intervention. In contrast to the previously mentioned studies, child participants were all typically developing. This study explored whether parents could learn the toy talk strategies and use them in spontaneous conversations with their toddlers. It also explored whether parent use of these strategies would accelerate growth in children's sentence diversity between 21 and 30 months. Although the instruction provided in this study was at a low

intensity, it still incorporated all three components previously discussed: parent education, use of responsive strategies, and modification of parent input.

The parent education sessions consisted of one group session and two individual coaching sessions. The parent group session involved two or three parents and lasted one hour. During the session, parents learned about children's language development, responsive strategies to use when interacting with their children, and the toy talk strategies were introduced. During group education sessions, information regarding language development was provided for an average of 17 min, responsive strategies were discussed for an average of 41 min, and toy strategies were discussed for an average of 25 min. Parents returned to receive 1-hour of individual coaching 2-3 weeks following the group session, and returned again 2-3 weeks following the first coaching session to receive another 1-hour individual coaching session. During individual coaching sessions, responsive strategies were discussed for an average of 3 min and toy talk strategies were discussed for an average of 2 min.

The group education and individualized coaching were intended to provide different instructional benefits. The group session provided parents with the opportunity to participate in group discussion and benefit from the comments and questions of other parents. The coaching sessions provided parents with the opportunity to receive individualized feedback as they applied the strategies to interactions with their own child, specifically relevant to the parent's current needs and performance (Cleave & Fey, 1997; Roberts & Kaiser, 2012; Suskind et al., 2016).

To evaluate the extent to which parents learned the toy talk strategies, measures of parent input were obtained prior to instruction when the child was 21-months and following the instructional period when the child was 24-months. Following instruction, parents in the treatment group increased the frequency and diversity of noun subjects compared to parents in

the control group. This indicates that brief instruction of toy talk strategies altered grammatical properties of the language input for parents in the treatment group. Parents' total utterances, mean length of utterance, number of different words, use of labeling and toy talk sentences with pronominal subjects were also examined; however, no significant differences between the treatment and control groups were found on these variables. This indicated that the effects of toy talk instruction were specific to parents' use of noun subjects.

Hadley et al. (2017) used growth modeling to examine the effect of toy talk instruction on developmental changes in children's sentence diversity. Child language measures from spontaneous parent-toddler language samples at 21-, 24-, 27-, and 30- months of age were used. There were no significant group differences in children's sentence diversity growth, after controlling for the number of different words children used in their language samples at each measurement point. However, considerable variability was evident in the treatment parents' diversity of noun subjects. This input variable when toddlers were 24 months old was a significant predictor of linear growth in the toddlers' sentence diversity at 27 months and overall acceleration from 21 to 30 months. Thus, input effects were established between this input variable and children's grammatical growth.

Finally, Suskind et al. (2016) delivered their parent-implemented intervention individually, similar to Roberts and Kaiser (2012). Suskind et al.'s Thirty Million Words curriculum was designed to improve parent knowledge of child language development and increase the quality and quantity of the parent input provided during parent-child interaction. This general stimulation intervention was implemented through a home visiting program for low-income families using video modules. It also provided quantitative linguistic feedback using the Language ENvironment Analysis (LENA) recording system. Participants included 23 mother-

child dyads. Children ranged in age from 1;6-3;0. Participants were randomly assigned to the experimental group (n = 12) or control group (n = 11).

Participants in the experimental group participated in eight weekly 1-hour home visits. The visits consisted of using a multi-media module, providing behavioral feedback, practicing of new skills using video-models, and setting goals for the following week. The multi-media modules focused on eight components over the course of the intervention, introduction of language development and program curriculum, narrated parent input, responsive conversation turn-taking, reduce directive language, book sharing, reducing child's television and screen time exposure, incorporating math and spatial language into everyday routines and conversations, and concluded with a review of all concepts and encouraged sharing of this information to other important people in the child's life. Modules also included examples demonstrating the strategies and books were provided. Parents used the LENA recording system during the weeks in between modules and recorded their time with their child on a typical day for an estimated ten hours. Individual weekly reports were provided to parents with data regarding the quantity of their talk, frequency of parent-child communicative interactions, and progress throughout the intervention. Video-modeling during the session involved the examiner being recorded demonstrating the target activity with the child, then the parent was recorded performing this same activity. The session concluded with the examiner and parent reviewing and discussing the performance of the strategies.

The control group participated in a nutrition intervention for eight weekly home visits. During each visit, a nutrition information sheet was reviewed with the mother. Similar to the experimental group, data was also gathered using the LENA, with videos of parent-child interaction, and by assessing knowledge of child development.

Suskind et al. (2016) directly measured parent knowledge of child language development and examined maintenance of knowledge and behavior change following the conclusion of the intervention. A questionnaire was used to assess parent knowledge prior to the intervention, 1-week post intervention, and 4-months post intervention. The questionnaire was divided into 5 domains: language acquisition, dialogic reading practices, support for math learning, predictors of school success, and TV viewing habits. Based on the scores on the questionnaire, parents in the experimental group significantly increased knowledge of child language development one week after the intervention concluded and this was maintained four months after the intervention concluded. Parents in the control group experienced no significant increase in parent knowledge of child development at any time point. The LENA outcomes were examined by measuring adult word count, conversational turn count, and child vocalization. Parents in the treatment group exhibited significant increases on all three measures during the intervention period, but significant differences were not maintained 4-months' post-intervention. The fact that parent behavior changes were not maintained could have due to the high number of strategies parents were taught over a relatively short period of time. These findings demonstrate that examining parent's maintenance of strategies following instruction can provide additional insight into parent's ability to sustain the behavioral changes needed for parent-implemented interventions to achieve their optimal effects.

Each of the existing interventions discussed has incorporated at least one of the common components with all approaches targeting parent education on parent responsivity and modifying language input in some manner. These parent-implemented interventions have demonstrated that parents can indeed learn and use language strategies, even with low-intensity interventions, and that this has an impact on children's language outcomes. The general stimulation interventions

provided the briefest instruction. Hadley et al.'s (2017) parent instruction was about 3½ hours over the course of 4 to 6 weeks and Suskind et al.'s (2016) parent instruction was approximately 8 hours over eight weeks. The instructional period for these studies required less time compared to the number of instructional hours for the parent-implemented interventions for children with identified language delays (Fey et al, 1993; Girolametto et al., 1996; Kaiser & Roberts, 2013; Roberts & Kaiser, 2011). Girolametto et al. (1996) required nearly 20 hours of commitment by parents over the course of three months and Fey et al. (1993), Roberts and Kaiser (2012), and Kaiser and Roberts (2013) required nearly 30 hours of commitment over the course of 4½ months and 3 months, respectively. Low intensity, parent-implemented general stimulation interventions may provide a new cost-effective option for the clinical management of late-talking toddlers. Such interventions could be used in a tiered, response to intervention model; however, parent's ability to learn the strategies, implement the strategies, and maintain use of strategies will influence the overall cost-benefit of any parent-implemented approach.

There is also a need for interventions to demonstrate the extent to which parents maintain strategy use, preferably at the individual level. Only three of intervention studies reviewed here examined parents' maintenance following conclusion of the intervention, and only one study explored input effects at the level of individual parent-child dyads. Fey et al. (1997) examined parents' maintenance of the strategies five months following the intervention and found that most parents continued to use sentence recasts, but once children begin to produce complex and grammatically-formed sentences, there was a reduction in parent's opportunity and need to recast. Kaiser and Roberts (2013) found that trained parents maintained use of EMT strategies 6-months after intervention, but then strategy use declined 12-months following intervention. Suskind et al. (2016) also found that parents maintained an increase knowledge of child language

development 4-months post-intervention; however, significant changes in parent behavior were not observed 4-months post-intervention. Girolametto et al. (1996) only examined mothers' outcomes during the 4-month interval at pre-test and post-test. Roberts and Kaiser (2012) examined parents' use of strategies at four time points: prior to intervention during the assessment, one month after assessment, two months after assessment, and three months after assessment when the intervention concluded. Once the intervention was completed, no follow-up observations were completed to examine whether parents continued to use the EMT strategies. Hadley et al. (2017) only examined parents' use of toy talk strategies from 21 to 24 months. They did not determine whether parents maintained long-term use of lexical NP subjects. On the other hand, Hadley et al. explored the effects of parent input at the level of the individual dyads, demonstrating the input effects of noun subjects in the parent input, the active ingredient altered by their intervention.

Although Hadley et al. (2017) did not examine parent maintenance of lexical NP subjects following the brief instruction, follow-up observations of parent-child interaction were obtained at 27 and 30 months to measure children's language growth. Therefore, the purpose of the current study will be to examine whether parents maintained use of toy talk strategies six-months post-instruction when children were 30 months of age to determine if brief instruction had any lasting effect, if the changes observed in Hadley et al. (2017) were short-lived, or if parents demonstrated variable patterns of maintenance. The following research question will be addressed:

1) Is there a difference in treatment parent use of lexical NP subjects six months after receiving toy talk instruction compared to parents in the control group?

CHAPTER 3

METHODS

Database

Primary data from the current study were obtained from existing language samples collected as part of an earlier study (Hadley et al., 2017). The purpose of the original study was to evaluate the early efficacy of a parent implemented intervention and its effects on children's production of diverse sentences.

All families in the existing database were recruited from Champaign County, Illinois and surrounding areas. The recruitment process was similar for treatment and control families. Information was distributed to parents through newspapers, community locations, and list-servs. Interested parents arranged a phone interview with the principal investigator. The interviews were used to identify English-only speaking households with toddlers that were typically developing. Children were excluded from participating, if parents reported a child history of neurological or sensory impairments or delays in the onset of walking and/or talking. Children in the treatment group were also excluded if their parents reported that their child was able to produce 4-word utterances. Children in the treatment group were matched to children in a no-treatment, quasi-control group on parent reported expressive vocabulary size at 21 months of age based on the *MacArthur-Bates Communicative Development Inventory* (CDI; Fenson et al., 2007). The child sex and parent level of education were also matched when possible.

Parent-child language samples in the database were obtained during 1-hr measurement sessions conducted when children were approximately 21, 24, 27, and 30 months of age. Between the 21- and 24-month sessions, parents attended one parent education session with one

or two other parent participants and two individual parent coaching sessions. Treatment families were compensated $15 per session. Treatment parents also received a parent education resource book and toy set to facilitate generalization of the language strategies to the home environment. Control families completed 1-hr measurement sessions when children were 21, 24, 27, 30, 33, and 36 months of age. Parents in the control group received no intervention and sessions were designed to characterize parent language input and children's language growth during parent-child free play at similar 3-month intervals. Control families were compensated $20 per session.

This follow up study used the parent-child language samples from the 24- and 30-month measurement points. Language samples were gathered in a sound-treated playroom using three sound-field microphones and a wireless lapel microphone in a vest worn by the child to create high quality compact disc (CD) recordings. Two digital pan-tilt-zoom cameras recorded the nonverbal interactive context on DVD. Toys available in the play sessions included bubbles, puzzles, play farm with farmers and animals, a tower arrangement of building blocks with penguins and a ball, a play kitchen with stove/oven, sink, cupboards, and a table with two place settings. A large Winnie the Pooh was seated at the table, along with a doll in a high chair. Additional toys were available in cupboards and closets including food, pots, pans, another doll, a bath set, a stroller, a crib, Mr. Potatohead pieces, and wind-up toys. The use of identical toys and set-up allowed for direct comparisons between the treatment and quasi-control groups

Parents and children could explore the room and play with any of the toys available. At the beginning of each measurement session, parents were encouraged to play with their children "as they would at home." Each measurement session began with the examiner reviewing the consent form with the parent, requesting the CDI, Ages and Stages Questionnaire-3 (ASQ-3; Squires & Bricker, 2009), and Family Demographics forms, and obtaining verbal assent from

child before leaving the room. It was assumed that treatment parents would use the responsive interaction and language modeling strategies they had learned about through the parent education and coaching session, but the examiner did not discuss nor remind parents about the strategies before the measurement sessions began.

The play sessions for both the treatment and control were one hour in length and divided into two sampling contexts. The first 30-min involved the parent-child dyad and the examiner joined the parent and child in the playroom during the second 30-min. For the current study, only the first 30-min of parent-child free play with age appropriate toys was used. Because the examiner was not present during the first 30-min, the parent-child portion was believed to be more representative of the parent's input when playing with their child at home. Although all parents were told that examiners would join in the parent-child play during the second 30 min, parents responded differently to the presence of the examiner. Some parents continued to play and talk with their child. Others allowed the examiner to become the primary play partner and took on an observer role. The examiners' language input also had the potential to influence the parent's language input and use of toy talk sentences, since examiners shifted the discourse towards third person sentences to create opportunities for the children to produce diverse sentences. Given these different parent responses to the examiner, it was important to eliminate this potential confound when measuring the immediate and long-term parent response to instruction.

Participants

The 38 parent participants from Hadley et al. (2017) served as participants in this follow up study. All parents in the treatment group (n = 19) attended all three parent education sessions and the measurement point sessions when their children were 21, 24, 27, and 30 months of age.

All parents (17 mothers, 2 fathers) in the treatment group were White, non-Hispanic (n = 19) and the mean age was 34.95 (SD = 5.19). The highest level of education included associate's degree or some college (n = 1), bachelor's degree (n = 7), and advanced degree (n = 11). For the parents in the control group, the majority of the families were White (n = 15). One family was White Hispanic and three families were Black. The participating parents' (18 mothers, 1 father) mean age was 30.05 (SD = 4.38) and their highest educational levels were high school (n = 1), associate's degree or some college (n = 3), bachelor's degree (n = 11), and advanced degree (n = 4).

Procedures

Language Samples. Language samples from the 24-month and 30-month measurement points from the parent-child play sessions were used. Transcribed language samples were obtained from the archival database. Language samples were transcribed in their entirety using the standard conventions for the Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2012). Trained undergraduate research assistants without any knowledge of the specific aims of the original study transcribed the adult utterances.

Adult Input Measures. Parent input measures examined the parents' use of toy talk strategies between the treatment and control groups at the 24-month and 30-month measurement points. Following Hadley et al. (2017), toy talk [TT] is defined "as a sentence (or finite clause) in

which the predicate describes the referential subject's state, action, location, or possession". To be coded as a toy talk sentence, use of an explicit subject and predicate is required. Toy talk can only be coded in the finite clauses with subject-verb-(object) word order. This includes declarative sentences and discourse questions with no structural movement. The referent must also be a concrete object or activity taking place in the playroom.

Toy talk sentences were coded by grammatical subject. Pronominal subjects were coded as [TT:P]. Lexical Noun Phrase (NP) subjects can be common nouns or proper nouns and were coded as [TT:NP].

Simple naming of the referent was coded as Labeling [Lab]. These utterances did not describe the state, action, location, or possession of the referent; therefore, they did not meet the operational definition of toy talk. Utterances in which the parent referred to himself or herself (e.g., *Mommy*) or to the child by name instead of using the appropriate first or second person pronouns (i.e., *I, you*) were not coded as toy talk because these sentences were not well-formed examples of adult sentences. There were other instances of utterances that did not meet the toy talk requirements. Toy talk was not coded in structural questions (e.g., *Where is the bear*?) and sentences with locative movement (e.g., *There he goes.*). These utterances exhibited constituent movement and/or inversion of the copula/auxiliary verbs, altering the transparency of English's subject-verb-(object) word order. Utterances that referred to a general activity or behavior (e.g., *That's right. That's nice.*) were not coded as toy talk since these utterances did not refer to concrete referents. See Appendix A for detailed coding procedures.

All parent utterances from the 24-month measurement point for the treatment and control groups were previously coded for toy talk. These coded utterances were extracted from the

archival database. All parent utterances from the 30-month measurement point for both groups were coded for toy talk for this study.

Reliability. All coders completed a training program on toy talk coding. Instruction included reading the original coding procedures in Appendix A and discussing these procedures with the investigator and/or faculty mentor. Coders then reviewed previously coded parent utterances from 3-min samples of 10 different parents, followed by discussion with the investigator and/or faculty mentor. Coders were encouraged to demonstrate their knowledge of coding decisions by explaining the reason each code was assigned and also encouraged to ask questions about coding decisions that were not clear. Next, all coders completed independent coding on a minimum of three 10-min practice transcripts. Coders progressed to independent coding of the 30-month transcripts after demonstrating 90% coding accuracy for three consecutive practice transcripts. Inter-observer agreement (IOA) was calculated and based on point-by-point agreement with each coding procedure. Each parent utterance was coded as: toy talk with noun phrase subject (TT:NP), toy talk with pronominal subject (TT:P), labeling (Lab), or a decision to not insert a code was made.

To ensure that high levels of coding reliability were maintained at the follow-up measurement point, six parent samples (3 treatment, 3 control; 15% of the database) were randomly selected and coded independently for toy talk by a second coder. This matched the procedures in Hadley et al (2017). Cohen's kappa was used to compute the degree to which two coders agreed and disagreed on their coding decisions for each parent utterance. Cohen's kappa was preferred to an inter-observer agreement (% correct) measure because the majority of parent utterances did not receive a code. Cohen's kappas ranged from .81 to .99, with a mean of .92. The kappas for all six samples exceeded .80, the levels of agreement conventionally considered to be acceptable (Sprent & Smeeton, 2001).

An error analysis was conducted for the 45 disagreements between coders. Of the 45 disagreements, 9 involved the use of lexical NP subject, pronominal subject, or labeling codes. Of these 9 disagreements, 8 were coded correctly by the original coder. These disagreements appeared to be unsystematic. Another 22 utterances were not coded by the reliability coder and 2 other utterances received codes incorrectly. These 24 utterances were coded correctly by the original coder. Finally, 12 utterances did not receive a code from the original coder. Further analysis revealed that the original coder made one systematic error in which utterances that included the child's name anywhere in the utterance were not coded. These utterances should have been coded as long as the child's name was not the sentence subject. Because this error was systematic and could be corrected, all transcripts were searched for the convention Cname and toy talk coding was added to utterances that met the criteria for a toy talk sentence or label.

Data Analysis and Predictions

Two-way analysis of variance (ANOVA) with repeated measures were planned. The primary dependent variable was the number of toy talk utterances with different lexical NP subjects. Additional repeated measures ANOVAs were conducted for the frequency of all toy talk sentences with lexical NP subjects and with pronominal subjects as well as the frequency of labeling. Condition was a between-subject factor and Time was a within-subject factor. Two possible outcomes seemed most likely. One possible scenario was that parents in both groups would maintain their 24-month levels of toy talk with lexical NP subjects, showing no increase or decrease in the diversity of lexical NP subjects over time. This outcome would result in a significant condition effect, given the group differences observed for treatment condition at 24 months (Hadley et al., 2017). This outcome would provide an affirmative answer to the primary

research question and demonstrate that parents are able to maintain their use of toy talk for an extended period of time. A second possible outcome was that use of different lexical NP subjects would decrease from 24 to 30 months for parents in the treatment group with no change in the use of toy talk for parents in the control group. This scenario would result in a significant Condition X Time interaction. These results would indicate that parents were unable to maintain strategy use when there is no ongoing instruction. Several interactions were also possible, but less likely. For example, parents' use of different lexical NP subjects in both the treatment and control group could increase at similar rates. This might suggest that parent use of toy talk is related to developmental changes occurring in children's language development during this time period. Descriptive analyses were also conducted to describe individual patterns of parent change and to support interpretation of the statistical findings.

CHAPTER 4

RESULTS

The purpose of this study was to examine parents' maintenance of toy talk input sentences six-months after the instruction ended. Recall that immediately following instruction, Hadley et al. (2017) found differences between treatment and control parents in the frequency and diversity of toy talk sentences with lexical NP subjects. However, no significant differences were found between groups in their use of toy talk sentences with pronominal subjects or in labeling. The current study focused on parents' maintenance of toy talk from post-instruction until the six-month follow-up measurement point. During this six-month period, treatment parents did not receive any additional instruction. Because the instruction was so brief, it was expected that treatment parents' use of toy talk with lexical NP subjects would decrease over this six-month period. In contrast, because control parents did not receive any instruction, no changes in toy talk input sentences were expected during this six-month period.

This chapter is organized in the following manner. First, general characteristics of parents' language abilities are described when their children were 24 and 30 months of age. These measurement points correspond to the post-instruction measurement point and the six-month follow-up. This will be followed by the statistical analyses examining if change in parents' use of lexical NP subjects between these two measurement points differed for the treatment and control groups. The chapter will conclude with a description of the changes found in the production of lexical NP subjects for individual parents.

General Characteristics of Parent Language Input

Means, and standard deviations for parents' total utterances, MLU, and NDW at post-instruction and the follow-up are reported in Table 1. Data for individual participants are provided in Appendix C. Post-instruction, parents in the treatment group produced an average of 384.21 (*SD* = 92.01) total utterances during the 30-min parent-child language samples. The average MLU was 4.01 (*SD* = 0.54) and the average NDW produced was 266.32 (*SD* = 51.26). Parents in the control group produced an average of 386.53 (*SD* = 98.97) total utterances during the 30-min parent-child language samples. The average MLU was 3.96 (*SD* = 0.52) and the average NDW produced was 253.68 (*SD* = 48.8).

At the 6-month follow-up, parents in the treatment group produced an average of 376.95 (*SD* = 94.56) total utterances during the 30-min parent-child language samples. The average MLU was 4.44 (*SD* = 0.61) and the average NDW produced was 295.26 (*SD* = 48.71). Parents in the control group produced an average of 389.84 (*SD* = 128.03) total utterances during the 30-min parent-child language samples. The average MLU was 4.41 (*SD* = 0.53) and the average NDW produced was 295.95 (*SD* = 46.14).

No significant differences were found between groups for total number of utterances, NDW, and MLU at the six-month follow-up, all $t < 0.353$, all $p > .174$, consistent with the post-instruction findings reported by Hadley et al. (2017). The similarities between groups demonstrate that any differences remaining in treatment parents' use of toy talk at the follow-up were not due to parents in the treatment group simply talking more, using more different words, or increasing the length of their utterances.

Group Differences in Toy Talk Sentences Over Time

The primary research question addressed whether there was a difference in treatment parents' use of toy talk sentences with lexical NP subjects six months after toy talk instruction compared to parents in the control group. Recall that toy talk is defined as a sentence with subject-verb-(object) word order in which the predicate describes the referential subject's state, action, location, or possession. Toy talk sentences with pronominal subjects (i.e., [TT:P]) were distinguished from toy talk sentences with lexical NP subjects (i.e., [TT:NP]). Utterances in which parents named an item with the noun in a copula predicate (e.g., *This is a NOUN*) were identified as labeling.

The frequency and diversity of toy talk sentences with lexical NP subjects were identified for each parent. The frequency of lexical NP subjects reflected the total number of parent sentences coded as TT:NP, or lexical NP subject tokens. The diversity of lexical NP subjects reflected the number of different noun subjects, or lexical NP subject types. Means, standard deviations, and ranges for the frequency and diversity of TT:NP subjects as well as the frequency of pronominal subjects and labeling at post-instruction and follow-up are reported in Table 2. Data for individual participants are provided in Appendix D. At the six-month follow-up, treatment parents produced an average of 27.95 (*SD* = 16.99) toy talk sentences with lexical NP subjects and an average of 13.26 (*SD* = 7.75) lexical NP subject types. Both measures appeared to decrease from post-instruction, when the mean frequency and diversity of lexical NP subjects produced by parents in the treatment group was 40.05 (*SD* = 22.26) and the 18.05 (*SD* = 9.99), respectively. At follow-up, the mean frequency and diversity of lexical NP subjects produced by control parents was 13.05 (*SD* = 6.9) and 8.11 (*SD* = 3.57), respectively. Immediately post-

instruction, the mean lexical NP subject frequency and diversity produced by parents in the control group was 10.05 (*SD* = 7.23) and 5.95 (*SD* = 2.90), respectively.

Two-way ANOVAs with repeated measures were used to analyze the data. Dependent variables were toy talk sentences with lexical NP subjects, toy talk sentences with pronominal subjects, and labeling. Condition was between-subjects factor and time was within-subjects factor. The ANOVA for the frequency of lexical NP subjects revealed a significant main effect for Condition, $F(1,36) = 28.276$, $p < .001$, $\eta_p^2 = .440$, a non-significant main effect for Time, $F(1,36) = 3.820$, $p = .058$, $\eta_p^2 = .096$, and a significant Time X Condition interaction, $F(1,36) = 10.320$, $p = .003$; $\eta_p^2 = .223$, see Figure 1.

The same pattern of results was observed for the diversity of lexical NP subjects. This ANOVA also revealed a significant main effect for Condition, $F(1,36) = 19.596$, $p < .001$, $\eta_p^2 = .352$, a non-significant main effect for Time, $F(1,36) = 1.797$, $p = .188$, $\eta_p^2 = .048$, and a significant Time X Condition interaction, $F(1,36) = 12.527$, $p = .001$; $\eta_p^2 = .258$, see Figure 2. As can be seen in Figures 1 and 2, treatment parents did not maintain their use of lexical NP subjects at the higher post-instruction levels; however, both the frequency and diversity of lexical NP subjects remained higher at the six-month follow-up for treatment parents compared to control parents.

Changes in parents' use of toy talk sentences with pronominal subjects and labeling were also examined to compare with the changes observed in toy talk sentences with lexical NP subjects. As can be seen in Table 2, parents in the treatment and control groups were more similar in their use of toy talk sentences with pronominal sentences and labeling at the six-month follow-up. The mean number of pronominal subjects produced by treatment parents was 28.11 (*SD* = 12.85) compared to a 22.42 (*SD* = 9.97) for control parents, and the mean number of

labels produced by treatment parents was 19.68 (*SD* = 7.99), compared to 20.79 (*SD* = 7.26) for control parents. The ANOVA for pronominal subjects revealed a non-significant main effect for Condition, $F(1,36) = 1.455$, $p = .236$, $\eta_p^2 = .039$, a significant main effect for Time, $F(1,36) = 5.944$, $p = .020$, $\eta_p^2 = .142$, and a non-significant Time X Condition interaction, $F(1,36) = .420$, $p = .521$, $\eta_p^2 = .012$, see Figure 3. In other words, parents in both groups used more descriptive talk about objects in the physical environment with pronominal subjects as their children developed. Finally, the ANOVA for labeling revealed a non-significant main effect for Condition, $F(1,36) = 0.921$, $p = .371$, $\eta_p^2 = .022$, a non-significant main effect for Time, $F(1,36) = .038$, $p = .847$, $\eta_p^2 = .001$, and a non-significant Time X Condition interaction, $F(1,36) = .023$, $p = .881$, $\eta_p^2 = .001$.

Individual Patterns of Change in Toy Talk Over Time

Parents' ability to maintain the frequency and diversity of lexical NP subjects following instruction was also examined at the individual level to describe different patterns of strategy use and maintenance over time. Although treatment parents' use of lexical NP subjects was expected to decrease from post-instruction to follow-up, their use was still expected to remain higher relative to the average level of use demonstrated by the control group. To examine treatment parents' maintenance of toy talk from post-instruction to follow-up, parents' change was described as positive or negative. Parents who increased their frequency or diversity of lexical NP subjects from post-instruction to follow-up had positive change. Parents who decreased their frequency or diversity of lexical NP subjects from post-instruction to follow-up had negative change.

To determine whether treatment parents were still using toy talk with lexical NPs at higher levels than would otherwise be expected, we computed z-scores based on the control group's use of lexical NP subjects. Recall that the mean frequency and diversity of lexical NP subjects for the control parents was 13.05 (*SD* = 6.9) and 8.11 (*SD* = 3.57), respectively. Using these means and standard deviations, z-scores were computed for the frequency and diversity of each treatment parent's use of lexical NP subjects at follow-up. Parents with a z-score $\geq$ 1.0 were considered to use lexical NP subjects at higher than expected levels at follow-up. Parents with a z-score < 1.0 were considered to use lexical NP subjects at expected levels. Data for individual participants are provided in Appendix E.

In Figure 5, the x-axis reflects parent change (i.e., positive vs negative) in the frequency of lexical NP subjects from post-instruction to follow-up. The y-axis reflects parents' levels of lexical NP subject use (i.e., z-score) relative to the control group. The patterns of change can be described by placement in the four quadrants: negative change with above average use (*n* = 8 treatment), positive change with above average use (*n* = 5 treatment, *n* = 3 control), positive change with expected use (*n* = 1 treatment, *n* = 12 control), or negative change with expected use (*n* = 5 treatment, *n* = 4 control). As can be seen, there were differences in the treatment parents' patterns of change in lexical NP subjects, with some parents' use declining and other parents maintaining similar levels of use or even increasing use relative to post-instruction levels. What is perhaps most important to note is that over half (*n* = 13) of the treatment parents continued to produce lexical NP subjects with greater than expected frequency compared to the control parents.

In Figure 6, parents' diversity of lexical NP subjects is presented in the same way. Parents fell into essentially the same four quadrants with only two exceptions: negative change

with higher than expected use (n = 7 treatment), positive change with higher than expected use (n = 4 treatment, n = 3 control), positive change with expected use (n = 1 treatment, n = 14 control), or negative change with expected use (n = 7 treatment, n = 2 control). Two treatment parents exhibited an above average frequency of lexical NP subjects, but only expected diversity of lexical NP subject types. Thus, 11 of the 18, or over 60% of the treatment parents produced diverse lexical NP subjects at higher than expected rates compared to the control parents.

In summary, treatment parents' use of lexical NP subjects in toy talk sentences declined from post-instruction to follow-up, demonstrating that strategy use was not maintained over the six-month time period. However, the individual analysis found that more than half of the treatment parents continued to produce lexical NP subjects at higher than expected levels at follow-up relative to controls.

CHAPTER 5

DISCUSSION

Parent input has been found to influence young children's language development which has led to the development of numerous parent-implemented language interventions (Fey et al., 1997; Roberts & Kaiser, 2012). Many parent-implemented language interventions are created to teach and work with parents to modify their input within children's natural environments throughout the day (Fey et al., 1997; Girolametto et al., 1996). This study examined whether parents maintained their use of toy talk strategies six months after receiving brief instruction.

The primary research question addressed if there was a difference in the use of lexical noun phrase (NP) subjects in declarative sentences between post-instruction and the six-month follow-up for the treatment group compared to the control group. It was expected that treatment parents would decrease production of lexical NP subjects at the six-month follow-up, because they did not receive additional instruction or reminders of strategies once instruction ended. Based on control parents' minimal use of lexical NP subjects when children were 24-months old, it was expected that control parents' use would not increase when children were 30-months old despite children's ongoing language development.

It was found that treatment parents' maintenance of lexical NP subjects declined over the six-month period, but levels remained higher than the control parents, whose production of lexical NP subjects did not change substantially over the course of this same time period. The lack of substantial change in control parents' use of lexical NP subjects from the post-instruction to the follow-up measurement points suggests that lexical NP subjects in declarative sentences remain relatively rare in conversational interactions with children under the age of three.

Parents' production of lexical NP subjects in declarative sentences from post-instruction to follow-up was the measure used to characterize parents' use of toy talk strategies. Both the frequency and diversity of lexical NP subjects were examined. On average, treatment parents did not maintain production from post-instruction to follow-up, but treatment parents' average use of lexical NP subjects was greater than control parents. Thus, the instruction had some lasting effect on treatment parents' input.

Hadley et al.'s (2017) primary rationale for increasing the diversity of noun subjects in parent input was to strengthen the representation of subject in children's mental grammar. However, this input modification may confer other developmental advantages. The production of semantically-specific, elaborated lexical noun phrases (e.g., *the pig, the egg*) in subject position is a feature of more literate language use. This register is expected in language use within the school environment, particularly to convey meaning in decontextualized situations effectively when partners do not have shared background knowledge (Schleppegrell, 2001). Because these findings demonstrate that lexical NP subjects continue to be used rarely in parent input as the children developed, explicit toy talk instruction may also be useful for increasing children's exposure to a more literate language register and increasing children's opportunities to produce more elaborate NP subjects in their own spontaneous speech.

Parents' production of pronominal subjects was also examined. For both groups, parents' production of pronominal subjects increased from post-instruction to follow-up. Both treatment and control parents' use of labeling were produced at similar rates from post-instruction to follow-up. Together, this pattern of findings indicates that toy talk instruction had rather specific effects on parents' use of lexical NP subjects, but did not change parents' use of descriptive sentences with pronominal subjects or labeling relative to controls.

As previously highlighted by other parent-implemented interventions, changing the intervention agent from clinician to parents may result in greater variability among parents (Fey et al., 1993). This was also found to be true in Hadley et al. (2017) and in this study when examining parents' maintenance of toy talk strategies. Given that only treatment parents received the intervention, it is no surprise their strategy use showed greater variability. As summarized in the previous chapter, individual parents learned and maintained the strategies at different levels.

Five treatment parents increased their use of toy talk strategies, using declarative sentences with different lexical NP subjects at above expected levels, from post-instruction to follow-up. Because expected use was based on the control parents' production of lexical NP subjects at follow up, the toy talk instruction seems to be a more likely explanation for the observed levels of use rather than developmental changes in the age or language development of the children. In other words, minimal changes were observed in control parents' use of lexical NP subjects during conversational interactions as their children grew older, at least during the age period examined in this study. This suggests that the toy talk instruction was primarily responsible for altering the treatment parents' input, a change that would be unlikely to occur in absence of the instruction.

At the individual level, we operationalized maintenance as no change or an increase over time. As expected, most treatment parents did not maintain their use of toy talk strategies at post-instructional levels. Given how brief the instruction was, the decline was not surprising. However, it was still satisfying to find that 8 of the 14 remaining parents continued to use toy talk strategies at a rate higher than expected based on the control parents. From this perspective, toy talk instruction was beneficial for these parents. That is, it seems likely they learned to use lexical NP subjects more than they might have if instruction had not been provided. Providing

booster sessions on a periodic basis after instruction concludes may be beneficial for helping parents maintain strategy use over time.

Finally, six treatment parents did not use toy talk strategies at levels above the control group at the follow-up measurement point. Four appeared to have learned the strategies initially, and then experienced a decline. These parents used the strategies immediately after receiving the instruction, but instruction did not have a lasting effect over time. As previously mentioned, these parents would have benefited from receiving additional instruction or reminders once the formal instructional period concluded as well. Two other parents appeared relatively indistinguishable from the control parents both post-instruction and at follow-up. Their general use of toy talk was minimal as was the change from post-instruction to follow-up (i.e., +4, -1). These treatment parents did not appear to have learned the toy talk strategies, and therefore had very little to carry over and use during their parent-child interactions at follow-up. Parents' difficulty learning the strategies could have been due to the need to focus more on being responsive when interacting with the child, not feeling comfortable communicating with the child during a play-based activity, or a child's limited language development could have made it more difficult to use the strategies.

Parent Strategy Use Typically Diminishes Over Time

Few parent-implemented language interventions examine parents' maintenance of strategies following the conclusion of the intervention (Fey et al., 1997, Roberts & Kaiser, 2013; Suskind et al., 2016). Of the studies reviewed, three studies noted that parents learned and used the strategies following instruction, but they did not maintain strategy use over time. The results of the current study were consistent with this general pattern in the literature. Several different

explanations may explain these results. First, as language develops over time, the strategies parents were taught may no longer be needed or as appropriate, decreasing the opportunities available for parents to continue to use the strategies. Fey et al.'s (1997) intervention sought to increase parents' use of sentence recasts with children between the ages of 3:8 and 5:10, but parent use declined 5-months following the intervention. The authors suggested that parents' decline in strategy use may have occurred as their children began to produce complex and well-formed sentences. As children's sentences become more adult-like, parents will have fewer opportunities to recast. This indicates that the changes in children's language abilities during the maintenance period could influence parents' maintenance. Differences in the length of time from post-instruction to follow-up could also influence parents continued strategy use, as well as the amount of change in their children's language abilities. The studies reviewed here varied in the length of the maintenance period as well as the age, cognitive and language abilities of the children. Fey et al. examined parents' maintenance 5-months after the intervention concluded, Suskind et al. (2016) examined maintenance 4-months following the intervention, and the current studied examined maintenance 6-months post-instruction. Roberts and Kaiser (2013) examined maintenance over the longest period of time, at 6-months and 1-year following the intervention. Only Fey et al. and Kaiser and Roberts examined children with disabilities, whose language abilities may develop at a slower rate than children typically developing. If declines in strategy use are affected by growth in children's language abilities, parents of children with disabilities may find strategies useful for a longer period of time compared to parents of children developing typically. Although children's language growth over time could impact many parents' maintenance of language strategies, this should have less influence on parents' maintenance of toy talk strategies. As children's language abilities develop, toy talk strategies can be used to

promote a more literate language register (Schleppegrell, 2001). In the current study, it seems more likely that parent declines were related to the fact that lexical NP subjects are not characteristic of natural language use in conversational interactions.

Another factor that may impact maintenance of strategies is parent motivation. It is possible that parents of children with language impairments (Fey et al., 1997; Kaiser & Roberts, 2013; Roberts & Kaiser, 2012) are more motivated to learn and implement strategies that could help improve their children's communication abilities. This may also be true of participants from low-income backgrounds that are seeking support to improve their children's developmental outcomes (Suskind et al., 2016). These motivations are likely to differ from the parents of the typically developing children who volunteered for the current study. Although these parents were interested in learning strategies to promote their children's language abilities, they did not volunteer to participate because they had serious concerns about their children's language development. Parents motivation may also be influenced by their children's progress in the intervention. If parents detect changes in their children's language growth in response to strategy use, parents may be more likely to continue to use the strategies. However, if parents do not see gains in their children's language, they may be less inclined and motivated to continue to use the strategies. The current study did not assess parent motivation, but this factor should be considered in future studies.

The final factor to consider when examining parents' maintenance of strategies is the design and implementation of the intervention. Because many parents may not have background knowledge related to language development, interventions must consider the amount of information parents will need and how to provide the most important information in a variety of ways to help parents best learn and use the strategies. If the program has many components, it

may be harder to retain the adequate knowledge and skills in each component. This factor may have impacted parents participating in Suskind et al. (2016)'s study who received eight weekly educational computer-based modules. Although each module was built on information provided during the preceding module and parents knowledge of the information was sustained over time, behavior changes were not sustained. With so much information provided over an eight-week period, it is possible that parents did not have enough time to incorporate the information from each module into their language interactions before continuing onto the next modules. Parents in Fey et al. (1997) also had numerous strategies to learn. In comparison, parents participating in the current study learned the two toy talk strategies in addition to child-centered play, responsive interactions, and information about language development. Future studies should incorporate an approach similar to Kaiser and Roberts (2013) and Roberts and Kaiser (2012) who focused on individual strategies until parents demonstrated they could use the strategies at criterion performance levels. The criterion levels were used to determine whether a new strategy could be introduced or if more instruction was needed. By ensuring parents use each intervention strategy effectively before introducing additional ones as part of the instructional programs, parents may be able to learn the strategies more deeply and maintain them over longer periods of time.

Limitations and Future Research

It is important to note that this was a retrospective study. The goals of the original study were to evaluate the feasibility of toy talk instruction for modifying parent use of lexical NP subjects, and to test a theoretically-motivated hypothesis about how this property of parent language input related to children's grammatical development. In addition, the initial study was

designed to determine if a very brief intervention could bring about this change. Parent maintenance of strategies was not the focus.

Certain demographic aspects of the study's sample were limited, including the racial, ethnic, linguistic, and socioeconomic diversity of the sample. The parent participants were also primarily mothers. Given that non-mainstream groups may have different beliefs about how to talk and play with children and different expectations for language use, different instructional methods may be needed when working with families from different backgrounds (Jarrett, Hamilton, & Coba-Rodriguez, 2015).

It is also important to consider parents' ability to learn and use the strategies. Even though the majority of treatment parents in this study demonstrated that they learned the toy talk strategies, there were two treatment parents that did not appear to have learned the strategies at post-instruction and then, could not be expected to maintain strategies that they did not learn. Future interventions may want to continue to examine the skills parents need to best learn and use toy talk strategies, recognizing that this may also depend upon the child's communication abilities. It may be helpful to assess parents' use of child-centered play, responsive interaction, and language modeling strategies including toy talk to criterion levels, adapting the approach of Roberts and Kaiser (2012). Including this within parent-implemented language interventions could increase fidelity and provide individualized and explicit feedback to parents on their use of the strategies, and increase the likelihood that behavioral changes in parents' strategy use can be sustained.

Clinical applications of toy talk strategies and examining maintenance

Parent-implemented language interventions are common particularly within early intervention programs which serve children birth to 3 years of age, and focus on supporting family use of language within the homes and natural environments of the children (Roberts & Kaiser, 2011). This is an ideal group to implement toy talk instruction with given that the targeted ages in the original study were 21- to 30–month-old children. The findings of this study demonstrate that most treatment parents were able to learn and use toy talk strategies over the 24-to 30-month time period, demonstrating promising results as a parent-implemented language modeling strategy.

In this study, the use of toy talk strategies was examined only during play-based activities in a research lab setting. In addition to play time, toy talk can be used in a variety of contexts (e.g., meal time, bed time, etc.). Upon viewing videos, and based on the individual feedback the parents received through coaching sessions, it was apparent that the parents' play skills and views on communicating with young children during play varied. Despite the importance and common use of play-based language interventions used by clinicians, it is important to recognize that interventions may need to be adapted to contexts in which parents are most comfortable using the strategies to promote strategy use in the child's natural environment Additional instruction may be needed to help parents interact and communicate with their child in a variety of activities in the home.

Toy talk instruction focused on the importance of providing parent education on language development and (brief) instruction with individualized feedback to help parents learn and use strategies. The individualized feedback can be applied to the clinical setting in which clinicians in many settings are encouraged to have interactions with parents whether through in-person

communication or consulting via email or telephone. This serves as an opportunity to provide parents with information regarding therapy progress and language strategies to use with the child. With this age group, particularly within the early intervention setting, toy talk instruction also encourages clinicians to include parents in the intervention, and the clinician could provide parents with feedback regarding their use of language strategies. After parents and others have practice implementing the strategies, it may be beneficial to plan short additional sessions reminding parents of the strategies, to maintain and refine strategy use as children develop.

Conclusion

The current study found that parents receiving the toy talk instruction did not maintain use of toy talk strategies six months following conclusion of the brief instructional period. However, more than half of the treatment parents continued to use lexical NP subjects at a rate higher than expected relative to control parents. This demonstrates that, in absence of explicit instruction, parents' production of lexical NP subjects does not increase with children's language development, in contrast to the changes observed in descriptive talk with pronominal subjects. These findings demonstrate that toy talk instruction had some lasting effects on parent input six months following instruction. Further research implementing booster instructions are recommended to maintain use of toy talk strategies at higher levels of use during this early period of language development.

CHAPTER 6

TABLES

Table 1

Parent Mean, Standard Deviations, Min/Max of General Measures

	Control			Treatment		
Measure	*M*	*SD*	*Min/Max*	*M*	*SD*	*Min/Max*
Total Utterances						
Post-instruction	386.53	98.97	198-565	384.21	92.01	205-596
Follow-up	389.84	128.03	187-647	376.95	94.56	252-577
MLU						
Post-instruction	3.96	0.52	2.86-4.83	4.01	0.54	3.01-5.14
Follow-up	4.41	0.53	3.48-5.33	4.44	0.61	3.17-5.54
NDW						
Post-instruction	253.68	48.80	176-369	266.32	51.26	189-402
Follow-up	295.95	46.14	205-372	295.26	48.71	200-400

Table 2

Parent Mean, Standard Deviations, Min/Max of Adult Input Measures

	Control			Treatment		
Measure	*M*	*SD*	*Min/Max*	*M*	*SD*	*Min/Max*
Toy Talk: NP subjects						
Post-instruction	10.11	7.23	1-33	40.05	22.26	11-95
Follow-up	13.05	6.90	2-31	27.95	16.99	4-63
Toy Talk: NP types						
Post-instruction	5.95	2.90	1-13	18.05	9.99	5-40
Follow-up	8.11	3.57	2-15	13.26	7.75	3-31
TT: Pronominal subjects						
Post-instruction	19.58	13.67	3-55	22.26	12.68	6-61
Follow-up	23.58	10.48	8-45	29.16	13.34	4-54
Labeling						
Post-instruction	21.68	9.84	3-41	19.16	9.79	7-41
Follow-up	21.74	7.39	10-34	19.58	7.95	8-38

CHAPTER 7

FIGURES

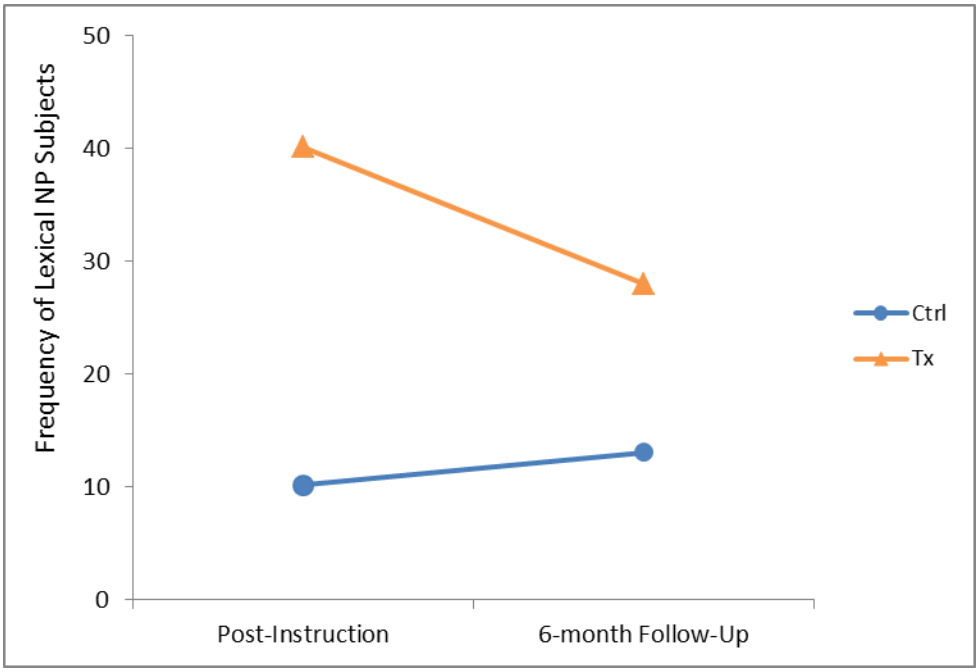

Figure 1. Frequency of Lexical NP Subjects in Parent Toy Talk (TT:NP)

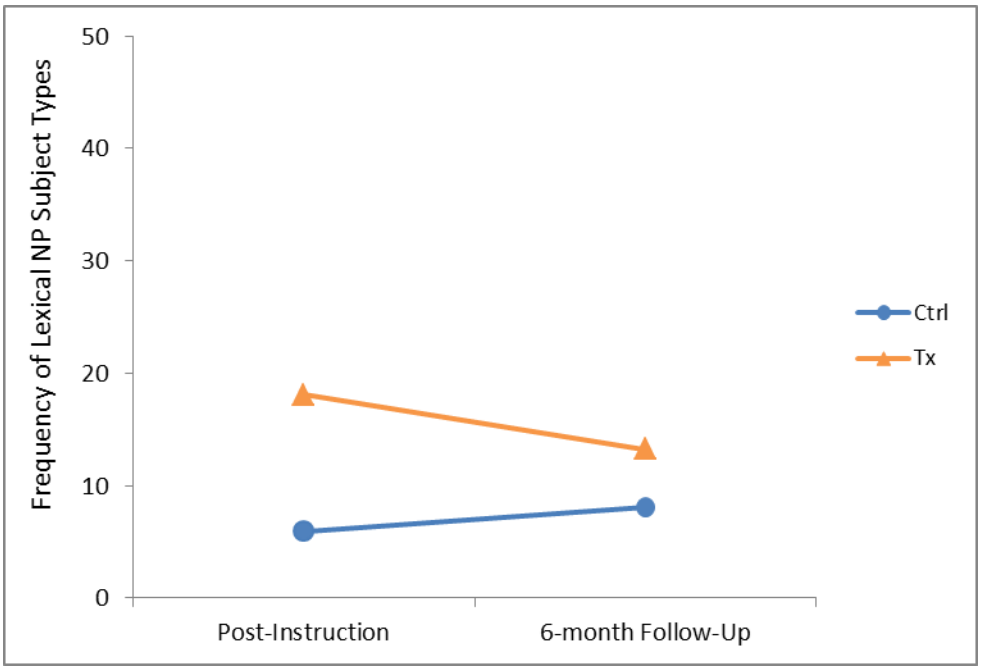

Figure 2. Diversity of Lexical NP Subjects in Parent Toy Talk (NPtype)

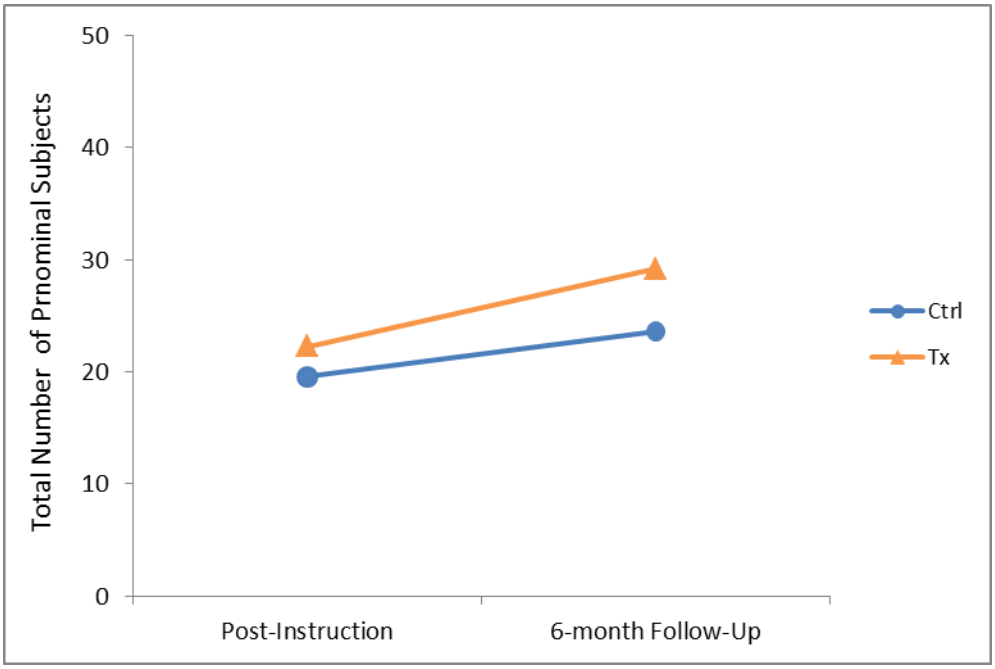

Figure 3. Frequency of Pronominal Subjects in Parent Toy Talk (TT:P)

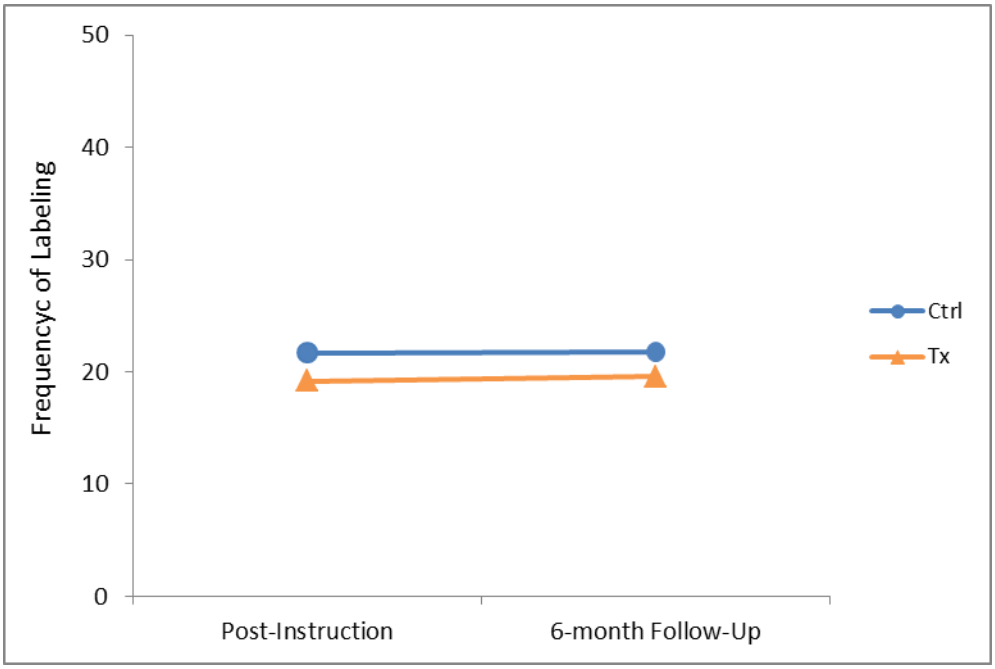

Figure 4. Frequency of Labeling in Parent Input

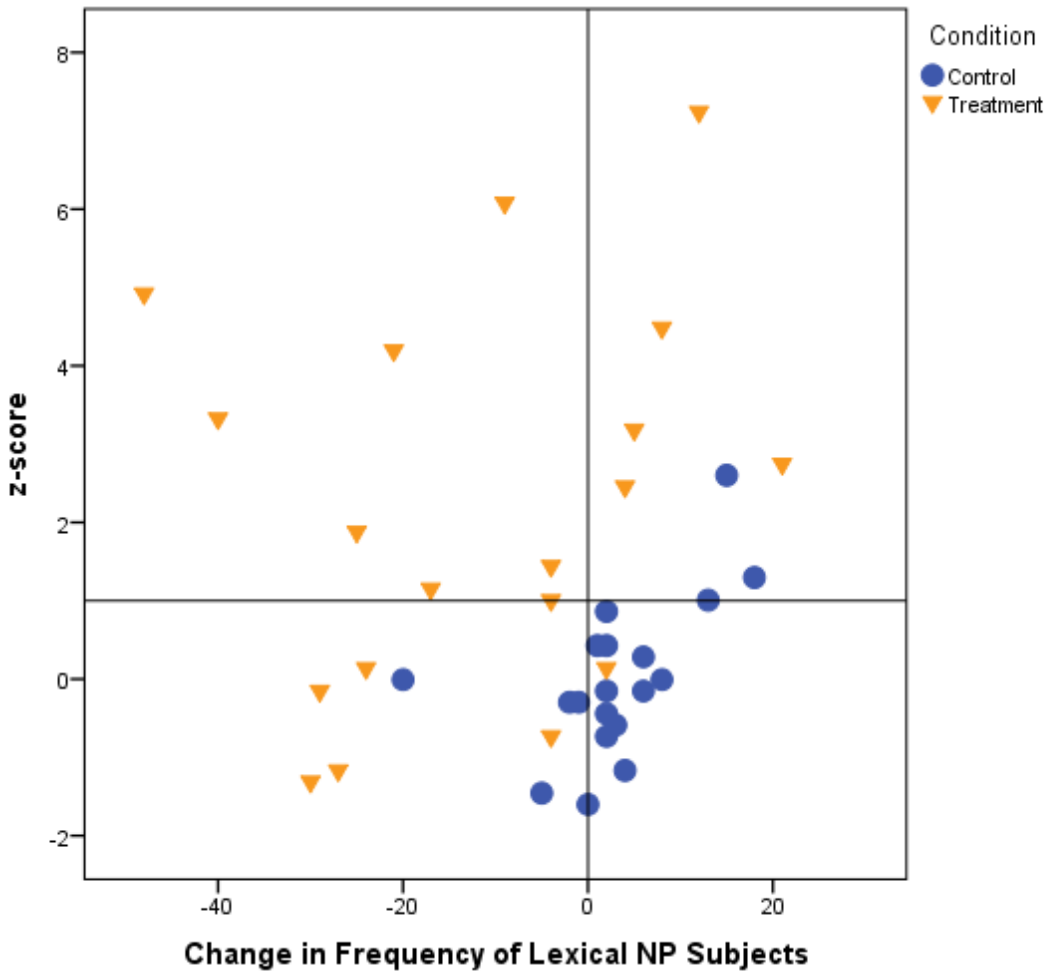

Figure 5. Change in Frequency of Lexical NP Subjects in Parent Toy Talk from 24 to 30 months Relative to Expectations Based on Control Group

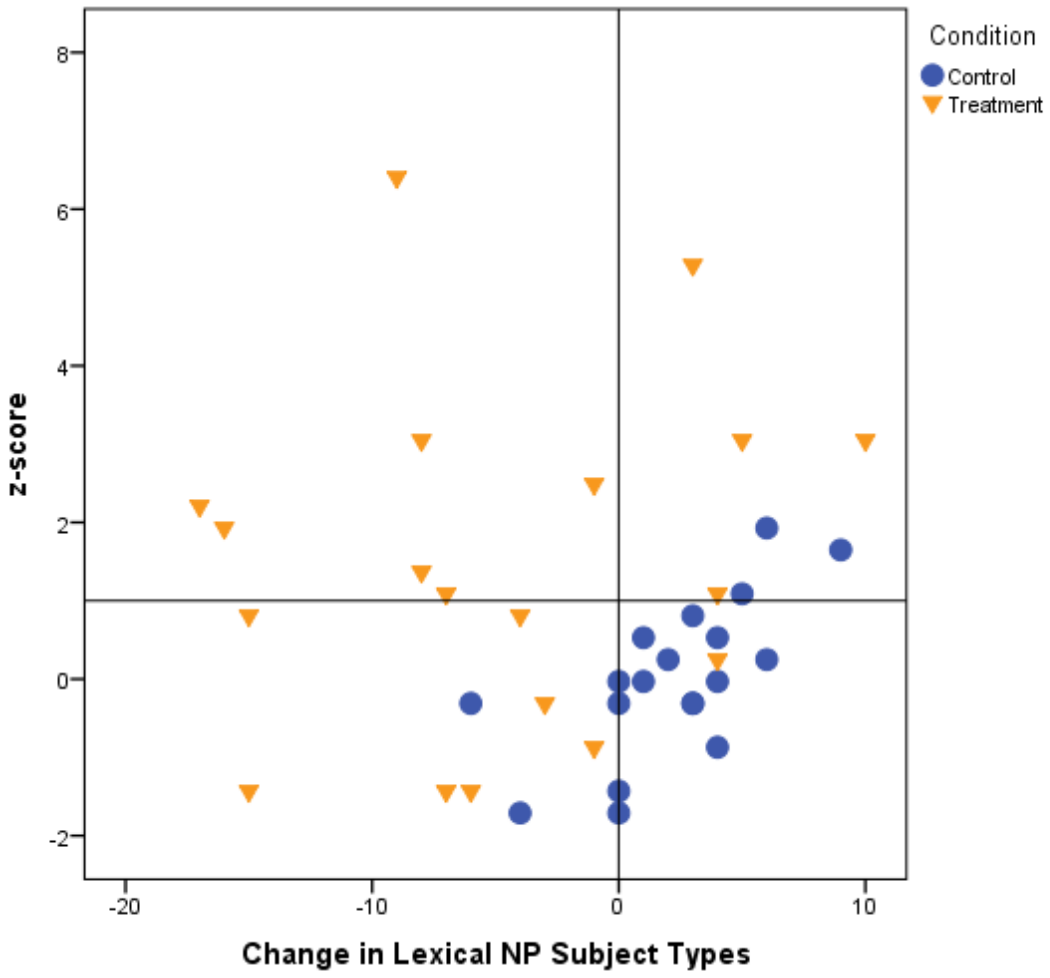

Figure 6. Change in Diversity of Lexical NP Subjects in Parent Toy Talk from 24 to 30 months Relative to Expectations Based on Control Group

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APPENDIX A
Toy Talk Coding Procedures
Applied Psycholinguistics Lab, Developed by Hadley et al. (2017)

1. Only parent utterances in spontaneous, complete and fully intelligible (C&I) utterances in the parent half of each measurement point will be coded.
    a. Do not code incomplete, partially intelligible, abandoned or interrupted parent utterances.
    b. Do not code parent utterances that are routines.
        i. If you encounter a routine parent utterance, insert the [rout] code so it will be excluded from other standard analyses.
    c. You WILL code parent utterances with the <overlap> notation.
    d. If you encounter a parent speaking to another adult, do not code it. This may happen if a cell phone rings or if an investigator enters the room because for some reason.
        i. If you encounter speech directed to another adult or an infant sibling, make sure this utterance is placed on an = line instead of a M line.

2. To be coded as toy talk [TT], the utterance must meet several specific criteria.

    a. Toy talk is operationally defined as a sentence (or finite clause) in which the predicate describes a referential subject's state, property, action, location, or possession. Thus, an <u>explicit subject and predicate</u> are both required.
    b. Toy talk can only be coded in finite[1] clauses with canonical SVO word order. These include declarative statements (e.g., *the bubbles made a mess.*), and discourse questions (e.g., *the egg is hot?*) that maintain SVO word order and have no movement. Declarative statements with tag questions are included (e.g., *the plate is in the cabinet, isn't it*?).

[1] Finiteness refers to a clause marked for the grammatical features of tense and agreement. Finiteness can be marked on copula BE, auxiliaries, or lexical verbs. In English, all main clauses are "finite" clauses – even if the tense/agreement features are not marked overtly. However, embedded clauses may be finite or nonfinite. To determine if an embedded clause (subject – verb sequence) is finite or non-finite, consider the following:

1. Can you find a verb form marked for tense/agreement?
    a. I think [Pooh <u>is</u> hungry]. → finite
    b. I know [Pooh like<u>s</u> honey.] → finite
    c. I made [Pooh drink some juice]. → nonfinite, no agreement
    d. Copula BE, auxiliary DO, BE, HAVE, and modals are all indicators of finite clauses.
2. If you replace the subject with a pronoun form, does it take a nominative pronoun (i.e., subject)?
    a. I think [<u>he</u> <u>is</u> hungry]. → finite
    b. I know [<u>he</u> like<u>s</u> honey.] → finite
    c. I made [him drink some juice]. → nonfinite, accusative pronoun (i.e., object)
3. Is infinitival to present?
    a. I want [Pooh <u>to</u> eat some honey.] → nonfinite
    b. I want [him <u>to</u> eat some honey.] → nonfinite

i. TT codes are NOT assigned in structural questions, even when the sentence subject is third person. (e.g., *Is it hot? Are the pigs eating? Where is the sheep? Where is the arm? What does the pig say? What's over here?)* because the movement of the copula/auxiliary and/or wh-element altered local agreement relationship and/or the canonical word order of the sentence.
ii. TT codes are NOT assigned in embedded wh-finite clauses (e.g., *I wonder where he is*.)
iii. TT codes are NOT assigned in sentences with locative movement (e.g., *here it is; there he goes*).

c. An explicitly stated 3rd person subject must appear in either the main clause (e.g., *Pooh likes juice)* or a finite embedded clause (e.g., *I think Pooh likes juice*.).
   i. TT codes are NOT assigned to descriptive comments with 1st or 2nd person subjects (e.g., *I'm eating; You're doing a good job*).
   ii. TT codes are NOT assigned in nonfinite embedded clauses (e.g., *You made Pooh/him drink juice.)*

d. The referent for the 3rd person subject must be present in the playroom, the referent must be part of the parent-child's pretend play (e.g., {mm} *this soup tastes good*), or the event must have occurred in the playroom in the immediate past (e.g., the bubble popped).
   i. Do NOT code utterances about people engaged in past or future events outside the playroom should not be coded (e.g., *Daddy had toast for breakfast. Theo/Mary is coming to pick us up*.).
   ii. Do NOT code utterances in which the parent refers to him/herself by name (e.g., Daddy/Mommy will do it) or to the child by Cname. As part of the intervention, parents were instructed to model adult-like sentences, including I and you to refer to self and child as addressee.
   iii. Utterances such as *That's right. That looks fun.* or *That's not very nice*. do not refer to a concrete referent and therefore are NOT coded as toy talk. These utterances often refer to the child's behavior/misbehavior.
   iv. Utterances with gerunds as subjects will NOT be coded (e.g., *Cooking is fun*) because the subject does not refer to a concrete object, but a general activity.
   v. If you have a pronoun subject like *this* or *that* and you are not sure whether you should code it as TT, try to substitute a lexically-specific noun in its place. If you could substitute a lexical NP for an appropriate discourse referent, then code it as TT.
      1. This is where you cook eggs. → the oven is where you cook eggs. → TT
      2. This is how you cook eggs. → ??{putting eggs in skillet} → NOT coded

e. The predicate must be explicitly stated. Predicates will typically take the form of verb phrases, adjective phrases, and prepositional phrases, and noun phrases when linking two noun labels. The predicates may describe the state or action of the subject including: state (e.g., X tastes good; X doesn't work), action (e.g., X is sleeping; X

popped), property (e.g., X is cute; X are hungry), possession (e.g., X is mine), location (e.g., X is over there; X is under the table), relationship (e.g., lexical NP subject – copula – NP). *Nina is a baby. Danny is a boy. pretzel isn't soup. bubbles are not food.)*

i. TT codes ARE assigned even if copula BE has been omitted (e.g., *the pig eating; he muddy*) since the predicate is expressed and TT coding is not dependent on grammaticality.
ii. TT codes are NOT assigned to elliptical responses such as *It does.* or *He should be.* These utterances have no explicitly stated predicate, and therefore, will not be coded.
iii. TT codes are NOT assigned with noun phrase predicates that provide simple labels (see #4 below).

3. Toy talk codes will be further classified based on the grammatical subject. Word level codes should be inserted next to the subject. Insert the code between the subject and the slash, when a copula or auxiliary is contracted to the subject (e.g., *It*[TT:P]*/'s hot; Water*[TT:NP]*/'s come/ing out*.) or to the word root for plural subjects (e.g., *the bubble*[TT:NP]*/s pop/ed*).

a. [TT:P] is assigned when the third person subject is a pronoun
    1. *She plays with the ball*
    2. *It popped*.
    3. *I think <u>he's hungry</u>.*
b. [TT:P] is assigned when *one* is used alone.
    1. *One fell.* (not elaborated; no common noun)

c. [TT:NP] is assigned for third person lexical noun phrase subjects. This includes both common nouns and proper nouns.
    1. *The baby needs to take a bath.*
    2. *Water's coming out.*
    3. *Pooh likes honey.*

d. [TT:NP] is assigned for the elaborated subject NP *that one*
    1. When *that one* is used with one of the predicates types listed above, it will be identified as TT:NP, because *one* can be elaborated and pluralized -- *that one, the yellow one/s*.
    2. When *that one* is used with an NP predicate consistent with the grammatical structure of a simple label (see below), it will NOT be coded as TT.

4. Parent utterances that name concrete referents with the following grammatical structure will be coded as Labeling [Lab]. Word level [Lab] codes should always be inserted next to the pronominal subject (*it*[Lab]*/'s a spoon).*

a. pronominal subject – copula (neg) – NP/color/number. – Code as [Lab]
    1. *It's a spoon.*
    2. *That's a dog.*
    3. *That's not a ball.*

4. *(T)here's your cup.*
5. *It's purple.*
6. *Here are two.*
7. *He's a cute penguin.*

b. pronominal subject – copula (neg) – *called/named* NP/color/number. – Code as [Lab]
   1. *It's called an orange.*
   2. *He's named Danny.*

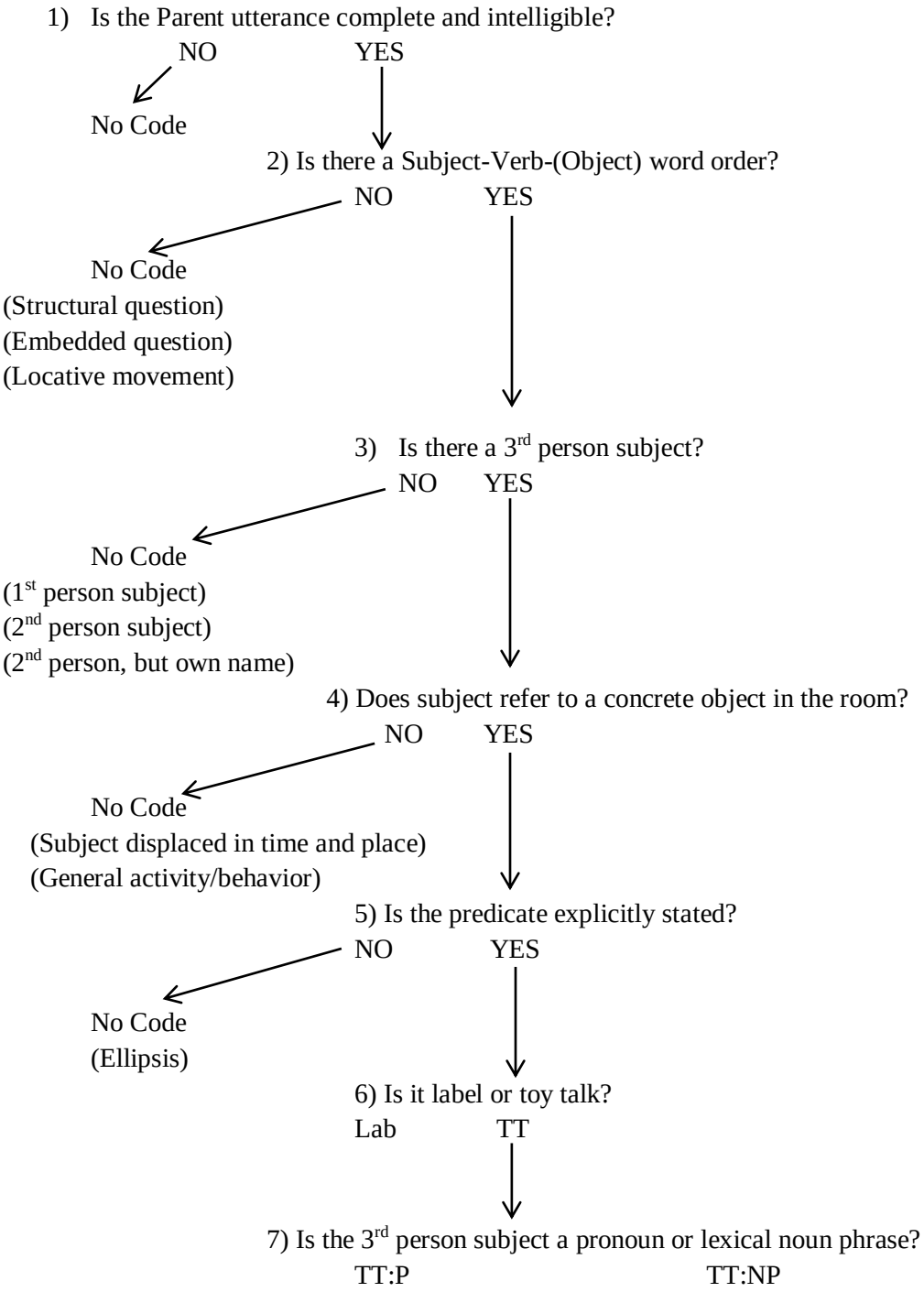
c. pronominal subject – copula omission -- NP/color/number. – Code as [Lab]
   1. *This a mama cow?*
   2. *That a bowl?*

   Note. We are coding this as [Lab] because the utterance meets the explicit subject and a predicate criteria; only the copula is omitted.

d. Do NOT code utterances that fit this form but do not provide a lexically-specific noun to name the referent – NO code
   1. *There's more.*
   2. *Here's some things.*
   3. *That's my stuff.*
   4. *This is mine.*
   5. *That's yours.*

APPENDIX B
Toy Talk Coding Decision Tree

Is this Toy Talk?



APPENDIX C

Individual changes for general measures

	Post-Instruction			6-month Follow-Up		
ID	***Utterances***	***MLU***	***NDW***	***Utterances***	***MLU***	***NDW***
Treatment						
SS01G	515	5.14	402	484	4.88	400
SS02B	409	3.82	277	461	4.04	329
SS03B	366	3.38	249	414	3.73	284
SS04G	277	4.09	249	290	4.59	291
SS05B	457	3.72	260	325	4.56	257
SS06B	359	4.36	244	327	5.39	321
SS07B	328	3.01	189	252	3.17	200
SS09G	335	4.61	301	449	4.93	345
SS10G	453	3.46	282	389	3.80	280
SS11G	596	3.95	310	577	4.30	339
SS12B	375	4.46	308	282	5.02	305
SS13B	287	3.85	206	273	4.09	244
SS14G	449	3.30	220	316	4.08	262
SS15G	357	4.24	233	312	4.23	241
SS16G	368	4.68	327	366	5.54	309
SS17G	205	4.27	196	287	4.62	250
SS18B	422	4.32	288	515	4.66	366
SS19G	290	3.59	244	357	4.94	276
SS20G	452	3.96	275	486	3.79	311
Control						
SS31G	376	4.38	276	317	5.33	310
SS32B	497	4.62	369	330	4.94	338
SS33B	442	3.80	269	475	4.80	346
SS35B	349	3.42	209	463	3.48	251
SS36B	524	3.90	280	647	3.78	325
SS37B	249	3.50	187	221	4.28	213
SS38B	461	4.83	305	407	4.96	331
SS39G	416	4.69	325	457	4.68	372
SS40G	303	4.44	233	362	4.42	300
SS41G	412	3.31	232	462	3.68	318
SS42B	365	4.21	249	292	4.22	261
SS43B	516	2.86	192	577	3.57	284
SS44G	198	3.56	176	263	3.92	238
SS45G	369	4.24	278	449	4.45	337
SS46G	251	3.50	206	187	4.42	205
SS47B	346	4.24	272	274	4.46	264
SS48B	338	3.81	252	275	4.58	303
SS49G	565	3.98	258	579	4.69	303
SS50G	367	3.87	252	370	5.14	324

Note: ID = Parent identification code, MLU = mean length of utterance, NDW = number of different words

APPENDIX D

Individual data for Input Measures

	Post-Instruction				6-month Follow-Up			
ID	***TT:NP***	***NPtype***	***TT:P***	***Lab***	***TT:NP***	***NPtype***	***TT:P***	***Lab***
Treatment								
SS01G	95	40	61	22	47	31	50	29
SS02B	30	15	12	16	35	11	29	25
SS03B	24	10	8	7	20	7	17	11
SS04G	27	8	22	7	23	12	23	14
SS05B	64	27	23	41	55	19	4	25
SS06B	38	21	11	26	21	13	42	20
SS07B	12	6	25	11	8	5	7	8
SS09G	38	26	23	20	14	11	24	31
SS10G	41	9	24	8	12	3	31	11
SS11G	51	24	31	34	63	27	31	21
SS12B	76	33	20	17	36	16	15	15
SS13B	11	9	20	20	32	19	32	11
SS14G	32	10	11	12	5	3	30	15
SS15G	51	19	18	19	26	12	31	21
SS16G	63	31	21	10	42	15	18	13
SS17G	12	5	19	12	14	9	34	18
SS18B	26	14	25	21	30	19	40	26
SS19G	36	18	6	27	44	17	54	38
SS20G	34	18	43	34	4	3	42	20
Control								
SS31G	12	7	16	18	11	9	16	22
SS32B	17	9	39	33	19	15	28	33
SS33B	8	7	19	18	10	8	27	15
SS35B	6	4	10	13	9	7	20	22
SS36B	15	7	12	14	16	7	16	18
SS37B	8	6	3	3	3	2	16	10
SS38B	14	9	55	22	16	10	40	27
SS39G	16	5	30	23	31	14	40	19
SS40G	6	4	11	22	8	7	28	28
SS41G	5	4	7	26	13	8	14	21
SS42B	13	8	23	23	11	8	13	20
SS43B	4	3	25	30	22	9	45	34
SS44G	1	1	5	25	5	5	18	20
SS45G	6	3	20	31	12	3	21	14
SS46G	2	2	7	13	2	2	8	16
SS47B	10	6	21	13	12	10	17	19
SS48B	9	8	17	41	15	11	16	32
SS49G	33	13	41	36	13	7	32	32
SS50G	7	7	11	8	20	12	33	11

Note: ID = Parent identification code, TT:NP = toy talk with lexical noun phrase subjects; NPtype = toy talk with different noun subjects; TT:P = toy talk with pronominal subjects; Lab=Labeling

APPENDIX E

Individual changes from post-instruction to 6-month follow-up

	TTNP			NPtype		
ID	Post-instruction	6-month Follow-up	**Change in use of TTNP**	Post-instruction	6-month Follow-up	**Change in use of NPtype**
Treatment						
SS01G	95	47	**-48**	40	31	**-9**
SS02B	30	35	**5**	15	11	**-4**
SS03B	24	20	**-4**	10	7	**-3**
SS04G	27	23	**-4**	8	12	**4**
SS05B	64	55	**-9**	27	19	**-8**
SS06B	38	21	**-17**	21	13	**-8**
SS07B	12	8	**-4**	6	5	**-1**
SS09G	38	14	**-24**	26	11	**-15**
SS10G	41	12	**-29**	9	3	**-6**
SS11G	51	63	**12**	24	27	**3**
SS12B	76	36	**-40**	33	16	**-17**
SS13B	11	32	**21**	9	19	**10**
SS14G	32	5	**-27**	10	3	**-7**
SS15G	51	26	**-25**	19	12	**-7**
SS16G	63	42	**-21**	31	15	**-16**
SS17G	12	14	**2**	5	9	**4**
SS18B	26	30	**4**	14	19	**5**
SS19G	36	44	**8**	18	17	**-1**
SS20G	34	4	**-30**	18	3	**-15**
Control						
SS31G	12	11	**-1**	7	9	**2**
SS32B	17	19	**2**	9	15	**6**
SS33B	8	10	**2**	7	8	**1**
SS35B	6	9	**3**	4	7	**3**
SS36B	15	16	**1**	7	7	**0**
SS37B	8	3	**-5**	6	2	**-4**
SS38B	14	16	**2**	9	10	**1**
SS39G	16	31	**15**	5	14	**9**
SS40G	6	8	**2**	4	7	**3**
SS41G	5	13	**8**	4	8	**4**
SS42B	13	11	**-2**	8	8	**0**
SS43B	4	22	**18**	3	9	**6**
SS44G	1	5	**4**	1	5	**4**
SS45G	6	12	**6**	3	3	**0**
SS46G	2	2	**0**	2	2	**0**
SS47B	10	12	**2**	6	10	**4**
SS48B	9	15	**6**	8	11	**3**
SS49G	33	13	**-20**	13	7	**-6**
SS50G	7	20	**13**	7	12	**5**

Note: ID = Parent identification code, TT:NP = toy talk with lexical noun phrase subjects; NPtype = toy talk with different noun subjects