CAREGIVERS' RESPONSES TO TODDLERS' INTELLIGIBLE AND UNINTELLIGIBLE UTTERANCES

By

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To my mom, a dedicated teacher, advocate, and friend to

many students and their families.

You inspire me.

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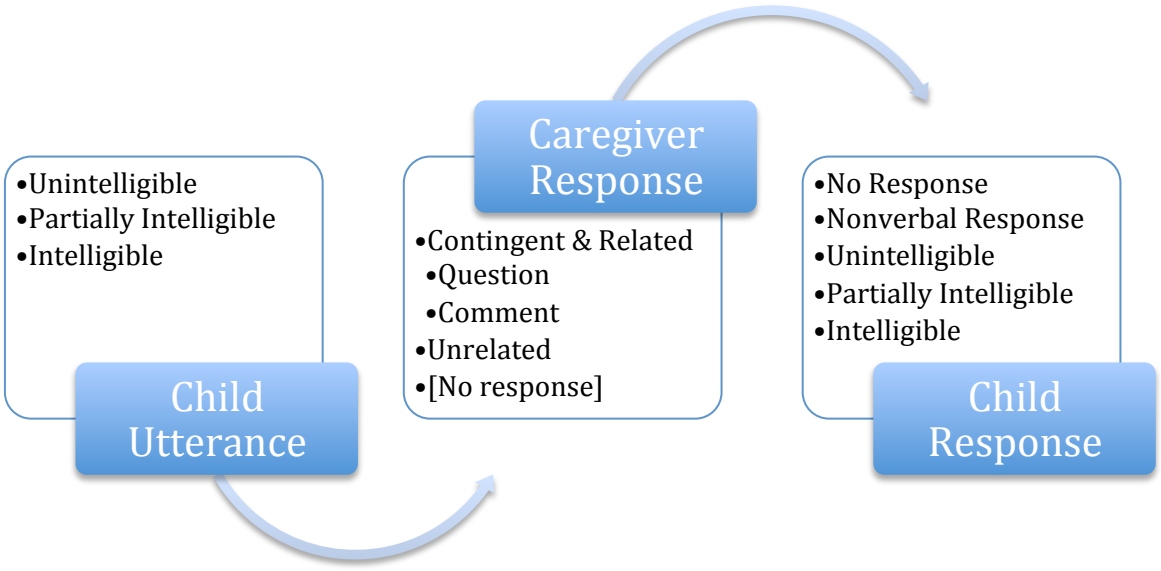
CHAPTER I

INTRODUCTION

Caregivers' patterns of responses to children's communication are associated with language growth in children with and without disabilities (e.g., Girolametto, Weitzman, Wiigs, & Pierce, 1999; Landry, Smith, Swank, Assel, & Vellet, 2001; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Yoder, McCathren, Warren, & Watson, 2001). Children's nonverbal and verbal acts of communication provide opportunities for caregivers to respond and provide contexts for different types of responses (e.g., questions or comments) that serve a range of pragmatic and linguistic functions. Caregivers' responses, in turn, provide additional opportunities for children to communicate with or respond to their caregivers. More specifically, "intentional [child] communication elicits maternal responses that in turn facilitate language development" (Yoder & Warren, 2001, p. 327). This bi-directional process is referred to as a transactional model of responsivity (Sameroff & Fiese, 2000; Warren & Brady, 2007). An example of the responsivity model is shown in Figure 1.

Figure 1



Child-Caregiver-Child Initiation and Response Model

In this model, a child's communicative utterance provides an opportunity for a caregiver to respond with a verbalization; that response by the caregiver then provides the next opportunity for a child response. How the caregiver responds to the child (hereafter referred to as the "syntactic form" of the caregiver's response) may depend on the caregiver's ability to understand the content and the intention of the child's initial utterance. Over time, specific characteristics of child utterances, such as speech intelligibility, may lead to differential caregiver input to children and varied opportunities for continued communication exchanges. These differences, in turn, could impact overall language development.

The contingent relationship between child utterances and caregiver responses is an important aspect of caregiver-child interactions. To understand how caregiver responses to children's communication affect language development, three aspects of this relationship must

be examined: (a) when caregivers respond; (b) what they say - the syntactic form and content of the response; and (c) why they respond the way they do - the pragmatic function of their responses.

Timing and Content of Caregivers' Responses: Contingent Responding

Contingent responding refers to caregivers' verbal and nonverbal responses that immediately follow children's communicative attempts. When responding contingently, a caregiver follows the child's lead and provides language input based on the child's attentional focus or communication (Spiker, Boyce, & Boyce, 2002; Warren & Brady, 2007). The adult does not introduce a new idea or topic or attempt to redirect the child's attention. Contingent responding signals to children that their caregivers share their focus or interests and, potentially, reinforces children for communicating with their caregivers. For young children, the timing and content of caregivers' responses is related closely to the impact of caregivers' responses on promoting language development (Snow & Gilbreath, 1983; Yoder, Kaiser, Alpert, & Fischer, 1993). When a caregiver provides new linguistic information that is related to the child's immediate utterance or action, it may be easier for the child to process and understand the new information because the child already has a referent and a context to associate with the new information. By providing language input related to the child's interest, the caregiver lessens the cognitive demands placed on the child, and the child may be better able to process the new information (McDuffie & Yoder, 2010). In addition, the temporal proximity and semantic relation between the child's utterance and the caregiver's response may scaffold language development by providing the child with an opportunity to compare his/her utterance with the

more advanced form of the caregiver's utterance (McDuffie & Yoder, 2010, Nelson, 1989; Scherer & Olswang, 1984; Yoder, Spruytenburg, Edwards, & Davies, 1995).

How and Why Caregivers Respond: The Form and Function of Caregivers' Responses

Caregivers' verbal behaviors can be categorized based on their syntactic form (e.g., comments, questions) and their general pragmatic function (e.g., acknowledge child's communication, add new information, seek new information or clarify information given by the child, or elicit a child behavioral response).

Comments. Comments are a broadly defined class of caregiver responses that includes simple acknowledgements, imitations, semantically related statements, and expansions. Caregivers' comments can acknowledge a child's communicative attempt (e.g., "yeah," "ok," "uh-huh") or imitate (repeat) a child's utterance without providing new semantic or grammatical information. Caregivers also can respond to children's utterances with semantically related comments. These comments can differ from the child's linguistic form and offer related information using different words and a unique phrase or sentence structure. Caregivers also can embed what children say into their own utterances and add new words to make an expanded linguistic model (an expansion) that is still semantically related to the child's utterance. A caregiver expands a child's utterance by repeating the child utterance, maintaining the child's word order, and adding semantic and/or grammatical content. For example, if a child said: "ball," the caregiver may respond with an expansion by saying: "the ball rolls" or "red ball" or "you want the ball," depending on the context and the perceived communicative intent of the child. Expansions arguably are the most salient type of contingent response because expansions serve a dual-function – they provide linguistic input and meaning at a time the child is most likely to

process the information, and they promote conversation and topic maintenance within the interaction. Expansions may promote language development by (a) modeling a more complex but related utterance; (b) teaching new vocabulary; and/or (c) continuing a conversation topic (Folger & Chapman, 1978; Scherer & Olswang, 1984; Seitz & Stewart, 1975; Slobin, 1968). Expansions are dependent, however, on child utterances. That is, a caregiver cannot expand when a child is not verbally communicating or when the child's utterance is unintelligible.

Questions. Questions are caregivers' utterances that ask the child to provide information or a specific response. By their syntactic form and their functional definition, questions naturally elicit responses from children, and children early in their language development respond more frequently to questions than to comments (Howe, 1981; Yoder, Davies, & Bishop, 1994). Questions serve varied pragmatic functions in conversation. Questions may be used to clarify the child's meaning or communicative intent, to continue a conversation by seeking additional information, or maintain and/or extend an ongoing conversation about a specific topic.

Questions include "real" or open-ended questions in which the answer is not known to the questioner (e.g., "What would you like to eat?" "What do you want to play?" "Where are they going?"); test-questions, which are requests for a child to label or name a person, object, or action and for which there is a correct response (e.g., "What is that?"); yes/no questions (e.g., "Do you want juice?" "Are you hungry?" "Do you want to put the pieces in the puzzle?"); and choice questions (e.g., "Do you want milk or apple juice?" "Do you want to play with the balls or the cars?" "Is the baby hungry or thirsty?").

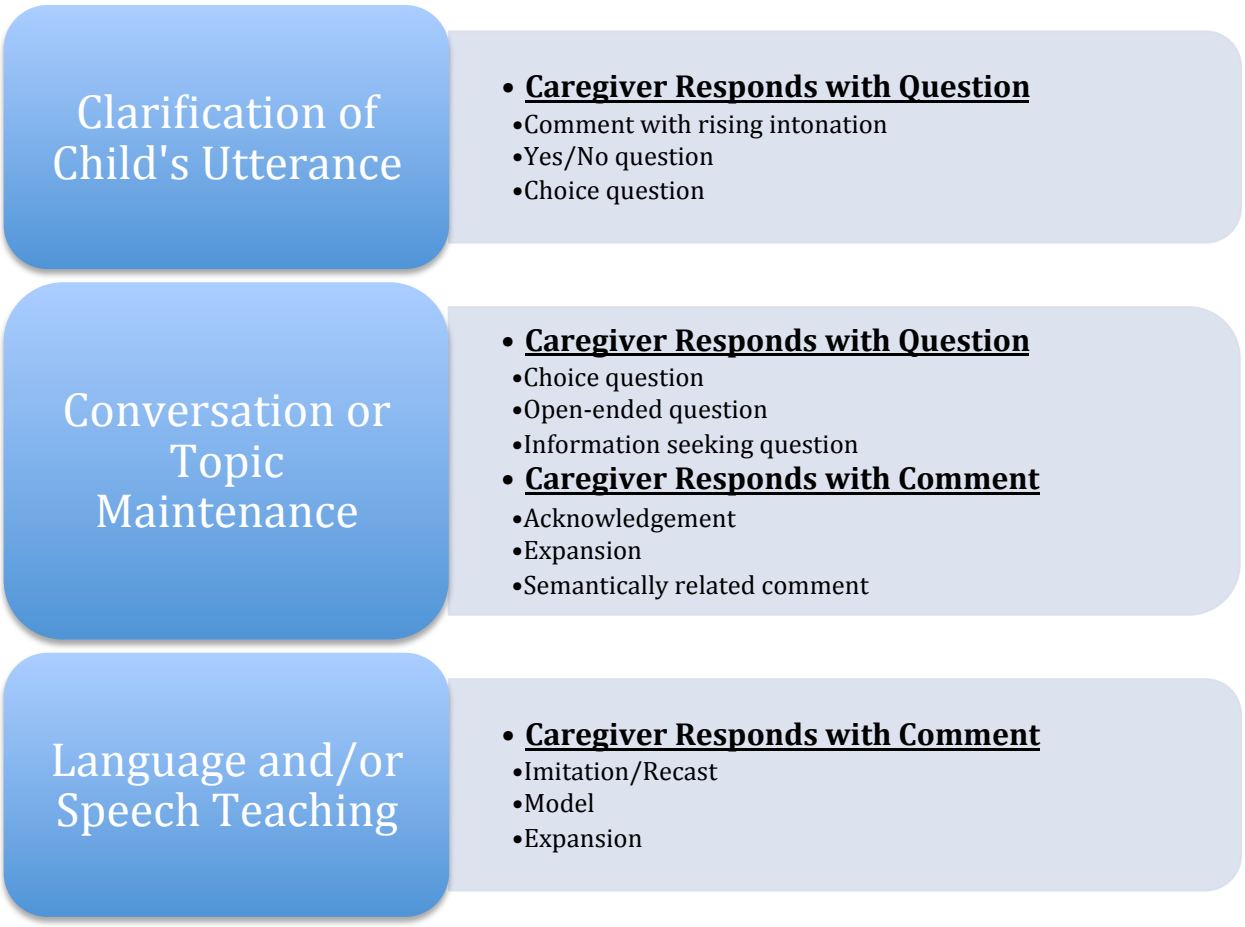
Questions that do not have a single, known answer (e.g., open-ended questions) and requests for confirmation of children's utterances are more likely to be associated with children's language development than other question types (Hoff-Ginsberg, 1986; Yoder, 1989; Yoder &

Kaiser, 1989). Furthermore, questions that continue the child's communication topic provide more opportunities for caregivers to respond contingently to children's utterances and to model topic maintenance (Yoder, Davies, Bishop, & Munson, 1994).

Directives are statements, instructions, or commands a caregiver uses to prompt or elicit a behavioral response from a child. These statements may tell the child what to do (e.g., "Sit down." "Clean up." "Come here.") or what not to do ("Stop hitting your brother.") or may provide support to modify or extend the child's ongoing actions or task completion (e.g., "Put the piece in the corner." "Keep trying.").

In the framework of this paper, the syntactic form of caregivers' responses refers to the type of utterance the caregivers used in response to children's communication (i.e., whether caregivers responded to a child's utterance with a comment or a question). The pragmatic function of a caregiver's response is the social communicative purpose of the utterance. Pragmatic functions include acknowledging a child's communication, requesting clarification of what a child said, maintaining the conversational topic by taking a turn, offering related information, asking for information, or primarily providing specific linguistic input (e.g., defining words, expanding sentence structure, recasting phrases to model a more accurate verbal response). Linguistic input may be semantic (about meanings of words or phrases), syntactic (about the structure of phrases and sentences), or both. Figure 2 provides examples of the syntactic form and pragmatic function of caregivers' responses, with functions illustrated in the boxes on the left and associated possible forms of caregivers' responses in the boxes on the right.

Figure 2



Example syntactic functions and associated pragmatic forms of caregiver responses to children's communication

Differential Responding

Caregivers adjust the complexity and content of their language during interactions to align with the expressive and receptive abilities of their children (Barnes, Gufreund, Satterly, & Wells, 1983; Cross, 1978; Newport, Gleitman, & Gleitman, 1977; Scherer & Olswang, 1984; Snow, 1977). Caregiver use of specific types of utterances generally is related to the pragmatic function of the caregivers' communication in that instance (to acknowledge a child's utterance, to request a clarification, to continue or maintain a conversation, to teach the meaning of a word,

or to model more advanced phrases and sentences). The pragmatic function of the caregiver's response also is linked to the form, function, or language level of the child's utterance. For example, caregivers use different types of questions with children with varied levels of productive language. Research has shown that mothers use more open-ended questions with children who have multi-word utterances (perhaps because they think children have the skills to answer more complex questions and can engage in conversational turn-taking) and more clarification requests with children who use single words to communicate (Yoder, 1989; Yoder, Bishop, & Davies, 1994).

Caregivers of children with disabilities may have different response patterns than caregivers of children without disabilities. For example, Conti-Ramsden (1990) and Nelson, Welsh, Camarata, Butkovsy, and Camarata (1995) found that both mothers of children with language delays and mothers of children without language delays were highly responsive to their children's utterances, but mothers of children with language delays responded with fewer grammatical recasts than mothers of children without language delays. These differences may have been related to specific differences in their children's speech and language, reflecting children's global language status (typical or delayed). Conti-Ramsden found that after controlling for children's intelligibility, parents' use of contingent replies and simple recasts were not different for parents of children with language delays compared to parents of children without language delays. However, parents of children with language delays used fewer complex recasts in response to children's utterances, and parents' use of contingent replies and recasts served different functions in the two participant samples. For children without language delays, parents used contingent replies and recasts to respond to children's communication and to

maintain and continue the conversation. For children with language delays, parents used contingent replies and recasts to request child responses and to provide linguistic information.

The Role of Speech Intelligibility

A child-driven model of mother-child interactions suggests there are specific aspects of a child's language that elicit specific types of parent responses (Yoder & Kaiser, 1989). Children's patterns of communication and their responses to parents' utterances can inhibit parents' responses and disrupt parent-child interactions. These child behaviors include low initiation rates, unintelligible speech, longer than expected response times, gaze avoidance, and challenging behaviors (Warren & Brady, 2007).

Intelligibility refers to whether a listener can accurately understand or "decode" a person's spoken communicative attempt (Camarata, 1996) or how clearly a person speaks, so that he or she is understood by the listener (Leddy, 1999). Intelligibility is a critical component of verbal, social interactions. Communicative competence relies, in part, on speech intelligibility and how well one can be understood (Kent, 1993). In practice, the quantification of intelligibility often is derived from the percentage of words and/or the percentage of utterances understood by an unfamiliar listener (e.g., a transcriber) in a continuous, spontaneous language sample (Gordon-Brannon, 1994). Many factors influence a child's intelligibility, including the number of speech sounds with errors, speech sound error types, consistency of misarticulations, pitch inflection, speaking rate, and length of utterances (Gordon-Brannon, 1994).

Intelligibility of children with typical speech and language development. Children's intelligibility generally improves as their speech and language skills develop; however, there is considerable variability even among typically developing children. Child age, rate of speaking,

length of utterances, vocabulary, and grammar skills can impact intelligibility (Gordon-Brannon, 1994, Paul, 2001). Weiss (1982) reported that by 24 months, 26 - 50% of utterances of children with typical speech and language development should be intelligible. Children's intelligible utterances should constitute between 51% and 70% of their spoken language at 30 months, between 71% and 80% at 36 months, and between 81% and 90% at 42 months. Speech of children with typical speech and language development generally is about 100% intelligible by the time they are four-years-old (Coplan & Gleason, 1988; Gordon-Brannon, Weiss & Lillywhite, 2001; Paul, 2001; Weiss, 1982; Weiss, Gordon, & Lillywhite, 1987).

Intelligibility of children with repaired cleft lip and/or palate. Cleft lip and/or palate (CLP) is the fourth most common birth defect and affects an estimated one in every 750 births in the United States (Cleft Palate Foundation, 1999; Kummer, 2008). While children with non-syndromic CLP are not at-risk for intellectual or other disabilities (Kummer, 2008), they are at-risk for delays in speech sound acquisition and early language development. Compared to age-matched children without CLP, more young children with CLP have atypical patterns of articulation. Common articulatory errors in children with CLP include glottal stops, pharyngeal stops/fricatives, velar stops/fricatives, and mid-dorsum palatal stops (Chapman & Hardin, 1992; McWilliams, Morris, & Shelton, 1990; Trost, 1981). Although young children with CLP have more compensatory articulation errors, in a study comparing the phonetic and phonological skills of two-year-olds with cleft palate, Chapman and Hardin (1992) found that, with the exception of backing and nasal assimilation, children with and without CLP used the same phonological processes. At two-years-old, children with and without CLP were more similar than different in their language development.

Researchers have investigated the relationship between time of palatal repair surgery and the development of speech skills (e.g., Dorf & Curtin, 1982, 1990; McWilliams et al., 1990; O'Gara & Logemann, 1988). In general, better speech outcomes are associated with earlier palatal surgeries. Currently, most children with CLP have their initial palate repairs around 12 months of age. After cleft palate repair, children with CLP have the capacity to produce normal speech. Although speech development improves after surgery, use of compensatory errors and delays in mastery of speech sounds still are observed in young children with repaired CLP (Jones, Chapman, & Hardin-Jones, 2003). In some cases, speech errors continue for one to three years following palatal surgery (O'Gara & Logemann, 1988; Chapman & Hardin, 1992). In general, young children with repaired CLP tend to produce more speech errors than children without CLP, but the development of speech and intelligibility is variable within this population. Decreased intelligibility in children with CLP may affect how caregivers respond to their children's communication attempts. Lower levels of child intelligibility possibly could result in caregivers more frequently seeking clarification or failing to understand the child's communicative intent and thus lead caregivers to provide less linguistic and conversational input to the child. Reduction in the frequency or disruption of the match between caregiver and child linguistic and conversational input could play a role in delaying children's semantic and syntactic language development.

Impact of intelligibility on caregiver responsiveness. Speech intelligibility and caregiver support for language development are related. To respond appropriately, provide additional, meaningful linguistic input, and to maintain conversations, caregivers must be able to understand their children (Camarata, 1996).

Child intelligibility may impact the form and function of caregivers' responses to children's communication. In a study examining parents' use of expansions, Yoder, Hooshyar, Klee, and Schaffer (1996) reported mothers of children with Down syndrome and mothers of children with language delays used similar numbers of expansions, but they differed in the types of child utterances they expanded. After controlling for the total number of utterances and the total number of child utterances and parent expansions, Yoder and colleagues found mothers of children with Down syndrome expanded more partially intelligible multi-word utterances, and mothers of children with language delays but without Down syndrome expanded more fully intelligible multi-word utterances. Differences in mothers' use of expansions may be related to a specific child characteristic, such as overall intelligibility. Compared to children with language delays, children with Down syndrome had more partially intelligible multi-word utterances and fewer fully intelligible multi-word utterances. Thus, for parents of children with Down syndrome, most opportunities to expand were when children produced partially intelligible multi-word utterances. Chapman and Hardin (1991), in a study examining language input during maternal interactions with children with CLP, concluded that mothers of children with and without CLP had similar rates of responsiveness to children's utterances; however, mothers of young children with CLP produced 50% more repetition requests following child utterances than mothers of children without CLP. Repetition requests may have replaced expansions in these mother-child interactions and thus reduced the frequency of contingent linguistic input for children with CLP.

Summary

Caregivers' use of expansions, comments that provide related, semantic input, and contingent, related questions may facilitate children's language development by (a) providing more advanced linguistic input that is related to the child's interest and presented at a time when the child may more easily process the information; (b) eliciting a child's communication, which in turn may provide more opportunities for the caregiver to contingently respond to the child and model related language; and (c) teaching and supporting conversational turn-taking and topic maintenance. Language learning opportunities may be greatest when caregivers use a combination of response strategies and match the form and function of their response to the child's communicative intent and language level. However, variations in child spoken language, as well as child language skills, influence the number of opportunities caregivers have to respond with meaningful, related language and to use strategies to maintain and extend conversational interactions. Fewer opportunities to use different language support strategies may impact children's overall language learning environment. One possible behavior that may influence the content of caregivers' contingent responses is the intelligibility of children's speech.

Study Purpose

The purpose of this study was to investigate the role of child intelligibility in caregiver-child interactions and to examine caregivers' responses to children's (a) intelligible utterances; (b) partially intelligible utterances; and (c) unintelligible utterances. For the purposes of this study, intelligible utterances were defined as utterances in which one or more content words were understood by an unfamiliar listener, who was not the child's conversational partner (i.e., the transcriber). The speech sounds for each word in the intelligible utterance either were

produced correctly or produced with articulatory errors that did not prevent the transcriber from understanding the word(s). Partially intelligible utterances were defined as utterances consisting of two or more content words in which at least one word was intelligible and one word was unintelligible (could not be understood). Unintelligible utterances were utterances consisting of one of more words in which no words were understood by the transcriber. Comments included linguistic expansions, imitations, semantically related comments that were not linguistic expansions, and simple acknowledgements of children's communication, such as "uh-huh," "yes," or "ok." Questions included all types of questions asked by the parent: open-ended questions, yes/no questions, choice questions, test questions, and comments with rising intonation indicating questioning intent (see Appendix A).

Because the focus of this study was on the impact of child intelligibility on caregiver responding, children with similar levels of language development who would provide a range of intelligible speech were selected. Toddlers with typical speech and language development and toddlers with non-syndromic, repaired CLP were included. Toddlers with CLP tend to have less intelligible speech compared to their age-matched peers without CLP, but they do not have other disabilities (e.g., cognitive delays or intellectual disabilities), and their overall language development typically is within normal range. Although we did not expect caregivers to respond differentially to toddlers with and without CLP based on cleft palate status (Chapman & Hardin, 1991), it is possible that the proportion of caregivers' use of specific forms and functions of communication in response to the communication of children with CLP differed based on the proportion of children's intelligible speech.

This study was an exploratory study, which may serve as a basis for future studies investigating the combination of caregiver language support strategies needed to promote

optimal language development for children with high rates of unintelligible speech. This study was the first step in establishing a developmental model for caregiver responding by examining how the forms, functions, and rates of caregivers' contingent verbal responses change as children age and as children's speech and language skills develop.

Research Questions

This study was designed to address the following research questions:

1. How do caregivers respond to children's intelligible, partially intelligible, and unintelligible utterances? More specifically, for each type of child utterance (intelligible, partially intelligible, and unintelligible), what percentage of caregivers' responses are (a) comments; (b) questions; or (c) others?
2. When controlling for age and language skills, are there significant differences in intelligibility in children with repaired CLP compared to children with typical speech and language development?
3. Do caregivers use different language strategies based on the intelligibility of children's utterances? More specifically,
    a. Controlling for child age, language skills, and CLP status, what is the average probability of caregivers responding to children's unintelligible utterances with a question?
        i. Is there a significant difference in the probability of caregivers' use of questions in response to intelligible and unintelligible utterances?

ii. Is there a significant difference in the probability of caregivers' use of questions in response to partially intelligible and unintelligible utterances?

b. Controlling for child age, language skills, and CLP status, what is the average probability of caregivers responding to children's unintelligible utterances with a related comment that provides semantic input?

i. Is there a significant difference in the probability of caregivers' use of related comments and expansions in response to intelligible and unintelligible utterances?

ii. Is there a significant difference in the probability of caregivers' use of related comments and expansions in response to partially intelligible and unintelligible utterances?

4. Given the probability of intelligible, partially intelligible, and unintelligible child utterances, what is the probability caregivers of children with CLP and caregivers of children with typical speech and language development will (a) respond to intelligible utterances with a question; (b) respond to intelligible utterances with a related comment or expansions; (c) respond to unintelligible utterances with a question; and (d) respond to unintelligible utterances with a related comment?

CHAPTER II

METHOD

Participants

A total of 38 children and their primary caregivers participated in this study. Data for this study were selected from two samples: (a) 19 children with non-syndromic, repaired CLP and (b) 19 children with typical language development. Participants were recruited through two larger research projects, the first funded by the National Institute for Deafness and Other Communication Disorders (NIDCD) and the second funded by the Vanderbilt Institute for Clinical and Translational Research (VICTR). Children with repaired CLP were recruited to participate in a randomized experimental group design study evaluating the effectiveness of an early intervention (Enhanced Milieu Teaching [EMT] with a phonological recasting emphasis; [EMT-SPEECH]) to facilitate speech and vocabulary development. Children with typical speech and language development were recruited to participate in a study comparing development of children with typical speech and language with the development of children with Specific Language Impairment (SLI) receiving EMT intervention or business-as-usual community therapies. Data collected for the proposed study were selected from the baseline assessment periods (Time 0) for these two existing studies.

Children with repaired cleft palates. Data from 19 children who were recruited to the EMT-SPEECH study between February 2010 and December 2011 were analyzed in the current study. Procedures for recruitment and assessment of those children were as follows. Children with non-syndromic, repaired CLP were recruited at two sites: Vanderbilt University in

Nashville, TN and East Tennessee State University in Johnson City, TN. Children were included in this study if they (a) were between 15 and 36 months old; (b) had a cognitive scale composite score of 80 or above on the *Bayley Scales of Infant and Toddler Development-III* (Bayley-III; Bayley, 2006); (c) could produce at least five different words per parent report on the *MacArthur-Bates Communicative Development Inventory (*MCDI; Fenson et al., 2007); and (d) demonstrated at least one type of articulatory error. These errors could include: (a) a compensatory error on at least one phoneme; (b) a consonant inventory of fewer than five stop or nasal consonants in all positions; and/or (c) errors on at least two stop or nasal consonants. Children were excluded from the sample if they (a) had a sensorineural hearing loss or sound field hearing threshold over 30dB HL, as measured by an audiologist or confirmed by the medical record; (b) were multilingual or non-English speaking based on parent report; (c) had a syndrome diagnosis from a geneticist; and/or (d) had more than three additional dysmorphic features in addition to the CLP.

Participants were recruited through flyers, websites, and advertisements. Flyers were sent to families of toddlers with CLP identified by Vanderbilt Children's Hospital Cleft Team, Bill Wilkerson Speech and Hearing Clinic, Tennessee's Early Intervention System (TEIS), the Regional Health Department, the International Adoptions Clinic, and local pediatricians, plastic surgeons, and speech language pathologists. Flyers also were distributed to area preschools, childcare centers, CLP support groups, and physicians' offices, and a monthly advertisement was printed in the Nashville and Williamson County Parent magazines. In addition, a description of the study was posted on the project webpage (http://kc.vanderbilt.edu/kidtalk/project-Speech.html) and on a project Facebook page (www.facebook.com).

Parents provided written consent for their children to participate in the project. The principal investigator (PI) or the project director (a certified speech-language pathologist) met with each parent to describe the study, review the written consent form, and answer any questions.

Children with typical speech and language development. Data from 19 children recruited to the language benchmarking study between November 2009 and December 2011 were analyzed in the current study. Procedures for recruitment and assessment of those children were as follows: Children with typical language development were recruited at Vanderbilt University. Children between 12 and 42 months were included in this sample if they had (a) a cognitive scale composite score of 90 or above on the Bayley-III; (b) a receptive communication subtest scaled score of 9 or greater on the Bayley-III; (c) an expressive communication subtest scaled score of 9 or greater on the Bayley-III; and (d) a language composite score of 90 or above on the Bayley-III. Children were excluded if they (a) had a diagnosis of a specific disability (e.g., autism spectrum disorder, Down syndrome, developmental delay); (b) had a sensorineural hearing loss or sound field hearing threshold over 30dB HL, as measured by an audiologist; (c) presented evidence of oral motor deficiencies based on the *Kaufman Speech Praxis Test for Children* (KSPT, Kaufman, 1995); and/or (d) were multilingual or non-English speaking per parent report.

Participants were recruited through flyers, websites, and advertisements. Flyers were distributed to area preschools and childcare centers and posted in the Vanderbilt University Kennedy Center. In addition, a monthly advertisement was printed in the Nashville and Williamson County Parent magazines. A description of the study also was posted on the project

webpage (http://kc.vanderbilt.edu/kidtalk/project-WORLD.html) and on a project Facebook page (www.facebook.com).

Parents provided written consent for their children to participate in the project. The principal investigator (PI) or the project director (a certified speech-language pathologist) met with each parent to describe the study, review the written consent form, and answer any questions.

Participant matching. Participants with typical language development were age and gender matched to participants with repaired CLP. For every selected participant with CLP, a participant with typical language development, who was the same gender as the participant with CLP and who was the same age (± 1 month) at baseline assessment, was identified and included in the sample of children with typical language development. Nineteen participants from each existing study were selected for an overall total sample of 38 children and their caregivers.

Screening and Assessment

Children in both extant studies were assessed using the sample protocols and assessment instruments indicated for the study (e.g., Bayley-III, PLS-4, MCDI, language sample). A speech language pathologist or master's level research assistant conducted all assessments, following the protocols developed for each measure. Assessors were trained to fidelity on the assessments before each study began and fidelity was reviewed for approximately 20% of the assessments distributed across time and participants. Scoring for each assessment was checked, and any disagreements in scoring were resolved before a final score was computed. Data then were doubled entered into a database, and any disagreements in data entry were resolved by consensus.

Cognitive skills. Children's cognitive skills were assessed using the Cognitive Scale of the Bayley-III. The Bayley-III is an individually administered, standardized, norm referenced assessment for children between 1 and 42 months. The Bayley-III measures infant and toddler development across five domains (Cognitive, Language, Motor, Social-Emotional, and Adaptive) and was developed to identify infants and toddlers with possible developmental delays. During this assessment, an examiner showed the child pictures and objects and asked the child to perform a series of tasks. Items on the Cognitive Scale were written to assess children's sensorimotor development, concept formation, and memory.

Language skills. Language skills were assessed using (a) standardized, norm referenced assessments; (b) language samples; and (c) caregiver report. The Language Scale of the Bayley-III was used to screen the language development of children with typical speech and language development. This language scale includes expressive and receptive language items. Receptive communication items measure vocabulary development, morphological development, social referencing, and verbal comprehension and require the child to point to or identify pictures and objects. Expressive communication items evaluate preverbal communication (e.g., babbling, gesturing), vocabulary development, and morpho-syntactic development. Children were asked to name objects, pictures, and/or attributes and to answer items that required them to use two-word utterances, plurals, and correct verb tense.

The *Preschool Language Scale - Fourth Edition* (PLS-4; Zimmerman, Steiner, & Pond, 2002), a standardized, norm referenced assessment, was individually administered to each participant (children with and without CLP) to assess participants' receptive and expressive language skills. The PLS-4 was designed to identify children with potential language delays and can be used with children from birth until 7-years-old. The PLS-4 uses a combination of elicited

and spontaneous child responses as well as caregiver report to assess children's understanding of language and their communication skills. Three standard scores were obtained from the PLS-4: (a) an Auditory Comprehension score; (b) an Expressive Communication score; and (c) a Total Language Score. Internal consistency reliability estimates, as measured by coefficient alpha, for children between 12 and 36 months in the norm sample ranged from 0.72 to 0.94 for the Auditory Comprehension scale, from 0.88 to 0.94 for the Expressive Communication scale, and from 0.88 to 0.97 for the overall scale. These values support the internal structure of the scale and the reliability of inferences made from the scores obtained on this measure.

Children's language also was assessed through language samples. An examiner followed a standardized protocol for presenting materials and responding to children's verbal communication during a 20-min language sample session in a clinic room (see Appendix B). During the 20-min session, the examiner presented a wordless picture book (e.g., *Goodnight Moon* or *Good Dog Carl*) and at least four sets of toys (e.g., babies, barn, cars, blocks, balls). The examiner introduced each toy set by naming the toy set and asking the child what they should do or where they should go. To elicit child language, the examiner pointed to at least four different pictures in the wordless book, modeled at least two novel play actions per toy set, and used two environmental strategies per toy set. These environmental strategies included sabotage, assistance, silly situations, in view but out of reach, and choice making (definitions for each strategy are provided in Appendix B). The examiner did not introduce any new language during the session but responded to the child by repeating all intelligible child utterances produced or acknowledging unintelligible utterances (e.g., if the examiner did not understand the child, she may have said "yeah" or "uh-huh" to acknowledges the child's utterance). Language samples were video recorded, transcribed and verified using the *Systematic Analysis of Language*

Transcripts software (SALT; Miller & Chapman, 2008), and analyzed to determine children's mean length of utterance in morphemes (MLUm), total number of words (TNW) used in the sample, number of different words (NDW) used in the sample, and percent intelligibility.

Caregivers completed the MCDI. The MCDI is a measure of children's expressive vocabulary. The MCDI provides caregivers with a list of words by category (e.g., animals, toys, food and drink, body parts), and caregivers indicate whether their children can produce the word. The total number of words selected by the caregiver serves as an estimate of the total number of words in the child's vocabulary. The MCDI has high internal consistency, with a reported coefficient alpha value of .96.

Caregiver measures. Caregivers also completed a demographic, researcher-created survey (see Appendix C). Information from this form was used to describe the participant sample.

Caregiver-Child Interactions

Procedures. A sample of caregiver-child interactions (CCX) was collected in a clinic setting. Before the CCX session began, the examiner showed the caregiver (e.g., mothers, fathers, grandmothers) a bookshelf of toys and told her to play with as many of the toys as she would like during the session. Caregivers were asked to play with their children as "they normally would." The play session lasted 10-min and was video recorded. A timer beeped after 10-min passed, and the caregiver was told she could stop playing after the timer beeped. The examiner started the timer after the caregiver and child selected and began playing with a toy. No coaching or feedback was provided to the caregiver during the session.

Materials. Caregivers and their children chose toys from a standard set of caregiver-child interaction materials. The toys in this set included developmentally appropriate toys for children between 15 and 36 months with varied play skills. Toys included: (a) a dump truck with a man figure; (b) two balls; (c) a garage with three cars; (d) wooden blocks; (e) a bus with nine toy people; (f) a phone; (g) a jungle animal puzzle; (h) wooden doll house and furniture; (i) pots and pans; (j) dinosaurs; (k) jungle animals; (l) people; (m) farm animals; (n) a pop-up toy; and (o) a shape sorter with five shapes. Procedures for caregiver-child play interactions and play materials are presented in Appendix D.

Transcription and Coding

Transcription. Language samples and CCXs were video recorded and then transcribed by trained transcribers. Transcribers were bachelors level research staff members who had been trained to criterion on multiple practice videos before the study began. Sessions were transcribed following conventional transcription procedures using SALT (see Appendix E). For children with repaired CLP, a certified speech-language pathologist verified transcripts prior to analysis and coding to ensure accurate transcription and correct any transcription errors. For children with typical language development, the primary coder (the author of this study) verified all caregiver-child interaction transcripts prior to analysis and coding.

Coding. Coding of child and adult utterances was completed by watching the videos of the CCX sessions and appending codes to the end each utterance in the verified SALT-based transcript. First, each child utterance was coded as intelligible, unintelligible, or partially intelligible. Second, every adult utterance was coded as (a) response to a child verbal utterance

or (b) not in response to a child verbal utterance. Third, every adult utterance then was coded as (a) question; (b) comment; or (c) other. Fourth, each adult utterance that immediately followed a child's utterance was further coded as (a) an acknowledgement; (b) imitation; (c) related comment; (d) expansion; (e) question – test; (f) question - yes/no; (g) question – choice; (h) question – open-ended; (h) comment with rising intonation; (i) directive; (j) unrelated response; (k) no opportunity to respond; or (l) no response. The SALT software then automatically counted and reported the occurrence of behavioral codes within the transcript within the transcript analysis and code summary functions of the software. Coding procedures are in Appendix A.

Coder training. The author served as the primary coder for all sessions. A second coder, a research assistant with 1 year of experience transcribing and coding language samples, CCX sessions, and intervention sessions with young children, was trained on the code for reliability purposes. First, the second coder read the CCX coding manual. Second, the two coders met to review the code and discuss any questions. Third, the two coders jointly watched a CCX session and reviewed a coded transcript. Fourth, the two coders independently coded a CCX session and then met to review the session and discuss any disagreements. Coders independently coded practice CCX sessions until they reached 85% agreement on all code categories for three consecutive videos. All coding disagreements during the training phase were reviewed and discussed before an additional session was coded.

Interobserver agreement. Interobserver agreement (IOA) was calculated for the coding of approximately 32% of CCX samples. The point-by-point formula was used across each code or code category. Every code was compared across the two coders. An agreement was recorded if both coders assigned the same code. A disagreement was recorded if the reliability coder's code did not match the primary coder's code. Rules and procedures for recording agreements and

disagreements for caregiver codes are provided in Appendix A. To calculate the percentage of IOA, the total number of agreements was divided by the total number of agreements plus disagreements, and this quotient was multiplied by 100. Agreements and disagreements for codes within each code category (e.g., child intelligibility codes, adult response form, adult response type) were aggregated to obtain IOA values for each category. For example, number of agreements and disagreements for codes of caregivers' use of open-ended question, test questions, choice questions, yes/no questions, and comments with rising intonation were summed and used to calculate the overall IOA for "Caregiver Question Type." IOA was calculated after approximately every third primary coded session to allow for coding reliability checks throughout the coding process. If IOA on any code was less than 85% agreement, the two coders met to review discrepancies before any additional sessions were coded. IOA data summarized by code category are in Table 1.

Table 1
Interobserver Agreement for CCX Session Coding

	Child Utterance Type[a]	Adult: No Response/ Opportunity	Adult: Response Form[b]	Adult: Comment Type[c]	Adult: Question Type[d]
# of Agreements					
Mean	91.5	16.17	55.58	21	23
SD	49.26	14.25	28.87	12.12	15.52
# of Disagreements					
Mean	0.67	1.08	4.33	1.58	4.36
SD	1.50	1.38	2.81	1.38	3.61
% Agreement					
Mean	98.72%	94.65%	93.10%	93.80%	87.5%
SD	3.7%	5.4%	3.9%	3.9%	7.9%
Range	(87.18%, 100%)	(82.75%, 100%)	(87.2%, 100%)	(80.0%, 100%)	(77.36%, 100%)

[a:] Intelligible, Partially Intelligible, or Unintelligible
[b:] Comment, Question, or Other
[c:] Imitation, Acknowledgement, Expansion, or Related Comment
[d:] Open-Ended, Test, Yes/No, Choice, Comment with Rising Intonation

Data Analysis

Because this was an exploratory study, three approaches to data analysis were used to provide a fuller understanding of the relation between child intelligibility and caregiver verbal responses to child utterances. First, a descriptive analysis was conducted to describe the child and caregiver behaviors (e.g., number of utterances, number of words used, number of different words used, child intelligibility) and to examine how caregivers responded to three types of children's utterances – fully intelligible, partially intelligible, and unintelligible. Second, a multilevel analysis was conducted to determine if there were statistical differences in the use of two important caregiver responses, questions and comments that provide semantic input, in response to three types of child utterances (intelligible, partially intelligible, and unintelligible utterances). Third, due to the sequential nature of the data (child utterance followed by caregiver

response), a sequential analysis was conducted to analyze caregiver responses to intelligible and unintelligible child utterances while controlling for the number and types of child utterances and caregiver responses. The sequential analysis provided information about the probability of a specific type of caregiver response given a type of child utterance.

Prior to data analysis, all data obtained from SALT transcript reports were entered into an Excel spreadsheet. For each CCX session, two SALT analysis reports were printed. Data from these reports were entered independently by the author and a research assistant into Excel spreadsheets. The spreadsheets then were compared, and data entry discrepancies were identified and discussed and a consensus entry determined. The clean data file was exported into an SPSS data file for analysis of child and caregiver behaviors. Demographic and assessment data were double entered into REDCap, a secure, web-based database. These data were exported into an Excel file and checked for any data entry errors. A clean Excel datafile, with no data entry errors, was exported to the SPSS data file for analysis. Sequences of behaviors (i.e., child utterance type and adult response type (including no response)) were embedded into the adult codes for each adult utterance or adult line in the transcript. These codes were used to determine each cell value for the 2 x 2 table for the sequential analysis. The code summary data that were double entered into Excel using the SALT reports also were used to prepare for the sequential analysis.

Research Question 1

Descriptive methods were used to address the first research question of how caregivers respond to children's intelligible, partially intelligible, and unintelligible utterances. Two SALT analysis reports were run. First, a standard measures analysis report was generated to obtain the values for caregiver and child total utterances, MLU in morphemes (MLUm), number of

different words used in the session (NDW), total number of words used in the session (TNW), words used per minute (WPM), and percent intelligibility. Second, a code summary report was generated to examine the frequency of each code coded within a CCX. From this code summary report, the number of caregiver responses that were (a) acknowledgements; (b) imitations; (c) related comments; (d) expansions; (e) questions; (f) open-ended questions; (g) yes/no questions; (h) choice questions; (i) test questions; (j) comments with rising intonation; or (k) others in response to each type of child utterance (a) intelligible; (b) partially intelligible; or (c) unintelligible was generated. Data reported in the standard measures and code summary reports were entered in the Excel spreadsheet, and the percent of caregiver responsiveness by child utterance type and percent of each type of caregiver utterance in response to child utterance type were calculated within Excel. Means, ranges, and standard deviations for each variable were calculated using a descriptive analysis within SPSS.

Research Question 2

An analysis of covariance (ANCOVA) was conducted using SPSS to examine whether there were significant differences in children's percent of intelligible utterances during the language sample between children with typical speech and language development and children with non-syndromic, repaired CLP. Child age (in months) and overall language skills (as measured by the Total Language standard score on the PLS-4) were entered as covariates into the ANCOVA to control statistically for these child level variables.

Research Question 3

To address questions 3a and 3b, a hierarchical 2-level logistic means model was used. A logistic model was employed because caregiver response type was considered a dichotomous variable in the analysis such that a code of 1 was used to represent the caregiver response of interest (for RQ3a, the response of interest was questions, and for RQ3b, the response of interest was related comments and expansions), and a code of 0 was used to represent all other types of caregiver responses. Specifically, a random-intercepts model with child utterances and caregivers' responses (Level-1) nested within dyads (Level-2) was used to examine whether caregivers used different strategies based on the intelligibility of children's utterances; this model was conditional on child age, language skills, and CLP status. In this model, Level-1 included the effect of type of child utterance (intelligibility) on caregiver responses, and Level-2 included covariates that could influence caregiver responses (i.e., child age, language skills, and CLP status). Coded transcripts were imported into Excel. All caregiver utterances that were not in response to a child utterance were deleted. The coded utterance level file was then imported into SPSS. The SPSS data file included the child/caregiver dyad ID, the type of child utterance, and the type of caregiver response for each matched child utterance and caregiver response sequence within the CCX. Letter codes were replaced with numeric values corresponding to the dummy codes for the analysis. In the first model (questions), child utterances (intelligible, partially intelligible, and unintelligible) were dummy coded with unintelligible utterances serving as the reference group. The first dummy code (I_U) was coded 1 when a child's utterance was intelligible and 0 otherwise; the second (P_U) was coded 1 when a child's utterance was partially intelligible and 0 otherwise. After entering both dummy codes into the model, the intercept and the coefficients associated with each code were examined to answer RQ3a. First, the intercept

provided an estimate of the average probability of a caregiver using a question to respond to a child's unintelligible utterance. Then differences in the average probability of caregivers responding with questions to intelligible and unintelligible utterances was examined using the I_U coefficient, followed by examining the differences in responding with questions to partially intelligible and unintelligible utterances using the P_U coefficient. Coefficients of the covariates were examined to test for interactions between each covariate and differences in caregivers' responses. Because the intercept and coefficient values were in logit form, values were converted to a predicted probability using the following formula:

$$\varphi_{ij} = \frac{1}{1 + \exp\{-\eta_{ij}\}}$$

In the second model (related comments and expansions), the intercept provided an estimate of the probability of a caregiver responding to a child's unintelligible utterance by providing a related comment (a linguistically meaningful comment about what the child was playing or doing). Differences in the probability of caregivers providing a related comment or expanding the child's utterance in response to unintelligible versus intelligible utterances were examined using the coefficient of the I_U dummy variable. Differences in the probability of caregivers providing a related comment or expanding the child's utterance in response to partially intelligible and unintelligible utterances were examined using the coefficient of the P_U dummy variable. Coefficients of the covariates entered with each dummy variable were examined to test for interactions between the covariate and differences in caregiver responding. The statistical models were tested using *HLM 6: Hierarchical Linear & Nonlinear Modeling* software (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004).

Statistical model for research question 3a. The following hierarchical 2-level logistic means model was used to examine caregivers' use of questions in response to children's utterances.

Level 1 (utterances):

$$Caregiver\ Use\ of\ Questions_{iu} = \pi_0 + \pi_{1u} I\_U_{iu} + \pi_{2u} P\_U_{iu} + \frac{\pi^2}{3}$$

Level 2 (dyads):

$$\pi_0 = \beta_{00} + \beta_{01}(child\ age\ in\ months)_u + \beta_{02}(total\ language\ skills)_u + \beta_{03}(CLP\ status)_u + u_{0j}$$

$$\pi_{1u} = \beta_{10} + \beta_{11}(child\ age\ in\ months)_u + \beta_{12}(CLP\ status)_u + u_{0j}$$

$$\pi_{2u} = \beta_{20} + \beta_{21}(child\ age\ in\ months)_u + \beta_{22}(CLP\ status)_u + u_{0j}$$

In this model, β_{00} represents the average probability caregivers respond to children's unintelligible utterances with a question; β_{10} represents the difference in probability of caregivers responding with a question to children's intelligible versus unintelligible utterances; β_{20} represents the difference in probability of caregivers responding with a question to children's partially intelligible versus unintelligible utterances. β_{11} represents the interaction between child age and differences in caregivers' use of questions in response to intelligible versus unintelligible utterances. β_{12} represents the interaction between having a repaired CLP and differences in caregivers' use of questions in response to intelligible versus unintelligible utterances. β_{21} represents the interaction between child age and differences in caregivers' use of questions in response to partially intelligible versus unintelligible utterances, and β_{22} represents the interaction between having a repaired CLP and differences in caregivers' use of questions in response to partially intelligible versus unintelligible utterances. Because caregivers' use of questions was a dichotomous variable (used a question versus all other responses), responses

followed a Bernoulli distribution. Model error or variance associated with a Bernoulli distribution was assumed to be $\frac{\pi^2}{3}$.

Statistical model for research question 3b. The following hierarchical 2-level logistic means model was used to examine caregivers' use of comments that provide semantic input (i.e., related comments and expansions) in response to children's intelligible, partially intelligible, and unintelligible utterances.

Level 1 (utterances):

$$\textit{Caregiver Use of Related Comments and Expansions}_{iu} = \pi_0 + \pi_{1u} I\_U_{iu} + \pi_{2u} P\_U_{iu} + \frac{\pi^2}{3}$$

Level 2 (dyads):

$$\pi_0 = \beta_{00} + \beta_{01}(\textit{child age in months})_u + \beta_{02}(\textit{total language skills})_u + \beta_{03}(\textit{CLP status})_u + u_{0j}$$

$$\pi_{1u} = \beta_{10} + \beta_{11}(\textit{child age in months})_u + \beta_{12}(\textit{CLP status})_u + u_{0j}$$

$$\pi_{2u} = \beta_{20} + \beta_{21}(\textit{child age in months})_u + \beta_{22}(\textit{CLP status})_u + u_{0j}$$

In this model, β_{00} represented the average probability caregivers respond to children's unintelligible utterances with a related comment (a linguistically meaningful comment about what the child was playing or doing).; β_{10} represented the difference in probability of caregivers responding with a related comment or expansion to children's intelligible versus unintelligible utterances; β_{20} represented the difference in probability of caregivers responding with a related comment or expansion to children's partially intelligible versus unintelligible utterances. β_{11} represented the interaction between child age and differences in caregivers' use of related comments and expansions in response to intelligible versus unintelligible utterances. β_{12} represented the interaction between having a repaired CLP and differences in caregivers' use of related comments and expansions in response to intelligible versus unintelligible utterances. β_{21}

represented the interaction between child age and differences in caregivers' use of related comments and expansions in response to partially intelligible versus unintelligible utterances, and β_{22} represented the interaction between having a repaired CLP and differences in caregivers' use of related comments and expansions in response to partially intelligible versus unintelligible utterances. Because caregivers' use of related comments and expansions was a dichotomous variable (used a meaningful comment versus all other responses), responses followed a Bernoulli distribution. Model error variance associated with a Bernoulli distribution was assumed to be $\frac{\pi^2}{3}$.

Research Question 4

Event-based sequential analysis procedures were used to determine the probability caregivers (a) respond to unintelligible utterances with a question; (b) respond to unintelligible utterances with a related comment; (c) respond to intelligible utterances with a question; and (d) respond to intelligible utterances with a related comment or expansion. Sequential analyses were run separately for each subgroup of participants (i.e., children with and without non-syndromic, repaired CLP). Therefore, a total of eight pooled sequential analyses were conducted – four for each participant group. Research Question 4 differed from Research Question 3 in that Research Question 4 controlled for the base rates of utterance types, accounted for all types of caregiver responses, and allowed for a more detailed examination of caregiver responses following types of child utterances by participant group.

Sequential analysis was selected to address the fourth research question because it captures sequences of coded events to examine the probabilities of those sequences while accounting for sequences that occur by chance (Yoder & Feurer, 2000). Yule's Q was used as the index of sequential association. Yule's Q controls for the probability of child utterance types and

caregiver response types and quantifies the sequential association between child utterance type and caregiver response type. On a scale of -1.0 to 1.0, the value of Yule's Q indicates whether the sequential association is larger or smaller than a chance occurrence of the sequence. A Yule's Q value of zero indicates no sequential association between the child utterance type and the caregivers' response type. A negative Yule's Q value indicates that caregivers' response type occurs after a child utterance type at less than chance estimates. A positive Yule's Q value indicates that caregivers' response type occurs after a child utterance type more frequently than is estimated by chance (Yoder & Feurer, 2000). Yule's Q was calculated using the following formula:

$$\text{Yule's Q} = ((A*D) - (B*C))/ ((A*D) + (B*C))$$

In this formula, A = the number of specified adult responses (e.g., questions) following the specified child utterance type (e.g., unintelligible utterances); B = the number of all other adult response types following the specified child utterance type (e.g., unintelligible utterances); C = the number of specified adult responses (e.g., questions) following all other types of child utterances; and D = the number of other adult response types following all other child response types.

CHAPTER III

RESULTS

Participants

Thirty-eight children and their caregivers participated in this study, 19 children with non-syndromic, repaired CLP and 19 children with typical speech and language development. Thirty-three caregivers were mothers. Three fathers and two grandmothers also participated in this study. Two fathers and one grandmother were primary caregivers. The other father and grandmother shared caregiving responsibilities with the child's mother. Descriptive and demographic information by subgroup are presented in Tables 2 and 3. There were no statistical differences between children with repaired CLP and children with typical speech and language and their caregivers on each of the categorical variables presented in Table 2. Chi-square analyses indicated there were no significant differences between groups on race χ^2 (2) = 5.70, p = 0.058, caregiver education χ^2 (3) = 3.623, p = 0.305, and SES χ^2 (14) = 15.270, p = 0.360. No differences were observed in caregiver age between caregivers of children with repaired CLP and children with typical speech and language development, F (1,34) = 2.11, p = 0.155. Children in each group were age and gender matched, and no significant differences were observed for child gender, χ^2 (1) = 0.128, p = 0.721, or child age F (1,36) = 0.000, p = 1.000.

Table 2
Participant Characteristics

	Children with CLP		Children with Typical Language	
	Frequency	Percent (%)	Frequency	Percent (%)
Total Number	19		19	
Gender				
Male	13	68.4	13	68.4
Female	6	31.6	6	31.6
Race				
Caucasian	15	78.0	14	73.7
African American	1	5.3	5	26.3
Asian	3	15.8	0	0
Cleft Palate Type				
Cleft Palate Only	2	10.5		
Unilateral CLP	13	68.4		
Bilateral CLP	3	15.8		
unknown	1	5.3		
Caregiver				
Mother	15	78.9	18	94.7
Father	2	10.5	1	5.3
Grandmother	2	10.5	0	0
Caregiver Education Level				
High School Graduate	2	10.5	1	5.3
Some College	4	21.1	4	21.1
4 Year Degree	7	36.8	4	21.1
Graduate School	4	21.1	10	52.6
SES				
< $25,000	1	5.3	3	15.8
$30,000 - $45,000	4	21.1	1	5.3
$50,000 - $70,000	5	26.3	4	21.1
$75,000 - $90,000	8	42.1	11	57.9
unavailable	1	5.3	0	0

Table 3
Participant Age

	Children with CLP			Children with Typical Language		
	Mean	SD	Range	Mean	SD	Range
Child age (months)	28.11	4.75	(18, 36)	28.11	5.03	(17, 37)
Caregiver age (years)	31.94	6.18	(21, 43)	34.58	4.68	(24, 44)
Age of CLP repair (months)	11.91	4.43	(9, 27)			

Mean standard scores on language and cognitive measures fell within the average range for all participants. For the full group, participants had a mean Bayley-III cognitive composite score of 99.74 (SD = 8.30) and mean standard scores of 102.95 (SD = 15.00) on the PLS-IV auditory comprehension scale, 102.13 (SD= 16.67) on the PLS-IV expressive communication scale, and 102.92 (SD = 16.51) on the PLS-IV total language scale. On average, caregivers reported on the MCDI that children had 351.20 total spoken words in their repertoire (SD = 207.67). No significant differences were observed on standardized cognitive and language measures for children with and without CLP. Means, standard deviations, ranges, and effect sizes for cognitive and language scores by participant group are shown in Table 4, and correlations between measures are provided in Appendix F.

Although there were no differences in MLUm between the two groups (F (1, 36) = 2.085, p = 0.157), significant differences in number of different words used (NDW) and number of total spoken words (TNW) in the language sample were observed between children with and without CLP. Children with CLP had fewer NDW (F (1, 36) = 7.174, p = 0.011) and fewer TNW (F (1, 36) = 10.635, p = 0.002) compared to children with typical speech and language development.

Table 4
Child Cognitive and Language Measures

	Children with CLP			Children with Typical Language			Effect Size
	Mean	SD	Range	Mean	SD	Range	d
Bayley-III cognitive composite score	101.05	10.75	(80, 120)	98.42	4.73	(90, 110)	0.37
PLS-IV auditory comprehension standard score	101.11	16.10	(67, 128)	104.79	14.01	(85, 136)	-0.24
PLS-IV expressive communication standard score	99.47	16.88	(74, 128)	104.79	16.47	(85, 147)	-0.32
PLS-IV total communication standard score	100.42	17.16	(68, 129)	105.42	15.89	(85, 146)	-0.30
MCDI total words (parent report)	333.44	227.51	(7, 642)	354.33	195.50	(17, 654)	-0.10
Language Sample – NDW*	33.42	29.37	(3, 91)	68.21	48.40	(7, 166)	-0.87
Language Sample – TNW*	90.74	84.96	(3, 257)	305.74	274.53	(20, 1167)	-1.06
Language Sample – MLUm	1.73	0.75	(1, 3.84)	2.18	1.13	(1.00, 4.57)	-0.47
Language Sample – Percent Intelligibility*	48.95	20.14	(11, 90)	60.00	13.19	(29, 86)	-0.65

* $p < .05$

Caregiver Responses to Child Utterances

On average, children had about 68 utterances in each 10-min CCX session, with total number of utterances ranging from 12 to 140. Of these utterances, on average, 27.8% were unintelligible, 17% were partially intelligible, and 54.9% were intelligible utterances. Overall, caregivers were highly responsive to all child utterances. Caregivers responded to 66.67% - 100% (mean = 90.39%, SD = 9.89%) of all child utterances.

Opportunities to respond did not differ by participant subgroups (i.e., children with and without CLP). That is, there were no significant differences in the total number of utterances, F (1, 36) = 0.816, p = .372, number of unintelligible utterances, F (1, 36) = 1.996, p = .166, number of partially intelligible utterances, F (1, 36) = 0.028, p = .867, and number of intelligible utterances, F (1, 36) = 1.676, p = .204, between children with CLP and children with typical speech and language development. There were significant differences, however, in MLUm (F (1, 36) = 4.012, p = .053), TNW (F (1, 36) = 6.576, p = .015), and words spoken per minute (WPM; F (1, 36) = 4.074, p = .051), between children with and without CLP during CCX sessions. Children with typical language had higher MLUm and spoke more WPM than children with CLP. Descriptive language data from CCX sessions for caregivers and their children are presented by participant subgroups in Table 5.

Table 5
CCX Descriptive Information by Participant CLP Status

	Children with CLP			Children with Typical Language		
	Mean	SD	Range	Mean	SD	Range
Caregiver						
Number of verbal utterances	152.74	44.32	(77, 233)	172.37	66.40	(70, 327)
Number of different words	140.21	27.03	(83, 185)	148.00	44.37	(65, 218)
Total words spoken	528.05	159.99	(211, 819)	589.63	279.96	(166, 1120)
Words per minute	55.18	16.55	(23.3, 86.5)	63.80	30.24	(19.4, 120.9)
MLU in morphemes	3.89	0.70	(2.65, 5.11)	3.85	0.67	(2.99, 5.37)
% responsiveness to unintelligible utterances	94.91	6.66	(83.3, 100)	94.78	7.64	(75, 100)
% responsiveness to partially intelligible utterances	91.86	8.85	(66.7, 100)	96.00	6.26	(83.33, 100)
% responsiveness to intelligible utterances	96.78	4.74	(81.3, 100)	98.24	3.04	(90.38, 100)
Child						
Number of verbal utterances	62.95	30.02	(14, 113)	72.37	34.15	(12, 140)
Number of different words	24.63	16.41	(0, 57)	35.53	20.95	(5, 71)
Total words spoken*	45.42	29.82	(0, 92)	82.89	56.29	(8, 185)
Words per minute*	9.62	5.12	(1.4, 17.1)	14.66	9.62	(1.7, 36.9)
MLU in morphemes*	1.53	0.51	(1, 2.84)	1.97	0.81	(1, 3.71)
Percent intelligibility	45.84	20.4	(0, 75)	57.37	14.26	(30, 85)
Number of unintelligible utterances	21.32	12.95	(4, 54)	16.37	8.07	(4, 30)
Number of partially intelligible utterances	11.32	8.35	(0, 24)	11.79	8.94	(0, 34)
Number of intelligible utterances	32.68	19.60	(0, 63)	41.58	22.65	(6, 81)

*$p < .05$

Note. % responsiveness = % of child utterances with caregiver responses

When responding to children's unintelligible utterances, caregivers, on average, responded to 30.35% (SD = 12.7%) of children's utterances with a comment, 33.58% (SD = 4.81%) of children's utterances with a question, and 14.85% (SD = 11.63%) of children's utterances with a directive or unrelated comment. In response to children's partially intelligible utterances, caregivers, on average, responded to 32.59% (SD = 25.46%) of children's utterances with a comment, 33.87% (SD = 25.48%) of children's utterances with a question, and 10.62% (SD = 17.76%) of children's utterances with a directive or unrelated comment. In response to children's intelligible utterances, caregivers, on average, responded to 41.37% (SD = 17.28%) of children's utterances with a comment, 33.07% (SD = 13.46%) of children's utterances with a question, and 8.62% (SD = 9.57%) of children's utterances with a directive or unrelated comment. Upon further examination of comment and question types, caregivers provided more related comments (a linguistically meaningful comment about what the child was playing or doing) in response to children's unintelligible utterances (mean = 21.62%, SD = 11.39%) and provided more imitations (mean = 15.88%, SD = 13.14%) and acknowledgements of communication (mean = 11.59%, SD = 6.48%) in response to children's intelligible utterances. Caregivers responded to 9.62% (SD = 9.18%) of children's unintelligible utterances, 16.03% (SD = 16.67%) of children's partially intelligible utterances, and 17.36% (SD = 10.89%) of children's intelligible utterances with comments with rising intonation. When responding to children's utterances with a question, caregivers also asked yes/no questions. Caregivers responded to 9.56% (SD = 7.88%) of children's unintelligible utterances, 6.41% (SD = 11.10%) of children's partially intelligible utterances, and 6.85% (SD = 6.69%) of children's intelligible utterances with a yes/no question. Means, standard deviations, and percentages of adult responses are presented in Table 6.

Table 6
Caregiver responses to children's utterances by utterance type

	Unintelligible Utterances		Partially Intelligible Utterances		Intelligible Utterances	
	Mean Number (SD)	Mean Percent (SD)	Mean Number (SD)	Mean Percent (SD)	Mean Number (SD)	Mean Percent (SD)
Comments	5.45 (3.81)	30.35 (12.70)	3.82 (3.45)	32.59 (25.46)	14.42 (8.81)	41.37 (17.28)
Acknowledgement	1.68 (1.71)	8.73 (7.69)	1.39 (1.99)	11.96 (14.18)	4.24 (3.33)	11.59 (6.48)
Imitation			0.50 (0.92)	3.84 (7.54)	5.00 (3.76)	15.88 (13.14)
Expansion			0.68 (1.02)	4.84 (7.13)	1.18 (1.54)	3.51 (4.30)
Related Comment	3.76 (2.67)	21.62 (11.39)	1.24 (1.50)	11.95 (18.95)	4.00 (3.13)	10.39 (5.88)
Questions	6.5 (4.5)	33.58 (14.81)	4.08 (4.02)	33.87 (25.48)	12.55 (8.74)	33.07 (13.46)
Open-Ended	1 (1.14)	6.13 (7.52)	0.63 (0.97)	3.97 (5.52)	1.26 (1.75)	3.26 (4.16)
Choice	0.11 (0.39)	0.27 (0.94)	0.03 (0.16)	1.3 (8.11)	0.11 (0.31)	0.28 (0.85)
Test	1.39 (1.50)	8.00 (7.54)	0.47 (1.08)	6.04 (17.91)	2.32 (2.65)	5.32 (5.25)
Yes/No	2.03 (1.87)	9.56 (7.88)	0.95 (1.66)	6.41 (11.10)	2.32 (2.37)	6.85 (6.69)
Rising Intonation	1.97 (1.90)	9.62 (9.18)	2.00 (2.11)	16.03 (16.67)	6.55 (5.39)	17.36 (10.89)
Others	2.32 (1.66)	14.85 (11.63)	0.92 (1.02)	10.62 (17.76)	3.16 (3.54)	8.62 (9.57)

Intelligibility

When controlling for child age and language skills, there were significant differences in intelligibility, as measured in the language sample, of children with repaired CLP (mean = 48.95%, SD = 20.14%) compared to children with typical speech and language development (mean = 60%, SD = 13.19%), F (3, 34) = 2.864, p = 0.051. Cleft palate status was a significant predictor of child intelligibility, F (1, 34) = 4.286, p = 0.046, and child age was a significant covariate, F (1, 34) = 4.324, p = 0.045.

Do Caregivers Use Different Language Strategies Based on the Intelligibility of Children's Utterances?

Use of questions. Based on the unconditional model, the predicted probability a caregiver would ask a question in response to any child utterance was 58.3%. The variance across caregiver-child dyads was 0.21 and was significant (p = 0.000). The results of the conditional, hierarchical 2-level logistic means model were as follows: when controlling for child age, language skills (as measured by PLS-IV total communication standard score), and CLP status, there was a 36.07% probability caregivers would respond to unintelligible utterances with a question, 43.8% probability caregivers would respond to intelligible utterances with a question, and 38.7% probability caregivers would respond to partially intelligible utterances with a question. There was no significant difference in the probability of caregivers responding to intelligible versus unintelligible utterances with a question (p = 0.843) or in the probability of caregivers responding to partially intelligible versus unintelligible utterances with a question (p = 0.597). Cleft palate status was a significant predictor of caregiver's use of questions in response to unintelligible utterances (p = 0.015), and differences in caregivers' use of questions in

response to intelligible and unintelligible utterances differed by children's cleft palate status (p = 0.040). The coefficients (in link logit form), standard errors, and p-values for the intercepts and covariates are shown in Table 7.

Table 7
Caregivers' Use of Questions: Coefficients, Standard Errors, and Significance Values

	η	SE	p
Unintelligible Utterances*	-0.572	0.119	0.000
Child Age	0.033	0.018	0.078
Child Language	0.008	0.005	0.141
CLP Status*	0.435	0.169	0.015
Intelligible vs Unintelligible Utterances	0.032	0.163	0.843
Child Age	-0.006	0.027	0.825
CLP Status*	-0.471	0.230	0.040
Partially Intelligible vs Unintelligible Utterances	0.113	0.214	0.597
Child Age	-0.040	0.038	0.294
CLP Status	-0.195	0.301	0.517

*$p < .05$

Related comments and expansions. Based on the unconditional model, the predicted probability a caregiver would provide a related comment or expansion in response to any child utterance was 20.43%. The variance across caregiver-child dyads was 0.126 and was significant (p = 0.000). The results of the conditional, hierarchical 2-level logistic means model were as follows: when controlling for child age, language skills (as measured by PLS-IV total communication standard score), and CLP status, there was a 22.86% probability caregivers would respond to unintelligible utterances with a related comment that provides semantic input, 14.97% probability caregivers would respond to intelligible utterances with a related comment or expansion, and 20.9% probability caregivers would respond to partially intelligible utterances with a related comment or expansion. There was a significant difference in the probability of caregivers responding to intelligible versus unintelligible utterances with a related comment or

expansion ($p = 0.004$); there was a higher probability caregivers would respond to unintelligible utterances with a related comment. There was no significant difference in the probability of caregivers responding to partially intelligible versus unintelligible utterances with a related comment or expansion ($p = 0.612$). Age, PLS-IV total communication score, and cleft palate status were not significant predictors of caregivers' use of related comments and expansions. There was, however, a significant interaction between child age and differences in caregivers' responses to intelligible and unintelligible utterances. Differences in caregiver use of related comments and expansions in response to intelligible and unintelligible utterances differed by child age ($p = 0.018$). Differences in caregiver use of related comments and expansions in response to partially intelligible and unintelligible utterances did not interact with child age or cleft palate status. The coefficients (in link logit form), standard errors, and *p*-values for the intercepts and covariates are shown in Table 8.

Table 8
Caregivers' Use of Related Comments and Expansions: Coefficients, Standard Errors, and Significance Values

	η	SE	*p*
Unintelligible Utterances*	-1.216	0.108	0.000
Child Age	-0.025	0.017	0.165
Child Language	-0.007	0.005	0.170
CLP Status	-0.296	0.159	0.070
Intelligible vs Unintelligible Utterances*	-0.521	0.178	0.004
Child Age*	0.072	0.030	0.018
CLP Status	0.240	0.276	0.384
Partially Intelligible vs Unintelligible Utterances	-0.114	0.226	0.612
Child Age	0.023	0.041	0.577
CLP Status	0.237	0.355	0.505

*$p < .05$

Sequential Analysis

Because of the differences observed in the descriptive analysis for use of language by children with and without CLP, the sequential analysis was run separately for the CLP and typical dyads. A small, positive sequential association was found between unintelligible utterances of children with repaired CLP and caregivers' use of questions (Q = .04). A positive sequential association also was observed between children's unintelligible utterances and caregiver's use of related comments (Q = .62 for children with CLP; Q = .64 for children with typical speech and language development) and between children's intelligible utterances and caregiver's use of related comments and expansions (Q = .42 for children with CLP. Q = .53 for children with typical speech and language development). Caregivers' use of questions and comments in response to intelligible utterances and caregivers' use of questions in response to unintelligible utterances of children with typical speech and language development occurred at less than chance estimates. Yule's Q values from the event-based sequential analysis are presented in Table 9.

Table 9
Yule's Q Values from Sequential Analysis

	Children w/ CLP	Children w/ Typical Language
	Q	Q
Respond to UU with a question	0.04	-0.07
Respond to UU with a related comment	0.62	0.64
Respond to IU with a question	-0.06	-0.006
Respond to IU with a related comment/ expansion	0.42	0.53

Note: UU = unintelligible utterance; IU = intelligible utterance

CHAPTER IV

DISCUSSION

The purpose of this study was to investigate the effects of child intelligibility on caregivers' responses to children's utterances. Overall, caregivers were highly responsive to all child utterance types. That is, caregivers did not respond more or less frequently to unintelligible utterances than they responded to intelligible utterances. We proposed that lower levels of child intelligibility could result in caregivers being less responsive because they failed to understand a child's communicative intent or responding differently (e.g. asking questions that sought clarification instead of responding with comments that provided semantic input) in response to unintelligible utterances. The findings from this study do not support this proposal. The probability of caregivers responding to children's utterances with a question did not differ based on child utterance type (intelligible, partially intelligible, or unintelligible). In addition, there was a greater probability caregivers would respond with a meaningful, related comment to an unintelligible utterance than to an intelligible utterance.

Caregivers frequently responded to child utterances by asking a question. On average, 33% of caregivers' responses to each child utterance type (intelligible, unintelligible, and partially intelligible) were questions. The probability of caregivers responding to a child utterance with a question did not differ based on child utterance type (i.e., there were no significant differences in the probability caregivers would respond to an intelligible versus an unintelligible utterance or to a partially intelligible versus an unintelligible utterance with a question). No previous studies have reported the distribution of caregiver questions in response

to intelligible and unintelligible child utterances for caregiver-child dyads of children with and without CLP.

In this study, the predicted probability of caregivers responding to child utterances with a question was almost 60%. This high probability of responding with questions could be related to caregivers' frequent use of questions with young children (the age of the children participating in the study). Caregivers ask questions because children who are in the early stages of language development respond more frequently to adult questions than to comments (Howe, 1981; Yoder, Davies, & Bishop, 1994). Overall, 39% of total caregiver verbal utterances were questions and this percentage did not differ in the CLP and typical dyads. The percentage of caregiver utterances that were questions in this study is consistent with the literature that reports approximately 20 - 50% of mothers' verbal communication with young children take the form of questions (Owens, 2008).

A sequential association was observed between caregivers' use of related comments and expansions following children's intelligible and unintelligible utterances for both CLP and typical dyads. Overall, the predicted probability a caregiver would provide a related comment or expansion in response to any child utterance was 20.43%. Caregivers were significantly more likely to make a related comment in response to unintelligible utterances (22.86% predicted probability) than in response to intelligible utterances (14.97% predicted probability). No differences were observed between caregivers' use of related comments in response to partially intelligible and unintelligible utterances, suggesting caregivers interpreted those types of utterances in the same way. When children's utterances were partially intelligible or unintelligible, caregivers commented on children's play actions and in doing so, may have modeled language appropriate to the children's interests. When children's utterances were

intelligible, caregivers were more likely to imitate or acknowledge the utterance. Thus, caregivers indicated they had heard and possibly understood the child's utterance, but they did not provide additional language or information by expanding the child's utterance.

Children with non-syndromic, repaired CLP. Based on previous studies, we anticipated significant differences in intelligibility between children with and without CLP (Chapman & Hardin, 1992; McWilliams, Morris, & Shelton, 1990; Trost, 1981), and this difference in intelligibility was confirmed. We also expected there would be no significant differences in overall language skills between children with and without CLP (Chapman & Hardin, 1991). While there were no statistical differences between children with and without CLP on standardized cognitive and language measures, there were significant differences observed in spoken language during the language sample and CCX sessions. Because of the observed differences between children with and without CLP in the descriptive analysis, CLP status was added to the multi-level analysis as a covariate. In the revised model, CLP status was a significant predictor of caregivers' use of questions in response to unintelligible utterances (p = .015). Compared to caregivers of children with typical speech and language development, caregivers of children with CLP were more likely to respond to unintelligible utterances with a question. Because children with CLP were less intelligible, their caregivers may have asked more questions to clarify children's utterances or communicative intent or to request children to repeat their utterances. This explanation would be consistent with previous findings, which reported that mothers of children with and without CLP had similar rates of responsiveness, but mothers of children with CLP produced 50% more repetition requests than mothers of children without CLP (Chapman & Hardin, 1991).

No other studies have compared the language of young children with and without CLP across a range of standardized and non-standardized measures. Findings from this study illustrate the importance of choice of language measure (standardized assessments and observational measures) and measurement context (language sample with examiner vs CCX vs natural environment samples) when comparing the language skills of children with CLP and typical children.

Limitations

The study has several limitations that impact the assessment of its results. First, the participant sample in this study may not be representative of typical caregiver-child dyads. Overall, caregivers in both the CLP and typical samples were highly educated, almost 66% of caregivers had a four-year college degree or graduate school training, and came from middle- to –upper class socioeconomic backgrounds. High maternal education is correlated with higher maternal responsivity. Mothers with more education talk more, speak in longer utterances, and use more diverse vocabulary than less educated mothers (e.g., Bornstein & Tamis-LeMonda, 1989; Huttenlocher et al., 2007; Rowe, 2008; Warren & Brady, 2007; Yoder & Warren, 2001), and mothers from middle- to upper-class socioeconomic backgrounds use more questions compared to mothers from lower socioeconomic backgrounds, who tend to use more directives (Owens, 2008).

Second, the study included relatively small samples of children with non-syndromic, repaired CLP and children with typical speech and language development. Results of a small sample may be less robust and more variable than findings from larger samples.

Third, only one CCX session per dyad was analyzed. The sample of CCX sessions was collected during the first weeks of the study. At the time of the CCX sessions, the caregiver and the child had met the research staff and visited the research center only a few times, and they had not previously been video recorded playing together. Therefore, it is unknown if the recorded CCX session was a representative sample of the child utterances and caregiver responses for each dyad. Future research should conduct additional CCX sessions to examine test-retest reliability of adult and child behaviors measured within the CCX session. It also is possible the recorded CCX sessions represented an optimal sample of responsivity due to the context of the interaction. That is, for the 10-min play session, caregivers and their children were in close proximity and could focus entirely on each other and the play materials; there were no competing noises or activities or other potential play partners (e.g., siblings). It is possible there could be greater variability in caregiver responsivity and linguistic input in natural environments (e.g., during home routines), and in settings in which there is less contextual support to assist caregivers in understanding the communicative intent of children's unintelligible utterances.

Fourth, using conventional standards (Gordon-Brannon, 1994), intelligibility was defined as the percentage of utterances understood by an unfamiliar listener in a continuous, spontaneous language sample; intelligibility of child utterances was determined by trained observers and not defined by the caregiver. It was not possible to code intelligibility based on inferring whether the caregivers understood each child utterance. Because the focus of this study was on caregiver responses to children's intelligible and unintelligible utterances, it is a limitation of the study that there were no data for whether the caregiver understood each child utterance. Differences between caregiver responses to unintelligible utterances of children with CLP and children with

typical speech and language might have been the result of caregivers of typical children actually understanding the utterances that were coded as unintelligible by the coder.

Finally, the pragmatic functions of child and caregiver utterances were not coded in this study; the study focused only on the syntactic form of each caregiver response. The findings of this study provide no empirical information about the pragmatic purposes of caregivers' responses. Different syntactic forms (e.g., comments and questions) may be used to accomplish the same pragmatic function (e.g., continue the conversation). Limited inferences about the role of caregivers' responses in children's language development can be drawn in the absence of a more complete examination of the function of caregivers' responses to different types of child utterances.

Future Research

This study was an exploratory study of caregivers' responses to toddlers' intelligible and unintelligible utterances. The focus of this study was on child intelligibility, but future research should examine additional caregiver and child factors that could influence caregiver responsiveness. For example, CLP status was a significant predictor of caregivers' use of questions in response to children's unintelligible utterances. It is unclear which factors associated with CLP status resulted in differences in caregiver responding. For example, in this setting, children with CLP may have lower rates of initiated language, may have more internalizing behaviors, or they may respond differently to caregiver utterances than children with typical speech and language development (e.g., may be less responsive to their caregiver's questions or comments). Significant variability across dyads in caregiver use of questions and related comments in response to children's verbal utterances was observed, and this variance was not

accounted for in full by child age, total language score, or CLP status. Using a larger, more representative sample, researchers should examine additional factors that account for the variability in caregiver responses, including caregiver education and/or SES and child responsiveness.

To better understand the impact of intelligibility on caregiver responses, a longitudinal study should be conducted to (a) examine the effects of child age and changes in intelligibility on the forms and rates of caregivers' contingent verbal responses and (b) to investigate caregiver responsiveness and linguistic input as a predictor of child language outcomes for children with CLP. Intelligibility may continue to be lower in children with CLP, even as they age or as their productive language increases in complexity. It is important to investigate how caregivers' responses to the intelligible and unintelligible utterances of children with CLP change as children age or as the complexity of their language increases.

To understand fully how caregiver responding impacts development, it is essential to examine changes in both the forms and rates of caregivers' contingent verbal responses and in the pragmatic functions of caregivers' responses over time. In this study, the syntactic form (e.g., comments, questions, directives) of caregivers' responses was examined, but the general pragmatic function of those responses was not coded or analyzed. An empirically based model explaining the impact of the range of caregiver linguistic input on child language development that addresses variability in both child and caregiver behavior is needed to guide intervention research. Future studies should examine the form, complexity, and function of caregivers' responses and examine how children respond to their caregivers' linguistic input and communication attempts. A transactional analysis of children's responses to caregivers' utterances (e.g., answering questions, imitating adult utterances) and the ways in which child

responses provide additional opportunities for caregiver input is needed to fully understand the effects of caregiver input on language development.

Finally, given the differences in language use in language samples and CCX sessions between children with and without CLP, future studies need to investigate interactions between children with CLP and their caregivers in naturalistic settings. Lower intelligibility, lower rates of talking, and less complex and diverse language could impact caregiver responsivity and linguistic input to a greater extent in daily interactions where adults are not exclusively attending to children and their immediate activities. Using the Language Environment Analysis System (LENA) to audio record children's interactions at home, Scherer, Kaiser, Roberts, Frey, Mullins, and Totino (2011), found significant differences in total number of adult words spoken to children with CLP and total number of adult words spoken to children with typical speech and language (d = -1.19) but no significant differences in the total number of adult words directed to children with expressive and receptive language delays and to children with CLP (d = -0.13). These data suggest that although the children with CLP had no cognitive or tested language delays, in naturalistic contexts, their caregivers' language was more similar to the language of caregivers of children with language delays than to the language of caregivers of children with typical language. Scherer et al. found caregivers of children with CLP had fewer conversational turns than caregivers of children with typical language (d = -1.31), suggesting that, in naturalistic contexts, children with CLP may receive less linguistic input and have fewer opportunities to practice communication in conversational turn-taking. Direct observational studies for children with CLP and their caregivers in naturalistic settings, with transcription and coding of caregiver and child utterances, are needed.

Implications for Practice

The results of this study have several implications for assessment and early intervention for young children with non-syndromic, repaired CLP. First, the assessment results indicate measurement context must be considered when evaluating language skills of children with CLP. Standardized measures should be supplemented with play-based language assessments with unfamiliar and familiar adults in multiple contexts (e.g., clinic and home or classroom and home). Furthermore, instead of relying solely on standardized test scores, data from language samples and CCX sessions also should be used (a) to measure progress during intervention and/or (b) as an outcome measure of early language intervention for young children with CLP. Second, although the language competence of children with CLP and children with typical language, as measured on standardized tests, was within the average range, differences in spoken language of children with and without CLP observed in this study suggest there is a gap between language competence and language performance for children with CLP. To address this gap, increasing language productivity (e.g., TNW, WPM) and the complexity of spoken language (e.g., MLUm) should be targets of early intervention for young children with CLP. Third, observed differences in child language use during the language sample and the CCX session suggest a need for cross setting support and intervention in multiple contexts to increase the verbal productivity of young children with CLP with less familiar conversational partners. In sum, the target of early language intervention for children with non-syndromic, repaired CLP may be to close the gap between language competence and language production across partners and contexts as well as to address speech production skills.

Conclusion

This study provides information about the similarities and differences in caregivers' responsiveness to the verbal utterances of toddlers with and without CLP and contributes to a very small literature on toddlers with CLP. Overall, caregivers acknowledged children's communicative attempts, confirmed, clarified, or elicited more child utterances through the use of questions, and provided additional semantic and syntactic information through the use of related comments and expansions. The rate of responsiveness did not differ based on the intelligibility of children's utterances or based on CLP status. Caregivers' use of questions in response to children's unintelligible utterances, however, differed by child CLP status. In addition, differences were observed in spoken language use of children with and without CLP. These findings suggest play-based language assessments should be used when evaluating the language skills and measuring intervention progress for young children with CLP; performance, as well as competence, as assessed in standardized testing, may be an important focus for ensuring optimal language development over time. Furthermore, caregiver responses to children's communication attempts should be examined in natural environments. Finally, additional research is needed to (a) examine the forms and functions of caregivers' responses; (b) investigate the effects of child age and changes in intelligibility on the forms and rates of caregivers' contingent verbal responses over time; and (c) to examine caregiver responsiveness and linguistic input as a predictor of child language outcomes for children with CLP.

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APPENDIX A

CODING AND IOA CALCULATION PROCEUDRES

General Coding Procedures

1. All coding will be completed using SALT software.
2. Code from verified transcripts only.
3. Every verbal child utterance in the transcript will receive 1 code.
    a. Intelligible utterance: **[ci]**
    b. Partially intelligible utterance: **[cp]**
    c. Unintelligible utterance: **[cu]**
4. Every verbal adult utterance in the transcript following a child's verbal utterance will receive 5 codes.
    a. links the adult utterance to the child utterance: **[mt]**
    b. type of child utterance **[i, pi, OR x]**
    c. form of adult response **[c, q, OR o]**
    d. type of adult response **[a, e, im, r, h, op, in, t, OR y]**
    e. summary combo code: (e.g., [ice] – child intelligible followed by adult comment - expansion)
5. Every verbal adult utterance that does not follow a child's verbal utterance will receive two codes
    a. First bracket: code the adult's utterance as <u>not</u> following a child's verbal utterance: **[ut]**
    b. Second bracket: code the form of the adult's utterance:
        i. [comment]: **[co]**
        ii. [question]: **[qu]**
        iii. [other]: **[ot]**
6. Every child utterance in the transcript must be separated by an [a] code
    a. Separate each "c:" line with an "a:" line
    b. "a" lines could include:
        i. adult utterance
        ii. no response from the adult following a child's intelligible, partially intelligible, or unintelligible utterance: **a: [inr]** or **a: [pnr]** or **a: [unr]**
        iii. no opportunity for the adult to respond to the child's intelligible, partially intelligible, or unintelligible utterance: **a: [ip]** or **a: [pp]** or **a: [up]**
        iv. no adult utterance following a child gesture, vocalization, or action: **a: [n]**
        v. no adult utterance following a child gesture, vocalization, or action due to no opportunity: **a: [p]**
7. Every adult utterance in the transcript must be separated by a "c" code
    a. Separate each "a" line with a "c" line
    b. "c" lines could include:
        i. child utterance
        ii. no response from the child: **c: [n]**
        iii. no opportunity for the child to respond to the adult: **c: [p]**

Child Codes

The following codes will be assigned to each verbal utterance. Each verbal child utterance should be coded for (a) whether the utterance was intelligible, partially intelligible, or unintelligible. Nonverbal child utterances (vocalizations or actions or gestures) should be coded as nonverbal. When a child does not respond to an adult utterance, a child code of "no opportunity" or "no response" should be assigned.

Coding Class	Code Description	Code
Child Utterance	Intelligible	[ci]
	Partially Intelligible	[cp]
	Unintelligible	[cu]
	Nonverbal	[nv]
Response to Adult (if no verbal utterance)	No opportunity	[p]
	No response	[n]

Caregiver Codes

The following codes will be assigned to each adult utterance following a child's verbal utterance. Each caregiver utterance should be coded for (a) whether the utterance followed a child's intelligible, partially intelligible, or unintelligible verbal utterance, (b) the form of the utterance (question, comment, or other), and (c) the specific type of utterance associated with the utterance form.

Coding Class	Code Description	Code
Caregiver Utterance	Matched to child utterance	[mt]
Type of child utterance	Intelligible	[i]
	Partially intelligible	[pi]
	Unintelligible	[x]
Caregiver Response Form	Comment	[c]
	Question	[q]
	Other	[o]
Comment Type	Expansion	[e]
	Imitation	[m]
	Related comment	[r]
	Acknowledgement	[a]
Question Type	Open-ended	[op]
	Yes/No	[y]
	Choice	[h]
	Test	[t]
	Comment with rising intonation	[in]
Other Response	Directive	[di]
	Unrelated comment	[un]
Summary Code	Expansion to Intelligible	[ice]
	Imitation to Intelligible	[icm]
	Related Comment to Intelligible	[icr]
	Acknowledgement of Intelligible	[ica]

	OE question to Intelligible	[iqo]
	Y/N question to Intelligible	[iqy]
	Choice question to Intelligible	[iqh]
	Test question to Intelligible	[iqt]
	Rising intonation to intelligible	[iqin]
	Directive to intelligible	[iod]
	Unrelated comment to intelligible	[iou]
	Expansion to partially intelligible	[pce]
	Imitation to partially intelligible	[pcm]
	Related Comment to partially intelligible	[pcr]
	Acknowledgement of partially intelligible	[pca]
	OE question to partially intelligible	[pqo]
	Y/N question to partially intelligible	[pqy]
	Choice question to partially intelligible	[pqh]
	Test question to partially intelligible	[pqt]
	Rising intonation to partially intelligible	[pqin]
	Directive to partially intelligible	[pod]
	Unrelated comment to partially intelligible	[pou]
	Related Comment to Unintelligible	[ucr]
	Acknowledgement of Unintelligible	[uca]
	OE question to Unintelligible	[uqo]
	Y/N question to Unintelligible	[uqy]
	Choice question to Unintelligible	[uqh]
	Test question to Unintelligible	[uqt]
	Rising intonation to Unintelligible	[uqin]
	Directive to Unintelligible	[uod]
	Unrelated comment to Unintelligible	[uou]

The following codes will be assigned to each "a" line when the adult fails to respond to a child's verbal utterance. No opportunity is coded when less than 3 s passes between two consecutive child verbal utterances.

Coding Class	Code Description	Code
Caregiver Utterance	No Opportunity to Respond to Intelligible Utterances	[ip]
	No Opportunity to respond to a partially intelligible utterance	[pp]
	No opportunity to respond to an unintelligible utterance	[up]
	No response to an intelligible utterance	[inr]
	No response to a partially intelligible utterance	[pnr]
	No response to an unintelligible utterance	[unr]

The following codes will be assigned to each adult utterance NOT following a child's verbal utterance. Each caregiver utterance should be coded for (a) utterance not linked to child's verbal utterance; and (b) the form of the utterance (question, comment, or other)

Coding Class	Code Description	Code
Caregiver Utterance	Not linked to child utterance	[ut]
Caregiver Form	Comment	[co]
	Question	[qu]
	Other	[ot]

The following codes will be assigned to each "a" line when the adult does not responds to a child's vocalization, gesture, or action.

Coding Class	Code Description	Code
Caregiver Utterance	No opportunity to respond to a nonverbal	[p]
	No response to a nonverbal	[n]

Code Definitions

Child Codes

Code	Definition	Examples
Intelligible utterance: [ci]	All words in the utterance are intelligible	c: want ball [ci].
Partially intelligible utterance: [cp]	At least one word in the utterance is unintelligible [x] and one word is intelligible	c: x ball [cp].

	(excluding articles)	
Unintelligible utterance: [cu]	The child says a word(s) that cannot be understood by the transcriber	c: x [cu]. or c: xxx [cu].
Nonverbal utterance: [nv]	The child vocalizes, gestures, or completes a play action without a verbal utterance	c: {points} [nv]. or c: {sings} [nv]. or c: {rolls car} [nv].
No opportunity for child to respond to adult: [p]	An adult makes more than one utterance with 3s or less between utterances.	a: roll ball. c: [p]. a: kick ball.
Child did not respond to an adult utterance: [n]	The child did not respond (verbally or nonverbally) to the adult's utterance within 3s of the adult's utterance	a: roll ball. c: [n].

Caregiver Codes

Code	Definition	Examples
Matched utterance: [mt]	Caregiver's verbal utterance is provided within 3s of a child verbal utterance	c: want ball [ci]. a: you want the ball [**mt**][i][c][e][ice].
Unmatched utterance: [ut]	Caregiver's verbal utterance is provided more than 5 s after a child's verbal utterance or is provided without a preceding child verbal utterance	a: you want the ball **[ut]**[co]. a: That is a big ball **[ut]**[co].
Form – Comment: [c]	Caregiver uses words or statements to comment on the speaker's state, the child's interest, focus, or action, on the environment, or on past, present, or future events	c: baby x [cp]. a: baby is sleepy [mt][pi][**c**][e][pce].
Form – Question: [q]	Caregiver asks a question or makes a comment with rising intonation	c: bus go [ci] a: Where are they going? [mt][i][**q**][op][iqo]
Form – Other: [o]	Caregiver's utterance is not a comment related to the child's utterance or action, or a question	c: baby drink [ci]. a: look [mt][i][**o**][di][iod]**.**

Code	Definition	Examples
Comment – Expansion: [e]	Caregiver repeats the child's utterance (same word order) and adds new words that are matched to the child's intent and function or makes a grammatical correction to the child's utterance	c: ball [ci]. a: you want the ball [mt][i][c**][e]**[ice]**.** or c: baby/s is tired [ci]. a: the baby/s are tired [mt][i][c]**[e]**[ice]**.**
Comment – Imitation: [m]	Caregiver repeats the child's utterance (word for word) and adds no new words and makes no grammatical changes	c: hi daddy [ci]. a: hi daddy [mt][i][c][**m**][icm]. or c: go [ci]. a: go [mt][i][c**][m]**[icm]**.**
Comment – Related: [r]	Caregiver makes a comment related to the intent of the child's communication or play action but does not repeat the child's utterance	c: baby/s are tired [ci]. a: the baby/s are going to take a nap [mt][i][c]**[r]**[icr]**.**
Comment – Acknowledgement: [a]	Caregiver responds to the child's utterance but does not imitate, expand, or provide any content words	c: he is the daddy [ci]. a: ok [mt][i][c]**[a]**[ica].
Question – Open-Ended: [op]	Caregiver asks a question that has no known "correct" answer	c: x [cu]. a: What do you want to play [mt][i][q]**[op]**[iqo]?
Question – Yes/No: [y]	Caregiver asks a question that can be answered with "yes" or "no"	c: juice [ci]. a: Is the baby hungry [mt][i][q]**[y]**[iqy]?
Question – Choice: [h]	Caregiver asks a question that provides a choice between two or more things	c: {points} x [cu]. a: Do you want the bus or the dump truck [mt][x][q]**[h]**[uqh]?
Question – Test: [t]	Caregiver asks a question that requires a child to label or name an action, object, or person	c: x ball [cp]. a: What is that [mt][pi][q]**[t]**[pqt]?
Question – Comment w/ rising intonation: [in]	Caregiver makes a comment using rising intonation to indicate a question	c: ball [ci] a: want ball [mt][i][q]**[in]**[iqin]?
Other – Directive: [di]	Caregiver makes a comment requesting a child to perform a behavior or make a specific comment	c: x. a: put the toy on the shelf [mt][x][o][**[di]**[uod]**.** or a: come here [ut][ot]. or a: say thank you [ut][ot].

Code	Definition	Examples
Other – Unrelated comment or question: [un]	Caregiver makes a comment or asks a question that is unrelated to the child's communication or play action	c: daddy at work [ci] a: here is a puzzle [mt][i][o]**[un]**[iou]**.** or c: {rolls car} a: Want to put the shapes in here [ut][qu]?

Possible Adult Codes Following Verbal Child Utterances

Matched to child verbal utterance - YES	Child Utterance	Was the adult response a comment?	What type of comment?	Code	Was the adult response a question?	What type of question?	Code	Was the adult response an other?	What type of other?	Code
	Intelligible	Comment	Expansion	[mt][i][c][e][ice]	Question	Open_Ended	[mt][i][q][op][iqo]	Other	Directive	[mt][i][o][di][iod]
			Imitation	[mt][i][c][m][icm]		Yes/No	[mt][i][q][y][iqy]		Unrelated	[mt][i][o][un][iou]
			Related	[mt][i][c][r][icr]		Choice	[mt][i][q][h][iqh]			
			Acknowledgement	[mt][i][c][a][ica]		Test	[mt][i][q][t][iqt]			
						Intonation	[mt][i][q][in][iqin]			
	Partially Intelligible	Comment	Expansion	[mt][pi][c][e][pce]	Question	Open_Ended	[mt][pi][q][op][pqo]	Other	Directive	[mt][pi][o][di][pod]
			Imitation	[mt][pi][c][m][pcm]		Yes/No	[mt][pi][q][y][pqy]		Unrelated	[mt][pi][o][un][pou]
			Related	[mt][pi][c][r][pcr]		Choice	[mt][pi][q][h][pqh]			
			Acknowledgement	[mt][pi][c][a][pca]		Test	[mt][pi][q][t][pqt]			
						Intonation	[mt][pi][q][in][pqin]			
	Unintelligible	Comment	Acknowledgement	[mt][x][c][a][uca]	Question	Open_Ended	[mt][x][q][op][uqo]	Other	Directive	[mt][x][o][di][uod]
			Related to play action or previous conversation topic	[mt][x][c][r][ucr]		Yes/No	[mt][x][q][y][uqy]		Unrelated to play action or previous conversation topic	[mt][x][o][un][uou]
						Choice	[mt][x][q][h][uqh]			
						Test	[mt][x][q][t][uqt]			
						Intonation	[mt][x][q][in][uqin]			

Possible Adult Codes for Adult Utterances NOT Preceded by a Child Verbal Utterance

Matched to child verbal utterance - NO	Was the adult utterance a comment?	Code	Was the adult utterance a question?	Code	Was the adult utterance an other?	Code
	Comment	[ut][co]	Question	[ut][qu]	Other	[ut][ot]

IOA Calculation Procedures

1. Copy the primary SALT transcript and paste into Column A of a blank Excel worksheet
2. In the Excel Worksheet:
    a. Highlight the transcript pasted into Column A
    b. Go to "Data" and "Text to Columns"
        i. Select "Deliminated"
        ii. Check "Other" and enter " ["
        iii. Click "Finish"
    c. This will move all codes into separate columns
3. Copy the reliability SALT transcript and paste into first blank column after separated codes from the primary transcript
    a. Excel should automatically separate the codes
        i. If the codes are not separated, repeat Step 2 for the second transcript
4. Insert a column to the left of Column A
    a. Number each row in the new Column A for each line of the transcript (e.g., 1, 2, 3, 4,…..360)
    b. This column will be used later to sort data back into the original order
5. Sort the data
    a. Highlight all data
    b. Go to "Data" "Sort"
    c. Sort data by Column B
        i. This will sort the data by "a" and "c" utterances
        ii. Check reliability for "c" utterances first and then for "a" utterances
6. **Check Child Utterance ("c") Codes**
    a. In the first blank column, enter a conditional formula (e.g, =IF(cellX = cellY), 0, 1) to compare the child code (ci, cp, or cu) from the Primary Transcript to the child code (ci, cp, or cu) from the Reliability Transcript
        i. If the codes match, excel should generate a "0" into the comparison cell
        ii. If the codes do not match, excel should generate a "1" into the comparison cell
    b. To calculate IOA:
        i. At the end of the first comparison column, sum all "0" cells
            1. This sum will be the number of agreements
        ii. In the next row of the same column, sum all "1" cells
            1. This sum will be the number of disagreements
        iii. In the next row of the same column, calculate percent agreement for child intelligibility
            1. (# of agreements) / (# of agreements + # of disagreements) * 100
            2. This value = % agreement for child intelligibility (comparing intelligible, partially intelligible, and unintelligible child utterance codes)
7. **Check Adult Utterance ("a") Codes**
    a. **Adult Responses to Child Utterances**
        i. First highlight all cells with adult utterances
        ii. Sort data by the first adult code column of the Primary Transcript

iii. In the first blank column, enter a conditional formula to compare the Reliability Transcript codes for the first adult code to the Primary Transcript codes of [mt]
    1. If the codes match, excel should generate a "0" into the comparison cell
    2. If the codes do not match, excel should generate a "1" into the comparison cell
iv. To calculate IOA:
    1. At the end of the first comparison column, sum all "0" cells
        a. This sum will be the number of agreements
    2. In the next row of the same column, sum all "1" cells
        a. This sum will be the number of disagreements
    3. In the next row of the same column, calculate percent agreement for adult responses
        a. (# of agreements) / (# of agreements + # of disagreements) * 100
        b. This value = % agreement for whether the adult utterance is in response to a child verbal utterance
v. *For each agreement in coding [mt], continue calculating agreement for each subsequent code*
vi. *For each disagreement in coding [mt], discontinue calculating agreement for each subsequent code for that utterance*
    1. If there is a disagreement in coding [mt] vs [ut], all subsequent adult codes will be different
    2. Therefore, all codes following the [mt] vs [ut] for the discrepant utterance will not be examined and will be classified as "no opportunity"

b. **Adult Utterances – No Opportunity to Respond or No Response to Child Verbal Utterances**
    i. Data should still be sorted by the first adult code
    ii. In the first blank column, enter a conditional formula to compare the Reliability codes for the first adult code to the Primary Transcript codes of [ip], [up], [pp], [inr], [unr], nad [pnr]
        1. If the codes match, excel should generate a "0" into the comparison cell
        2. If the codes do not match, excel should generate a "1" into the comparison cell
    iii. To calculate IOA:
        1. At the end of the first comparison column, sum all "0" cells
            a. This sum will be the number of agreements
        2. In the next row of the same column, sum all "1" cells
            a. This sum will be the number of disagreements
        3. In the next row of the same column, calculate percent agreement for adult no response/no opportunity to respond
            a. (# of agreements) / (# of agreements + # of disagreements) * 100

b. This value = % agreement for whether no adult response following a child's verbal utterance is due to no response or no opportunity to respond

c. **Adult Response: Form**

i. First highlight all cells with adult utterances with first code of [mt] on both the Primary and Reliability Transcripts

ii. Sort data by the third adult code column of the Primary Transcript (should be [q], [c], or [o]).

iii. In the first blank column, enter a conditional formula to compare the Reliability codes for the third adult code to the Primary codes of [c]
   1. If the codes match, excel should generate a "0" into the comparison cell
   2. If the codes do not match, excel should generate a "1" into the comparison cell

iv. In the next blank column, enter a conditional formula to compare the Reliability codes for the third adult code to the Primary codes of [o]
   1. If the codes match, excel should generate a "0" into the comparison cell
   2. If the codes do not match, excel should generate a "1" into the comparison cell

v. In the next blank column, enter a conditional formula to compare the Reliability codes for the third adult code to the Primary codes of [q]
   1. If the codes match, excel should generate a "0" into the comparison cell
   2. If the codes do not match, excel should generate a "1" into the comparison cell

vi. To calculate IOA for Comments:
   1. At the end of the first comparison column, sum all "0" cells
      a. This sum will be the number of agreements
   2. In the next row of the same column, sum all "1" cells
      a. This sum will be the number of disagreements
   3. In the next row of the same column, calculate percent agreement for adult comments
      a. (# of agreements) / (# of agreements + # of disagreements) * 100
      b. This value = % agreement for whether the adult response is a comment
   4. *For each agreement in coding [c], continue calculating agreement for each subsequent code*
   5. *For each disagreement in coding [c], discontinue calculating agreement for each subsequent code for that utterance*
      a. If there is a disagreement in coding [c], all subsequent adult codes will be different
      b. Therefore, all codes following the [c] for the discrepant utterance will not be examined and will be classified as "no opportunity"

vii. To calculate IOA for Others:
    1. At the end of the next comparison column, sum all "0" cells
        a. This sum will be the number of agreements
    2. In the next row of the same column, sum all "1" cells
        a. This sum will be the number of disagreements
    3. In the next row of the same column, calculate percent agreement for adult others
        a. (# of agreements) / (# of agreements + # of disagreements) * 100
        b. This value = % agreement for whether the adult response is an Other

viii. To calculate IOA for Questions:
    1. At the end of the next comparison column, sum all "0" cells
        a. This sum will be the number of agreements
    2. In the next row of the same column, sum all "1" cells
        a. This sum will be the number of disagreements
    3. In the next row of the same column, calculate percent agreement for adult questions
        a. (# of agreements) / (# of agreements + # of disagreements) * 100
        b. This value = % agreement for whether the adult response is a question
    4. *For each agreement in coding [q], continue calculating agreement for each subsequent code*
    5. *For each disagreement in coding [q], discontinue calculating agreement for each subsequent code for that utterance*
        a. If there is a disagreement in coding [q], all subsequent adult codes will be different
        b. Therefore, all codes following the [q] for the discrepant utterance will not be examined and will be classified as "no opportunity"

d. **Adult Comment Type**

i. First examine all cells where the third adult utterance on the Primary and Reliability Transcripts is a [c]

ii. For these utterances, sort data by the fourth adult code column of the Primary Transcript (should be [a], [e], [m], or [r]).

iii. In the first blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [a]
    1. If the codes match, excel should generate a "0" into the comparison cell
    2. If the codes do not match, excel should generate a "1" into the comparison cell

iv. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [e]
    1. If the codes match, excel should generate a "0" into the comparison cell

2. If the codes do not match, excel should generate a "1" into the comparison cell

v. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [m]
    1. If the codes match, excel should generate a "0" into the comparison cell
    2. If the codes do not match, excel should generate a "1" into the comparison cell

vi. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [r]
    1. If the codes match, excel should generate a "0" into the comparison cell
    2. If the codes do not match, excel should generate a "1" into the comparison cell

vii. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [r]
    1. If the codes match, excel should generate a "0" into the comparison cell
    2. If the codes do not match, excel should generate a "1" into the comparison cell

viii. To calculate IOA for <u>Acknowledgements</u>:
    1. At the end of the first comparison column, sum all "0" cells
        a. This sum will be the number of agreements
    2. In the next row of the same column, sum all "1" cells
        a. This sum will be the number of disagreements
    3. In the next row of the same column, calculate percent agreement for adult acknowledgements
        a. (# of agreements) / (# of agreements + # of disagreements) * 100
        b. This value = % agreement for whether the adult comment is an acknowledgement

ix. To calculate IOA for <u>Expansions</u>:
    1. At the end of the next comparison column, sum all "0" cells
        a. This sum will be the number of agreements
    2. In the next row of the same column, sum all "1" cells
        a. This sum will be the number of disagreements
    3. In the next row of the same column, calculate percent agreement for adult expansions
        a. (# of agreements) / (# of agreements + # of disagreements) * 100
        b. This value = % agreement for whether the adult comment is an expansion

x. To calculate IOA for <u>Imitations</u>:
    1. At the end of the next comparison column, sum all "0" cells
        a. This sum will be the number of agreements
    2. In the next row of the same column, sum all "1" cells

a. This sum will be the number of disagreements
3. In the next row of the same column, calculate percent agreement for adult imitations
    a. (# of agreements) / (# of agreements + # of disagreements) * 100
    b. This value = % agreement for whether the adult comment is an imitation

xi. To calculate IOA for Related Comments:
1. At the end of the first comparison column, sum all "0" cells
    a. This sum will be the number of agreements
2. In the next row of the same column, sum all "1" cells
    a. This sum will be the number of disagreements
3. In the next row of the same column, calculate percent agreement for adult related comments
    a. (# of agreements) / (# of agreements + # of disagreements) * 100
    b. This value = % agreement for whether the adult comment is a related comment

xii. To calculate overall IOA for Comment Type
1. Sum # of agreements for acknowledgments, expansions, imitations, and related comments
2. Sum # of disagreements for acknowledgements, expansions, imitations and related comments
3. Calculate percent agreement: (# of agreements) / (# of agreements + # of disagreements) * 100

e. **Adult Question Type**

i. First examine all cells where the third adult utterance on the Primary and Reliability Transcripts is a [q]
ii. For these utterances, sort data by the fourth adult code column of the Primary Transcript (should be [h], [op], [ri], [t], or [y]).
iii. In the first blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [h]
1. If the codes match, excel should generate a "0" into the comparison cell
2. If the codes do not match, excel should generate a "1" into the comparison cell

iv. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [op]
1. If the codes match, excel should generate a "0" into the comparison cell
2. If the codes do not match, excel should generate a "1" into the comparison cell

v. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [ri]

1. If the codes match, excel should generate a “0” into the comparison cell
2. If the codes do not match, excel should generate a “1” into the comparison cell

vi. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary codes of [t]
1. If the codes match, excel should generate a “0” into the comparison cell
2. If the codes do not match, excel should generate a “1” into the comparison cell

vii. In the next blank column, enter a conditional formula to compare the Reliability codes for the fourth adult code to the Primary Transcript codes of [y]
1. If the codes match, excel should generate a “0” into the comparison cell
2. If the codes do not match, excel should generate a “1” into the comparison cell

viii. To calculate IOA for <u>Choice Questions</u>:
1. At the end of the first comparison column, sum all “0” cells
    a. This sum will be the number of agreements
2. In the next row of the same column, sum all “1” cells
    a. This sum will be the number of disagreements
3. In the next row of the same column, calculate percent agreement for adult choice questions
    a. (# of agreements) / (# of agreements + # of disagreements) * 100
    b. This value = % agreement for whether the adult responded with a choice question

ix. To calculate IOA for <u>Open-Ended Questions</u>
1. At the end of the next comparison column, sum all “0” cells
    a. This sum will be the number of agreements
2. In the next row of the same column, sum all “1” cells
    a. This sum will be the number of disagreements
3. In the next row of the same column, calculate percent agreement for adult use of open-ended questions
    a. (# of agreements) / (# of agreements + # of disagreements) * 100
    b. This value = % agreement for whether the adult responded with an open-ended question

x. To calculate IOA for <u>Rising Intonation</u>
1. At the end of the next comparison column, sum all “0” cells
    a. This sum will be the number of agreements
2. In the next row of the same column, sum all “1” cells
    a. This sum will be the number of disagreements
3. In the next row of the same column, calculate percent agreement for adult use of rising intonation

a. (# of agreements) / (# of agreements + # of disagreements) * 100
b. This value = % agreement for whether the adult responding with a comment with rising intonation with questioning intent

xi. To calculate IOA for Test Questions
1. At the end of the first comparison column, sum all "0" cells
a. This sum will be the number of agreements
2. In the next row of the same column, sum all "1" cells
a. This sum will be the number of disagreements
3. In the next row of the same column, calculate percent agreement for adult use of test questions
a. (# of agreements) / (# of agreements + # of disagreements) * 100
b. This value = % agreement for whether the adult responded with a test question

xii. To calculate IOA for Yes/No questions
1. At the end of the first comparison column, sum all "0" cells
a. This sum will be the number of agreements
2. In the next row of the same column, sum all "1" cells
a. This sum will be the number of disagreements
3. In the next row of the same column, calculate percent agreement for adult use of yes/no questions
a. (# of agreements) / (# of agreements + # of disagreements) * 100
b. This value = % agreement for whether the adult responded with a yes/no question

xiii. To calculate overall IOA for Question Type
1. Sum # of agreements for choice questions, open-ended questions, comments with rising intonation, test questions, and yes/no questions
2. Sum # of disagreements for choice questions, open-ended questions, comments with rising intonation, test questions, and yes/no questions
3. Calculate percent agreement: (# of agreements) / (# of agreements + # of disagreements) * 100

APPENDIX B

Language Sample Protocol

A language sample is a naturalistic adult-child interaction with a specific set of toys to evaluate a child's spontaneous expressive language skills.

Purpose:

1. A language sample captures a child's initiated, unprompted language using a 20-minute language sample.
2. A language sample avoids adult use of language-rich verbs and labels that may not occur in the child's natural environment but provides a fun, responsive and engaging environment.

Materials:

There are 7 toys sets that comprise the language sample:

1. Babies
2. Barn, animals, blocks
3. Piggy bank with coins
4. Gumball machine with balls
5. Shape sorter barn with letters and animals
6. Blocks with block train
7. Cars with ramp
8. Wordless picture book (*Goodnight Moon)*

Procedures:

1. Set the timer for 21 minutes.
2. Be at the child's eye level in close proximity to the child.
3. Use a warm, positive tone of voice and engage with the child.
4. Respond to all child communication (gesture, vocalization, words) by imitating their words or by making a sound (e.g., "mhm," "yeah," "uh-huh")
5. Present at least 4 toy sets and the wordless picture book during the 20 minute session. Toys may be combined. Remove toys that aren't being used by the child/tester. Depending on the age of the child, different toy sets may be appropriate and additional toy sets may be appropriate. Always introduce: book, babies, cars, at least one barn animal set, and the gumball set.
6. The tester introduces each toy set by saying:
    a. Book: Here's my moon book, tell me what you see.
    b. Babies: Here are some babies, what should we do?
    c. Barn: Here are some animals, what should they do?
    *If both barn sets are introduced: Here are some *more* animals, what should they do?
    d. Blocks: Here's some blocks, what should we make?
    e. Balls: Here's some balls, where should they go?
    f. Cars + ramp: Here are some cars, where should they go?
    g. Pig: Here's my pig, what should we do?
7. For the book, point to at least 4 different pictures.

8. Play with the child during each of the play sets.
9. For each of the play sets:
    a. Model at least 2 novel play actions
    b. Use at least 2 time delay strategies:
        1.) Assistance: creating a situation in which the child needs the adult's help
        Examples: Bottles, bags, jars, etc that the child cannot open; toys the child cannot assemble alone; wind-up toys the child cannot operate
        2.) Inadequate portions: providing a small amount of a desired material
        Examples: Pouring a small amount of water into a tub; putting only a small ball of playdoh on the table; squirting only a tiny amount of paint in the dish
        3.) Choice Making: the adult holds up two options and waits from the child to communicate (this should be done without any words).
        4.) Waiting with routine: the adult sets up a routine modeling the target, and then waits to see if the child produces the target.
        Example: The adult and child pour beans together in a routine (e.g., scoop beans, pour beans). The 3rd time, the adult holds the beans up and does not pour the beans; instead, she looks at the child expectantly until he communicates/requests.
        5.) Waiting with cue: the adult sets up the environment so that the objects cue the child.
        Example: The adult holds the shoe up to the baby's foot and looks at the child expectantly until he communicates/requests.
10. Discontinue playing with a given set if the child looses interest and after you have modeled 2 play actions and used 2 environmental prompts (if possible).
11. If the child has not initiated vocalizations or verbal language within a two-minute interval, make a comment about the toy set or book.
12. Be sure to label the video with the correct name on the video log.

<u>Tester Language</u>

- Be nonverbally engaging with the child (smile, play with the toys, touch the child).
- You may promote language by using sounds, being silly, setting up situations in which child can request, and/or violating an expectation with a toy.
- The only words you may use are the words you hear the child say during the language sample.
- If a child says a word, pause for a moment, and then repeat the word.
- If the child continues to talk, let the child talk. Repeat what you remember from the long utterance only. Do not add in words you think you might have heard.
- When repeating a word, use a "comment-like" tone rather than a questioning tone (i.e. "fish" rather than "fish?"). The tester should respond to all child communication with a verbal response.

Troubleshooting

1. *No Language:* If the child is not saying anything after several nonverbal methods and two minutes of interaction has passed without a child utterance, then the tester can make a comment about the toy set or book.
2. *Child asks a question:* If a child asks you a question, then respond with a nonverbal gesture (i.e. point or show). If you are not able to answer nonverbally, then use a brief, positive response.

APPENDIX C

Child and Family Characteristics

Date survey completed (mm/dd/yyyy)**: _____**

Person completing the survey: _____ **Relationship to child: _____**

1. What is child's date of birth? **/ /**

2. What is your child's birth order (Check ONE)

- ❒ First born
- ❒ Second born
- ❒ Third born
- ❒ Fourth born

3. What is child's gender?

- ❑ Male
- ❑ Female

4. Please choose the category that best describes child's ethnicity:

- ❒ American Indian/Alaska Native
- ❒ Asian/Pacific Islander
- ❒ Black, not Hispanic
- ❒ Hispanic
- ❒ White, not Hispanic
- ❒ Other (specify):_____
- ❒ Decline

5. Child lives with:

- ❒ Biological mother and father
- ❒ Biological mother and stepfather
- ❒ Biological mother only
- ❒ Biological father only
- ❒ Biological father and stepmother
- ❒ Adoptive mother and father
- ❒ Adoptive mother only
- ❒ Adoptive father only
- ❒ Foster parents
- ❒ Relatives
- ❒ Other (specify): _____

6. How many siblings or other children who live in the home with the child are under age 3?
_____ # of children under age 3

7. How many siblings or other children who live in the home with the child are 3-5 years of age?
_____ # of children 3-5

8. How many siblings or other children who live in the home are 6-18 years of age?
_____ # of children 6-18

9. How many adults live in the home? _____ # of adults

10. Does anyone in your immediate family (parents, siblings, nieces, nephews) have behavioral, learning, speech or language problems?

_____ *Yes* _____ *No*

If Yes, please describe who and what the problem is.

_____	_____	_____	_____
(relationship)	*(age)*	*(problem)*	*(lives with child?)*
_____	_____	_____	_____
(relationship)	*(age)*	*(problem)*	*(lives with child?)*
_____	_____	_____	_____
(relationship)	*(age)*	*(problem)*	*(lives with child?)*

11. What languages are spoken in child's home? *(Check ALL that apply)*

- ❒ English
- ❒ Spanish
- ❒ Other language (specify _____)
- ❒ Unknown/Decline

12. What is the primary caregiver's date of birth: *mm / dd / yyyy*

13. What is the primary caregiver's gender?

- ❑ Male
- ❑ Female

14. What is the relationship of the primary caregiver to the child? (select one)

- ❒ Birth mother
- ❒ Adoptive mother
- ❒ Foster mother
- ❒ Step-mother
- ❒ Other relative guardian (e.g., aunt)
- ❒ Birth father
- ❒ Adoptive father
- ❒ Foster father
- ❒ Step-father
- ❒ Other non-relative guardian

15. What is the highest grade completed by primary caregiver? **(select one)**

- ❒ 8th grade or below
- ❒ 9th grade
- ❒ 10th grade
- ❒ 11th grade
- ❒ High School
- ❒ GED
- ❒ Some College
- ❒ Trade school
- ❒ 2 yr degree
- ❒ 4 yr degree
- ❒ Some graduate school
- ❒ Graduate degree

16. Is the primary caregiver currently taking classes? **(select one).**

- ❒ No
- ❒ Yes, part-time
- ❒ Yes, full-time

17. Please list average total yearly (or monthly) cash/check household income before taxes including child support.

Yearly: _____ **OR** Monthly: _____

OR

Please mark the line next to the range that is closest to your total average <u>yearly</u> household cash/check income before taxes including child support.

____$0 to $4,999 ____ $20,000 to $24,999 ____ $40,000 to $44,999 ____ $60,000 to $64,999

____$5,000 to $9,999 ____ $25,000 to $29,999 ____ $45,000 to $49,999 ____ $65,000 to $69,999

____$10,000 to $14,999 ____ $30,000 to $34,999 ____ $50,000 to $54,999 ____ $70,000 to $74,999

____$15,000 to $19,999 ____ $35,000 to $39,999 ____ $55,000 to $59,999 ____ $75,000 or above

18. Do you or your child receive any additional support (e.g., Tenn Care, Unemployment, Food Stamps?) _____ yes _____ no

19. What is the primary caregiver's employment status?

- ❑ Full-time
- ❑ Part-time
- ❑ Unemployed/Not working
- ❑ Unknown/Decline

Complete only if primary caregiver is NOT the child's mother:

20. What is the child's mother's date of birth: *mm / dd / yyyy*

21. What is the child's mother's employment status?

- ❑ Full-time
- ❑ Part-time
- ❑ Unemployed/Not working
- ❑ Unknown/Decline

22. What is the highest grade completed by the mother? **(select one).**

- ❒ 8th grade or below
- ❒ 9th grade
- ❒ 10th grade
- ❒ 11th grade
- ❒ High school
- ❒ GED
- ❒ Some college
- ❒ Trade school
- ❒ 2 yr degree
- ❒ 4 yr degree
- ❒ Some graduate school
- ❒ Graduate degree

23. What is the child's father's date of birth: *mm / dd / yyyy*

24. What is the child's father's employment status?

- ❑ Full-time
- ❑ Part-time
- ❑ Unemployed/Not working
- ❑ Unknown/Decline

25. What is the highest grade completed by the father? **(select one).**

- ❒ 8th grade or below
- ❒ 9th grade
- ❒ 10th grade
- ❒ 11th grade
- ❒ High school
- ❒ GED
- ❒ Some college
- ❒ Trade school
- ❒ 2 yr degree
- ❒ 4 yr degree
- ❒ Some graduate school
- ❒ Graduate degree

26. Were there any complications during the child's delivery (e.g., premature birth, spent time in the Neonatal Intensive Care Unit (NICU)?

_____Yes _____No _____ Not sure

If yes, please describe:_____

27. How much did child weigh when he/she was born?

____ ____ AND ____ ____

ENTER POUNDS ENTER OUNCES

OR ____ ____ . ____ ____ OR ____ ____ ____ ____

ENTER KILOGRAMS ENTER GRAMS

28. Did your child have feeding/eating difficulties at birth? _____Yes _____No _____Not sure

If yes, please check all that apply:

- ❑ Reflux
- ❑ Food allergies
- ❑ Difficulties sucking
- ❑ Specialized bottle, which type _____
- ❑ Other, please describe _____

29. Does your child have difficulty eating now? _____Yes _____No

If yes, please check all that apply:

- ❑ Picky eater (e.g., will only eat a few kinds of food)
- ❑ Puts too much food in mouth (e.g., stuffs)
- ❑ Holds food in mouth for longer that you would expect
- ❑ Doesn't eat enough food

Other, please describe _____

30. Which best describes your child's cleft diagnosis:

- ❑ Unilateral cleft lip and palate
- ❑ Bilateral cleft lip and palate
- ❑ Unilateral cleft palate only
- ❑ Bilateral cleft palate only

31. Is your child followed by a Cleft Palate Team*?* _____*Yes* _____*No*

If yes, name _____

32. Has child had any major surgeries or significant hospitalizations since birth?

Number of hospitalizations: _____

Age at cleft lip repair :_____

Age at cleft palate repair :_____

Wear a palatal obturator? :_____

Fistulae repair?; _____*Yes* _____*No*

Other? If yes, please describe:_____

33. Has your child had any of the following:

Tonsillitis?_____ Yes _____No
If yes, please give his/her Age_____ Duration of problem _____Hospitalized _____Yes _____No
Sinusitis?_____ Yes _____No
If yes, please give his/her Age_____ Duration of problem _____Hospitalized _____Yes _____No
Frequent Colds?_____ Yes _____No
If yes, please give his/her Age_____ Duration of problem _____Hospitalized _____Yes _____No
Earaches?_____ Yes _____No
If yes, please give his/her Age_____ Duration of problem _____Hospitalized _____Yes _____No
Draining Ears?_____ Yes _____No
If yes, please give his/her Age_____ Duration of problem _____Hospitalized _____Yes _____No
High Fever?_____ Yes _____No
If yes, please give his/her Age_____ Duration of problem _____Hospitalized _____Yes _____No

34. Does your child have difficulty hearing? _____ yes _____ no
If yes, please give the date of his/her hearing screening _____

35. During the past three months has your child experienced:

Recurrent ear infections? _____Yes _____No
Placement of ear tubes? _____Yes _____No
If yes, please give a date for ear tubes: _____

36. Does your child have difficulty seeing? _____ yes _____ no
If yes, please give the date of his/her vision screening _____

37. Does your child have any physical handicaps? _____ yes _____ no
If yes, please describe _____

38. Does your child take any medication regularly? _____Yes _____No

If yes, please describe:_____

39. Has your child been seen by a geneticist*? _____Yes _____No*
*If yes, what was result?*_____

40. Does your child have any allergies? _____Yes _____No

If yes, please check all that apply:

- ❑ Food, please specify _____
- ❑ Environmental (e.g., pollen, dust)
- ❑ Medicine

41. Do you have any concerns about how your child talks and makes speech sounds?

_____ Yes _____ No _____ A little

If yes, please check all that apply:

- ❑ My child has difficulty saying words
- ❑ My child has difficulty saying or pronouncing certain sounds (e.g., “at” for “cat” or “do” for “dog”)
- ❑ Other (please describe): _____

42. How does your child primarily communicate?

- ❑ Sounds
- ❑ Gestures
- ❑ One or two words
- ❑ Phrases
- ❑ Sentences

43. How often is your child understood by the following:

a) Parents

- ❑ 25%
- ❑ 50%
- ❑ 75%
- ❑ 100%
- ❑ n/a

b) Brothers/Sisters

- ❑ 25%
- ❑ 50%
- ❑ 75%
- ❑ 100%
- ❑ n/a

c) Grandparents:

- ❑ 25%
- ❑ 50%
- ❑ 75%
- ❑ 100%
- ❑ n/a

d) Playmates:

- ❑ 25%
- ❑ 50%
- ❑ 75%
- ❑ 100%
- ❑ n/a

e) Unfamiliar Adults:

- ❑ 25%
- ❑ 50%
- ❑ 75%
- ❑ 100%
- ❑ n/a

44. Did your child babble (e.g., ga-ga-ga, ba-ga-ba)? _____Yes _____No

45. When did you child say his or her first words?

_____ months

_____ my child does not have any words

46. Did your child start talking and then stop talking? _____Yes _____No

If yes at what age? _____ months

47. Do you have any concerns about how your child understands what you say?

_____ Yes _____ No _____ A little

48. Do you have any concerns about how your child uses his or her hands and fingers to do things?

_____ Yes _____ No _____ A little

49. Do you have any concerns about how your child uses his or her arms and legs?

_____ Yes _____ No _____ A little

50. Did your child achieve motor milestones (e.g., walked later than 15 months) later than expected?

_____ Yes _____ No

If yes, please describe:_____

51. Do you have any concerns about how your child behaves?

_____ Yes _____ No _____ A little

If yes, please check all that apply:

- ❑ My child is shy or withdrawn
- ❑ My child has tantrums more that I would expect
- ❑ My child has trouble listening or following directions
- ❑ Other (please describe): _____

52. Do you have any concerns about how your child gets along with others?

_____ No _____ Yes _____ A little

If yes, please describe: _____

53. Do you have any concerns about how your child is learning to do things for himself/herself?

_____ No _____ Yes _____ A little

If yes, please describe: _____

54. Do you have any concerns about how your child is learning preschool or school skills?

_____ No _____ Yes _____ A little

If yes, please describe: _____

Thank you very much for completing this questionnaire!

APPENDIX D

Caregiver-Child Interaction Protocol

Purpose: To get a sample of the child and parent's play and language skills

General Procedures:

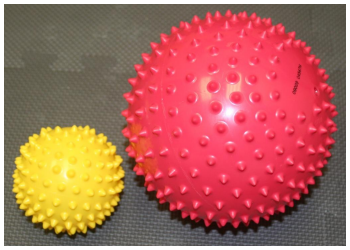
1. Be sure the materials are set-up (but out of the child's sight) before the testing session.
2. At the beginning of the entire testing session, explain to the parent that we will video record them reading a book, eating snack, playing with toys.
    a. Suggest that the most desired activity come last and that usually the order is book, snack, play.
    b. Explain that they will eat, read, play until the time beeps.
3. Make sure the video camera has enough charge for you to unplug it and carry it around to ensure good view of the adult and child play.
4. At the end of all 3 tasks, thank the parent for letting us watch their regular interactions and discuss the importance of the information we get from watching children interact with their parents.
5. Be sure to label all videos with the correct name and to note when you had to stop and re-start the video (e.g., videos to discard) on the video log.

Procedures

1. Expose the bookshelf of toys and tell the parent that they can chose any or all of the toys and play with the toys as they normally would until the timer beeps (about 10 minutes).
2. Explain how the garage and elephant toy works. Ask the parent if they have any questions.
    1. Set the timer for 11 minutes.
    2. Start video recording and the timer when the adult and child have selected a toy or are engaged together selecting a toy.
    3. Give the parent a 30 second warning before the timer beeps.
    4. Do not provide any coaching or feedback to the parent.
    5. If the parent asks a question about what they should be doing, respond by telling them to do what feels natural (e.g., what they normally do).
    6. If the child protests playing with toys (e.g., refuses to engage for more than 2 minutes), ask the parent if this is their usual performance with toys. If it is, continue recording until the timer beeps. If it is not, make a plan with the parent to try again during the next session or after book or snack.

Play Materials

Dump Truck with man (1)



Balls (2)

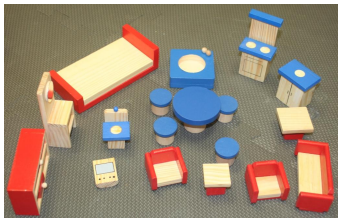
Garage with 3 Cars

Wooden Blocks

Bus with 9 People

Phone (1)

Jungle Animal Puzzle



Wooden Furniture

Pots & Pans

Dinosaurs (4)

Jungle Animals (6)

People (6)

Farm animals (7)

Pop-up Toy (1)

Shaper Sorter with 5 shapes

Wooden Doll House

APPENDIX E

KidTALK Transcription Guidelines

Starting a New Transcription

All of the sessions that we analyze are transcribed and coded using the Standard Analysis of Language Transcripts (SALT) program. Once you have opened this program, you can type just as you would in any other program.

1. Locate the session and video to be transcribed on the spreadsheet (or on the DVD if in training).
2. Complete the following information and then select OK.
3. Locate the KidTALK HEADER and complete the following information.
4. Save the file into appropriate location File → Save As → See file naming conventions and file location specific to your project.
5. Complete the SALT header for the session

```
$ Child, Adult

+ ID: ___ → Child's ID number

+ Sex:__ → M or F

+ Session: ___ → see naming conventions specific to each project

+ Adult: ___→ (e.g., mother, father, therapist, teacher)

+ Context: ___→ This is the location of the session (home or clinic)

+ DOB: __ → see spreadsheet for list of birthdates

+ DOE: ____ → date the video was recorded

+ Transcriber: ____ → your first and last name

+ DOT: ______ → date you finished the transcript

+ Verifier:

+ DOV:

- 0:00
```

Entering Time

1. 0:00 is the automatic time. If the sample does not start at 0:00, remove 0:00 and enter correct time.

2. Enter the time on its own line, beginning with a hyphen (MM:SS)
   - 23:52 = 23 minutes, 52 seconds

3. Record the time every minute after the start time.
   - 23:52

```
c bus.

a bus.

c drive.

a go.
```

   - 24:52

4. The last line of every transcript should be a time, even if one whole minute has not elapsed.

General Rules for Entering Transcripts

1. Begin in the first column, do not indent.

2. Enter the speaker label as defined in the speaker line, followed by a space.
   a = adult
   c = child

```
a now you tell me a story.

a onceuponatime there was a~

a good.

c driver

a bus.
```

3. As SALT ignores text case during analysis, either upper or lower case text may be entered.

4. Type in the exact words of each speaker.

5. For long utterances the SALT editor will automatically wrap the text into two or more lines as needed. DO NOT press <Enter> until the end of the utterance.

```
a and then what happen/ed?

c the bus jump/ed over the fence, met a cow who was on the grass eat/ing
the grass.
```

6. Each utterance should be entered on a separate line. Even when the same speaker says more than one utterance in a row, each utterance is given its own line.

```
a now you tell me a story.

a onceuponatime there was a~
```

```
c bus.

a good.

c (then) then he was trynta stop them brake/s.

c that girl run.

c he try/ed to race the bus.
```

7. Utterances are separated when they are different thoughts or when it appears to be the same thought but is separated by a pause of greater than 3 seconds.

8. Only transcribe adult utterances that are directed to the child (as opposed to another adult).

9. Transcribe all child utterances.

10. Only commas (,) and double quotes (" ") may be used to punctuate a sentence. All other punctuation marks have special meaning.
    `c the cow said "moo".`

11. An utterance must end with an ending punctuation mark (. ! ? > ^ ~) as the last character. When necessary, quotation marks should be placed before the ending punctuation.

SPECIAL CASE: When children list a long string of nouns:

Example 1: labeling or listing objects or pictures

Wrong:

```
c a dog and a boy and girl and a boy and a dog and a girl and a pink
butterfly and a purple one and a banana.
```

Right:

```
c a dog.

c and a boy.

c and a girl.

c and a boy.

c and a dog.

c and a girl.

c and a pink butterfly.

c and a purple one.
```

```
c and a banana.
```

Example 2: repeating the same words

Wrong:

```
c and a girl and a girl and a girl.
```

Right:

```
c (and a girl and a girl) and a girl.
```

Example 3: not listing, all words are still part of the utterance

Right:

```
c the dog played with a cat, a ball and a boy.
```

Wrong:

```
c the dog played with a cat.

c a ball.

c and a boy.
```

Words and Vocalizations

1. A 'word' is consistently used by the child, and is consistently interpreted by the listener.

2. A 'production' is consistently treated as a word by a parent or person familiar with the child, then you should also treat it as a separate word or form, (e.g., wawa for water.).

3. Babbling should be transcribed as a vocalization using brackets.
   ```
   c {ba ba ba ba}.
   ```

4. Vocalizations should be transcribed as {vocalizes} if you can't spell out the sounds like in babbling. Vocalizations are usually mostly vowels while babbling is consonant and vowels.

5. Singing or sounds are sometimes transcribed in brackets, depending on the type of sound.

   ```
   c {singing}.
   c {car sounds}.
   c {whee}.
   c {oo}.
   c {sounds}.
   ```

   The following sounds should be transcribed (e.g., not put in brackerts):
   Baa

Choochoo
Cockadoodledoo
Grrr
Meow
Moo
Ouch
Quack
Uhoh
Vroom
Woof
Yum

6. When names or titles are used use transcribe as follows:

```
c littleredridinghood.
c onceuponatime.
```

7. Words are separated by blank spaces and commas, and may be "quoted".

8. A word is considered to be any group of legal word characters.

9. Laughter that is directed towards an adult (e.g., to share enjoyment with the adult NOT laughing to him or herself) should be transcribed in brackets:
   Example:
   C {laughs}.
   A {laughs} fun toys.

10. Echolalia or scripted speech (rote language or chunky speech) should be transcribed in { }.

Communicative Gestures

1. Gestures that are used for communication are transcribed in brackets { }.

2. Gestures for communication include:
   a. Pointing at an apple and saying apple.
      ```
      c {pointing}.
      C {pointing} apple.
      ```
   b. Raising arms in the air to indicate he wants to be picked up.
      ```
      c {reaches up}.
      ```
   c. Child grabs toy from parent while looking at parent (looking indicates intentional communication)
      ```
      c {grabs toy} mine.
      ```

3. Common prelinguistic gestures include pointing, showing and giving
   ```
   c {holds up ball}.  → SHOW
   c {gives ball to mom}.  → GIVE
   ```

```
c {points to ball}.  → POINT
c {open hand reach for ball}. → OPEN HAND REACH
c {nods head}. → to indicate yes to a question
c {shakes head}. → to indicate no to a question or that the child wants
something to end.
```

4. Only gestures that are clearly an attempt to communicate with an adult are transcribed. For example, a child and adults exchanging toys (e.g., grabbing toys without intentionally communicating they want the toy) is not considered to be communicative.
   Example: communicative
   ```
   c {grabs toy while looking at the adult who is holding onto the toy} mine.
   ```
   Example: non-communicative
   ```
   c {grabs toy from adult not looking at the adult} mine.
   ```

Symbolic Language that Doesn't Use Words

There are special rules for children who use signs and augmentative devices. These gestures should be written outside brackets, so that SALT is able to count them as words.

Example:
C {selects the ball button on electronic device} ball.

Example:
C {signs more} more.

Transcribing Child Actions

1. Play actions that are obviously and intentionally imitated by the adult are transcribed.

2. If the adult imitates an action and says something they are transcribed on the same line.
   Example:
   ```
   C {pours water}.
   A {pours water}. → for this to be transcribed the adult must be in
   CLOSE proximity to the child and be CLEARY imitating what the child
   is doing (e.g., not simply pouring water side by side).
   ```

   Example:
   ```
   C {drives car}.
   A {drives car} I drive car.
   ```

Ending Punctuation

1. Every utterance may only include one and end with one of these punctuation marks: . ! ? ~ > ^

2. The ending punctuation mark must be at the very end of the utterance.

3. *Statements* end with a period or exclamation mark (. !).

4. *Questions* end with question marks (?).
```
a then what happen/ed?
c the cow said "moo".
```

5. *Intonation prompts* (open-ended utterance used to prompt other speaker) end with a tilde (~).
```
a the bus~
c jumped over the fence.
```

6. Abandoned utterances end with a greater-than sign (>). The speaker voluntarily stops mid-utterance.
```
c the bus jump/ed over the>
c the cow said "moo".
```

7. Interrupted utterances end with a caret (^).
```
c the bus jump/ed over the^
a the bus jump/ed over the fence.
```

Bound Morphemes

1. Marks the use of: (a) plurals, (b) possessives, (c) verb inflections, and (d) contractions with a slash.

2. Types of Plurals and Possessives:
   (a) Regular Plural Inflection: `boy/s`
   Not used on words without singular form (e.g. scissors)
   ```
   scissors = scissors
   cats = cat/s
   ```

   (b) Possession: `dog/z bone`
   Not used on possessive pronouns (e.g. his, hers, theirs)
   ```
   His hat = his hat.
   Cat's = cat/z hat.
   ```

   (c) Plural Possessives: the animal/s/z food
   ```
   Dogs' bones = dog/s/z bone/s.
   Cats' hats = cat/s/z hat/s.
   ```

3. Verb Inflections and Contractions
   (a) Third Person Singular Verb Inflection: jump/3s
   - Not used on irregular verbs (e.g. does or has)
   ```
   c he has tire/s.

   c he run/3s away.
   c policeman blow/3s his whistle.
   ```

(b) Progressive Inflection: skip/ing
- Not used on participles (flying bird); "flying" serves as a modifier NOT a verb.
- Not used on gerund (I like dancing); "dancing" serves as a noun NOT a verb.
- Not used on concatenatives (gonna, wanna, hafta)

```
c he wanna get the bus.

c she like driving the bus.
c the bus is run/ing away.
```

(c) Regular Past Tense: laugh/ed
- Do not change the spelling of the word stem (e.g use cry/ed not cri/ed)
- Not used on irregular past tense verbs (e.g. had or made)
- Words like tired, bored, closed do not function as verbs and do not get slashed.

```
c he try/ed to stop him.

c he ran and jump/ed into the lake.

c the bus is bored.
```

(d) Contracted Verbs: he/'ll go, he/'s going

```
c he/'s going to race the bus.

c he/'ll go to the policeman.
```

(e) Contracted Negatives: did/n't, was/n't
- Do not use slash for won't, don't, ain't, let's

4. Always keep the spelling of the word root or stem.

```
c baby/s/z bottles.

c he try/ed to catch the bus.
```

Transcribing Unintelligible Utterances

1. Use a X to mark an unintelligible word or syllable.

```
c he X race the bus.

c he XX jump the fence.

c XXX.
```

2. Use XX to mark an unintelligible segment (e.g., more than 1 word in the utterance).

```
c he XX jump the fence.
```

3. Use XXX when the entire segment is unintelligible.

4. Partially unintelligible words are considered intelligible…e.g. "Xing"

Spelling Conventions

1. Be consistent with spelling conventions. Error check does not monitor spelling inconsistencies.

2. Note the bound morphemes rules above and use them consistently.

3. Do not use a period for abbreviations because it is reserved for use as ending punctuation. Either spell out the word or just leave the period off.

4. Proper names and title are transcribed as a single linked word.
   ```
   c lighteningmcqueen

   c misterjones

   c missward

   c devonsmith
   ```

5. Do not use and an apostrophe at the beginning of a word (e.g, 'cuz for because should be transcribed):
   ```
   c cuz he was tired of being on the road.
   ```

6. Numbers can be written out or entered as digits. (e.g., twentyone OR 21), but MUST be done the SAME way throughout a transcript (e.g., you cannot use 1 and one within the same transcript)

7. Counting and saying the alphabet: If the child recites several letters of the alphabet or numbers
   Example: Child says "q r s t u v"
   ```
   c {child says the alphabet}.
   ```
   Example: Child says "1 2 3 4 "
   ```
   c {child counts}.
   ```

8. Singing or sounds should be transcribed in brackets:
   ```
   c {singing}.
   c {car sounds}.
   ```

Unique Word Spellings

Word Spelling	Notes

Ain't	
Aks	When a child says, "He aks me for a ride" and it is clearly pronounced "AX", please type "aks" and not ask.
Allgone	
Allright	ONE word.
alotta	"a lot of"
Atta	Means "that's a"
Betcha	Means "bet you"
Bouta	Means "about to"
Byebye	should be transcribed as: byebye NOT: (bye) bye
Cuz	Transcribe cuz, NOT: cause or (be)cause
Doggy	Doggy or doggy/s
Door	Regardless of how the child says the word, if you think he is saying "door" transcribe: door.
Don't	Don't does not get slashed
Ew	Sound indicating grossness {ew}
Finta	(Fittin to) means "going to" or "about to"
Getcha	as in " I'm going to getcha"
Gimme	Means: give me (e.g., gimme the toys)
Gonna	
Gotta	
Hafta	
Heezy	"This party is the heezy" (meaning something is cool or fun)
Hey	
Hisself	
Hmm	Hmm DOES have 2 mm. Please transcribe with 2 mm {hmm}

Huh	Request for clarification (huh?)
Ima	Means: I'm gonna
/ing	Transcribe: run/ing even if the child says "runin"
Legos	Brand name, NO slash
Let's	Let's does not get slashed
Liketa	"like to"
Lookit	"look at"
Mhm	{mhm}
Mister	Misterjones
Mmm	Childs hums "mmm" indicating "I don't know" {mmm}
Momma	For momma or mamma

Unique Word Spellings

Word Spelling	**Notes**
MRS, MISS, or MS	
Nope	
Nuhuh	Indicates negative response, NO
Oh	
Ohno, ohmy	Transcribe as one word
Ohmygoodnessess	One word for "oh my goodness"
OK	NEVER okay
Onceuponatime	All one word
Oops	For oopsy, whoops, oop, oops
Oughta	"ought to"
Playdoh	All one word
Psst	

Racecar	All one word
Sposta	"supposed to"
Shh	*Note only 2 h's {shh}
Stopsign	All one word
Tada	NOT tah-dah or ta da {tada}
Thankyou	Transcribe thankyou as one word
Them	NEVER 'em
Theend	The end should be transcribed at one word
Theyselves	
Trynta	"trying to)
Uhhuh	Indicates "yes"
Uhoh (one word)	
Uhuh	Indicates "no"
Usey	in reference to having to use the restroom ("I gotta go usey")
Wanna	
We vs. whee	We go to the mall. {Whee} girl down slide.
What did	For "What did " NOT: wha(t) (di)d NOT what'd
Whatcha	"what are you"
Whoopin	for spanking/beating
Whee	{whee}
Wow	Used for whoa, woohoo etc.
Y'all	one word, no slashes
Yay	yay, yea in excitement
Yeah	Indicates "yes"

Yep	
You'rewelcome	Transcribe you're welcome as one word

Mazes and Part Words

Maze: any false start, repetition, or reformulation and is marked by enclosing that part of the utterance in parentheses.

1. Mark any repetition, false start, or reformulation as a maze and place it in parentheses.
   Example: If the child says: "the bus, the bus, the bus ran away"

   `c (the bus, the bus) the bus ran away.`

   Example: If the child says: "and the girl, the driver, the busdriver ran after the bus"

   `c and (the girl, the driver) the busdriver ran after the bus.`

2. After marking all mazes in parentheses, make sure that the words outside of the parentheses can stand alone.

3. Place all fillers ("um", "eh", "ah", "er") in parentheses as a maze unless they are being used as an affirmation, negation, or interrogation.
   `c (um) the bus (um) ran away.`

   `c (er) the driver (er) ran.`

4. All adjacent mazes should combined into a larger continuous maze, regardless of type (e.g. part words, repetitions, fillers, etc.)
   * Mazes cannot be nested within each other
   `c (the bus um the bus) the bus ran away.`

   `NOT: (the bus (um) the bus) the bus ran away. ← INCORECT NESTING!`

5. When you have a choice of which words or phrases to mark as the maze, mark the earliest occurrences as mazes. The last occurrence of the word or phrase is considered the successful production.
   `c the bus saw (the) the cow.`

   `NOT: c the bus saw the (the) cow.`

6. Mark stuttering at the beginning of words with an asterisk after the completed sound(s) and then put in parentheses.
   Example: the child says. I saw a c-c-c-cow

```
c I saw a (c*c*c*) cow.
```

7. Mark stuttering within a word with underscore markings connecting to the beginning and ending sounds of the word in addition to the asterisk and parentheses
   Example: the child says. I saw a c-c-c-cow
   ```
   c a ye_l*l*l*_ow car.
   ```

8. Part words that occur at the end of an abandoned utterance or at the end of an utterance that is interrupted are not marked in parentheses as mazes.
   ```
   c He saw the c*>
   c What that?
   ```

Parenthetical Remarks and Overlapping Speech

Parenthetical Marks a word or clause within an utterance that has been added by the speaker as an explanation or comment.

1. Mark parenthetical remarks that interfere with the rest of the utterance with double parentheses.
   Example:
   ```
   c the animal ((I can't remember the name)) jump the fence.
   ```
   Example:
   ```
   c the ((what's that called)) <> bus ran away.
   a <bus>.
   ```

2. Once parenthetical remarks are enclosed in double parentheses, the remaining utterance should be able to stand on its own.

Overlapping Speech: when two or more speakers speak at the same time.

1. Overlapping speech is marked with angle brackets (<>). Be sure to mark the concurrent speech of all speakers.
   Overlapping speech can be the same words
   ```
   a <onceuponatime>.
   c <onceuponatime>.
   ```
   Or different words
   ```
   a <onceuponatime>.
   c <there was a bus>.
   ```

2. Overlapping speech may occur at any place within an utterance, including within or around mazes. Mark the overlapping speech and continue transcribing and segmenting utterances as normal.
   ```
   c the bus <ran away> from the driver.
   a <talk louder>.
   ```

3. If overlapping speech occurs at the end of an utterance, place the final punctuation mark after the angle bracket.

```
a <talk louder>.
```

4. If one speaker speaks during another's utterance but does not overlap with any speech, mark the interruption in the other speaker's utterance with empty angle bracket.
```
c the bus ran away <> from the driver.
a <uhhuh>
```

Gestures and Transcriber Comments

Gestures and non-verbal turns: communicative gestures or vocalizations that contribute to the speaker's turn.

1. Mark gestures, vocalizations, and nonverbal turns with braces {}.
```
a do you think the bus was happy to be on the road again?
c {child shakes his head yes}.
```

2. Nonverbal content comments can be marked with braces within an utterance to supplement the speech, or as its own utterance to stand as a communicative turn without speech.
Example:
```
c the bus jump/ed over that {child points to the book}.
```
Example:
```
a and then what happen/ed?
c {child shrugs shoulders}.
```

3. Additional comments may be added to the transcript to provide general clarification about a given speaker or event
** comments must start with = (not "c" or "a") so they are not counted in the summary.
```
c XXX.
= loud background noise is present.
= the child has hand in mouth.
```

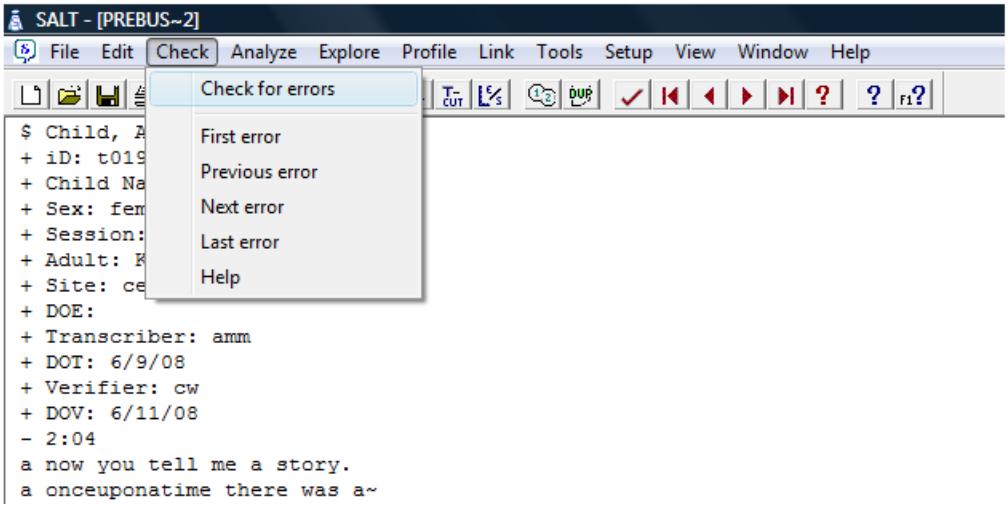
4. All additional comments are started with an equal sign on their own line.

Checking for Errors

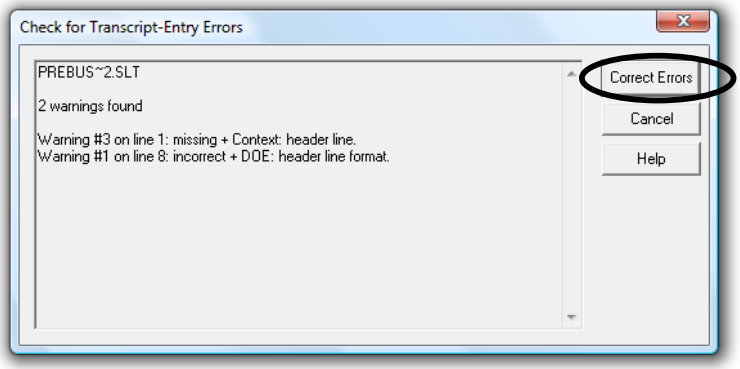
1. Transcriber self checks for errors:
The "check for error" function of SALT will not find spelling mistakes or incorrect slashing of morphemes. So it is very important to check the transcript for correct use of:

   (a) Word segmentation
   (b) Bound morphemes
   (c) Unique word spellings
   (d) Correct use of mazes
   (e) Beginning and ending time is entered correctly
   **Mistakes lead to inflated word counts and inaccurate data.

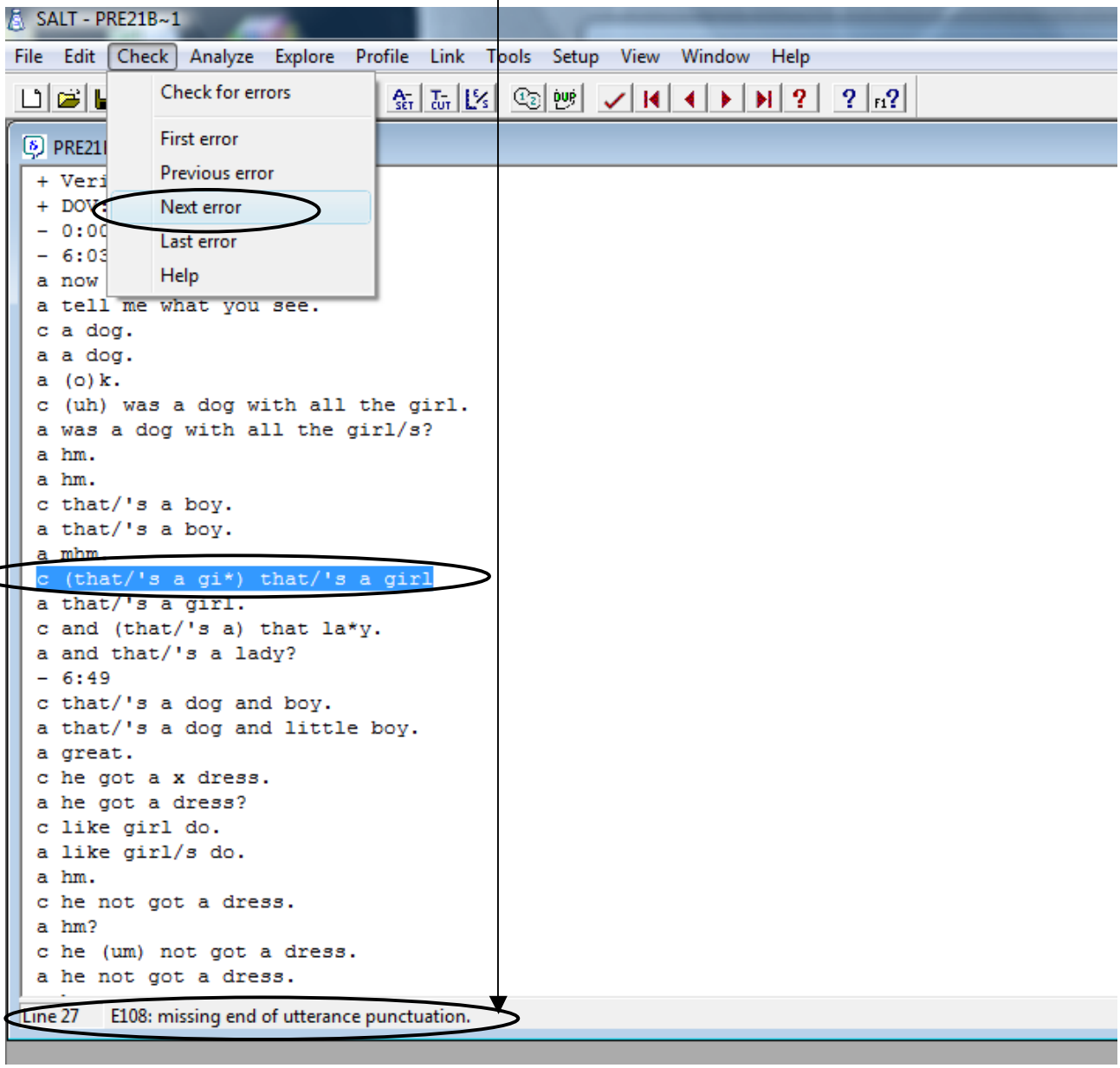
2. Transcriber runs "error" check in SALT:
   (a) Check for Errors



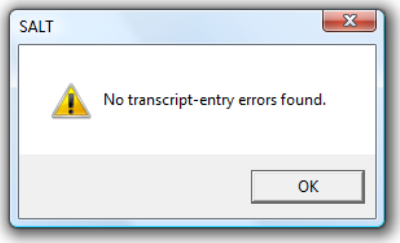
   (b) Correct Errors



(c) Fix errors by going through "next errors." The line at the bottom of the page, tell you the error.



(d) When you've corrected all errors, run "check for errors again" to ensure that your transcript is error-free:



APPENDIX F

Correlation Matrix for Full Sample of Participants

	LS Intel	MCX Intel	Bayley	PLS AC	PLS EC	PLS TOTAL	MCDI Total	LS NDW	LS TW	LS MLU
LS Intel	1	**.358***	-.130	.002	.100	.058	.310	**.470***	**.394***	**.346***
MCX Intel	**.358***	1	.281	**.559***	**.390***	**.499***	**.513***	**.541***	**.377***	**.401***
Bayley	-.130	.281	1	**.573***	**.548***	**.590***	**.442***	.190	.077	.154
PLS AC	.002	**.559***	**.573***	1	**.775***	**.935***	**.505***	**.408***	.267	**.419***
PLS EC	.100	**.390***	**.548***	**.775***	1	**.948***	**.524***	**.569***	**.461***	**.530***
PLS Total	.058	**.499***	**.590***	**.935***	**.948***	1	**.548***	**.523***	**.394***	**.506***
MCDI total	.310	**.513***	**.442***	**.505***	**.524***	**.548***	1	**.711***	**.500***	**.750***
LS NDW	**.470***	**.541***	.190	**.408***	**.569***	**.523***	**.711***	1	**.912***	**.857***
LS TW	**.394***	**.377***	.077	.267	**.461***	**.394***	**.500***	**.912***	1	**.718***
LS MLU	**.346***	**.401***	.154	**.419***	**.530***	**.506***	**.750***	**.857***	**.718***	1

* $p < .05$

Correlation Matrix – Participants with Typical Speech and Language Development

	LS Intel	MCX Intel	Bayley	PLS AC	PLS EC	PLS TOTAL	MCDI Total	LS NDW	LS TW	LS MLU
LS Intel	1	.287	-.080	.192	.390	.323	**.584**	**.593***	.414	**.579***
MCX Intel	.287	1	.017	**.538***	.387	**.488***	**.512***	**.478***	.234	.399
Bayley	-.080	.017	1	.406	.384	.420	.274	.086	.124	.030
PLS AC	.192	**.538***	.406	1	**.759***	**.927***	.410	.390	.242	.353
PLS EC	.390	.387	.384	**.759***	1	**.947***	**.613***	**.628***	**.513***	**.612***
PLS Total	.323	**.488***	.420	**.927***	**.947***	1	**.561***	**.557***	.419	**.529***
MCDI total	**.584***	**.512***	.274	.410	**.613***	**.561***	1	**.790***	**.613***	**.864***
LS NDW	**.593***	**.478***	.086	.390	**.628***	**.557***	**.790***	1	**.913***	**.866***
LS TW	.414	.234	.124	.242	**.513***	.419	**.613***	**913***	1	**.729***
LS MLU	**.579***	.399	.030	.353	**.612***	**.529***	**.864***	**.866***	**.729***	1

* $p < .05$

Correlation Matrix – Participants with CLP

	LS Intel	MCX Intel	Bayley	PLS AC	PLS EC	PLS TOTAL	MCDI Total	LS NDW	LS TW	LS MLU
LS Intel	1	.256	-.087	-.172	-.163	-.179	.161	.266	.303	.065
MCX Intel	.256	1	**.468***	**.566***	.353	**.484***	**.540***	**.566***	**.588***	.362
Bayley	-.087	**.468***	1	**.722***	**.735***	**.767***	**.553***	**.534**	**.480**	.375
PLS AC	-.172	**.566***	**.722***	1	**.784***	**.941***	**.570***	.449	.388	**.505***
PLS EC	-.163	.353	**.735***	**.784***	1	**.947***	.453	**.495***	**.475***	.397
PLS Total	-.179	**.484***	**.767***	**.941***	**.947***	1	**.536***	**.491***	.452	**.468***
MCDI total	.161	**.540***	**.553***	**.570***	.453	**.536***	1	**.834***	**.729***	**.705***
LS NDW	.266	**.566***	**.534**	.449	**.495***	**.491***	**.834***	1	**.964***	**.838***
LS TW	.303	**.588***	**.480**	.388	**.475***	.452	**.729***	**.964***	1	**.794***
LS MLU	.065	.362	.375	**.505***	.397	**.468***	**.705***	**.838***	**.794***	1