University of Iowa
Iowa Research Online

Theses and Dissertations

2012

Developing a novel coding system for analyzing language stimulation behaviors during adult-child interactions

Rebecca Mae Alper
University of Iowa

Copyright 2012 Rebecca Mae Alper

This dissertation is available at Iowa Research Online: http://ir.uiowa.edu/etd/2809

Recommended Citation
Alper, Rebecca Mae. "Developing a novel coding system for analyzing language stimulation behaviors during adult-child interactions." thesis, University of Iowa, 2012.
http://ir.uiowa.edu/etd/2809.

Follow this and additional works at: http://ir.uiowa.edu/etd

Part of the Speech Pathology and Audiology Commons

DEVELOPING A NOVEL CODING SYSTEM FOR ANALYZING LANGUAGE STIMULATION BEHAVIORS DURING ADULT-CHILD INTERACTIONS

by

Rebecca Mae Alper

A thesis submitted in partial fulfillment
of the requirements for the Master of
Arts degree in Speech Pathology and Audiology in the Graduate College of
The University of Iowa

May 2012

Thesis Supervisor: Professor Richard Hurtig

Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

MASTER'S THESIS

This is to certify that the Master's thesis of

Rebecca Mae Alper

has been approved by the Examining Committee
for the thesis requirement for the Master of Arts
degree in Speech Pathology and Audiology at the May 2012 graduation.

Thesis Committee: _____
Richard Hurtig, Thesis Supervisor

_____
Amanda Owen VanHorne

_____
Patricia Zebrowski

_____
Linda Louko

_____
Karla McGregor

ACKNOWLEDGMENTS

Thank you to the faculty in the Department of Communication Sciences and Disorders at the University of Iowa, especially Dr. Richard Hurtig, for your support and guidance during the completion of this thesis.

TABLE OF CONTENTS

LIST OF TABLES v

LIST OF FIGURES vi

CHAPTER 1-INTRODUCTION 1

Input:Types and Important Factors 2
Language Stimulation: Theory and Approaches 3
Language Stimulation: Intervention 4
Available Coding Systems: Limitations 5
Goals of the Current Study 5

CHAPTER 2-THE NEW CODE 10

The Alper Code 10
Dependent Measures and Codes 16
Summary of Limitations of Published Coding Systems 24

CHAPTER 3-METHODS/DEMONSTRATING CODE USEFULNESS 28

Overview 28
Participants 28
Data Collection and Study Design 29
Data Analysis 30

CHAPTER 4-RESULTS 36

Outline 36
Number of Verbal Behaviors 36
Mother and Child Talkativeness 36
Mothers' Verbal Behaviors During Reading and Play (CC) 37
Mothers' Verbal Behaviors with Familiar and Unfamiliar Stimuli 38
Mothers' Verbal Behaviors Using the DC 39
Play Breakdown 40
Children's Verbal Behaviors During Reading and Play (CC) 41
Children's Verbal Behaviors with Familiar and Unfamiliar Stimuli 41

CHAPTER 5-DISCUSSION 61

The Different Levels of Coding 61
Talkativeness 63
Directiveness 64
Facilitative Contexts and Stimuli 66
Rare Events and Mother-Child Alignment 67
Future Directions 68
Establishing Code Reliability 69
Contingent Analysis 69
Tailoring the Code for Specific Purposes 70
Gathering Normative Data 70

Analyzing Clinician-Client Interactions 71
Analysis for Determining Dosage in Intervention 71
Clinical Training via Self-Analysis 72
Conclusion 73
REFERENCES 75

LIST OF TABLES

Table

1. Studies investigating parent-implemented RI and MT interventions 7-8

2. Language stimulation behaviors included in a variety of observational and intervention studies 9

3. Language stimulation behaviors included in published codes as compared to the Alper Code 26

4. Examples of incidental teaching techniques used in Peterson et al. (2005) study.....27

5. Books and toys by subject and week 33-34

6. Description of the data contained within each tier 35

7. Number of verbal behaviors coded for each participant in each setting.....57

8. Percent of mother and child conversational turns during reading, play, familiar, and unfamiliar interactions.....58

9. Play activity pairs and rationales for pairings.....59

10. Percent of RA1 and RA2 mothers' verbal behaviors that were non-directive/responsive during each play activity.....60

11. Response contingency possibilities 74

LIST OF FIGURES

Figure

1. ELAN Screenshot 32

2. Mother verbal behaviors during reading and play using the CC 44

3. RA1 mother verbal behaviors during familiar and unfamiliar reading sessions using the CC.....45

4. RA2 mother verbal behaviors during familiar and unfamiliar reading sessions using the CC.....46

5. RA1 mother verbal behaviors during familiar and unfamiliar play sessions using the CC.....47

6. RA2 mother verbal behaviors during familiar and unfamiliar play sessions using the CC.....48

7. RA1 and RA2 mother verbal behaviors that were non-directive/responsive during reading and play. 49

8. Percent of RA1 mother verbal behaviors that were non-directive/responsive when comparing the use of familiar and unfamiliar stimuli.....50

9. Percent of RA2 mother verbal behaviors that were non-directive/responsive when comparing the use of familiar and unfamiliar stimuli.....51

10. Child verbal behaviors during reading and play using the CC 52

11. RA1 child verbal behaviors during familiar and unfamiliar reading sessions using the CC.....53

12. RA2 child verbal behaviors during familiar and unfamiliar reading sessions using the CC.....54

13. RA1 child verbal behaviors during familiar and unfamiliar play sessions using the CC.....55

14. RA2 child verbal behaviors during familiar and unfamiliar play sessions using the CC.....56

DEVELOPING A NOVEL CODING SYSTEM FOR ANALYZING LANGUAGE STIMULATION BEHAVIORS DURING ADULT-CHILD INTERACTIONS

by

Rebecca M. Alper

A thesis submitted in partial fulfillment
of the requirements for the Master of
Arts degree in Speech Pathology and Audiology in the Graduate College of
The University of Iowa

May 2012

Thesis Supervisor: Professor Richard Hurtig

Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

MASTER'S THESIS

This is to certify that the Master's thesis of

Rebecca M. Alper

has been approved by the Examining Committee
for the thesis requirement for the Master of Arts
degree in Speech and Hearing Science at the May 2012 graduation.

Thesis Committee: _____
Richard Hurtig, Thesis Supervisor

_____
Amanda Owen VanHorne

_____
Patricia Zebrowski

_____
Linda Louko

_____
Karla McGregor

ACKNOWLEDGMENTS

Thank you to the faculty in the Department of Communication Sciences and Disorders at the University of Iowa, especially Dr. Richard Hurtig, for your support and guidance during the completion of this thesis.

TABLE OF CONTENTS

LIST OF TABLES v

LIST OF FIGURES vi

CHAPTER 1-INTRODUCTION 1

Input:Types and Important Factors 2
Language Stimulation: Theory and Approaches 3
Language Stimulation: Intervention 4
Available Coding Systems: Limitations 5
Goals of the Current Study 5

CHAPTER 2-THE NEW CODE 10

The Alper Code 10
Dependent Measures and Codes 16
Summary of Limitations of Published Coding Systems 24

CHAPTER 3-METHODS/DEMONSTRATING CODE USEFULNESS 28

Overview 28
Participants 28
Data Collection and Study Design 29
Data Analysis 30

CHAPTER 4-RESULTS 36

Outline 36
Number of Verbal Behaviors 36
Mother and Child Talkativeness 36
Mothers' Verbal Behaviors During Reading and Play (CC) 37
Mothers' Verbal Behaviors with Familiar and Unfamiliar Stimuli 38
Mothers' Verbal Behaviors Using the DC 39
Play Breakdown 40
Children's Verbal Behaviors During Reading and Play (CC) 41
Children's Verbal Behaviors with Familiar and Unfamiliar Stimuli 41

CHAPTER 5-DISCUSSION 61

The Different Levels of Coding 61
Talkativeness 63
Directiveness 64
Facilitative Contexts and Stimuli 66
Rare Events and Mother-Child Alignment 67
Future Directions 68
Establishing Code Reliability 69
Contingent Analysis 69
Tailoring the Code for Specific Purposes 70
Gathering Normative Data 70

Analyzing Clinician-Client Interactions 71
Analysis for Determining Dosage in Intervention 71
Clinical Training via Self-Analysis 72
Conclusion 73
REFERENCES 75

LIST OF TABLES

Table

1. Studies investigating parent-implemented RI and MT interventions 7-8

2. Language stimulation behaviors included in a variety of observational and intervention studies 9

3. Language stimulation behaviors included in published codes as compared to the Alper Code 26

4. Examples of incidental teaching techniques used in Peterson et al. (2005) study.....27

5. Books and toys by subject and week 33-34

6. Description of the data contained within each tier 35

7. Number of verbal behaviors coded for each participant in each setting.....57

8. Percent of mother and child conversational turns during reading, play, familiar, and unfamiliar interactions.....58

9. Play activity pairs and rationales for pairings.....59

10. Percent of RA1 and RA2 mothers' verbal behaviors that were non-directive/responsive during each play activity.....60

11. Response contingency possibilities 74

LIST OF FIGURES

Figure

1. ELAN Screenshot 32

2. Mother verbal behaviors during reading and play using the CC 44

3. RA1 mother verbal behaviors during familiar and unfamiliar reading sessions using the CC.....45

4. RA2 mother verbal behaviors during familiar and unfamiliar reading sessions using the CC.....46

5. RA1 mother verbal behaviors during familiar and unfamiliar play sessions using the CC.....47

6. RA2 mother verbal behaviors during familiar and unfamiliar play sessions using the CC.....48

7. RA1 and RA2 mother verbal behaviors that were non-directive/responsive during reading and play. 49

8. Percent of RA1 mother verbal behaviors that were non-directive/responsive when comparing the use of familiar and unfamiliar stimuli.....50

9. Percent of RA2 mother verbal behaviors that were non-directive/responsive when comparing the use of familiar and unfamiliar stimuli.....51

10. Child verbal behaviors during reading and play using the CC 52

11. RA1 child verbal behaviors during familiar and unfamiliar reading sessions using the CC.....53

12. RA2 child verbal behaviors during familiar and unfamiliar reading sessions using the CC.....54

13. RA1 child verbal behaviors during familiar and unfamiliar play sessions using the CC.....55

14. RA2 child verbal behaviors during familiar and unfamiliar play sessions using the CC.....56

CHAPTER 1-INTRODUCTION

Parents and caregivers are in an optimal position to provide rich, meaningful language models for their children in a variety of natural environments and interaction contexts. For instance, a study by Weizman & Snow (2001) showed that the presentation of “sophisticated” (i.e. uncommon) words in higher density, and in meaningful interaction contexts, to kindergarten-aged children within the home was responsible for greater than one third of the variance in terms of children’s vocabulary scores at the same age and two years later. Fortunately, most children do not need input beyond that which their caregivers naturally provide in order to develop into proficient language users. However, some children, who have impairments that negatively impact their ability to learn and/or use language, may benefit from extra and/or specialized input in order to acquire the necessary language skills. Even the most talented clinicians are significantly limited by the amount of time they have access to a child, and by the sometimes limited variety of environments in which they have the opportunity to provide services.

As an initial step towards quantifying the ways that parents and clinicians stimulate children’s language development during reading and play interactions, this study aimed to develop a comprehensive way of describing and coding the widest possible range of language stimulation behaviors occurring during adult-child dyadic interactions. As will be discussed throughout the introduction, one of the problems with existing codes is the variability in terms of the way that language stimulation behaviors have been categorized and coded varies from study to study. This new coding scheme is presented as a means of solving this problem due to its comprehensiveness and the carefully-constructed operational definitions assigned to each code. Before exploring the various coding schemes that have been published, some the current knowledge about adult-child linguistic interactions will be presented.

Input: Types and Important Factors

The need for a more comprehensive, detailed way of quantifying language stimulation behaviors during adult-child linguistic interactions is strongly motivated by the information that is currently available about this type of input. Specifically, information about the impact of the quantity and quality of the input on normal language development and the differences in the input received by different populations of children supports the need for comprehensive and consistent quantification of language stimulation behaviors.

Rowe (2008) demonstrated a link between the types of linguistic input that was provided to preschool-aged children, and the children's outcomes in terms of receptive vocabulary scores a year later. The type of input that a child receives can be influenced by parental factors such as knowledge of normal child development as well as socioeconomic status (Rowe, 2008). Additionally, the degree to which mothers were responsive as characterized by "meaningful change in the mother's behavior that was contiguous and contingent on the child's act" (p. 752) was shown to predict a child's arrival at early linguistic milestones (i.e. imitations, first words, 50 expressive vocabulary items, word combinations, and discussion of past-tense events) (Tamis-LeMonda, Bornstein, & Baumwell, 2001). Similarly, Yoder & Warren (1999) showed a positive relationship between a child's use of pre-linguistic intentional communication and their mother's responsivity as it relates to language development.

Also of interest is the finding that parents of children with disabilities tended to be less responsive and more directive than parents of typically-developing children (Kim & Mahoney, 2004). Similarly, parents of children with language delay were shown to produce fewer responses, use less "self-directed speech" (aka self-talk or speech not directed at the communication partner specifically), and provide fewer expansions as compared to parents of typically-developing children, which suggests that these parents might benefit from education about how to provide their children with extra support even

though they are not at a typical developmental level (Vigil, Hodges, & Klee, 2005). Therefore, it is important to determine the optimal input based on the needs of the child, and subsequently determine a method of scaffolding parents in providing this input. In order to determine what is optimal, there must be a way of comprehensively and reliably quantifying parental verbal behaviors.

Language Stimulation: Theory and Approaches

One of the ways that parents have been encouraged to provide rich language models for their children is through predominantly responsive, child-centered approaches incorporating language stimulation behaviors. Two categories of approaches, responsive interaction (RI) and milieu therapy (MT) are the ones that will be discussed here. The terms "responsive interaction" and "milieu therapy" were chosen for the purpose of this paper, but it should be noted that different authors sometimes use different terminology to describe techniques that encompass similar behavioral strategies. The RI and MT approaches were developed based upon a social-interactionist framework. The social-interactionist theory places a premium on following the child's lead and on tailoring the input based upon that specific child's movement through the learning process (Warren & Yoder, 1994).

Schneider & Watkins (1996) note that Vygotsky's Zone of Proximal Development (ZPD) fits well within the social-interactionist perspective on development and learning. According to Vygotsky (1978) the ZPD is "the distance between the actual developmental level, as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p.86). Therefore, the RI and MT approaches to adult-child interaction in the context of language development encourage the adult to provide the child with temporally and contextually contingent responses that are within that child's ZPD in order to optimize learning. Further, it is the hypothesis of this author

that the language models provided to the child during a responsive interaction have the potential to be more meaningful than adult-directed interaction due to the fact that the subject matter is dictated by the child's interest and attention at the moment when the input is being delivered. The biggest difference between the RI and MT approaches as they are defined for the purpose of this paper is that RI in its strictest form solely provides models for the child (i.e. it is entirely non-directive), while MT approaches incorporate both responsive and directive language stimulation techniques.

Language Stimulation: Intervention

Another motivation for the development of a more comprehensive way of describing and quantifying language stimulation behaviors is the need for easy comparison of the results of established RI and MT interventions. Interventions incorporating the use of language stimulation techniques in the form of RI or MT approaches, especially involving caregivers, are well supported in the child emergent language literature. Roberts & Kaiser (2011) reviewed 18 group (as opposed to single-subject) studies involving parents as agents of early language intervention using a variety of different early language intervention strategies. Eight of the ten studies investigated interventions designed based on the Hanen Program for Parents (Manolson, 1992). A couple of the remaining studies referenced were unpublished manuscripts (Roberts & Kaiser, 2011).

RI and MT family-based interventions have been shown to influence a variety of positive changes in both the adults and children involved in the interventions. A group of studies that illustrate some of the common themes and challenges seen in this area of research are presented in Table 1.

The studies listed in Table 1 and those included in the Roberts & Kaiser (2011) study are representative of the available literature about MT and RI. The above studies will be discussed briefly below, and in great detail in Chapter 2 in terms of how they

relate to the main goal of this study (i.e. developing a novel comprehensive coding system).

Available Coding Systems: Limitations

Given that research into parent-child language interactions as well as RI and MT interventions have been well represented in the literature, there should be consistent, comprehensive ways of quantitatively and qualitatively describing the types of language stimulation behaviors that occur during adult-child interactions. However, as will be demonstrated here (and in great detail in Chapter 2), this is not the case. Table 2 compares the language stimulation behaviors that were coded in seven different observational or intervention studies.

It is evident when looking at Table 2 that all of these studies were lacking codes for many of the possible behaviors, and in some cases the same behavior was captured in different ways by different codes. While it is plausible a coding system might only capture certain language stimulation behaviors relevant to the specific research questions being addressed, the variability amongst the codes makes comparing them difficult. Given that meta-analysis is recognized as the highest level of evidence for clinical decision making (Gillam & Gillam, 2006), the ability to compare across different codes and studies is imperative to the clinical relevance of research about adult-child linguistic interactions.

Goals of the Current Study

Overall, the current study was designed to address the need for a more detailed and comprehensive way of describing RI and MT interactions in order to accurately quantify as well as describe language stimulation behaviors occurring during adult-child interactions. The main purpose of this project was to develop a comprehensive coding system to describe a wide range of language stimulation behaviors that occur during adult-child interactions. A secondary purpose was to demonstrate the quantitative and

qualitative usefulness of the coding system for use in the analysis of real adult-child dyads interactions across a number of different situations.

Study	Participants	Intervention Type	Outcomes of Intervention
Peterson, Carta, & Greenwood (2005)	3 mother-child dyads with children 24-43 months old with language delays (no control group)	Milieu: incidental teaching & responsive interaction	Children: responsive interaction→increased child comments, incidental teaching→increased correct responses, both increased MLU and SICD (Hedrick, Prather, & Tobin, 1984) scores Mothers: able to implement intervention techniques
Girolametto & Pearce (1996)	25 mother-child dyads with children 23-33 months old delays in expressive vocabulary (control and intervention groups)	Responsive interaction/language stimulation for target vocabulary—adaptation of the Hanen Program for Parents (Manolson, 1992)	Children: increase in number of words reported on CDI (Fenson et al., 1993), larger variety of words used (treated and untreated), acquisition of more control words, produced more grammatically complex utterances, and produced more multi-word utterances than children in the control group Mothers: shorter utterances, fewer words per minute, increased use of target words, and increased use of language stimulation techniques

Table 1—Studies investigating parent-implemented RI and MT interventions.

Study	Participants	Intervention Type	Outcomes of Intervention
Kaiser, Hemmeter, Ostrosky, Fischer, Yoder, & Keefer (1996)	12 mother-child dyads with children 28-56 months old with language delays (no control group)	Responsive interaction (intervention targets selected for each child)	Children: varied, most showed more spontaneous use of targets Mothers: increased use of child's targets, increased semantic feedback, fewer instances of not following child's lead as compared to pre-treatment
Baxendale & Hesketh (2003)	37 children between the age of 2;6 and 3:6 with language impairment (half were in parent intervention and other half received clinician intervention)	Hanen Program for Parents (Manolson, 1992) and a clinician-based intervention	71% of children (from both groups) showed significant improvement on language measures, no significant difference between intervention groups, but parent intervention required more clinician time
Buschmann, Jooss, Rupp, Feldhusen, Pietz, & Philipi (2008)	58 parent-child dyads with children with expressive language disorders between the age of 2;0 and 2;3 (divided between intervention and delayed intervention/control group)	Heidelberg Parent-based Language Intervention (Buschmann & Jooss, 2007)	Children: Intervention group →greater gains on standardized German comprehension and production measure, and greater gains in terms of vocabulary, morphology, and syntax as reported by parents compared to the delayed intervention/control group

Table 1—Continued

	Peterson et al. (2005)	Girolametto & Pearce (1996)	Kaiser et al. (1996)	Baxendale & Hesketh (2003)	Rowe (2008)	Tamis-LeMonda et al. (2001)	Vigil et al. (2005)
Acknowledgement/ Response Statement	+		+			+	
Buildup/Breakdown							
Conf./Correction						+	
Connecting							
Defining							
Demonstrative						+	
Expan./Extension	+		+	+			
Exploratory						+	
Imperative	+				+		+
Initiation/Topic Maintenance							+
Interpretations							+
Interrogative			+		+	+	+
Labeling		+					+
Mand-Model	+						
Model	+		+				
Self/Parallel-talk							+
Recast				+			
Repetition	+			+		+	+
Talkativeness		+			+		+
Time-Delay	+						

Table 2—Language stimulation behaviors included in a variety of observational and intervention studies.

CHAPTER 2-THE NEW CODE

The Alper Code

Chapter 1 of this manuscript served to demonstrate the need for a novel, comprehensive code for the purpose of quantifying language stimulation behaviors occurring during adult-child interactions. A novel code (the "Alper Code") is presented below as a means of addressing this need. The codes selected for inclusion in the Alper Code were chosen and defined in such a way as to create a complete (or as close to as possible) list of codes, with each code operationally defined so as to be unique from all of the other codes. Some of the codes listed have been included in other coding systems, but many of them (as is evident in Table 2) were overlooked by other coding systems. The language stimulation behaviors included in the mothers' and children's codes are listed below. The categories and sub-categories will be explained below in the discussion of the various levels of coding.

Mother Verbal Behaviors:

- Labeling
  - Naming an object
  - E.g. "dog", "that is a dog"
  - Does not include non-specific labels "this one" or "that one", but can be incorrect (e.g. still counts if the child says "dog" for a cat).
- Connecting
  - Tying something to a past event or something outside the context of the book/play
  - E.g. "zebra" (child)→ "we saw zebras at the zoo yesterday" (mother)
  - E.g. "aww isn't that cute, cute like you"
- Defining
  - Mother defines new words in the book for the child
  - E.g. "This is a stapler, you use it to join two pieces of paper together" (Ezell & Justice, 2005)
- Self/parallel-talk
  - Self-talk (Actions)
    - Mother describes what SHE is doing.

        - E.g. “I am making a tower with blocks. I am using a blue block and a red block” (Paul, 2007).
    - Self-talk (Thoughts/Feelings)
        - Mother describes what SHE is thinking/feeling/knowing/desiring.
        - E.g. “I think that flower is really pretty” or “I feel sad” or “I know”, “I want” etc.
    - Parallel-talk (Actions)
        - Mother describes what the CHILD is doing.
        - E.g. “You are making a tower with the blocks. You just put the blue block all the way at the top!” (Paul, 2007)
    - Parallel-talk (Thoughts/Feelings)
        - Mother describes what the CHILD is thinking/feeling.
        - E.g. “You don’t think that will work” or “You are happy to see the doggie”
- Expansion/Extension
    - Expansion (Utterance)
        - Use what the child has said and add appropriate grammatical markers to make into a “correct” adult-like utterance, but maintaining the same sentence type (i.e. declarative→declarative or interrogative→interrogative).
        - E.g. “doggy bed” (child)→ “The doggy is in the bed” (mother) or “That is the doggy’s bed” (mother) (Paul, 2007).
    - Expansion (Phrase)
        - Use what the child has said and make into an adult-like phrase.
        - E.g. “bed” (child)→ “in the bed” (mother)
    - Extension
        - Like an extension, except adds semantic information.
        - E.g. “doggy bed” (child)→ “Yes, the doggy was tired so he went to bed.” (mother) (Paul, 2007)
- Recast
    - Recast (Total)
        - Like expansions, but changes the statement into a different form (e.g. declarative→interrogative, negative, or negative interrogative).
        - E.g. “doggy bed” (child)→ “Is the doggy under the bed?” (mother) or “The doggy is not in the bed!” (mother) or “Isn’t the doggy under the bed?” (mother) (Paul, 2007)

        - Recast (Partial)
            - Like above, except using just a phrase.
            - E.g. “doggy bed” (child)→ “in the bed?” (mother)
- Interrogatives
    - Interrogative (Yes/No)
        - Question seeking yes/no response
        - E.g. “Do you want a cookie?” (mother)
    - Interrogative (Open)
        - Open-ended question.
        - E.g. “Where did the doggy go?” (mother)
- Imperative
    - Verbal command
    - E.g. “Point to the doggy” (mother)
- Buildup/Breakdown
    - Start with an expansion of the child’s utterance→break it down into phrases→build it back up into full utterance.
    - The whole buildup/breakdown must be within a turn to be counted.
    - E.g. “doggy bed”→ “The doggy is in the bed. The bed. He’s in the bed. In the bed. The doggy’s in the bed.” (Paul, 2007).
- Repetition
    - Repetition (Full)
        - E.g. “Blue cow”(child)→ “Blue cow” (mother)
    - Repetition (Partial)
        - E.g. “Blue cow” (child)→ “Blue” (mother)
- Confirmation/Correction
    - Confirmation
        - Verbal “yes” response indicating correctness of a statement or answering a question.
        - Can be in the form of “good job” or “right” or other affirming response.
    - Correction
        - Verbal “no” response indicating incorrectness of a statement or answering a question. Can also include things like “That’s not a ball” in response to verbal or nonverbal gestures.
- Acknowledgment/response statement
    - Acknowledgement
        - The mother recognizes that she has heard what the child has said or a filler response in a turn after the child.
        - E.g. “I’m hungry” (child)→ “OK” (mother) (Paul, 2007).

        - Response Statement
            - Mother takes a conversational turn (does not have to be in response to what the child has said) that does not fit into any of the categories listed above. Unintelligible utterances will also be categorized as this unless it is the first turn in which case it is an acknowledgement.
            - "Can we go outside?" (child)→ "We went to the park earlier today." (mother)

Child Verbal Behaviors:

- Repetition
    - Repetition (Full)
        - E.g. "Big blue cow" (mother)→ "Big blue cow" (child)
    - Repetition (Partial)
        - "doggy's bed" (mother)→ "bed" or "doggy" (child)
- Generalization
    - Child takes mother's utterance and generalizes it to a new object.
    - E.g. "big blue cow" (mother)→ "big purple horse" (child)
- Labeling
    - Naming an object
    - E.g. "dog", "that is a dog"
- Connecting
    - Tying something to a past event or something outside the context of the book/play
    - E.g. "zebra" (mother) → "we saw zebras at the zoo yesterday" (child)
- Self/parallel-talk
    - Self-talk (Actions)
        - Child describes what SHE/HE is doing.
        - E.g. "I'm building a tower."
    - Self-talk (Thoughts/Feelings)
        - Child describes what SHE is thinking/feeling.
        - E.g. "I think she wants a cookie" or "I feel sad"
    - Parallel-talk (Actions)
        - Child describes what the MOTHER is doing.
        - E.g. "You are building too"
    - Parallel-talk (Thoughts/Feelings)
        - Child describes what the MOTHER is thinking/feeling.
        - E.g. "You like that dog" or "You think he wants to come inside"

- Interrogatives
  - Interrogative (Yes/No)
    - Question seeking yes/no response
    - E.g. “Do you want a cookie?” (mother)
  - Interrogative (Open)
    - Open-ended question.
    - E.g. “Where did the doggy go?” (mother)
- Imperative
  - Verbal command
  - E.g. “Point to the doggy” (mother)
- Confirmation/Correction
  - Confirmation
    - Verbal “yes” response indicating correctness of a statement or answering a question.
  - Correction
    - Verbal “no” response indicating incorrectness of a statement or answering a question.
- Acknowledgment/response statement
  - Acknowledgement
    - The child recognizes that she has heard what the mother has said, or also sometimes a filler response. An acknowledgement occurs right after the mother’s turn as compared to a response statement, which is a second turn.
    - E.g. “I’m hungry” (child)→ “OK” (mother)
    - Child interjections during reading can be characterized as this at the first turn and response statements if they take two in a row.
  - Response Statement
    - Child takes a conversational turn that does not fit into any of the categories listed above. Unintelligible utterances will also be categorized as this unless it is the first turn in which case it is an acknowledgement.

As a means of addressing the need for analysis of interactions at varying depths, the Alper Code was tailored for analysis at three levels, with each level incorporating all of the behaviors listed above. The Full Code (FC) allowed for analysis of all of the behaviors listed above for the mothers and children (including all of the behavior subtypes listed under the major headings), and in order to accomplish this each behavior

was coded separately when using the FC. The FC facilitated examination of interactions at the level of behavior sub-categories (e.g. open-ended vs. yes/no interrogatives). The FC was used for the most fine-grained analysis, and was the basis for the groupings used to make the other coding levels.

The next level of coding was the Condensed Code (CC), which was used for the purpose of examining interactions at the level of the behavior category. This code included all of the behaviors from the FC, but the behaviors were grouped differently to allow for categorical, as opposed to sub-categorical, analysis. The CC groupings, which were made by combining several behaviors from the FC into a single grouping, are listed as the major headings in list above. The changes from the FC to the CC included grouping all interrogatives together, collapsing all self and parallel-talk behaviors into one self/parallel-talk category, grouping confirmations and corrections together, combining expansions and extensions, collapsing all recast behaviors into one category, and grouping acknowledgements and response statements. These changes were made so that the following general categories of behaviors could be analyzed: questions (i.e. interrogatives), narration of actions (i.e. self/parallel-talk), yes/no responses (i.e. confirmation and correction), grammatical and semantic additions to the child's utterances (i.e. expansions and extensions), rephrasing the child's utterance as another sentence type (i.e. recasts), and other general statements (i.e. response statements and acknowledgments). These groupings were particularly helpful due to the fact that some of the behaviors in the FC occurred infrequently (e.g. parallel-talk) when described alone. Therefore, the CC was used to maintain the comprehensive nature of the code while illuminating some category-based points of interest that were more difficult to see using the FC, especially given the limited sample size.

Finally, the behaviors were also categorized as either directive or non-directive/responsive for the purposes of the directive code (DC). Just like the CC, the DC also included all of the behaviors in the FC, but it dichotomized them into either

"directive" or "non-directive" (aka "responsive") behaviors. The DC was only used to analyze the mother verbal behaviors. Directive behaviors were classified as those which required a verbal response from the child including all interrogatives and imperatives. All other behaviors were classified as non-directive.

Each level of coding was specifically designed to address different research questions, and provide complementary quantitative and qualitative information about the types of verbal behaviors that occur during mother-child interactions. One of the strengths of the three levels of coding is that they all include the same set of verbal behaviors for analysis, but the analysis occurs at different levels and focuses on different things. This makes it easier to compare the information gleaned from using each of the codes, and addresses some of the problems caused by discrepancies amongst published coding systems. The three levels of the Alper Code allow for versatility in terms of the focus of analysis, but maintain the ability of the investigator to compare data analyzed at different levels of detail due to the fact that all of the codes are based on and include all of the behaviors in the FC.

Dependent Measures and Codes

Now that the Alper Code has been presented, it is important to consider the challenges presented by some of the available studies measuring the use of language stimulation behaviors. Additionally, and most importantly for this study, it is essential to compare the published codes available to the Alper code in order to demonstrate the advantages of the latter. The studies included in Table 1 were selected for inclusion in this paper due to their significance in a couple of areas.

First, these studies illustrate that the way in which the "benefit" of a certain intervention was measured varied from study to study. For instance, Kaiser et al. (1996) measured the mothers' use of both verbal and nonverbal RI strategies, while Girolametto & Pearce (1996) looked at the mothers' verbal output in terms of rate, quality, and

amount. The same was true in terms of the dependent measures selected for the children participating in the studies. Peterson et al. (2005) used MLU, standardized test scores, and child comments/correct responses as dependent outcome measures for the children in their study. Alternatively, Kaiser et al. (1996) and Girolametto & Pearce (1996) focused on the children's use of the specific treatment targets as their primary dependent measures. Baxendale & Hesketh (2003) used standardized language measures as a means of measuring treatment outcomes, as did Buschmann et al. (2008), although the latter also used parent report of language development in the listed areas as an outcome measure. The importance of the information provided about the outcome measures is that the variability in this area makes it difficult to compare across studies, especially when combined with the range of ways of categorizing and coding language stimulation behaviors (to be discussed below).

Secondly, and most relevant to the present study, each study reviewed selected a different set of language stimulation behaviors as the ones trained during the parent program. Therefore, each study's coding system differed from the other studies, and all of the coding systems varied in terms of their comprehensiveness and specificity in terms of behavioral descriptions. Table 1 provides an overview of intervention studies incorporating RI and/or MT techniques. However, given that the main purpose of this study was to develop a coding system for looking at verbal behaviors occurring during adult-child dyadic interactions, it is useful to consider carefully the coding systems that have been used previously for the purposes of collecting observational data, as well as the intervention studies presented in Table 1. The differences in terms of the language stimulation behaviors that were trained and the outcome measures make it difficult to isolate the key components of each intervention that are responsible for the positive outcomes in each case.

Table 3 is the same as Table 2 in Chapter 1, with the exception that Table 3 adds in the Alper Code for comparison. The main purposes of this table include: 1) re-

emphasizing the heterogeneity of the different published codes, and 2) demonstrating the comprehensive nature of the Alper Code as compared to previously-implemented coding systems.

Table 3 compares the coding systems in each of the studies listed to the Alper Code in terms of the language stimulation behaviors that were included. The studies included in the comparison are listed in the top row of the table, while the language stimulation behaviors are listed in the first column of the table.

There are a number of important points to consider when interpreting the information presented in Table 3. First, in Peterson et al. (2005), Kaiser et al. (1996), and Tamis-LeMonda et al. (2001) the authors noted that they included a category for descriptive statements, which were checked above as "acknowledgment/response statements". However, it was unclear as to whether or not the categories in the three listed studies also encompassed other behaviors not included in the "acknowledgment/response statement" definition used in the Alper Code. Additionally, in Peterson et al. (2005) the language stimulation behaviors checked were those that were taught, not necessarily measured.

Although the "interrogatives" box was checked for Kaiser et al. (1996) it is helpful to note that the authors described these behaviors as the adult requesting clarification of the child's response, which is a narrower use of questions than the all-encompassing categories for questions in the Alper Code. Similarly, the "interrogatives" box was checked for Rowe (2008), but it is important to note that these were actually characterized as non-imperative utterances that still required/elicited a response from the child (which would include interrogatives).

Also important to note is in Girolametto & Pearce (1996) where the authors defined "talkativeness" as the number of words per minute and number of utterances, as opposed to the number of words produced as defined in Rowe (2008), or the relative percent of turns as defined in the Alper Code. Additionally, Girolametto & Pearce (1996)

coded “labeling” only when one of the target words was labeled, as opposed to the Alper Code definition, which included labeling of any object.

A further example, in Tamis-LeMonda et al. (2001) “demonstratives” and “exploratory” comments were mostly a combination of self/parallel-talk and certain imperatives/interrogatives respectively, but they were defined slightly differently, so they did not fit neatly into the code. Next, in Vigil et al. (2005) “interpretations” were very similar to extensions, because they expanded one or two words said by the child relying on contextual cues to build the utterance. Additionally, although the “self/parallel-talk” box was checked for Vigil et al. (2005), it should be noted that only self-talk was coded, as opposed to both behaviors included in the Alper Code.

Now that a side-by-side overview of the reviewed studies has been presented to facilitate comparison of their codes with the Alper code, the studies will be discussed individually in greater detail in terms of the types of behaviors that were taught to the parents in each intervention and the codes that were used. Peterson et al. (2005) trained the mothers participating in their study to use two different milieu teaching techniques: incidental teaching and responsive interaction. The responsive interaction techniques included imitation of the child’s utterance, expansion of the child’s utterance, and making descriptive statements. The incidental teaching techniques were comprised of manding, modeling, time-delay, and mand-modeling. The child verbal behaviors that were recorded included comments and correct responses. Examples of these techniques are supplied in Table 4 (Peterson et al., 2005).

The Alper Code also accounted for models, mand-models, and time delay, even though these codes were described under different labels from those used in Peterson et al. (2005). For instance, modeling in some cases might be categorized in the Alper Code under self/parallel talk, labeling, or another specific label. Imperatives (aka “mands”) are captured by the Alper Code, and so the combination of an imperative and a “model” could be analyzed using the Alper Code as well. Additionally, the nature of the data

analysis technique using the Alper Code (described in Chapter 3), could easily be used to determine the time a parent waits before providing a verbal model for a target. Further, the Alper Code describes many different child verbal behaviors, while Peterson et al. (2005) only described comments or correct responses. Overall the Alper Code covers the behaviors that were included in Peterson et al. (2005), but even more importantly it includes many behaviors that were not included (see Table 3).

The parents who participated in the Girolametto & Pearce (1996) study were taught to provide models of 10 target words, but to do so in a manner that followed their child's lead in terms of his/her interest at the time. Additionally, the program was entirely responsive in nature, because the children were not required to imitate the target words or respond in any certain way. The mothers were instructed to keep a record of when the child produced the target words, and they were allowed to introduce new words once the child had mastered the previous target word. The mothers' verbal output was analyzed in terms of "talkativeness" (in this case the words per minute and number of utterances), number of times a target word was labeled, "focused labeling" (at least three presentations of a target within 10 utterances), MLU, and TTR (type-token ratio). The children's verbal output was analyzed in terms of "talkativeness", use of multi-word utterances, number of target and control words used, and number of different words used (Girolametto & Pearce, 1996). The Alper Code includes all of the verbal behaviors included in the above study (even though some of them are described/grouped slightly differently: see Table 3) and many more. Clearly, the code described in Girolametto & Pearce (1996) was tailored to measure the treatment targets, but it is still important to note the many aspects of the parent-child verbal interactions that would not have been captured using the Giroalmetto & Pearce (1996) would have been captured using the Alper Code.

The parents who participated in the Kaiser et al. (1996) study were taught to use RI behaviors that included nonverbal (e.g. mirroring, pausing, following the lead of the

child) and verbal (e.g. descriptive statements, expansions, models, and requests for clarification) domains. Intervention targets were selected based upon the individual needs of each child. The children's verbal behaviors were quantified in terms of their use of their treatment targets as well as number of utterances that they initiated (Kaiser et al. 1996). With the exception of modeling, which as discussed above in relation to Peterson et al. (2005) is described in different ways using the Alper Code, all of the verbal behaviors included in the Kaiser et al. (1996) code were included in the Alper Code. Additionally, the Alper Code allows for the quantification of many verbal behaviors that were not included in the Kaiser et al. (1996) code (see Table 3).

The parents who participated in the Baxendale & Hesketh (2003) study were provided with strategies from the Hanen Program for Parents (Manolson, 1992) as a means of increasing responsiveness. The specific strategies used were not discussed in great detail; however, it was noted that the rate of parents' recasts, imitations, and expansions contingent to child responses was tracked. The children's verbal output was quantified by calculating the MLU (Baxendale & Hesketh, 2003). The list of verbal behaviors tracked in Baxendale & Hesketh (2003) is only a subset of the verbal behaviors included in the Alper Code. This is particularly important for this study, because there were no specific treatment "targets" that the children were supposed to acquire, and so the short list of verbal behaviors that Baxendale & Hesketh (2003) tracked is particularly limiting in terms of measuring responsiveness as compared to the Alper Code.

The language stimulation techniques taught to the parents who participated in the Buschmann et al. (2008) study were not discussed in great detail other than to note that they promoted "interaction" and "language modeling" (p.112). The child verbal behaviors during the interactions were not described, because the results were reported in terms of outcomes on pre and post-test measures. While the authors referenced the parent training program on which their intervention was based, they did not note whether or not they used all of the same training techniques.

The variability in terms of outcome measures and targeted/coded language stimulation behaviors in the intervention studies presented above presents some challenges in terms of making evidence-based treatment decisions. As mentioned earlier, the highest level of evidence for the purpose of clinical decision making is meta-analysis (Gillam & Gillam, 2006). The variability in the currently-available coding systems would make comparison of the methods and results of these studies difficult when performing a meta-analysis. A more uniform, comprehensive code (like the Alper Code), which allows for analysis of specific behaviors, but also provides detailed quantitative information about what is occurring across a wide range of language stimulation behaviors at many different levels of analysis, would facilitate comparison of studies for the purpose of evidence-based clinical decision making. Given the many discrepancies amongst the available published codes, it is understandable that this would be a confounding factor in intervention studies given that there is a comparable level of disagreement amongst people about how behaviors should be grouped and quantified for the purposes of "simple" observational studies.

For instance, in the Rowe (2008) study investigating mothers' use of child-directed speech as it relates to socioeconomic status, the mothers' speech was analyzed in terms of lexical diversity, the number of words that they produced, and the average length of their utterances (aka MLU). Additionally, the mothers' utterances were broken down into "directive" (i.e. imperatives) and "eliciting" (i.e. verbal behaviors requiring the child to provide an answer) utterances (p.192). The children's verbal output was only assessed in terms of their performance on the vocabulary outcome measures (Rowe, 2008). The "directive" and "eliciting" utterances described in Rowe (2008) are also captured by the

Alper Code, but once again the Alper Code includes many behaviors that were not described in Rowe (2008).

Another observational study, Tamis-LeMonda et al. (2001), investigated the connection between the degree of maternal responsiveness and the children's arrival at early language milestones. As described earlier, the mothers' responses were coded based on contingency (within 5 seconds of the child's verbalization) and contiguity. Additionally, the maternal responses were categorized as affirmative (e.g. yes/no), imitative, interrogative, descriptive, exploratory (e.g. "Look here"), or demonstrative (e.g. "Why don't you feed the doll?") (p.752). The Alper Code does not include specific "demonstrative" or "exploratory" codes, but these verbal behaviors would be captured under other categories (for the examples given the exploratory comment would be coded as an "imperative" and the demonstrative would be coded as an "interrogative"). As with all of the other studies the Alper Code described many adult verbal behaviors not included in Tamis-LeMonda et al. (2001) (see Table 3). The children's' behaviors were coded and placed into one of four groups including "(1) bidding to or looking at mother, (2) exploring an object/toy (i.e., looking at or manipulating the object), (3) vocalizing, or (4) playing with a toy or object (i.e., engaging in nonsymbolic or symbolic levels of play with the object)" (p. 751). Each behavior was assigned to only one category (Tamis-LeMonda et al., 2001). The focus of the code for the children in Tamis-LeMonda et al. (2001) was at a lower linguistic/developmental level than that of the Alper Code, which makes comparison not appropriate at this time.

A third observational study, Vigil et al. (2005), investigated the differences in terms of the amount and type of language interaction occurring between parents of

children with language disorders and those with typically-developing language. The parents' utterances were analyzed in terms of the average utterance length (aka MLU) as well as the number of turns taken and the number of those turns that were contingent on a child's utterance. Additionally, the utterances were categorized as "initiations" (i.e. starting a new topic), "responses" (i.e. following the conversation partner and maintaining their topic), and "self-directed speech" (aka self-talk). Finally, the mothers' verbal behaviors were also grouped into interrogatives, "behavioral directive" (aka imperative), nonverbal gestures, "descriptives", "expansions", "interpretations", "imitations", and "labeling" (p.113-114). The Alper Code does not contain specific categories for "initiations" or "interpretations" as discussed earlier in this section, but just as with the other studies, the Alper Code includes all of the rest of the categories described by Vigil et al. (2005) and many more. The children's verbal behaviors in Vigil et al. (2005) were not coded in this manner given that the focus was on the mothers' interaction.

Summary of Limitations of Published Coding Systems

The evidence presented above about the various coding schemes for quantifying mother and child verbal behaviors illustrates several limitations of the current state of research. First, there is a general lack of consensus about the behaviors that warrant analysis and how these behaviors should be defined/grouped. For instance, Vigil et al. (2005) included verbal behaviors that are absent from Tamis-LeMonda et al. (2001). Second, several of the studies presented codes that were ambiguous (e.g. Buschmann et al., 2008) or exclusionary of one conversation partner despite the fact that they claim to be investigating dyadic interaction (e.g. Rowe, 2008). Third, there was further lack of

agreement about the level of detail at which the analysis should be conducted. This last point appears similar to the first upon initial consideration, but it is truly separate, because the grouping of the behaviors can vary independently of the level of detail of analysis. For instance, Rowe (2008) focused primarily on responsiveness versus directiveness, while Vigil et al. (2005) included a variety of different language stimulation behaviors. Finally, and most importantly, while the Alper Code could be used to describe almost all of the behaviors included in the other reviewed codes, none of the codes listed above describe language stimulation behaviors at a comparable level to that of the Alper Code. As a step towards a solution to the problem presented by the lack of comprehensiveness present in the various codes used in the other studies, the Alper Code allows for comprehensive coding of verbal behaviors contributed by both children and adults at several complementary levels of detail.

	Peterson et al. (2005)	Girolametto & Pearce (1996)	Kaiser et al. (1996)	Baxendale & Hesketh (2003)	Rowe (2008)	Tamis-LeMonda et al. (2001)	Vigil et al. (2005)	Alper CC
Acknowledgement /Response Statement	+		+			+		+
Buildup/Breakdown								+
Conf./Correction						+		+
Connecting								+
Defining								+
Demonstrative						+		*
Expan./Extension	+		+	+				+
Exploratory						+		*
Imperative	+				+		+	+
Initiation/Topic Maintenance							+	*
Interpretations							+	*
Interrogative			+		+	+	+	+
Labeling		+					+	+
Mand-Model	+							*
Model	+		+					*
Self/Parallel-talk							+	+
Recast				+				+
Repetition	+			+		+	+	+
Talkativeness		+			+		+	+
Time-Delay	+							*

* These behaviors are able to be captured with the Alper Code, but would be described under a different label (to be discussed in the sections below).

Table 3—Language stimulation behaviors included in published codes as compared to the Alper Code.

Technique:	Example:
Mand	“Tell me what you want.” (p.98)
Model	“I want the fire truck” (p.98)
Time-Delay	Parent is aware of what the child wants but waits at least 15 seconds for the child to request (p.98)
Mand-Model	“Tell me what you want.”→Incorrect child response→ “Fire truck” (parent model, p.98)

Table 4—Examples of incidental teaching techniques used in Peterson et al. (2005) study.

CHAPTER 3-METHODS/DEMONSTRATING CODE USEFULNESS

Overview

This chapter describes a study designed to illustrate how the code can be implemented for analyzing language stimulation behaviors occurring during the interactions of mother-child dyads during reading and play. The study included the collection of a corpus of dyadic interactions, and analysis of this corpus to determine whether or not the coding system would reveal differences in the quality or quantity of language stimulation behaviors occurring in the reading and play interactions used by different participants.

Participants

The participants in this study were two mother-child dyads. Participants were recruited using flyers around the University of Iowa campus, as well as via the Department of Communication Sciences and Disorders faculty, staff, and graduate student e-mail list. The mothers participating in the study met the following screening criteria:

- Age 18-40
- Native English speaker
- Minimum high school education
- Report being comfortable reading to own child in English

The children participating in the study met the following screening criteria:

- Age 3;0-4;0
- In English-only household
- No speech, language, hearing, or learning impairments or delays (according to parent report)

Data Collection and Study Design

Subjects participated in 4, 30-minute sessions over the course of 4-5 weeks (allowing for one week to be rescheduled if needed). The sessions were conducted in the home, and audio-video recordings were made by the primary investigator using a FlipCam. The investigator instructed the dyads to play with the selected toys and books just as they would do normally. Each session for each dyad began with approximately 15 minutes of reading (the sessions were terminated at a naturalistic end point, so the exact durations varied), and ended with approximately 15 minutes of play.

Based upon the hypothesis that the types and frequency of verbal behaviors might vary depending on how comfortable the child and/or the parent felt with the particular toy or book this study was designed to assess the interactions based on the dyads' familiarity with the books and toys. For instance, when reading a familiar book there might already be established routines in terms of the dialogue occurring between adult and child (e.g. always repeating the same line or labeling the same pictures). In contrast, unfamiliar books might elicit more novel conversation or labeling, or perhaps children might ask more questions when reading unfamiliar books or playing with unfamiliar toys.

The RA1 dyad was recorded interacting with familiar stimuli for the first two weeks (i.e. familiar books and toys), and unfamiliar stimuli for the second two weeks. The opposite was true for the RA2 dyad. The stimuli changed from week to week regardless of familiarity. In other words, different familiar books were read during each "familiar" session, and different unfamiliar books were read during each "unfamiliar" session. There was some overlap in play activities, but there was at least one different play activity incorporated each week. Table 5 lists the stimuli used each week.

The subjects were provided with 14 books to choose from when selecting their "unfamiliar" books to read. The subjects (mother and child) were allowed to select a book to read collaboratively immediately prior to their reading session. The assortment of books was taken from the "Breakthrough to Literacy" first grade curriculum developed

by Brown & Zimmerman, and included books with varied subject matter and amount of text (McGraw Hill, 2004). The assortment of "unfamiliar" toys included a board game, Kinects construction toys, an extensive toy food collection, and markers/paper for coloring. The dyads were instructed to select toys and books that they interacted with very frequently when choosing the "familiar" stimuli. Following each session the mothers completed a weekly questionnaire regarding their reading habits with their child during the previous week.

Data Analysis

Immediately following each recording session, the video samples were uploaded to a computer for the purpose of analysis. The samples were analyzed using the ELAN language archiving software, which is offered as a free download from the Max Planck Institute (Wittenburg et al., 2006). ELAN was selected as the platform because it allows for: 1) a high degree of customization and analysis across multiple tiers of transcription simultaneously, 2) the creation of drop-down menus with lists of targets to be coded, 3) some within-program statistical analysis and easy exportation of data to more sophisticated software for further analysis, and 4) sequential/contingent analysis via strategic organization of the tiers.

The ELAN software was used to implement the coding system in two particularly important ways. First, seven tiers (described in detail below) were created to allow for detailed, simultaneous transcription. Second, controlled vocabularies (i.e. lists of coded behaviors) were created for the tiers describing behaviors, and these controlled vocabularies were turned into drop-down menus. The tiers and the types of data coded in each tier are described in Table 6.

The elements in each controlled vocabulary corresponded to the operational definitions of the behaviors included in the Full Code (FC: see Chapter 2). The

nonverbal tiers are listed here, but the information coded in these tiers is not presented in this document.

The drop-down menus were used to facilitate accurate and consistent coding. All of the coding was done by the primary investigator. The speech/verbal tiers (i.e. the first four tiers) were coded on the first pass through each session. The nonverbal tiers were then coded on the second pass. This was done in order to promote accuracy and consistency, because the nonverbal coding required great attention to the video, while the verbal coding required a great deal of attention to the transcription tier. The utterances in the speech tier were “chunked” in such a way that they could each be described by one verbal behavior label. A screenshot of a typical transcription window with an open drop-down menu is presented in Figure 1.

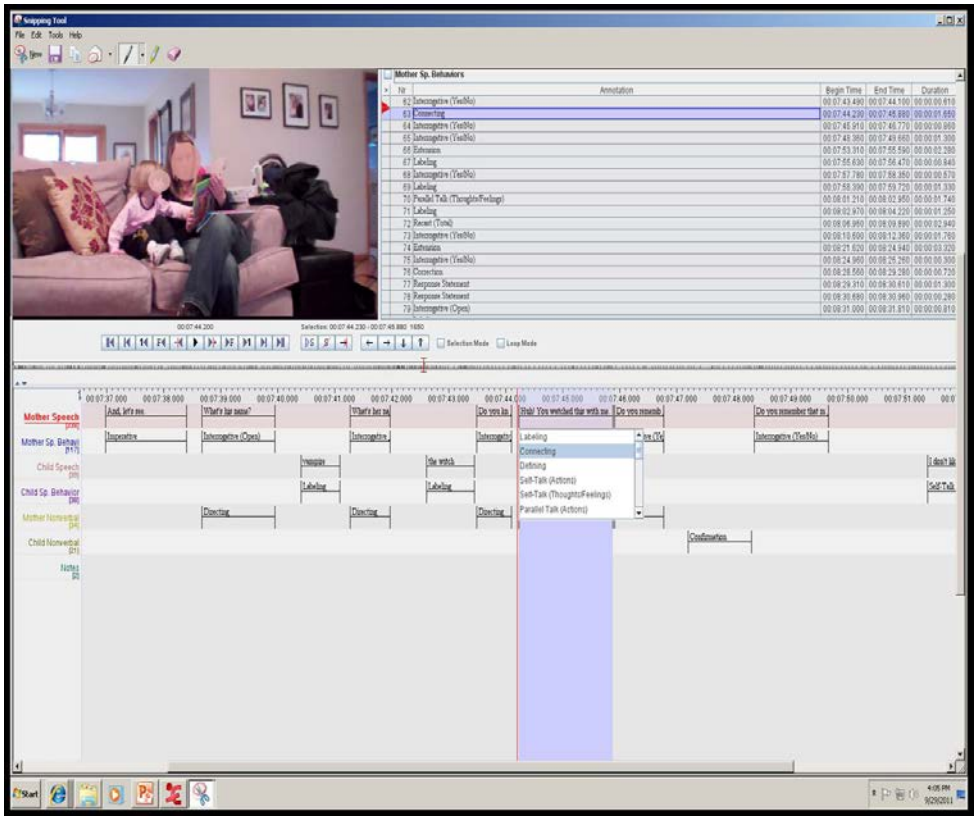

Figure 1-ELAN Screenshot

	RA1	RA2
Week 1	Familiar Stimuli Books: *Scooby-Doo Shiny Spooky Knights* *Aurora and the Helpful Dragon* *Tiana and Her Furry Friend* Toys: Monster bowling Trains	Unfamiliar Stimuli Books: *One Stormy Night* *Grasshopper and the Ants* Toys: Kinects
Week 2	Familiar Stimuli Books: *Take Care, There* *Curious George Visits an Amusement Park* *Curious George Goes to a Costume Party* *Curious George and the Dump Truck* Toys: Monster bowling	Unfamiliar Stimuli Books: *Time for Bed, Little Bear* *Splishy-Sploshy* Toys: Board game
Week 3	Unfamiliar Stimuli Books: *Benji's Pup* *In Grandma's Garden* *Time for Bed, Little Bear* *My Wonderful Aunt* Toys: Toy food	Familiar Stimuli Books: *Star Wars** *David Gets in Trouble* *It's Christmas, David* Toys: Flashcards Card game

Table 5—Books and toys by subject and week

	RA1	RA2
Week 4	Unfamiliar Stimuli Books: *The Little Yellow Chicken* *One Stormy Night* *Dinosaur Toes* *Grasshopper and the Ants* Toys: Board game Coloring	Familiar Stimuli Books: *The Cat in the Hat* *Can't You Sleep, Little Bear:?* Toys: Action figures Video game

Table 5—Continued

Tier	Data Coded
Mother Speech	Alphabetic transcription of the mother's speech
Mother Verbal Behaviors	Controlled vocabulary: Mother verbal behaviors
Child Speech	Alphabetic transcription of the child's speech
Child Verbal Behaviors	Controlled vocabulary: Child verbal behaviors
Mother Nonverbals	Controlled Vocabulary: Nonverbal Behaviors
Child Nonverbals	Controlled Vocabulary: Nonverbal Behaviors
Notes	Additional comments by the transcriptionist

Table 6—Description of the data contained within each tier.

CHAPTER 4-RESULTS

Outline

The data collected were analyzed in a number of different ways, which are outlined below.

1) Mother verbal behaviors
    a. Play versus reading
    b. Familiar versus unfamiliar
    c. Directive versus responsive
    d. Comparison across different types of play activities
    e. Within-subject comparisons
    f. Across-subject comparisons
2) Child verbal behaviors
    a. Play versus reading
    b. Familiar versus unfamiliar
    c. Comparison across different types of play activities
    d. Within-subject comparisons
    e. Across-subject comparisons
3) Other comparisons
    a. Mother and child "talkativeness"
    b. Full versus condensed code

Number of Verbal Behaviors

Given that the data presented here are from only two dyads, the opportunities for making generalizations are limited. However, the large number of data points (especially for the verbal behaviors) support observations made about patterns within a dyad. The total numbers of verbal behaviors coded are detailed in Table 7.

Mother and Child Talkativeness

The first comparison that was made using the data from the reading and play sessions was mother and child "talkativeness". For the purposes of this study "talkativeness" was operationally defined as the relative percent of total conversational turns taken by the mother and child respectively. Table 8 contains the relative percent of

conversational turns taken by each mother and child broken down by reading versus play, and familiar versus unfamiliar sessions.

The data in Table 8 indicate that in general the mothers were more “talkative” than their children, and that in general RA1 mother talked more in relation to her child as compared to RA2 mother and her child. It is important to note that these results do not reflect the overall number of verbal behaviors. In other words, even though RA1 mother was more “talkative” in relation to her child does not mean that she talked more than RA2 mother. “Talkativeness” is an important measure to consider in combination with responsiveness, because it would be expected that mothers who are responsive would be less “talkative” than those who are highly directive.

Mothers’ Verbal Behaviors During Reading and Play (CC)

The next set of comparisons that were made involved analyzing the relative percent of the total number of verbal behaviors for each type of verbal behavior. For instance in order to determine the relative percent of interrogatives during reading, the total number of interrogatives during the reading sessions for an individual mother was divided by the total number of verbal behaviors recorded for that mother during the same reading session. Figure 2 shows RA1 and RA2 mothers’ verbal behaviors during reading and play broken down using the CC.

One thing to note when looking at Figure 2 is that there are a couple of behavior groups that occur frequently for both mothers. For instance, acknowledgements/response statements comprised 23.93%-31.16% of RA1 and RA2 mother’s verbal behaviors across reading and play. Similarly, interrogatives comprised 20.31%-28.75% of RA1 and RA2 mothers’ verbal behaviors across reading and play. Both mothers used relatively more imperatives during play than during reading (4.40% during reading vs. 8.00% during play for RA1 and 12.88% during reading vs. 18.20% during play for RA2). Additionally, both mothers engaged in relatively more self/parallel-talk during play than during reading

(10.99% during reading vs.17.56% during play for RA1 and 6.54% during reading vs. 11.67 % during play for RA2). RA1 mother's use of connecting during reading (8.42% of total verbal behaviors) stands out as compared to her use during play (1.98% of total verbal behaviors) as well as RA2 mother's use of connecting during reading and play (1.02% and 0% of total verbal behaviors during reading and play respectively). Finally, there were some behavior groups that each comprised less than 5% of RA1 and RA2 mothers' verbal behaviors across reading and play. These included buildups/breakdowns, defining, expansions/extensions, recasts, and repetitions. This is not to say that these behaviors are unimportant, but rather to point out that they could be considered "rare events" in the settings used in this study. The potential importance of these rare events will be explored in further detail in the discussion section of this paper.

Mothers' Verbal Behaviors with Familiar and Unfamiliar Stimuli (CC)

The mother verbal behaviors were also compared during reading and play in settings using familiar and unfamiliar books or toys. The relative percent of the RA1 and RA2 mother verbal behaviors during reading using familiar and unfamiliar books are depicted in Figures 3 and 4.

One interesting observation that can be gleaned from these graphs is that RA1 mother used relatively fewer interrogatives and imperatives during sessions with unfamiliar books as compared to sessions with familiar books (32.68% during familiar vs. 25.42% during unfamiliar for interrogatives and 5.18% during familiar vs. 3.73% during unfamiliar for imperatives). This observation will be important when considering directiveness later on.

The relative percent of RA1 and RA2 verbal behaviors during play using familiar and unfamiliar toys are depicted in Figures 5 and 6. There are a few key points to be taken away from these figures. Interrogatives comprised a smaller percent of both

mothers' verbal behaviors during sessions using unfamiliar as compared to familiar toys. Self/parallel-talk made up a larger percent of both mothers' verbal behaviors during unfamiliar as compared to familiar toy sessions. The mothers differed in terms of their larger or smaller percent of use of acknowledgements/response statements. RA1 mother's relative percent of use was larger during sessions with familiar as compared to unfamiliar toys (36.02 during familiar vs. 25.04 during unfamiliar). RA2 mother's relative percent of use was smaller during familiar as compared to unfamiliar (23.50% during familiar vs. 35.92% during unfamiliar). The mothers also differed in their use of labeling. RA1 mother's relative percent of use was larger during sessions with unfamiliar as compared to familiar toys (1.86% during familiar vs. 8.84% during unfamiliar). Finally, RA2 mother's relative percent of use was smaller during sessions with unfamiliar as compared to familiar toys (10.31% during familiar vs. 5.07% during unfamiliar). The changes discussed here as a function of familiarity will also show up in the discussion of responsiveness and directiveness.

Mothers' Verbal Behaviors Using the DC

Once the mothers' verbal behaviors were analyzed using the CC, they were analyzed again using the Directive Code (DC). This code dichotomized the behaviors into either "directive" or "non-directive" (aka "responsive"). The percent of each mothers' verbal behaviors that were non-directive (aka responsive) is depicted in Figure 7. Further, RA1 and RA2 mothers' verbal behaviors were compared in relation to their directiveness when using familiar and unfamiliar stimuli as depicted in Figure 8 and 9 respectively.

Figures 7, 8, and 9 illustrate some important observations. First, Figure 7 illustrates that both RA1 and RA2 mother were fairly consistent in terms of the percent of their verbal behaviors that were non-directive during reading and play (66.85% during reading and 68.93% during play for RA1 and 60.53% during reading and 61.49% during

play for RA2). Second, Figure 7 also shows that RA1 mother was less directive than RA2 mother overall during reading and play. Third, Figure 8 shows that RA1 mother was less directive when interacting with unfamiliar books (62.15% non-directive during familiar vs. 70.85% non-directive during unfamiliar) and play (62.11% non-directive during familiar vs. 73.78% non-directive during unfamiliar). Conversely, Figure 9 illustrates that RA2 mother was almost equal in terms of her relative percent of non-directive behaviors during familiar (61.95% non-directive) and unfamiliar (59.61% non-directive) reading, but she showed a similar increase in non-directiveness as RA1 mother when comparing play with familiar (56.83% non-directive) versus unfamiliar (64.38% non-directive) toys. That is to say overall RA1 mother's directiveness appears to be related more to the familiarity of the stimuli than the setting (i.e. reading versus play). On the other hand, RA2 mother's directiveness did not change based upon the familiarity during reading, but did change based upon familiarity during play. A further analysis of the specific play activities and directiveness is presented in the next section.

Play Breakdown

The participants engaged in a wide variety of play activities. Therefore, the activities were categorized and paired based upon the principle of matching activities that provided similar types of language opportunities. The activities that were paired together, and the rationales for forming each pair, are provided in Table 9. The mothers' verbal behaviors during each of the play activities were subsequently analyzed and compared using the DC as well, and those data are presented in the Table 10.

Overall the board game and toy food activities were the ones during which RA1 mother was the least directive (74.04% and 74.54% non-directive respectively), and SlapJack was the activity during which RA2 mother the least directive (72.22% non-directive). Trains and action figures were the activities during which both mothers were the most directive respectively (57.76% non-directive and 45.07% non-directive

respectively). The data above suggest that not all play activities are equal in terms of discouraging directiveness.

Children's Verbal Behaviors During Reading and Play (CC)

Just as with the mothers' verbal behaviors, the children's verbal behaviors were analyzed using the CC. The data are presented in Figure 10. One thing that sticks out in this figure is that for some of the behaviors listed (with the exception of acknowledgements/response statements, repetitions, connecting, and generalization) the values are similar across both children and both activities except for one outlying bar in each group. In all of the groups with the circled bars above (i.e. confirmation/correction, imperative, interrogative, labeling, and self/parallel-talk) the three other bars are within 3% of each other while the circled bar is the outlier.

Children's Verbal Behaviors with Familiar and Unfamiliar Stimuli

The children's verbal behaviors were also compared during reading and play using familiar and unfamiliar books and toys. The relative percent of the RA1 and RA2 child verbal behaviors during reading using familiar and unfamiliar books are depicted in Figures 11 and 12. As shown in these figures, the largest change in terms of relative percent of use of a behavior for both children was in labeling. Labeling made up a larger percent of each child's verbal behaviors when interacting with familiar as compared to unfamiliar books (25.93% during familiar vs. 3.03% during unfamiliar for RA1 and 17.91% during familiar vs. 6.81% during unfamiliar for RA2). This is not entirely surprising given that the children likely know more of the words to accompany the content of familiar books. Both children demonstrated a difference in the relative percent of confirmations/corrections across sessions, but the differences were in opposite directions. RA2 child used a relatively smaller percent of confirmations/corrections

when interacting with unfamiliar as compared to familiar books (20.90% during familiar vs. 15.7%1 during unfamiliar). Conversely, RA1 child used a relatively larger percent when interacting with unfamiliar as compared to familiar books (14.81% during familiar vs. 20.45% during unfamiliar). The second largest difference for RA1 child was a larger relative percent of self/parallel-talk during unfamiliar as compared to familiar book reading sessions (8.64% during familiar vs. 15.91% during unfamiliar). On the other hand, the second largest change for RA2 child was a larger relative percent of interrogatives during unfamiliar as compared to familiar book reading sessions (6.47% during familiar vs. 15.71 during unfamiliar).

The data related to the children's verbal behaviors during play using familiar and unfamiliar toys are presented in Figures 13 and 14. As with the data from familiar and unfamiliar reading, labeling was the behavior that showed the largest difference in terms of its relative percent of the total when comparing familiar and unfamiliar toy play sessions for both children. Unlike the data for the reading sessions, the data from play showed a larger relative percent of labeling during unfamiliar as compared to familiar toy sessions for RA1 child (6.88% during familiar vs. 18.04% during unfamiliar). The opposite was true for RA2 child (29.80% during familiar vs. 13.33% during unfamiliar). The second largest difference across sessions for both children was in terms of the relative percent of acknowledgements/response statements, although once again the difference went in opposite directions. RA1 child's relative percent of acknowledgements/response statements was smaller during unfamiliar toy play sessions (32.11% during familiar vs. 22.47% during unfamiliar). The opposite was true for RA2 child (22.64% during familiar vs. 35.94% during unfamiliar). Note that these changes appear to go in the opposite direction of those seen for labeling, so it is possible that there is some interaction between these two categories which at this point cannot be determined. Both children used relatively more interrogatives when interacting with unfamiliar stimuli. RA1 child also showed a relatively higher percent of use of

self/parallel-talk and a relatively lower percent of use of imperatives with unfamiliar stimuli. By contrast, RA2 child did not show large differences in these behavior categories. However, RA2 child used a relatively smaller percent of repetitions when interacting with unfamiliar as compared to familiar stimuli.

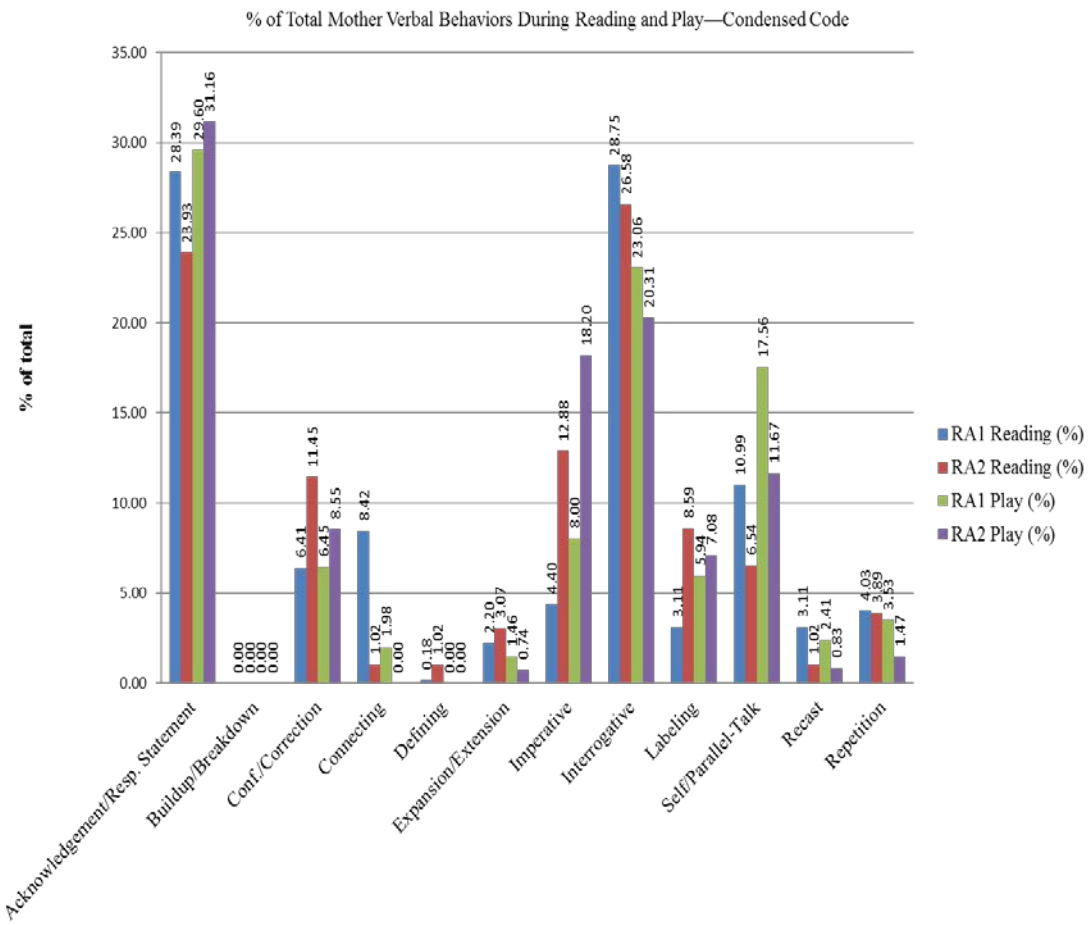

Figure 2—Mother verbal behaviors during reading and play using the CC.

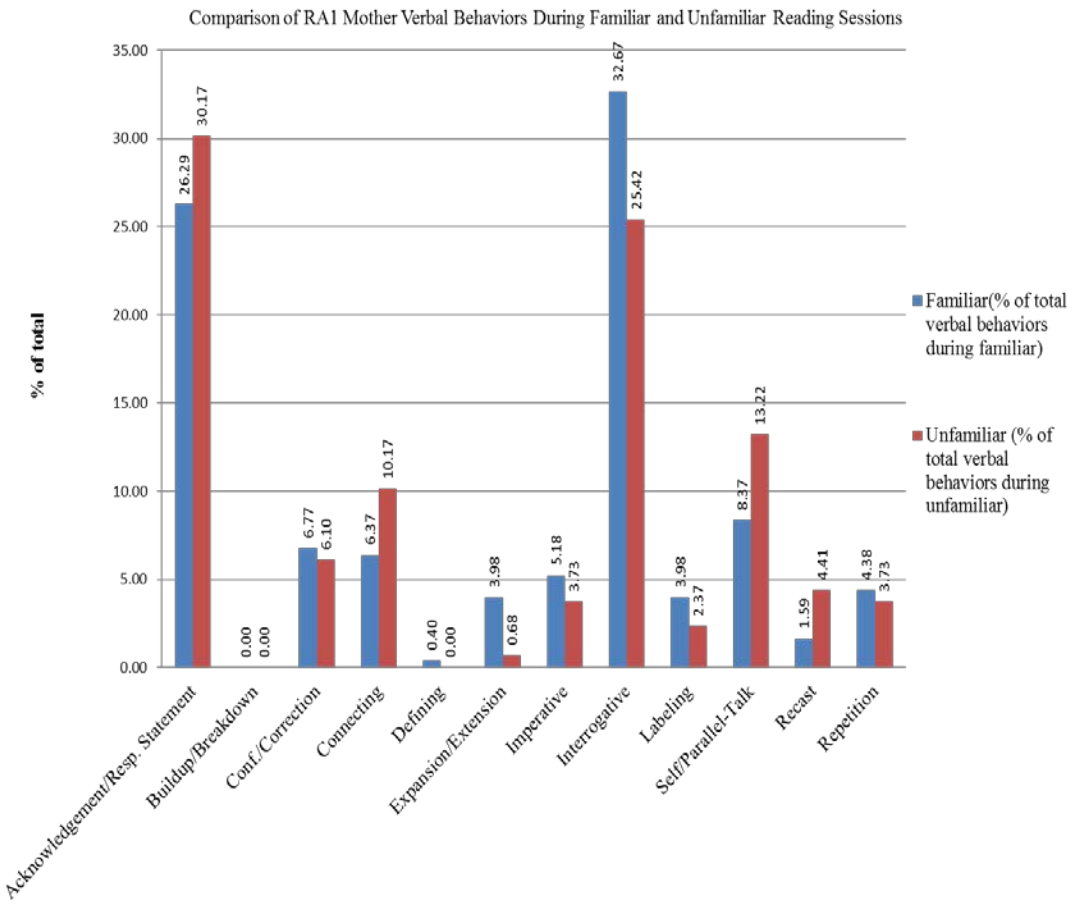

Figure 3—RA1 mother verbal behaviors during familiar and unfamiliar reading sessions using the CC.

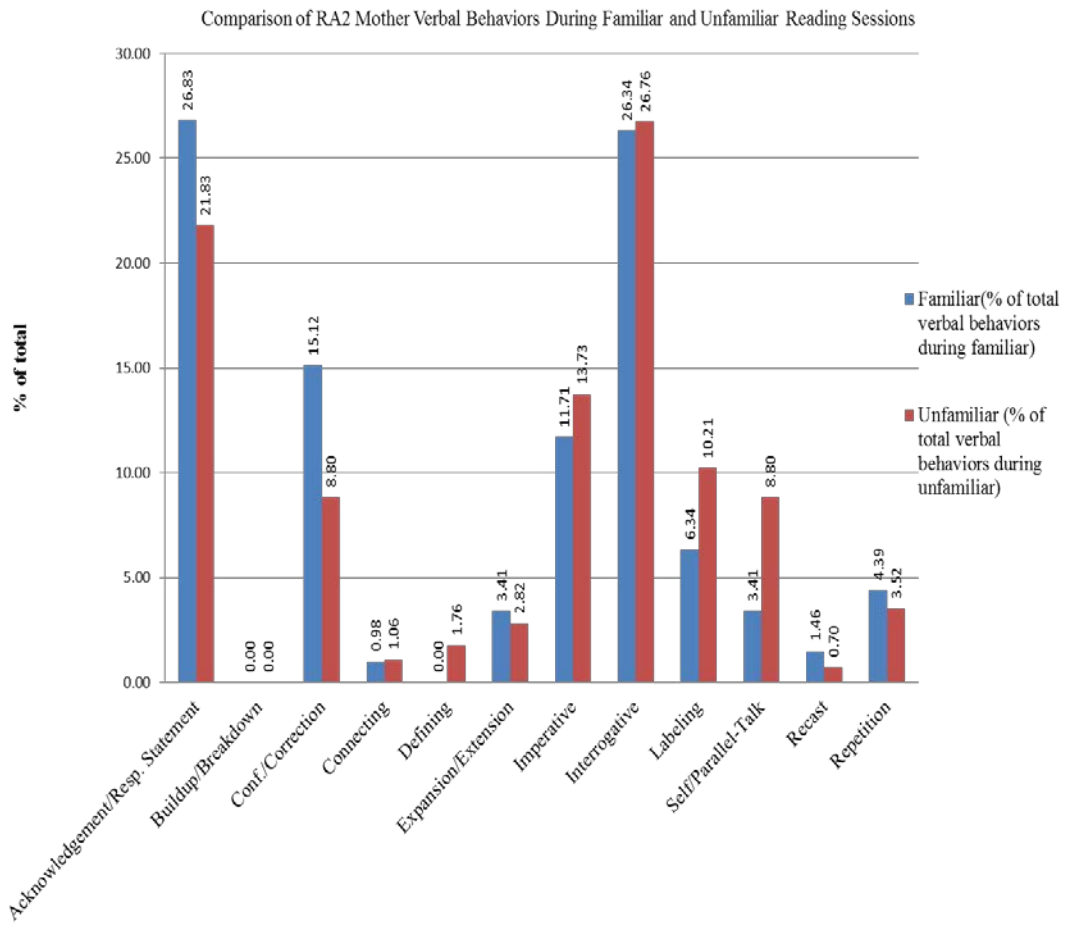

Figure 4—RA2 mother verbal behaviors during familiar and unfamiliar reading sessions using the CC.

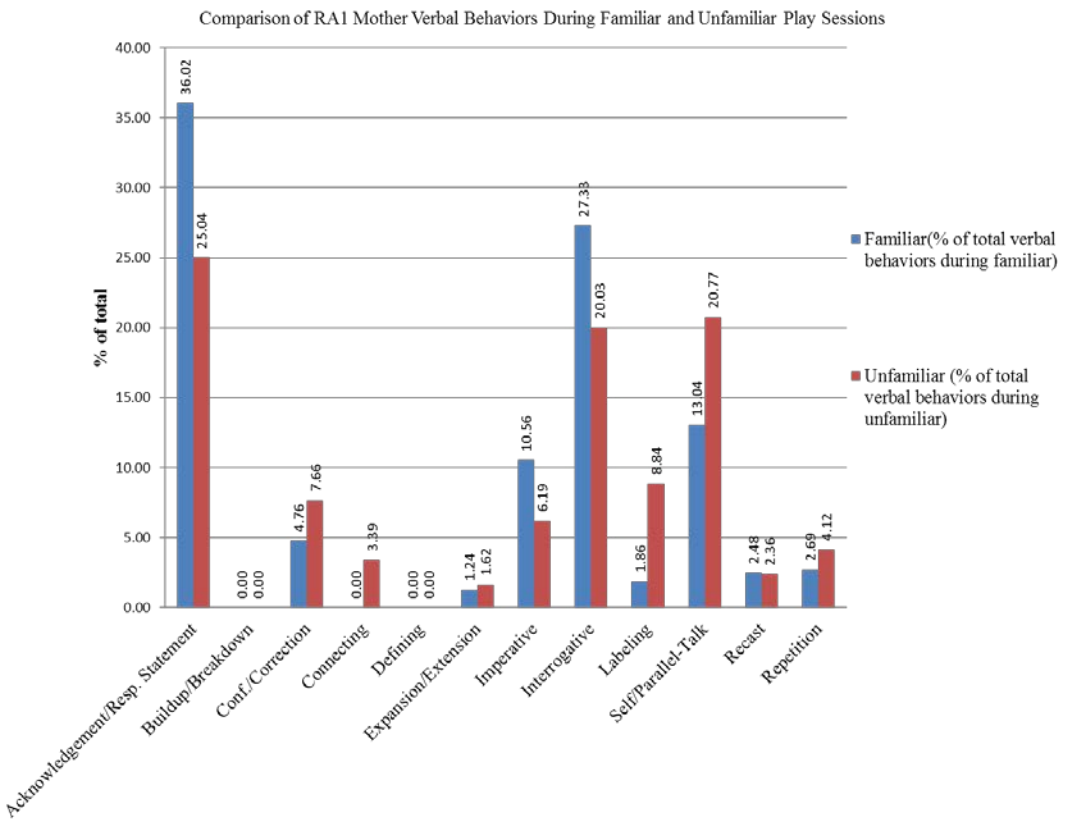

Figure 5—RA1 mother verbal behaviors during familiar and unfamiliar play sessions using the CC.

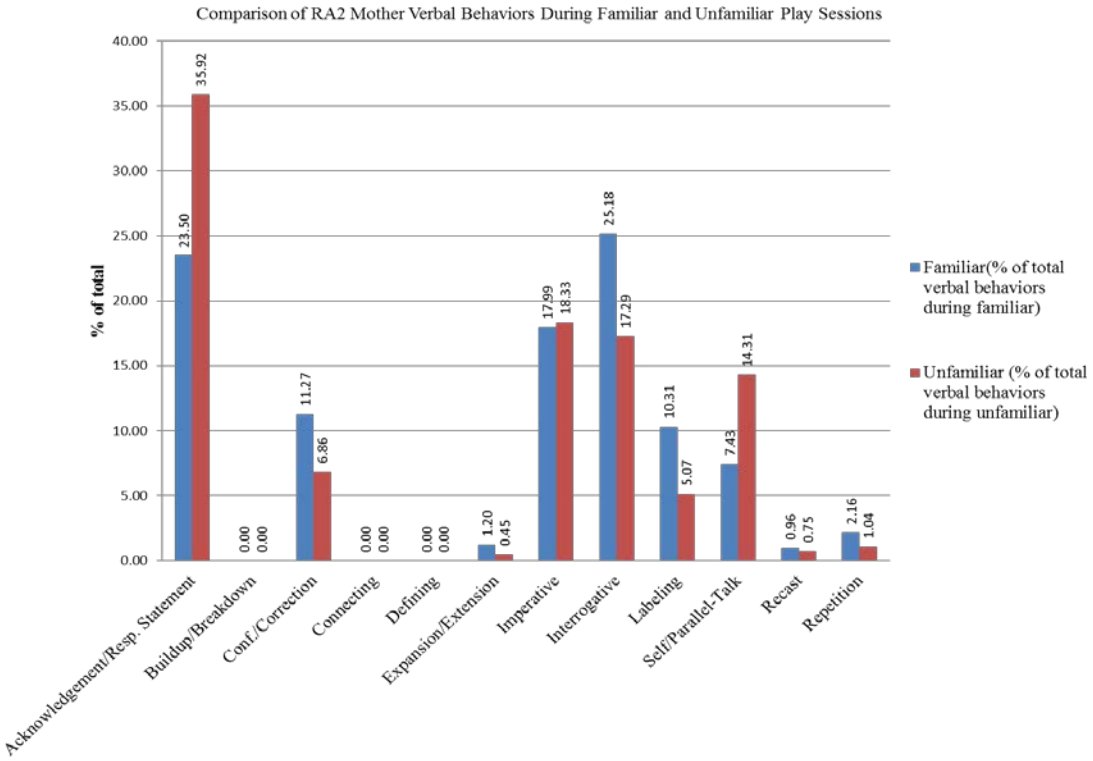

Figure 6—RA2 mother verbal behaviors during familiar and unfamiliar play sessions using the CC.

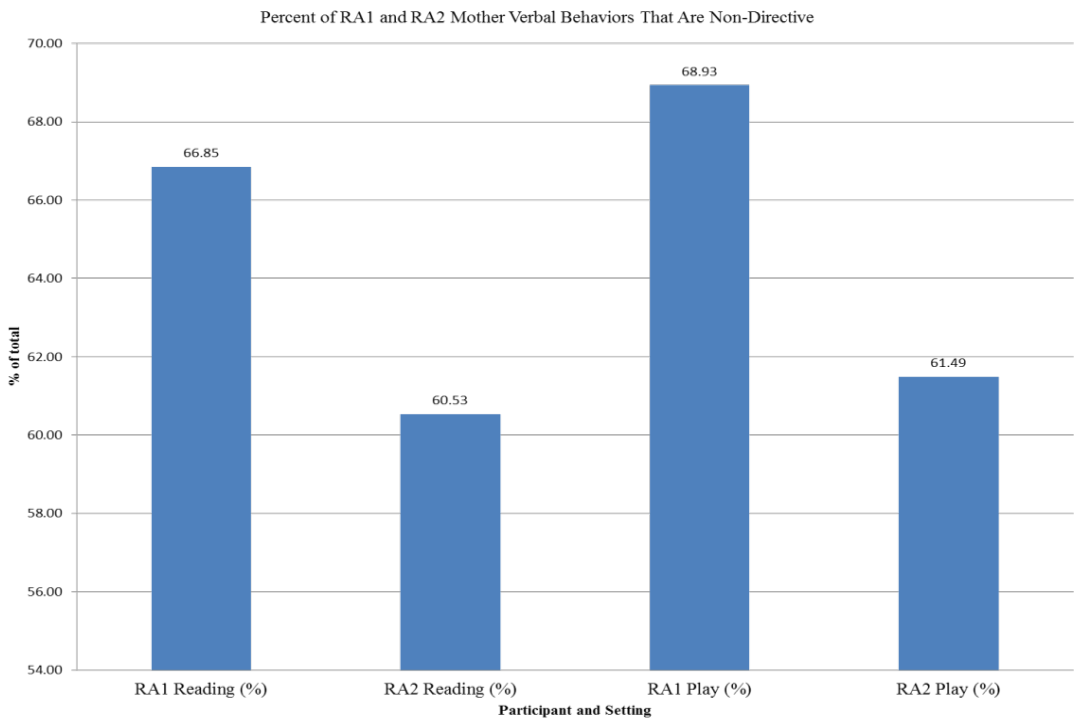

Figure 7—RA1 and RA2 mother verbal behaviors that were non-directive/responsive during reading and play.

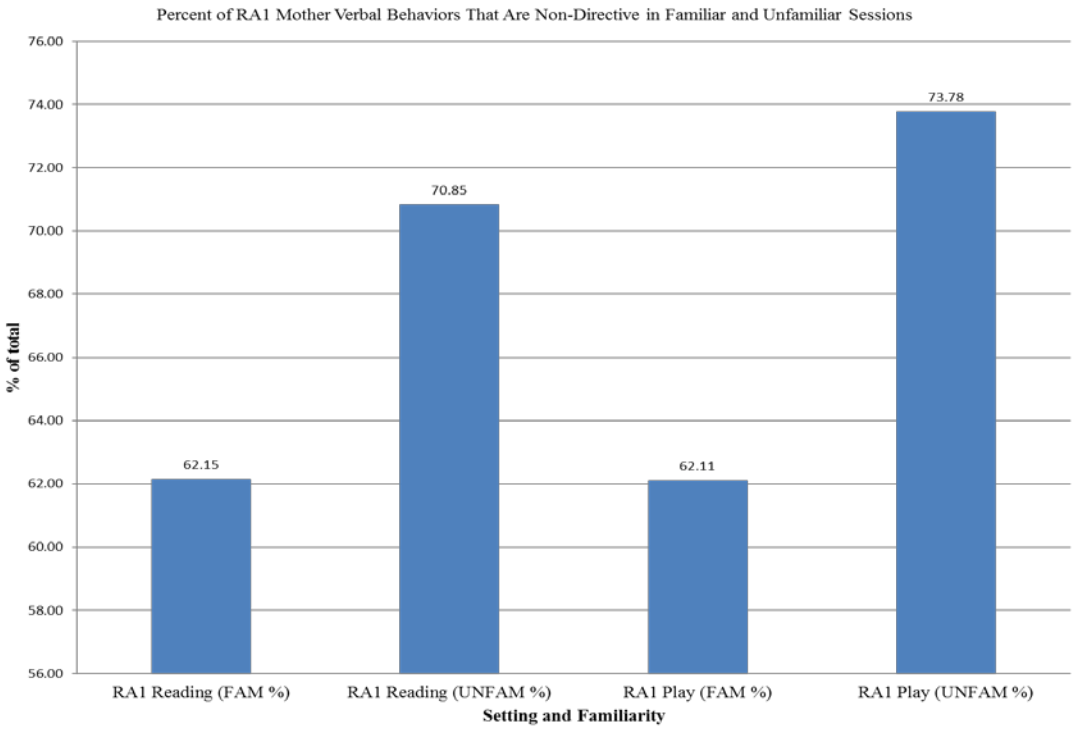

Figure 8—Percent of RA1 mother verbal behaviors that were non-directive/responsive when comparing the use of familiar and unfamiliar stimuli.

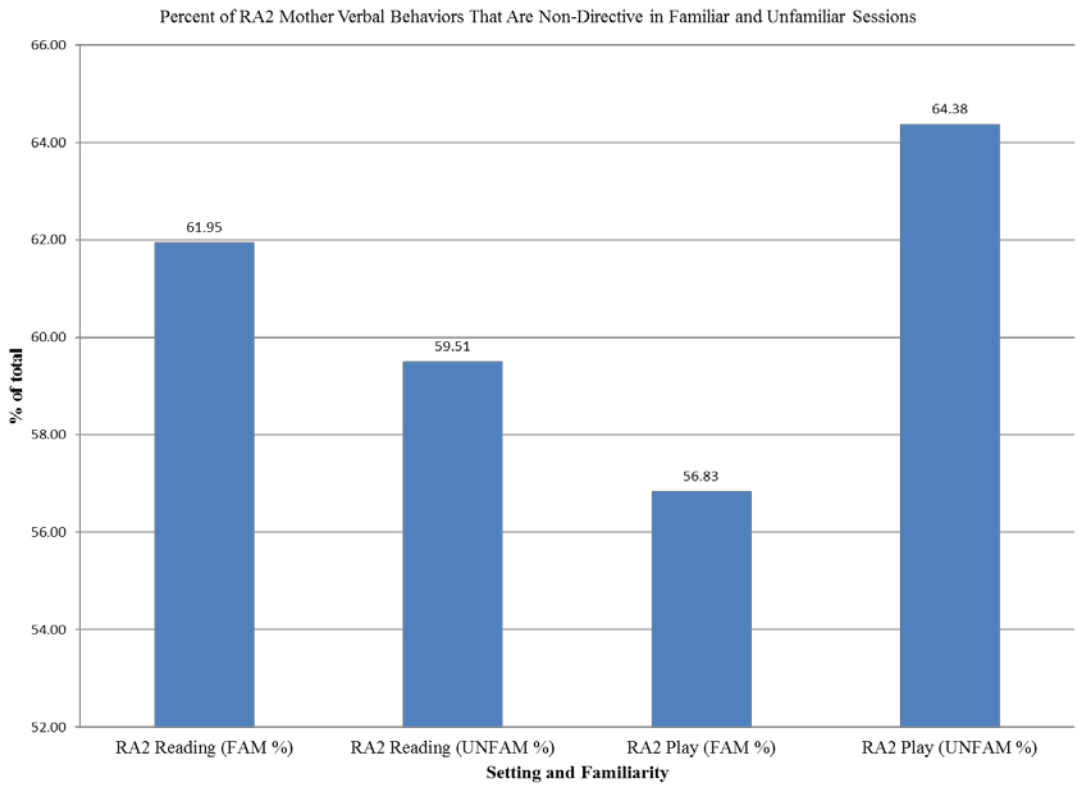

Figure 9—Percent of RA2 mother verbal behaviors that were non-directive/responsive when comparing the use of familiar and unfamiliar stimuli.

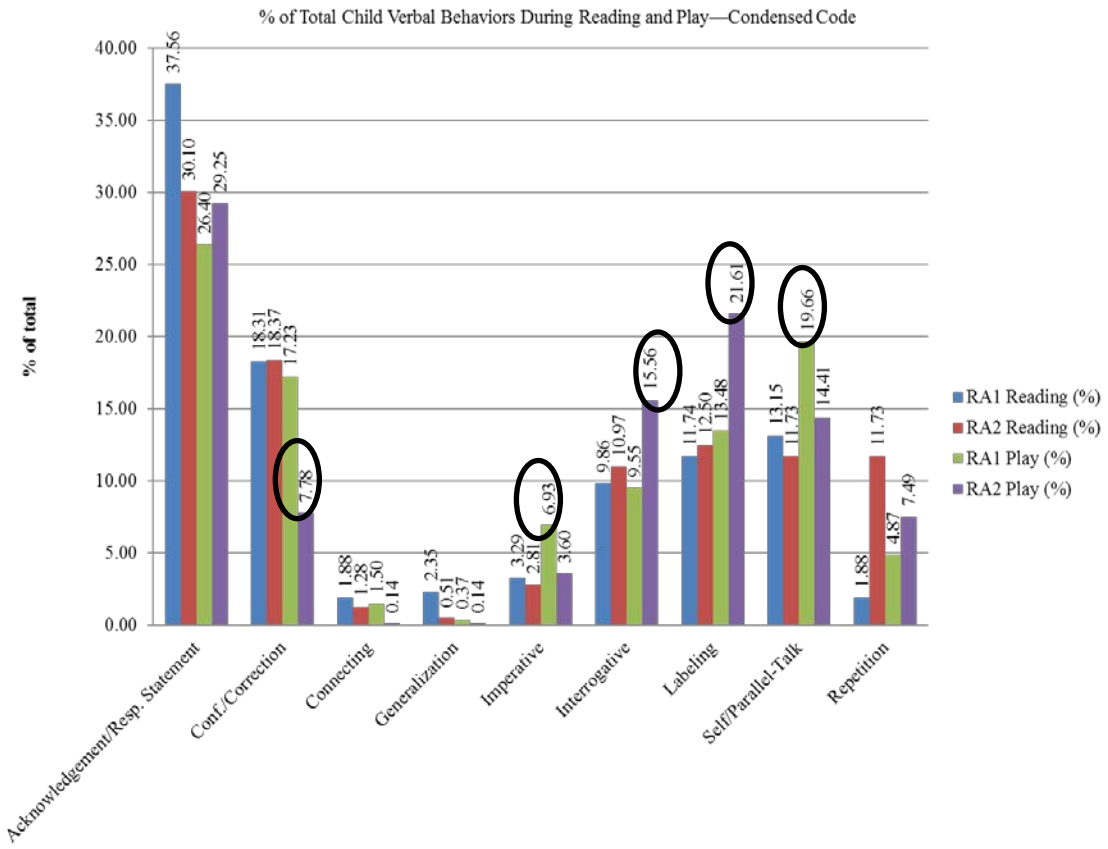

Figure 10—Child verbal behaviors during reading and play using the CC.

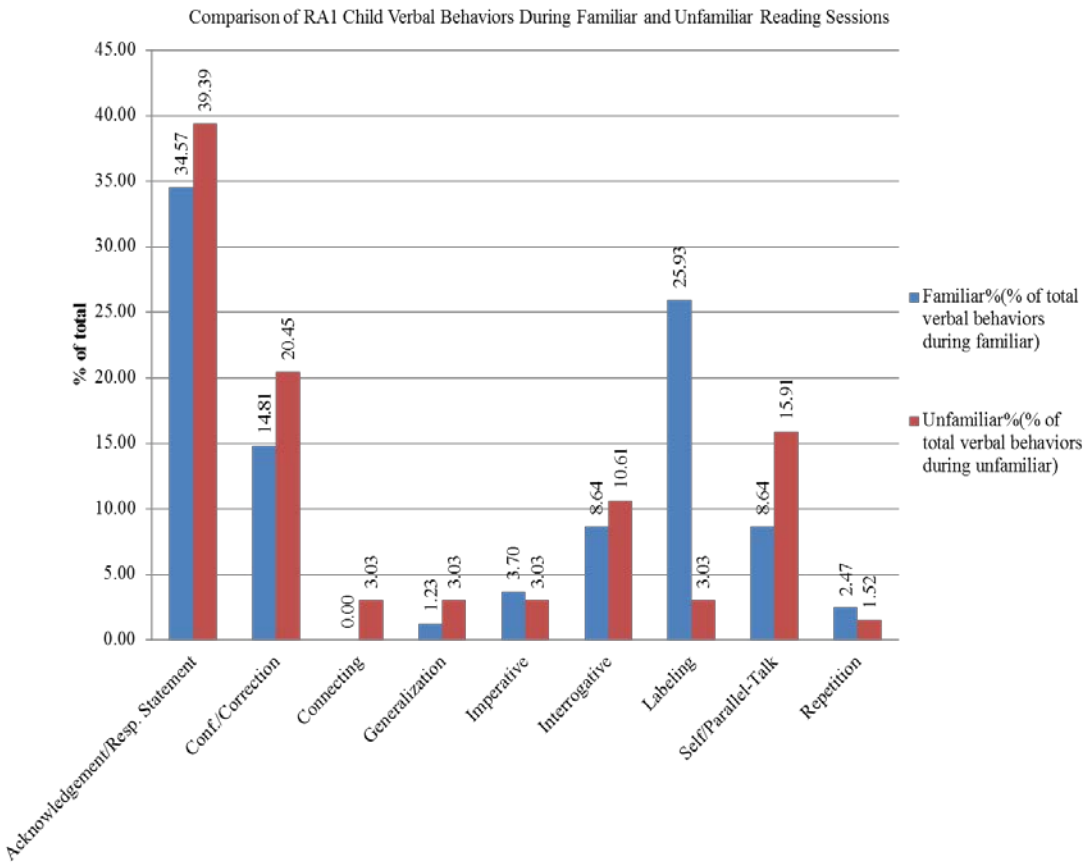

Figure 11—RA1 child verbal behaviors during familiar and unfamiliar reading sessions using the CC.

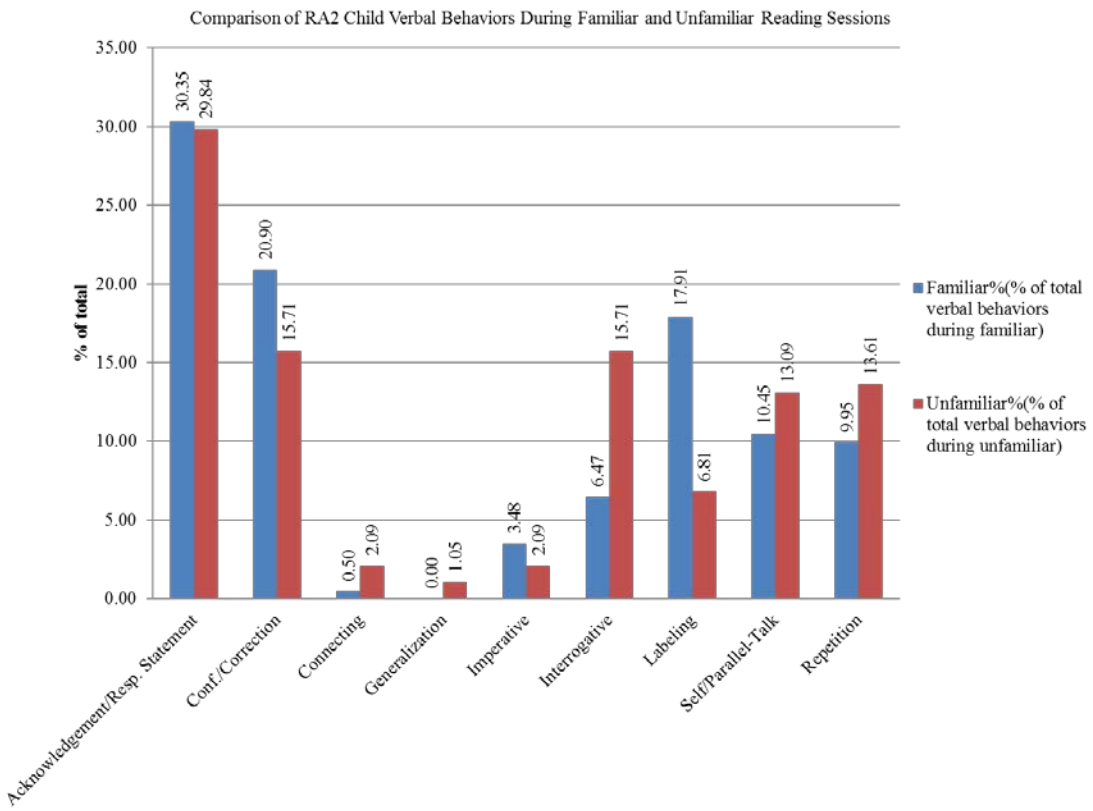

Figure 12—RA2 child verbal behaviors during familiar and unfamiliar reading sessions using the CC.

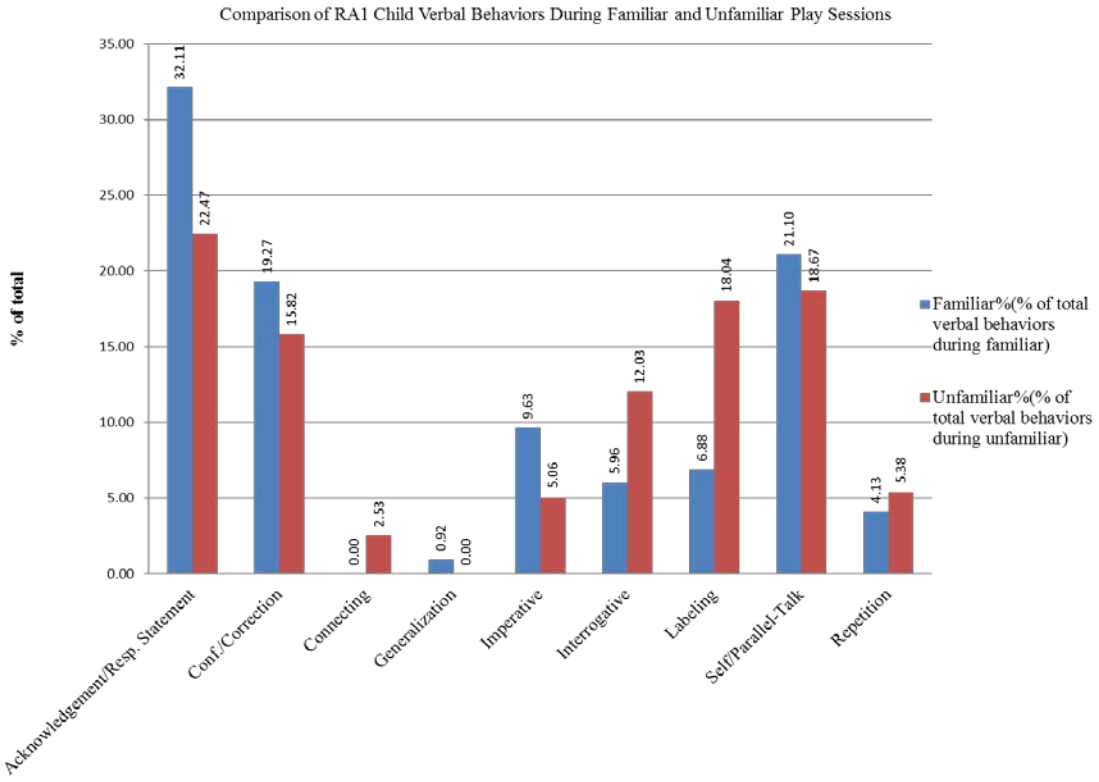

Figure 13—RA1 child verbal behaviors during familiar and unfamiliar play sessions using the CC.

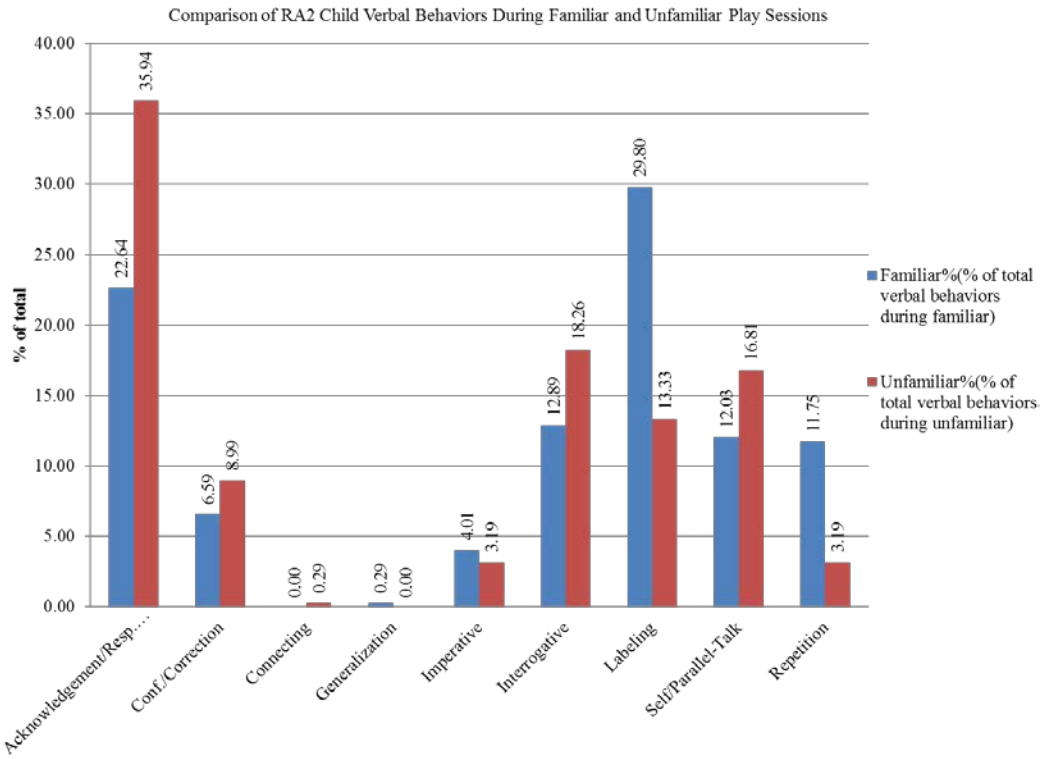

Figure 14—RA2 child verbal behaviors during familiar and unfamiliar play sessions using the CC.

Subject and Behaviors	Reading	Play	Total (All 4 Session Reading + Play)
RA1 Mother Verbal	546	1162	1708
RA1 Child Verbal	213	534	747
RA2 Mother Verbal	284	1088	1372
RA2 Child Verbal	191	694	885

Table 7—Number of verbal behaviors coded for each participant in each setting.

Subject	Reading	Play	Familiar Reading	Unfamiliar Reading	Familiar Play	Unfamiliar Play
RA1 Mother	71.94	68.51	75.60	69.09	68.90	68.24
RA1 Child	28.06	31.49	24.40	30.91	31.10	31.76
RA2 Mother	55.51	61.05	50.49	59.79	54.44	66.04
RA2 Child	44.49	38.95	49.51	40.21	45.56	33.96

Table 8—Percent of mother and child conversational turns during reading, play, familiar, and unfamiliar interactions.

Activity Pair	Rationale
Trains & Figurines	-Both of these activities provided opportunities for talking about actions, and did not have built-in turn-taking opportunities.
Toy Food & Kinects	-Both of these activities involved making objects out of lots of little parts, were collaborative/interactive in nature, and did not have built-in turn-taking opportunities.
Bowling & SlapJack Card Game	-Both of these activities involved turn-taking and were competitive in nature.
Candy Land & Chutes and Ladders	-Both of these were board games with built-in turn-taking opportunities and were similar in terms of the linguistic level required to play.

Table 9—Play activity pairs and rationales for pairings.

Participant	Trains (RA1) vs. Action Figures (RA2)	Toy Food (RA1) vs. Kinects (RA2)	Bowling (RA1) vs. SlapJack (RA2)	Board Game (RA1) vs. Board Game (RA2)
RA1	57.76	74.04	69.17	74.54
RA2	45.07	62.94	72.22	65.86

Table 10—Percent of RA1 and RA2 mothers' verbal behaviors that were non-directive/responsive during each play activity.

CHAPTER 5-DISCUSSION

Due to the extensive and varied range of data presented above, this section will be divided up in order to address each point of interest independently. An outline of the discussion section is presented below.

1) The Different Levels of Coding
2) Talkativeness
3) Directiveness/Responsivity
4) Facilitating Contexts and Stimuli
5) Rare Events & Mother-Child Alignment
6) Future Directions
7) Conclusion

While the information discussed here is broken down into the sections described in the outline above, these sections ultimately relate back to the two main purposes of the study. As a reminder, the main purpose of this project was to develop a comprehensive coding system to describe a wide range of language stimulation behaviors that occur during adult-child interactions. A secondary purpose was to demonstrate the quantitative and qualitative usefulness of the coding system for analysis of real adult-child dyads interactions with a variety of stimuli.

The Different Levels of Coding

One of the main purposes of this study was to develop an effective and comprehensive way of quantifying the verbal behaviors that occur during everyday mother-child interactions. This resulted in the creation of three levels of the Alper Code: the FC, and two permutations, the CC and the DC, which were each developed to examine the data at a different level of detail. The first two chapters identified how the codes used in the cited observational and intervention studies varied in terms of their level of detail. The main differences between the Alper Code and the others is that the levels of the Alper Code were all designed based on the same theoretical underpinnings,

all of them are compatible for use on the same data set in order to provide complementary information, and the Alper Code incorporates a more comprehensive list of language stimulation behaviors than any of the other codes discussed in Table 3 (i.e. the codes from the cited studies). An important additional difference between the Alper Code and the published codes is that the former allows for analysis of both the adult and the child at similar levels of detail. In contrast, many of the published codes provided much less detailed information about the children than about the mothers (Peterson et al., 2005; Girolametto & Pearce, 1996; Kaiser et al., 1996; Baxendale & Hesketh, 2003, Rowe, 2008; Tamis-LeMonda et al., 2001; Vigil et al., 2005). The strengths, challenges, and possible uses of these codes will be discussed here.

The FC was used to analyze the data at a level of detail similar to the task-analysis performed in the clinic (for instance open-ended vs. yes/no questions). When given a large enough sample size, this code could be very useful in terms of making fine distinctions between the very specific verbal behavior subcategories. Additionally, this level of detail could be very useful for the purpose of comparing specific language scaffolding techniques as a part of particular interventions. However, when working with a small sample size, or when trying to analyze the data for broader category-based patterns in the verbal behaviors, the information about sub-categories in the FC is unnecessary. As will be discussed in future directions section, portions of the details included in this code could be maintained in specific studies for the purpose of analyzing specific subcategories.

The main strength of the CC was that it maintained the same degree of comprehensiveness as the FC, but it eliminated some of the “noise” of the FC by providing data about behavior categories as opposed to sub-categories. The CC and FC together allowed for very thorough analysis of the different behavior categories. Finally, the DC was useful given that directiveness and responsiveness are concepts that have been widely discussed in the literature presented in this paper. The information about

directiveness is particularly interesting within the context of the specific information about behavior categories or subcategories provided by the CC and FC respectively. Each of the codes serves to answer questions that arise from the other codes. For instance, if a mother is found to be highly directive using the DC, then the CC can be used to determine whether the directiveness arose out of primarily imperatives or interrogatives. Finally, if the CC revealed that the directiveness resulted primarily from the use of interrogatives, then the FC could be used to determine whether the interrogatives were yes/no or open-ended.

Talkativeness

The measure of "talkativeness" in this study was defined as the relative percent of total number of verbal behaviors that were attributed to either the mother or the child (refer to Table 8 for the percent values). A similar measure was used in the Vigil et al. (2005) study, which involved counting the number of turns taken by the mothers and children respectively. This was deemed to be important due to the fact that responsiveness was a focus of the study. Unlike the present study, however, Vigil et al. (2005) only reported the number of initiations and responses as a means of comparing between the two groups of mothers as opposed to reporting on the comparison between mothers and their children as was done in the present study. Girolametto & Pearce (1996) also used the measure of "talkativeness", which was defined as the number of utterances produced and the rate of word production. However, just as in Vigil et al. (2005), Girolametto & Pearce (1996) did not use their talkativeness data to investigate the relative contributions of the mothers and children to the interactions, but rather compared across mothers and across children separately. The data from the present study revealed that in general RA1 mother was more "talkative" as compared to RA1 child than RA2 mother was as compared to RA2 child. These results raise one main question in relation to talkativeness: What do the data related to talkativeness tell about a dyad?

It is tempting to assume that a mother who is less “talkative” as compared to her child (i.e. her contribution to the total number of verbal behaviors is not much greater than that of the child) would also be less directive using the definition of directiveness presented here (i.e. verbal behaviors requiring the child to do respond verbally). However, as we have seen with the data from RA1 and RA2 mother this was not the case. While RA1 was more talkative, she was also generally less directive (see Figure 7). This observation lends itself to the idea that the quality of the talking is more important than the quantity in some regards. Based upon qualitative observations of the investigator recording the video sessions, it appeared that RA2 child was much more verbally and physically active, which meant that he required frequent redirection to task. This high level of verbal activity contributed to the fact that his mother seemed less “talkative”. However, when she did talk she was more directive, which was thought at least in part to be a means of behavior management. On the other hand, RA1 child was very compliant and required limited redirection to task. She was also qualitatively observed to be quieter than RA2 child. Overall, these results suggest that the most important information that can be gained from this type of measure of “talkativeness” is simply the relative contributions of each communication partner, which become more meaningful in the context of other quantitative and qualitative information. The number of turns contributed by each communication partner is not necessarily significant in and of itself without considering the other qualities of the interaction.

Directiveness

Another objective of this study was to develop a comprehensive way of quantifying directiveness and responsiveness in the context of mother-child interactions. As discussed earlier in the introduction, responsiveness and directiveness (operationally defined in a variety of different ways discussed earlier) are concepts that have sparked interest in terms of observational and intervention studies (Buschmann et al., 2008;

Baxendale & Hesketh, 2003; Rowe, 2008; Tamis-LeMonda et al., 2008; Vigil et al., 2005; Yoder & Warren, 1999; Kaiser et al., 1996).

Overall, RA1 mother was less verbally directive than RA2 mother (see Figure 7). However, these results, in addition to qualitative observations of the children, raise the following questions: Is directiveness always a bad thing? If not, then how much is too much? Is this something that varies from child to child?

The most intuitive answer to the first question is that directiveness is not always a bad thing. When working with children there is some benefit to being able to redirect the child to the task at hand, or to ask them a follow-up question to elicit a more complete response. This rejection of the all-or-nothing view of responsivity and directiveness is supported by the fact that some of the studies discussed in this paper incorporated the use of RI and MT techniques for the purpose of intervention. In other words, requiring a response from the child or regulating a behavior is probably not a bad thing at times. For instance Peterson et al. (2005) demonstrated that responsive strategies and directive strategies (i.e. ones requiring the child to answer) were both beneficial just in different ways (see Table 1). The data from the current study showed that while RA2 mother was more directive, her child was also qualitatively observed to be much more active than RA1 child. However, it is important to remember that one of the benefits of responsitivity is the ability to work within the child's Zone of Proximal Development (ZPD) and to provide him or her with linguistic input that is tailored to something to which they are attending at that moment (Vygotsky, 1978).

The second and the third questions go hand-in-hand. It remains to be determined what the ideal balance of directiveness and responsiveness might be, and the rate at which each of the verbal behaviors should be used in an optimal environment. However, it is possible that there is no magical "ideal" number or ratio that dictates the balance of directive and responsive behaviors. Perhaps this is something that truly varies from child to child. On the other hand, it is possible that there is an ideal ratio or rate of use of

directive and responsive behaviors, but that it is up to the adult to find a facilitating context that allows for the desired interaction to take place. Only more data and analysis of specific behaviors used by many different individuals will provide the answers to some of these questions.

Facilitative Contexts and Stimuli

The data collected during this study suggest that the verbal behaviors of the mother and child, the interaction context (i.e. reading or play), and the nature of the stimuli (i.e. familiar or unfamiliar toys or books and the specific nature of the toys) all have the potential to impact the nature of the mother-child interactions. Although strategies for manipulating these variables are incorporated as part of good clinical training, these variables have not been fully explored in the available observational and intervention literature related to parent-child interactions. For instance, Baxendale & Hesketh (2003), Tamis-LeMonda et al. (2001), Vigil et al. (2005), and Kaiser et al. (1996) all extracted their interaction data solely from play activities with minimal reported consideration for the familiarity of the stimuli. Additionally, data were not collected during reading as a part of these studies. The data reported in Rowe (2008) were collected during different activities including reading, meals, and play. However, these data were not analyzed specifically with consideration for the different interaction contexts. The present study considered all of the factors that were not incorporated in the studies mentioned above.

While the observational nature of this study, and the limited number of participants, does not allow for conclusions to be drawn about the relative importance of each of these factors in general, it is still important to consider the data from the individual dyads in order to influence the direction of further investigation. Different types of stimuli and different interaction contexts provide diverse opportunities for language stimulation behaviors. This is particularly important, because any

environmental facilitation could alleviate some of the burdens placed upon the parents to create an appropriate interaction context. This could potentially increase the efficiency and/or effectiveness of intervention.

Rare Events and Mother-Child Alignment

The data collected during the observations of both dyads demonstrated that certain verbal behaviors were only seen somewhat infrequently (e.g. generalization, defining, connecting, and recasting) or not at all (e.g. buildup/breakdown). However, given that the ideal rate of use of these behaviors is not known, they cannot be discarded as unimportant despite their low rate of occurrence. This raises the questions of which rare events are important and for what purpose. One of the potential flaws of many of the studies presented in Table 1 is that the verbal behaviors were grouped so broadly that the codes were not conducive to capturing these rare events. For instance, the focus of the Kaiser et al. (1996) study was on responsive techniques, but these techniques were characterized broadly (e.g. no consideration of expansion vs. extension, buildup/breakdown). Additionally, it could be useful to collect data on the rarely-occurring responsive or directive behaviors even when focusing on the effectiveness of responsive techniques in general in order to determine whether or not there are specific advantages of some of the behavior subcategories. These data could help inform whether or not these rarely-occurring behaviors are those that need to be trained or that require direct instruction in order to incorporate them into parent-child interactions. In the future, contingent analysis could reveal information about what occurs to precipitate the use of these rarely-occurring verbal behaviors as well as to determine the type of response that is occasioned in the child as a result.

Another question that arises when considering the verbal behaviors recorded for each mother and each child in the two dyads is whether the data seem to “fit” each other. That is to say, do the mothers’ verbal behaviors “fit” with what is seen in the children and

vice versa? This "fit" could potentially be seen in a couple of different ways. One possibility is that the child's distribution of verbal behaviors could look very similar to the mother's (e.g. if the mother asked a lot of questions so did the child, etc.). A second possibility would be more of a complementary alignment where the child's verbal behaviors complemented the mother's and vice versa. For instance, if the mother used many interrogatives the child would be expected to do a lot of labeling and/or confirming/correcting. A final possibility is that the mother and child would be on totally different verbal paths, in which case no obvious "fit" would be seen.

The analytical technique of determining the alignment or "fit" of the language stimulation behaviors used by mothers and their children could be used to compare between different cultural, socioeconomic, linguistic, disorder, or other groups. For example, it might be expected that children with typical language might demonstrate a better "fit" with their parents as compared to their same-age peers with language disorders. This might be expected due to the more limited repertoire of verbal behaviors one might expect to see in a child with a language impairment. This is just one example of the type of question that could be investigated with the application of this analytical technique using the Alper Code.

Future Directions

This study was a heuristic first step in developing a methodology for quantifying verbal language stimulation behaviors occurring during adult-child interactions. There are a number of different directions in which future research in this area could proceed. The paths that are presented in this section include:

- establishing intercoder/intracoder reliability
- analyzing the use of verbal behaviors based on contingency rather than solely on rate of occurrence
- tailoring the codes/using select parts of the codes in order to look at specific verbal behaviors in greater detail

- using the code to gather normative data for a variety of groups and inform the development of interventions with caregivers as agents of intervention
- using the code to analyze clinician-client interaction during intervention
- using the code as a means of measuring dosage in intervention
- using the code for the purpose of clinical self-analysis to inform clinical training

Establishing Code Reliability

The current study demonstrated that the design of the codes used here accomplished the goal of creating a comprehensive means of describing verbal behaviors occurring during adult-child interactions. However, one of the main things still needed is to demonstrate that the codes used in this study are consistent for the purpose of quantification is to conduct a study to establish both inter and intracoder reliability in the use of the Alper Code. This is particularly important given that all of the data used in this demonstration study were collected and analyzed by one individual who also designed the code.

Contingent Analysis

One of the factors that may influence the impact of a verbal behavior is the nature of the behaviors that precede, accompany, or follow that behavior. One example might be the difference between a child asking a question followed by the parent responding with a question (e.g. "What is this [boat]?"→ "Well what is this blue stuff under it?"), versus a child asking a question followed by the parent answering a question (e.g. "What is this [boat]?"→ "It is a boat; it floats on the water"). This example demonstrates how contingent analysis could be revealing in terms of the types of interactions that occur in different situations and contexts. Contingent responses categorized in this fashion could be thought to fit into one of the categories constructed in Table 11.

The type of analysis required to determine the time and content-based contingency of adult or child responses would also allow for the construction of a probability matrix that could be used to determine the likelihood of a certain response by

the child or mother given a particular verbal behavior by the communication partner. This type of analysis could be useful in the future for determining whether these probabilities are consistent across children or whether this is an area of great individual difference. That information would be helpful in terms of informing the design of interventions.

Tailoring the Code for Specific Purposes

Another way that the code can be used in the future is that it can be adapted or tailored to examine specific behaviors categories or sub-categories in more or less detail in order to answer specific questions. For example, some of the detail of the FC could be maintained while other categories could be investigated using the CC (e.g. separating out parallel and self-talk but collapsing interrogatives). Additionally, the DC could be set up so that it would still provide information about some of the categories of behaviors rather than just directive or responsive (i.e. whether the directive behavior was an interrogative or imperative, etc.). This might be helpful in separating the function of the directiveness. For instance, a mother who is primarily directive through the use of mostly imperatives might be doing so as a means of behavior management, while a mother who is directive through the use of mostly interrogatives might be doing so for other reasons.

Gathering Normative Data

One of the long-term goals that helped motivate this study was gathering comprehensive normative information about the different verbal behaviors that occur during adult-child interactions, and to eventually determine what is ideal in terms of the rates of use of these different verbal behaviors for the purpose of intervention. Once the code has been established as reliable these data may begin to be collected.

Analyzing Clinician-Client Interactions

This study used the Alper Code to look at interactions between mothers and their children. However, the code was designed to capture the spectrum of adult-child interactions including parents, caregivers, and even clinicians. In fact, the use of the code for the purpose of analyzing clinician-client interactions could be extremely helpful in optimizing play-based or client-centered therapy with young children. The code (or a tailored version of it) could be used to provide a more rigorous way of collecting data in the clinic (as opposed to on-line data recording) or as a means of quantifying intervention techniques as a part of clinical research.

Analysis for Determining Dosage in Intervention

One of the main purposes of quantification of verbal behaviors is to determine what is “normal” and what is “optimal”. The issue of dosage, or what is “optimal”, in intervention is an area in need of further investigation, especially as the field of speech pathology places an ever-increasing emphasis on “evidence-based” or “best” practice. For example, Proctor-Williams & Fey (2007) showed that children with typical language skills produced more of the target irregular past-tense verbs, and produced them more accurately, in the recast condition (as compared to being provided with models) when the recasts were provided at the rate at which they typically occur in conversation. However, this same study also demonstrated that there is such a thing as too many recasts, because the typical-language children’s performance declined when recasts were provided at an elevated intervention rate. The children with specific language impairment (SLI) did not show increased accuracy when recasts were provided at the conversational or intervention rate.

This study highlights two important points related to dosage: 1) dosage matters and 2) more is not always better. This is relevant to the information presented in the RI and MT studies above in a couple of ways. First, while there are clearly benefits to

interventions based upon a social-interactionist perspective, it is unclear how much intervention is necessary and how much is too much. Additionally, the studies discussed demonstrate the wide variety of ways in which language stimulation behaviors are grouped and coded. Therefore, dosage is an issue not only on the macro level of how much RI or MT is helpful, but also on the micro level in terms of which specific strategies are the most effective and efficient. Based on the previous two points it is imperative that the behaviors recommended to parents and clinicians due to their value as rich language models be quantified and investigated in order to determine what happens normally, what is too little, and what is too much.

Clinical Training via Self-Analysis

Another use of the codes developed in this study is for the purpose of clinical training through self-analysis. Clinicians could code and quantify their own verbal behaviors in order to determine how directive or responsive they are with their clients, or to see how strictly they are sticking with a designated protocol for intervention or cueing hierarchy. For example, a clinician could quantify how often they provide a child with an open-ended interrogative before moving up the cueing hierarchy to a two-option forced choice or a yes/no question as opposed to only asking yes/no questions. Once more information has been obtained about the ideal rates of use of specific verbal behaviors (e.g. extensions, labeling, etc.) clinicians could use the techniques described here to monitor their rate of use. This could also be applied to already established intervention protocols such as the Hanen Program for Parents (Manolson, 1992). The use of self-analysis for the purpose of clinical training could eliminate some of the burden placed upon clinical supervisors and promote independent self-guided learning and behavior modification amongst clinicians.

Conclusion

Using the information that has been discussed about the importance of the type and quality of early adult-child language interaction, and the discrepancies amongst established systems used to describe these interactions, the Alper Code was developed as a means of quantitatively and qualitatively describing the language stimulation behaviors occurring during early adult-child language interactions. The pilot data collected in this study served to demonstrate how each level of the code could provide unique and complementary information about adult-child interactions. While the establishment of inter and intra-coder reliability are essential to the process of validating the code, this does not detract from the fact that the Alper Code has been shown to be much more comprehensive in nature then any of the other codes discussed. Once the reliability of the code has been established, the comprehensiveness of the Alper Code will lend itself to the pursuit of any or all of the applications discussed above.

Response contingent based on time and content. Example: Mother: What is chasing the bird? Child: Cat [content correct and within allotted time window for the child's turn]	Response contingent based on content but NOT time. Example: Mother: What is chasing the bird? Mother: Stop trying to close the book. Child: Cat [content correct but not within the allotted time window for the child's turn].
Response contingent based on time but NOT content. Example: Mother: What is chasing the bird? Child: I want a cookie [not contingent content but response within the allotted time window for the child's turn]	Response not contingent based on time or content. Example: Mother: What is chasing the bird? Mother: Stop trying to close the book. Child: I want a cookie [not contingent content and child's response not within the allotted time window]

Table 11—Response contingency possibilities

REFERENCES

Baxendale & Hesketh (2003). Comparison of the effectiveness of the Hanen Parent Program and traditional clinic therapy. *International Journal of Language and Communication Disorders, 38*(4), 397-415.

Bazaldua, B. (2011). *Aurora and the helpful dragon.* New York, NY: Random House.

Bazaldua, B. (2011). *Tiana and her furry friend.* New York, NY: Random House.

Buschmann, A. & Jooss B. (2007). Early language intervention in late-talking toddlers: ‘‘Heidelberg Parent-based Language Intervention HPLI’’ (In German). *Forum Logopaedie, 5,* 6–11.

Buschmann, A., Jooss, B., Rupp, A., Feldhusen, F., Pietz, J., & Philipi, H. (2008). Parent based language intervention for 2-year-old children with specific expressive language delay: A randomized controlled trial. *Archives of Disease in Childhood, 94,* 110-116.

Butler Seder, R. (2010). *Star Wars: A scanimation book: Iconic scenes from a gallery far, far away…*New York, NY: Workman Publishing Company.

Cowley, J. (n.d.). *One stormy night.*Chicago, IL: Wright Group.

Cowley, J. (n.d.). *Splishy-sploshy.*Chicago, IL: Wright Group.

Cowley, J. (n.d.). *The little yellow chicken.*Chicago, IL: Wright Group.

Cowley, J. (n.d.). *Time for bed, little bear.*Chicago, IL: Wright Group.

Ezell, H.K. & Justice, L.M. (2005). *Shared Storybook Reading*. Baltimore, MD; Paul H. Brookes Publishing Co.

Fenson, L., Dale, P., Reznick, S., Thal, D., Bates, E. Hattung, J., Pethick, S., & Reilly, J. (1993). MacArthur Communicative Development Inventories. San Diego, CA: Singular Publishing Group, Inc.

Gillam, S.L. & Gillam, R.B. (2006). Making evidence-based decisions about child language intervention in schools. *Language, Speech, and Hearing Services in Schools, 37,* 304-315.

Girolametto, L. & Pearce, P.S. (1996). Interactive focused stimulation for toddlers with expressive vocabulary delays. *Journal of Speech and Hearing Research, 39*(6), 1274-1284.

Hedrick, D.L., Prather, E.M., & Tobin, A.R. (1984). *Sequenced Inventory of Communication Development-Revised*. Seattle, WA: University of Washington Press.

Herman, G. (2000) *Scooby-Doo: Shiny spooky knights.* New York, NY: Scholastic.

Kaiser, A.P., Hemmeter, M.L., Ostrosky, M.M., Fischer, R., Yoder, P., & Keefer, M. (1996). The effects of teaching parents to use responsive interaction strategies. *Topics in Early Childhood Special Education, 16*(3), 375-406.

Kim, J.M. & Mahoney, G. (2004). The effect of mother's style of interaction on children's engagement: Implications for using responsive interventions with parents. *Topics in Early Childhood Special Education,24*(1), 31-38.

Mahy, M. (n.d.). *My wonderful aunt: Story one.* Bothell, WA: Wright Group.

Manolson, A. (1992). It takes two to talk: A parent's guide to helping children communicate. Toronto, Canada: The Hanen Center.

McCloskey, S. (2000). *In grandma's garden.*Chicago, IL: Wright Group.

McGraw Hill (2004). Breakthrough to literacy. Retrieved from: http://www.breakthroughtoliteracy.com/index.html?PHPSESSID=&page=df_pr_first_books

Nesheim, L. (n.d.). *Dinosaur toes.*Chicago, IL: Wright Group.

Nicholas, E. (n.d.) *Benji's pup.*Chicago, IL: Wright Group.

Parkinson, R. (il.). (n.d.). *Grasshopper and the ants.*Chicago, IL: Wright Group.

Paul, R. (2007). *Language disorders: From infancy through adolescence (3rd ed.).* St. Louis, MO: Mosby Elsevier.

Peterson, P., Carta, J.J., & Greenwood, C. (2005). Teaching enhanced milieu language teaching skills to parents in multiple risk families. *Journal of Early Intervention, 27*(2), 94-109.

Proctor-Williams, K., & Fey, M.E. (2007). Recast density and acquisition of novel irregular and past tense verbs. *Journal of Speech, Language, and Hearing Research,50,* 1029-1047.

Rey, M. & Rey, H.A. (1990). *Curious George visits an amusement park.* New York, NY: Scholastic.

Rey, M. & Rey, H.A. (1999). *Curious George and the dump truck.* New York, NY: Houghton Mifflin.

Rey, M. & Rey, H.A. (2001). *Curious George goes to a costume party.* New York, NY: Houghton Mifflin.

Roberts & Kaiser (2011). The effectiveness of parent-implemented language interventions: A meta-analysis. *American Journal of Speech-Language Pathology, 20,* 180-199.

Rowe, M. (2008). Child directed speech: Relation to socioeconomic status, knowledge of child development, and child vocabulary skill. *Journal of Child Language, 35,* 185-205.

Schneider, P. & Watkins, R.V. (1996). Applying Vygotskian developmental theory to language intervention. *Language, Speech, and Hearing Services in Schools, 27,* 157-170.

Seuss, Dr. (1957). *The cat in the hat.* New York, NY: Random House.

Shannon, D. (2002). *David gets in trouble*. New York, NY: Scholastic.

Shannon, D. (2010). *It's Christmas, David*. New York, NY: Scholastic.

Tamis-LeMonda, C.S., Bornstein, M.H., & Baumwell, L. (2001). Maternal responsiveness and children's achievement of language milestones. *Child Development, 72*(3), 748-767.

Vigil, D.C., Hodges, J., & Klee, T. (2005). Quantity and quality of parental language input to late-talking toddlers during play. *Child Language Teaching and Therapy, 21*(2), 107-122.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes.* M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.), Cambridge, MA: Harvard University Press.

Waddell, M. & Firth, B. (1991). *Can't you sleep, little bear?*. London, UK: Walker Books, Ltd.

Warren, S.F. & Yoder, P.J. (1994). Communication and language intervention: Why a constructivist approach is insufficient. *The Journal of Special Education, 28*(3), 248-258.

Weizman, Z.O. & Snow, C.E. (2001). Lexical input as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology, 37*(2), 265-279.

Wittenburg, P., Brugman, H., Russel, A., Klassmann, A., Sloetjes, H. (2006). ELAN: A professional framework for multimodality research. In: *Proceedings of LREC 2006, Fifth International Conference on Language Resources and Evaluation*. Retrieved from: http://www.lat-mpi.eu/tools/elan/ . Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands.

Yoder, P.J. & Warren, S.F. (1999). Maternal responsivity mediates the relationship between prelinguistic intentional communication and later language. *Journal of Early Intervention, 22*(2), 126-136.