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THE MACARTHUR-BATES COMMUNICATIVE DEVELOPMENT INVENTORY AS AN ASSESSMENT TOOL FOR LOW-INCOME, AFRICAN AMERICAN CHILDREN

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Arts

in

The Department of Communication Sciences and Disorders

by
Elizabeth Waters Wooden
B.A., Louisiana State University, 2004
May 2006

ACKNOWLEDGMENTS

Dr. Janna Oetting… I sat in your class as an undergraduate student and discovered the field of speech language pathology. Your guidance throughout writing this thesis has allowed me to gain an enormous amount of knowledge and enjoy the research process. You are a true mentor, and I promise to always build on what you've taught me.

Dr. Hugh Buckingham and Dr. Jan Norris… thank you for being on my thesis committee. Your input was invaluable. Dr. Buckingham, we've been pals since the good old days over in Coates. Thank you for imparting to me all your wisdom and for allowing me to experience being a teaching assistant. Dr. Norris, the LLD after school program was an unbelievable introduction into the clinical world. I learned so much from you and from all those children.

Mrs. Shannon Farho… I am grateful for all the background work that you and many student clinicians completed in order to obtain the CDI inventories. Without them, my project wouldn't exist.

Mrs. Natalie Overall… through a tough first year and a pair of theses, we've made it. Thank you for help with this project and for sharing so much knowledge with me. I am so glad to have you as a colleague and a friend.

Mom, Dad, Kate, and T.H… you raised me to believe that I could do anything I set my mind to. It's a good thing I'm so hardheaded! You've all been my role models since the day I was born; thanks for always leading me in the right direction.

Scott… you made me realize years ago that the goal in life is to have a positive impact on others. You exemplify the "I'm Third" motto. I am so lucky to have your love and support while I pursue my dreams. Your patience is amazing. Here's what those late nights on the computer were all about.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The purpose of this study was to examine the usefulness of the MacArthur- Bates Communicative Development Inventory (CDI) as an assessment tool for low-income, African American (AA) children. The data were from eighty-seven typically developing AA children, aged 8 to 30 months; these children were recruited from childcare centers that served low-income populations in Baton Rouge, Louisiana. Each participant's primary caregiver completed a biographical sketch and a CDI inventory. Two analyses were completed. The first analysis examined the distribution of the CDI scores relative to the child's age, gender, birth order, and level of maternal education. The second analysis involved examination of the subsections and items of the vocabulary checklist sections of both versions of the CDI.

For the first analysis, the children's percentile scores were found to be normally distributed. Raw scores on the CDI were also found to increase with the children's ages, and a moderate correlation between CDI raw scores and age was identified. First-born children exhibited higher levels of expressive language than their later-born peers. Additionally, significant group differences were found between males and females on sections of the CDI Words and Gestures inventory, but the direction of the main effects varied across sections. Group differences were not significant for level of maternal education, but a restricted range of educational levels may have contributed to this finding.

For the second analysis, results indicated that every item (except *basement*) from each of the vocabulary sections was comprehended and/or produced by one or more of the children. Sections with the greatest number of marked items included the Sound Effects and Animal Sounds and Games and Routines. Together, these results indicate that the CDI can be considered a useful tool for assessing the early language development of low-income, AA children.

CHAPTER 1
INTRODUCTION

Throughout her two years in the speech pathology master's program, Catherine experienced a wide variety of clinical practica. One of these experiences was with Early Steps, Louisiana's assessment and intervention program for children under the age of three years. This placement increased her interest in early intervention and provided her with experience treating children in the earliest stages of language development. At commencement, Catherine accepted a position with a well-known provider of early intervention within the city.

Within the first week, Catherine knew she had chosen a job that ideally suited her interests and skills. Given that her caseload consisted of primarily low-income, African American (AA) children, she also knew she would need to select assessment tools that were culturally appropriate for this type of child profile. As she prepared for evaluations, Catherine pulled out the *MacArthur-Bates Communicative Development Inventory* (CDI). In graduate school, she had learned that the CDI was a widely used tool capable of measuring a variety of features in early language development. As she read through the manual, she questioned if this tool was appropriate for the specific population she was serving. The literature suggested that AA children from low-income families were at risk for misidentification due to differences in their experiences and knowledge about the world when compared to children from middle-income families (Seymour, Bland-Stewart, & Green, 1998). Would the CDI be an appropriate component in the assessment battery she was developing for her low-income, AA caseload?

In response to Catherine's dilemma and similar experiences of clinicians across the nation, this study is designed to examine the utility of the CDI to assess the early language development of low-income, AA children. The literature review for this study is organized into four sections. First I review research that has documented the relationship between

socioeconomic status and early language acquisition. Secondly I describe the nature and format of the CDI as an assessment instrument for early receptive and expressive language skills. The third section contains a body of work that has established the CDI as a valid tool for the assessment of typically developing and developmentally delayed children. The final section of literature focuses on prior research that has specifically examined the validity of the CDI with low-income populations. As will be shown, very little research has examined the usefulness of the CDI for low-income, AA children.

Relationship between Socioeconomic Status and Early Language Acquisition

Many studies throughout the years have examined the effects of socioeconomic status on the development of early childhood language. Some of these studies have used occupation as a measure of socioeconomic status, while others have used level of maternal education. Regardless, all of the research indicates that low-income children have less opportunity to experience interactions which support language development than their middle- or upper-income peers (Dollaghan, Campbell, Paradise, Feldman, Janosky, Pitcairn, & Kurs-Lasky, 1999; Hart & Risley, 1995). Low-income children have also been found to have lower levels of receptive and expressive language when they enter school (Elardo, Bradley, & Caldwell, 1977; Hart & Risley, 1995; Hoff-Ginsberg, 1991; Wallace, Roberts, & Lodder, 1998). Three of these studies are reviewed to illustrate these findings.

Hart and Risley (1995) identified striking differences in the early childhood experiences of children from different socioeconomic (SES) backgrounds. Forty-two families were part of their three-year longitudinal study, and the data were caregiver-child language samples that were collected in the children's homes. On the basis of occupation, thirteen families were classified as

upper SES; ten were classified as middle SES; and thirteen were classified as lower SES, with six of these families receiving federal aide.

Results of this study indicated that the frequency and diversity of words spoken to the children varied depending on level of family income. For example, parents in upper SES households spent an average of 48 minutes per hour interacting with their children at 24 to 25 months of age, while the lower SES family spent an average of only 17 minutes per hour engaged in interaction with their children. Not only was the amount of time that parents spent interacting with their children different across households, but the amount of language they offered to their children also differed. Parents in upper SES families spoke an average of 487 utterances per hour to their children in contrast to an average of 178 utterances spoken to the children by the lower SES families. The quality of the mother-child interaction also differed across the groups. Upper- and middle-income families presented language considered to be richer including more total words and a wider variety of language such as nouns, past tense verbs, declarative sentences, and affirmative feedback than parents in low-income households.

Along with assessing children's language environment and varying levels of language exposure in the early years of development, Hart and Risley (1995) also examined the children's vocabulary production and growth over time. The effect of increased early exposure to language was evidenced by the fact that when the children were 36 months, those from upper SES households were found to have larger vocabularies (1,000 to 1,200 words) than those from low SES households (400 to 600 words). A widening gap in vocabulary production could be seen as early as 24 months of age.

Another study completed by Hoff-Ginsberg (1991) investigated the effects of both social class and communicative setting on mothers' interactions with their children. Mother-child

interaction was observed in the homes of 33 middle class and 30 working class families with children ranging in age from 18 to 29 months. Each mother-child dyad was videotaped in four settings: mealtime, dressing, book reading, and toy play. Some of the maternal language measures examined included number of utterances, utterances per minute, number of roots, mean length of utterance, and number of conversation eliciting utterances.

Mothers from the middle class homes produced a larger number of utterances than working class mothers (258 vs. 215), and middle class mothers used utterances that elicited conversations more often than the working class mothers (33.7 vs. 29.6). Mean length of utterance was found to be very similar between the two groups though working class mothers more often used utterances to direct their children's behavior (22.3 vs. 15.8). This study documented the existence of significant social class differences in the mother's child-directed speech. Results indicated that some class differences in child-directed speech might reflect broad differences in the interaction styles of different social classes rather than a direct result of poverty.

Finally, Dollaghan, Campbell, Paradise, Feldman, Janosky, Pitcairn, and Kurs-Lasky (1999) designed a study to determine the effect of maternal educational level on children's spontaneous speech and language skills. Three levels of maternal education were examined: less than high school graduate, high school graduate, and college graduate. The children's language was examined with four expressive language measures obtained from a spontaneous speech sample and one measure of language comprehension obtained from the *Peabody Picture Vocabulary Test- Revised*.

Results from this study are shown in Table 1. Analysis showed statistically significant group differences as a function of educational levels for mean length of utterance in morphemes,

total number of different words, total number of words, and the receptive measures obtained from the standardized tool. For example, children of mothers with less than a high school education were found to produce fewer total words (454 vs. 533) and fewer different words (118 vs. 183) than children of mothers with some college experience. The only measure that did not show a group effect was percentage of consonants correct.

Table 1 Speech and Language Measures by Maternal Education (Dollaghan et al., 1999)

	Maternal Educational Level		
Measure	< High School	High School	College
MLUm	2.73	2.97	3.29
NDW	118	141	183
TNW	454	501	533
PCC	78	80	81
PPVT-R	90	101	110

Note. MLUm = mean length of utterance in morphemes; NDW = number of different words; TNW = total number of words; PCC = percentage of consonants correct; PPVT–R = Peabody Picture Vocabulary Test–Revised standard score.

These three studies show that the language environment of low-income children is very different from that of upper- and middle-income children. When compared to middle- and upper-income mothers, those from low-income households were found to spend less time talking to their children, expose their children to fewer different words, and use more prohibitions and directive utterances with their children. Results indicated that children from low-income households also produce shorter utterances and use fewer vocabulary words than their upper- and middle-income peers.

The CDI as an Assessment Tool

The *MacArthur-Bates Communicative Development Inventory* (Fenson, Dale, Reznick, Thal, Bates, Hartung, Pethick, and Reilly, 1993) is a nationally recognized parent report instrument used to assess the early language development of children. The test manual indicates that the CDI may be used to identify children at risk for a language delay, target specific

communicative skills for intervention, monitor results of treatment, screen and preselect children at different levels of language development for participation in research studies, and examine the influence of other variables on language development (Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994). Because of the tool's broad range of utility, the CDI now has versions available in many languages (Bates, Caselli, & Casadio, 1990; Camaioni, Caselli, Longobardi, & Volterra, 1990; Jackson-Maldonado, Thal, Marchman, Bates, & Gutierrez-Clellen, 1993; Ogura & Murase, 1991).

A compilation of more than twenty years of research served as the precursor to the development of the current version of the CDI. By the late 1980s, the early version of the instrument consisted of four forms: the *Communicative Development Questionnaire* (8-12 months), the *Language and Gesture Inventory* (12-18 months), the *Early Language Inventory* (18-27 months), and the *Grammatical Development Questionnaire* (24-36 months). Preliminary normative studies completed from 1987 to 1988 led to the modification of these four instruments into the two inventories that exist today.

The CDI consists of two separate inventories: the *CDI/Words and Gestures* (CDI/WG) for children 8 to 16 months and the *CDI/Words and Sentences* (CDI/WS) for children 16 to 30 months. Both of the versions allow parents to report on their child's ability in several components of language development and yield raw scores and percentile rankings for each of the test components. The following is a detailed description of the two versions of the CDI.

The CDI/WG for 8- to 16-month-old children is composed of two major parts. Part I contains a series of questions followed by a comprehensive vocabulary checklist. The first section has three questions that focus on whether the child is responsive to language. The second section asks the parent to identify phrases (from a list of 28 items) that the child understands.

The third section includes two questions concerning the child's frequency of imitating words and labeling objects. The major portion of Part I is a 396-item vocabulary checklist that is divided into 19 semantic categories. Ten of the categories relate to nouns: animal names, vehicles, toys, food and drink, clothing, body parts, furniture and rooms, small household items, outside things and places to go, and people. The remaining seven categories are sound effects and animal sounds, games and routines, verbs, adjectives, pronouns, question words, prepositions and locations, quantifiers, and words about time. Parents identify items that the child understands (receptive language) and items that the child understands and produces (expressive language).

Part II of the CDI/WG focuses on the child's use of actions and gestures in order to provide a more comprehensive evaluation of early communicative skills. The 63 gestures are organized categorically into six sections. Section A "First Communicative Gestures" includes items that signal the beginning of children's intentional communication. Section B "Games and Routines" contains items which help build a social interactive basis for communication. Section C "Actions with Objects" and Section E "Imitating Other Adults Actions" assess the child's growing understanding of objects and their appropriate use. Items from Section D "Pretending to be a Parent" are some of the first true types of symbolic gestures often used by children. Section F determines if the child has begun to use imaginative play and asks the parent to provide specific examples of the child making pretend substitutions during play. This section provides supplementary qualitative information.

The CDI/WS for 16- to 30-month-old children also contains two parts. Part I is a 680 word vocabulary production checklist which is divided into 22 semantic categories. The following eleven categories relate to nouns: animals, vehicles, toys, food and drink, clothing, body parts, small household items, furniture and rooms, outside things, places to go, and people.

Additional categories include games and routines, verbs, adjectives, words about time, pronouns, question words, prepositions and locations, quantifiers and articles, helping verbs, and connecting words. Following the checklist are five questions regarding the child's use of decontextualized language including reference to the past, future, and absent objects and events.

Part II of the CDI/WS assesses morphological and syntactic development using 125 items organized into five sections. Three of the sections assess the production of regular and irregular bound morphemes such as plural –s, possessive –'s, progressive –ing, past –ed, irregular plural nouns, irregular past tense verbs, and over-regularized plural nouns and past tense verbs. The final two sections of the inventory focus on multiword utterances. One of these sections is a forced choice format that requires the parent to choose which member in each of 37 sentence pairs characterizes the syntactical form their child most often uses. The final section asks the parent to record three of the child's longest utterances and provides qualitative information similar to the final section of the CDI/WG form.

Detailed information on age, gender, and demographic profiles of the original and revised normative samples for the CDI are seen in Appendices A, B, and C. Original normative data for the inventories came from 1,789 children recruited from sites in New Haven, Seattle, and San Diego. The original normative sample included a total of 659 CDI/WG inventories and 1,130 CDI/WS inventories. More recently, test developers have been working to update the normative data for the CDI in an attempt to increase its utility for children from diverse family backgrounds. Though the new normative data are not yet published, the percentile scores of the sample are available on the test developers' website. The updated sample includes a total of 2,252 inventories, 1,089 CDI/WG and 1,463 CDI/WS. As seen in Appendix C, the updated normative data contains increased percentages of minority children and caregivers with lower

levels of education. This current dataset better reflects the current demographics of the United States population.

Validity of the CDI

Given that the CDI is a tool that is used for both clinical and research purposes, numerous studies have been completed in order to document its concurrent and predictive validity. Five research studies that have examined the ability of the CDI to effectively characterize the early language skills of children who are typically developing and who are developmentally delayed are reviewed in this section (Dale, 1991; Dale, Bates, Reznick, & Morriset, 1989; Heilmann, Weismer, Evans, & Hollar, 2005; Miller, Sedey, & Miolo, 1995; Thal, O'Hanlon, Clemmons, & Fralin, 1999).

Dale et al. (1989) published research on the validity of the *Early Language Inventory*, an early version of the CDI. Several special populations including high social risk, preterm, full term, and precocious children were included in the study. The *Early Language Inventory* and direct measures of language skills adapted from the *Bayley Scales of Infant Development* (Bayley, 1969) were administered to children at 20 months of age. The study showed significant correlations between the Part 1: Vocabulary Checklist of the inventory and the expressive language subscore of the *Bayley Scales of Infant Development* (*r* ranged from .43 to .63). A low relationship between vocabulary and SES was also noted, suggesting the possible utility of the *Early Language Inventory* across a wide range of social classes.

Dale (1991) completed a more detailed study of the CDI comparing the use of the parent report measure to both structured and naturalistic forms of assessment in determining the vocabulary and syntactic development of 24-month-old typically developing children (*N*= 24). The CDI measures of total vocabulary, total complexity, mean of three longest utterances, and

use of regular morphemes were involved in two comparisons. First the CDI measures were compared to standardized tests including the *Expressive One-Word Picture Vocabulary Test* and the Memory for Sentences subtest of the *Stanford-Binet Intelligence Scale IV*. When comparing the CDI and the *Expressive One-Word Picture Vocabulary Test*, results indicated a moderately strong correlation with total expressive vocabulary (r = .73) and a moderate correlation with three of the syntax measures. These included total complexity, mean of three longest utterances, and use of regular morphemes (r ranged from .50 to .54). Correlations were also moderately strong for measures of total vocabulary, total complexity, and use of regular morphemes of the CDI and the Memory for Sentences subtest of the *Stanford-Binet Intelligence Scale IV,* r = .75, .66, and .75 respectively.

The CDI measures were then compared to a language sample which yielded measures of mean length of utterance, vocabulary type-token ratio, total number of different words, the Index of Productive Syntax, and regular bound morpheme use. Results indicated moderately strong correlations of all the CDI measures with total number of different words, mean length of utterance, and Index of Productive Syntax (r ranged from .60 to .79). Significant correlations were also found for the CDI measures with vocabulary type-token ratio and regular bound morpheme use (r ranged from .38 to .58). Together these findings indicate that the CDI measures of vocabulary and syntactic development are related to both structured and naturalistic forms of assessment for typically developing two-year-olds. In contrast, a negative correlation of the pronominal reference portion of the CDI with all language sample measures was found (r ranged from -.33 to -.51). This finding suggests a weakness in the pronominal reference section, and modification of this component of the CDI is ongoing (Dale, 1991).

The following three studies were important to the validation of the CDI for children with developmental disabilities. The rationale behind this research took into consideration that parents are often informed at birth that their child is developmentally disabled and at risk for compromised development. Researchers questioned whether parents of developmentally disabled children would exhibit lower expectations of their children's development and therefore underestimate their children's ability during parent report measures. If this hypothesis were found true, then the CDI would be less useful in the assessment of this population (Miller, 1988).

A study by Miller, Sedey, and Miolo (1995) included 44 children with Down syndrome and 46 typically developing children with mental ages ranging from 12 to 27 months. Concurrent validity was examined by comparing results from the vocabulary checklist of the CDI to the number of different words spontaneously produced during a thirty-minute language sample and the number of expressive language items passed on the mental scales of the *Bayley Scales of Infant Development*. Significant correlations between parent report vocabulary and the two validation measures were obtained for both of the subject groups (r ranged from .70 to .82). Predictive validity of the CDI was also examined by comparing children's scores at 20 and 28 months. Results indicated that the children's vocabulary checklists at the two ages were moderately correlated (r = .63).

Thal et al. (1999) also tested the validity of the CDI to measure vocabulary and syntax for another special population, preschool children with language impairment. The study included twenty children 39 to 49 months of age with an identified language delay. The children with specific language delay were older than the normative data for the CDI but had language levels that fell within the range measured by the CDI. Scores on the CDI/WS were compared to behavioral measures including the *Expressive One-Word Picture Vocabulary Test*, a subset of

the *Stanford Binet Intelligence Scale*, and a spontaneous language sample. Results indicated moderate to strong correlations between parent report and behavioral measures of the children's vocabulary and syntax *(r* ranged from .52 to .86).

Finally, Heilmann, Weismer, Evans, and Hollar (2005) examined the utility of the CDI to identify the language abilities of 38 late-talking toddlers. All parents completed the CDI/WS when their children were 24 months of age, and then the children were directly assessed at 30 months of age along with parent completion of a second CDI. The direct assessment measures were then compared to parent report measures obtained for the late talkers at 30 months of age, and results supported earlier evidence suggesting that the CDI/WS is a valid tool to assess the language skills of this age group. However, the correlations in this study were weaker and much more variable than correlations in Miller et al.'s research (r = .38 to .67). Heilmann et al. (2005) interpreted these findings as indicative of the restricted range of language abilities represented in the late talkers in this study**.**

Taken together, these five studies combine to establish the CDI as an effective tool for evaluating the language skills of children who are typically developing and children with developmental delays whose language level falls within the 8- to 30-month-old level. This is the age range at which the CDI normative data has been based.

Only one study has examined the validity of the CDI at the item level. This study was by Bryant (2003). Her study focused on a subset of items on the CDI (i.e. specifically those related to tense marking). The study included 18 two-year-old children, 12 of which were at risk for specific language impairment and 6 of which had low average language development. CDI/WS inventories were collected from the children's parents, and two 20-minute language samples from the children were recorded for analysis. Eight items from the Helping Verb section of the

CDI/WS and one item from the word endings section of Part I on the CDI/WS were classified as reflecting early emergence of tense marking (i.e. *am, are, did/didya, do, does, is, was, were*). Six items from the Sentence Complexity section of Part II on the CDI/WS were classified as reflecting more advanced marking of tensing (i.e. auxiliary BE, copula BE, auxiliary DO, regular past tense –ed). Then, both the emerging and more advanced tense markers recorded by parents on the CDI/WS were compared to measures of tense marking recorded in the children's language samples.

Results of the study revealed that parent report of emerging tense markers on the CDI/WS was moderately to highly correlated with language sample measures (r= .65, p= .002). Additionally, CDI/WS parent report of the more advanced marking of tensing was moderately correlated with measure from the language samples (r= .57, p= .007). These findings indicate that the CDI/WS may be an effective tool for evaluating the emergence of tense marking, which some argue may be important in the differential diagnosis of children with specific language impairment and children with typical language development (Rice, 2003; 2004).

Validity of the CDI with Low-Income Children

Because of the noted effects of socioeconomic status on a child's environment and early development of language, research has also focused on examining the utility of various standardized tests for sociodemographically diverse populations. A caution regarding the use of the CDI with low-income minority samples is cited in its manual (Fenson et al. 1993). According to the 1990 Bureau of Census figures, the demographic profile for people 18 to 34 years of age indicated that 23.2% had educational levels lower than a high school diploma, but only 4.5% of the normative sample for the CDI had educational levels this low. Likewise, 13% of people ages 18 to 34 years in the United States in 1990 were AA, yet only 4% of the

normative population for the CDI were from families who identified themselves as AA. Because of these statistics and the advised caution by the developers of the CDI, the validity of the CDI for low-income samples needs to be examined. Three studies have examined this issue (Arriaga, Fenson, Cronan, and Pethick, 1998; Feldman, Dollaghan, Campbell, Kurs-Lasky, Janosky, & Paradise, 2000; Roberts, Burchinal, & Durham, 1999).

Arriaga, Fenson, Cronan, and Pethick (1998) compared CDI scores of children from low- and middle-income families. The CDI scores for the 103 low-income children were collected, and the middle-income sample (*N*=309) was drawn from the CDI normative study. The middle-income sample was matched to the low-income sample for age and gender. The CDI measures of vocabulary, sentence complexity, and combining sentences for the two samples were analyzed using a group comparison design.

Results from this study are presented in Tables 2 and 3. As shown in Table 2, low-income children scored lower than the middle-income sample on vocabulary and sentence complexity. CDI measures of vocabulary revealed a mean percentile score for the low-income group of 29.74 and a mean percentile score for the middle-income sample of 50.04. Similarly, the percentile score for sentence complexity for the low-income children was significantly lower than those of the middle-income sample (31.15 vs. 51.69). In other words, CDI measures of vocabulary and sentence complexity revealed an overall effect of SES resulting in a negative shift of the entire low-income distribution of about 20%. As shown in Table 3, percentile scores for children reported to be combining words increased irregularly, possibly as a result of the low number of children in each age category. Nevertheless, the overall pattern of children reported to be combining words appeared to be accelerated in the middle-income sample. These findings

highlight the importance of Fenson et al.'s (1993) caution against using the CDI for low education/ low-income samples.

Table 2 CDI Measures of Vocabulary and Sentence Complexity in Low- and Middle-Income Samples from Arriaga et al. (1998)

	Vocabulary		Sentence Complexity	
	N	Percentile M (*SD*)	*N*	Percentile M (*SD*)
Low-Income				
Girls	44	22.82 (20.67)	30	17.67 (15.52)
Boys	59	34.90 (28.71)	35	42.71 (27.21)
Combined	103	29.74 (26.17)	65	31.15 (25.71)
Middle-Income				
Girls	132	50.83 (27.90)	90	54.36 (27.47)
Boys	177	49.45 (26.51)	105	49.40 (25.16)
Combined	309	50.04 (27.08)	195	51.69 (26.30)

Table 3 CDI Percentage of Low- and Middle-Income Samples Reported to be Combining Words from Arriaga et al. (1998)

Age in Months	Low-Income %	Middle-Income %
16	0 (4)	25 (12)
17	33 (6)	50 (18)
18	0 (5)	40 (15)
19	29 (7)	75 (20)
20	71 (7)	81 (21)
21	33 (9)	85 (27)
22	57 (7)	81 (21)
23	86 (7)	86 (21)
24	80 (5)	93 (15)
25	89 (9)	96 (26)
26	100 (4)	92 (12)
27	70 (10)	100 (30)
28	100 (8)	100 (24)
29	100 (6)	100 (18)
30	100 (9)	100 (26)

N*s* shown in parentheses.

Roberts, Burchinal, and Durham (1999) studied the validity of the CDI to accurately measure vocabulary and grammatical development in 87 AA children. The children's mothers' mean maternal education level was 12.4 years; 69% of the families were from low-income households. A shortened version of the CDI/WS instrument was administered at 18, 24, and 30

months of age to record measures of expressive vocabulary, irregular nouns and verbs, and maximum sentence length. A battery of other standardized language tests was also administered in order to track the children's development of vocabulary and grammar between one and three years of age. The final measure involved the *Home Observation for Measurement of the Environment Inventory for Infants*, a tool used to assess various features of an infant's home environment (Caldwell & Bradley, 1984).

The study found that children's raw scores on the CDI increased linearly with age. Additionally, girls were found to use longer utterances than boys and more irregular forms. However, percentile scores decreased as age increased resulting in percentile scores considerably below the mean at 30 months of age (See Table 4). According to the authors, these results could be attributed to a variety of factors. As children get older, language assessment instruments may not measure their vocabulary as well as when they were younger. The authors also noted the possibility that mothers may be underreporting their children's vocabulary at 30 months of age. The authors interpreted these results indicating that CDI percentile scores should be used cautiously with samples of AA kids from predominantly low-income families (Roberts et al., 1999).

Finally, Feldman and colleagues (2000) examined the measurement properties of the CDI with a large sociodemographically diverse sample of one- and two-year-olds (*N*= 2,156). This study was completed in Pittsburgh. Twenty percent of the participants were AA, and 42% received Medicaid benefits. The CDI/WG was administered to children aged 10 to 13 months, and the CDI/WS was administered to children aged 22 to 25 months. Each inventory was scored and subsequently analyzed based on developmental trends and sociodemographic associations.

Table 4 CDI Raw Scores and CDI Percentile Scores from Roberts, Burchinal, and Durham (1999)

	Age in Months		
	18	24	30
Number of vocabulary words[a]			
Percentile Score *M (SD)*	53.1 (30.7)	45.4 (27.3)	26.8 (30.8)
Number of vocabulary words[b]			
Percentile Score *M (SD)*	61.3 (26.5)	52.4 (27.4)	34.3 (34.6)
Number of irregular nouns and verbs[a]			
Percentile Score *M (SD)*	67.7 (21.1)	54.8 (24.2)	30.8 (23.6)
Number of irregular nouns and verbs[b]			
Percentile Score *M (SD)*	72.5 (20.3)	58.0 (24.9)	34.0 (27.2)

[a] Results including all children in the study.
[b] Results omitting questionably high or low scores in the study.

Results from the study are presented in Table 5. Also included are comparative data from the original norming of the CDI by Fenson et al. (1993). In the Pittsburgh study, each of the continuous scale scores of the CDI was found to increase with age in months except for sentence complexity scores. The scaled scores for subtest were found to slightly decrease between 24 and 25 months (10.2 vs. 9.8). Naming/labeling reported on the CDI/WG and in plural, progressive, and past tense morphosyntactic forms reported on the CDI/WS also increased linearly with age. Nevertheless, a great deal of variation in the children's scores was noted, which can be seen in elevated measures of the standard deviations. Age was found to be the only sociodemographic factor that contributed significantly to scores on every section of the CDI/WG. For the CDI/WS, girls were found to have higher mean scores than boys on all five sections of the inventory. Therefore, age and gender were the two demographic factors that were significant for the two versions of the CDI.

These findings sparked a debate among researchers in the field on how to best interpret these data. Feldman et al. (2000) suggested that correlations among CDI continuous scale scores and certain sociodemographic groups, though found to be inconsistent, served as an indication

that different scales of the CDI could be susceptible to differential reporting biases in varying populations. Fenson, Bates, Dale, Goodman, Reznick, and Thal (2000) responded to Feldman's work by stating that the mean scores and standard deviations of the two studies were similar with both showing trends of linear increase according to age in months. Fenson et al. (2000) also suggested that the highly variable means and standard deviations of the CDI are reflections of individual differences and high variability in early language development rather than being reflections of insufficient measurement properties of the CDI.

Table 5 CDI Scores in Two Samples from Fenson et al. (1993) and Feldman et al. (2000)

	Age in Months			
CDI/WG	10	11	12	13
Phrases Understood				
Norming study	11.5 (6.7)	13.3 (5.8)	15.5 (5.6)	17.6 (6.5)
Pittsburgh study	14.0 (6.3)	15.0 (6.4)	16.0 (6.4)	17.4 (6.2)
Vocabulary Comprehension				
Norming study	66.8 (60.2)	78.4 (75.1)	86.4 (49.2)	121.8 (68.9)
Pittsburgh study	83.6 (68.8)	92.3 (74.0)	105.0 (77.2)	119.0 (77.4)
Total Gestures				
Norming study	18.4 (8.2)	23.0 (8.0)	27.8 (9.9)	33.2 (11.1)
Pittsburgh study	21.8 (8.1)	23.2 (8.8)	26.6 (9.2)	29.7 (9.5)
	Age in Months			
CDI/WS	22	23	24	25
Vocabulary Production				
Norming study	268.9 (167.3)	334.9 (156.8)	311.7 (173.7)	366.0 (161.0)
Pittsburgh study	249.2 (165.8)	281.9 (178.5)	302.4 (172.8)	312.4 (168.9)
Mean Sentence Length				
Norming study	3.8 (1.9)	4.7 (2.2)	4.7 (2.7)	5.5 (2.7)
Pittsburgh study	3.0 (1.6)	3.5 (1.9)	3.8 (1.9)	3.9 (1.9)
Sentence Complexity				
Norming study	6.4 (7.3)	10.5 (10.2)	9.1 (9.6)	11.4 (10.2)
Pittsburgh study	8.7 (8.1)	9.2 (8.3)	10.2 (8.7)	9.8 (8.5)

In summary, research has shown that children from low-income households are exposed to fewer words and lower levels of language in the first years of their lives. They also have lower receptive and expressive vocabularies than their upper- and middle-class peers. The CDI

is a parent report instrument that is often used to assess the early receptive and expressive language skills of children under the age of three years. In numerous studies, the CDI has been validated as an assessment tool for children who are typically developing and developmentally delayed. Few studies have been completed to examine the usefulness of the tool with sociodemographically diverse samples. Those that have, however, suggest that the CDI should be used cautiously with children from low education/ low-income households. Very limited attention has been directed at the individual items on the tool.

Purpose of Research

The purpose of this study was to examine the utility of the *MacArthur-Bates Communicative Development Inventory* for assessing the language development of low-income, African American children in the urban South. Recall, this type of research is needed to help clinicians, like Catherine, evaluate the utility of the CDI for low-income, AA children. The following questions guided this research.

1. How do the CDI scores distribute relative to the normative database?
2. How do the variables of age, gender, and birth order affect the distribution of the children's scores?
3. How does level of maternal education affect the distribution of the children's scores?
4. Are there particular items and/or subsections on the CDI that are unknown to the children?

Predictions

For the first question, it was predicted that the CDI percentile scores of the low-income, AA sample in the present study would fall below average scores reported in the CDI normative sample. More specifically, an overall negative shift in the distribution of the low-income, AA

scores when compared to the normative data for the CDI was predicted. This prediction was based on research by Arriaga et al. (1998). It was also predicted that the CDI raw scores of the low-income, AA sample would increase linearly with age in months across the two inventories. These predictions were based on research by Feldman et al. (2000) and Roberts, Burchinal, and Durham (1999). The distribution of the children's scores however was unknown.

For the second question, it was predicted that percentile scores might be negatively correlated with age in months based on findings by Roberts, Burchinal, and Durham (1999). It was also predicted that the girls' scores would be higher overall than the boys' scores based on similar findings by Feldman et al. (2000) and Roberts et al. (2000). For question three, a positive correlation of years of maternal education and CDI raw scores was predicted based on Dollaghan et al. (1999). Finally, no prediction was made regarding the children's knowledge of items and subsections of the CDI due to the lack of data in previous research.

CHAPTER 2
METHODS

Participants

Eighty-seven participants were recruited from parent training programs, childcare centers, local clinics, and public hospitals that serve low-income populations in and around Baton Rouge, Louisiana. Participants were identified for study eligibility using the following inclusionary criteria:

1. An African American caregiver who had a normally developing child, aged 8 to 30 months, who had been raised in a monolingual English speaking environment.
2. A child who was delivered full term (> 38 weeks), weighed at least 5.7 pounds at birth, and presented no reported hearing loss, no major birth or medical complications, and no diagnosed developmental disabilities.

Caregivers were not eligible to participate if they previously completed a CDI form, received services for substance abuse or addiction, received services for other mental health conditions, and/or received special education services when in school. Maternal education level at or below 12 years (high school graduate) was used as the predictor of low income based on the research by Laosa (1980). Specifically, in this study, maternal education level was identified as the principal socioeconomic factor affecting language development.

An overview of participant characteristics can be seen in Table 6. A total of 91 inventories were collected; however, data from four of the participants were excluded from the study. These four participants were excluded because their ages fell outside of the normative range for the CDI version they were given (2 were 18 months of age and given the CDI/WG and 2 were 31 months of age and given the CDI/WS inventory). Therefore, the sample for this study included 87 participants. For these 87 participants, their mothers were asked to complete one of

two versions of the *MacArthur-Bates Communicative Development Inventory*. The CDI/WG was utilized for children ages 8 to 16 months of age, and the CDI/WS was used for children 16 to 30 months of age.

Table 6 Participant Characteristics

	Boys (n = 45)	Girls (n = 42)	Total (N = 87)
CDI Inventory			
Words and Gestures	17	14	31
Words and Sentences	28	28	56
Ethnicity			
Caucasian	0	0	0
African American	42	42	84
Other	2	0	2
Maternal Education			
< High school	21	22	43
High school graduate	15	13	28
High school graduate +	8	7	15
College graduate	1	0	1
Paternal Education			
< High school	15	16	31
High school graduate	19	13	32
High school graduate+	3	7	10
College graduate	1	0	1
Birth Order			
First-Born	24	22	46
Later-Born	18	19	37

Note: "< High school graduate" indicates fewer than 12 years of education. "High school graduate" indicates 12 years of education. "High school graduate +" indicates 13 to 16 years of education. "College graduate" indicates 17+ years of education.

Thirty-one participants, 17 males and 14 females, completed the CDI/WG inventory; and fifty-six participants, 28 males and 28 females, completed the CDI/WS inventory. Age in months for the entire sample ranged from 8 to 30 months with a mean age of 19.37 (SD = 6.485). In the sample, 87 participants provided information regarding level of maternal education, and 75 of the participants provided information regarding level of paternal education. Mean maternal education was 11.59 years (SD = 2.003), and mean paternal education was 11.65 years (SD = 1.827). Levels of maternal and paternal education ranged from 7 to 18 years; however, 98% of

the participants' years of education fell at or below 12 years. In the sample, 83 participants provided information regarding birth order. A total of 55.4% of the sample were first-born children, and the remaining 44.6% of the sample ranged from second- to fourth-born children in the family.

Procedure

Caregivers completed all study requirements on-site in childcare centers in and around Baton Rouge, Louisiana. Each caregiver was asked to provide written consent in order to participate in the study. A biographical sketch including information about the caregiver and child was completed prior to acceptance to the study. After meeting eligibility criteria, a version of the *MacArthur-Bates Communicative Developmental Inventory* was provided to each participant. A certified speech language pathologist obtained signed consent forms, determined participant eligibility through evaluation of the basic information form, and oversaw the administration of the CDI forms. Undergraduate and graduate level student clinicians also took part in data collection. Each participant was compensated $5.00 for completing the study, and the certified speech language pathologist was compensated $10.00 for each CDI obtained for the study. Funding was made available through an external grant from the San Diego State University Foundation.

Data Coding

Each parent inventory was hand scored by the author according to the procedure stated in the testing manual (See Appendix D). The raw score for each child was converted to percentiles for each major section of the inventory. Two sets of percentile scores were recorded based on normative tables in the CDI technical manual (Fenson et al. 1993) and on new normative tables received from one of the test developers V. A. Marchman (personal communication, October 10,

2005). All biographical information, raw scores, and percentiles were entered into SPSS for statistical analysis.

Reliability

A second examiner was trained to score the CDI forms according to test manual procedures. The second examiner independently coded 20% of the inventories, and the results were compared to the author's results. For the CDI/WG, agreement between the two sets of raw scores was 99.97%, and agreement between the two sets of percentile scores was 95.24%. For the CDI/WS, agreement between the two sets of raw scores was 99.92%, and agreement between the two sets of percentile scores was 90.28%. Given the low level of error that was found, the scoring of the entire data set was considered reliable. The raw data used to calculate reliability can be found in Appendix E.

CHAPTER 3
RESULTS

Preliminary Analysis

In order to compare the current sample to the normative database, raw data from the CDI inventories were converted into percentile scores. Percentile scores were recorded based on the original CDI normative data from the test manual (Fenson et al. 1993) and on the updated normative data received from V. Marchman (personal communication, October 10, 2005). Recall, the recent renorming effort increased the number and diversity of participants (See Appendices A, B, and C). The distribution of percentile scores relative to the normative databases can be seen in Table 7. For the CDI/WG inventory, four percentile scores are listed, and for the CDI/WS inventory, three percentile scores are listed.

Table 7 CDI/WG and CDI/WS Percentile Scores

	Original CDI Percentile Scores	Updated CDI Percentile Scores	*r*
CDI/WG			
Phrases Understood	64.13 (25.87)	58.39 (26.97)	.982
Words Understood	61.48 (27.29)	53.39 (28.55)	.989
Words Produced	49.42 (38.45)	53.39 (27.31)	.913
Total Gestures	65.40 (29.17)	54.30 (28.50)	.969
CDI/WS			
Words Produced	36.52 (31.14)	40.07 (29.88)	.997
Irregular	51.85 (27.16)	55.20 (26.30)	.967
Sentence Complexity	50.17 (28.16)	57.93 (25.82)	.968

Mean percentile scores for the whole sample ranged from 36.52 to 65.40. Visual inspection of the CDI/WG revealed that updated percentile scores were lower than the original percentile scores for each section except the Words Produced section. For the CDI/WS, the updated percentile scores were higher than the original percentile scores in all three sections of the inventory. In both cases, however, the differences between the original and updated scores were smaller than the standard deviations obtained within each normative system. Pearson's

correlations were run to compare the percentile scores from the original and updated normative databases. Strong correlations were found for each set of original and updated percentile scores (r ranged from .913 to .997, all p values < .01). Based on the findings, the updated set of percentile scores were used for all subsequent analyses.

CDI Distribution Relative to the Normative Database

Table 8 provides descriptive information about the distribution of the CDI percentile scores that were derived from the normative database. A typical bell curve contains a wide range of scores with a median of 50 percent and with quartiles of 25 and 75 percent. Upon visual inspection, the study sample contained a wide range of derived percentile scores ranging from 3 to 99 across both inventories. The median of the CDI/WG sections was slightly higher than normal with a range of 53 to 60, and the quartile scores also closely approximated expected percentiles. Additionally, the median and quartile scores for the Irregular and Sentence Complexity sections of the CDI/WS indicated a distributional pattern that overlapped with the normative sample. However, the CDI/WS Words Produced section mean and quartiles were found to be below average.

Table 8 Distribution of CDI Percentile Scores

			Percentiles		
	Minimum	Maximum	25	50	75
CDI/WG					
Phrases Understood	13	99	35.00	55.00	80.00
Words Understood	3	99	26.00	53.00	76.00
Words Produced	5	99	35.00	55.00	75.00
Total Gestures	3	99	27.50	60.00	75.00
CDI/WS					
Words Produced	3	99	17.00	28.00	60.25
Irregular	13	99	31.00	57.50	75.00
Sentence Complexity	10	99	37.50	60.00	82.50

CDI Scores as a Function of Age

Table 9 shows the CDI/WG raw scores as a function of age in months. The CDI/WG participants were first grouped into four age categories rather than being examined individually by months. Table 9 illustrates that as children aged, raw scores on the CDI/WG increased. However, large standard deviations were found in each section. To examine the variable of age, the data were divided into two age groups, 8- to 11-month-olds and 12- to 16-month-olds. Descriptive information about these two groups can be found in Table 10. Independent t-test results revealed significant group differences for the Phrases Understood and the Total Gestures sections of the CDI/WG; $t(18)=3.12$, $p=.006$ and $t(28)=3.63$, $p=.001$ respectively.

Table 9 CDI/WG Raw Scores as a Function of Age in Months

CDI/WG Section	8 months N = 5	10 months N = 8	12 months N = 7	14 months N = 11
Phrases Understood	10.60 (6.31)	13.87 (8.87)	19.43 (4.20)	20.82 (5.25)
Words Understood	77.80 (81.17)	90.25 (126.23)	105.00 (56.53)	156.00 (99.48)
Words Produced	1.00 (1.73)	33.25 (86.01)	7.86 (11.04)	47.64 (61.37)
Total Gestures	15.20 (7.46)	21.25 (14.56)	31.17 (7.25)	36.00 (12.33)

Table 10 CDI/WG Data for T-Test Analysis of Age

CDI/WG Sections	8 to 11 months N = 13	12 to 16 months N = 18	Independent T-Test Results
Phrases Understood	12.62 (7.87)	20.28 (4.79)	$t(18)=3.12$, $p=.006$*
Words Understood	85.46 (107.38)	136.17 (87.20)	$t(29)=1.45$, $p=.158$
Words Produced	20.85 (67.70)	32.17 (51.55)	$t(29)=.529$, $p=.601$
Total Gestures	18.92 (12.31)	34.29 (10.82)	$t(28)=3.63$, $p=.001$*

* indicates significance at the .05 level.

The CDI/WG percentile scores as a function of age can be seen in Table 11. Upon visual inspection, percentile scores were found to decrease overall from the 8-month-old group to the 14-month-old group though variation is seen in the 10- and 12-month-old groups. A Mann-Whitney U test was used for analysis of group differences. A Mann-Whitney U test is utilized for data reflecting percentile ranks and evaluates differences in the medians between two groups of data. This analysis examined the differences in medians of two age groups, 8- to 11-month-

olds and 12- to 16-month-olds. Table 12 provides descriptive information regarding each group. Results revealed no significant group differences in percentile scores for any sections of the CDI/WG.

Table 11 CDI/WG Percentile Scores as a Function of Age in Months

CDI/WG Section	8 months N = 5	10 months N = 8	12 months N = 7	14 months N = 11
Phrases Understood	67.60 (26.48)	56.25 (31.72)	64.00 (20.01)	52.18 (29.11)
Words Understood	76.40 (17.63)	50.50 (31.55)	53.86 (24.10)	44.73 (30.35)
Words Produced	64.00 (15.17)	59.88 (23.33)	43.71 (26.56)	50.00 (34.24)
Total Gestures	63.40 (29.37)	50.38 (29.41)	63.00 (22.76)	48.27 (31.74)

Table 12 CDI/WG Data for Mann-Whitney U Analysis of Age

CDI/WG Sections	8 to 11 months N = 13	12 to 16 months N = 18	Mann-Whitney U Test Results
Phrases Understood	60.62 (29.22)	56.78 (25.98)	z=.421, p=.674
Words Understood	60.46 (29.26)	48.28 (27.71)	z =1.20, p=.229
Words Produced	61.46 (19.96)	47.56 (30.80)	z =1.06, p=.288
Total Gestures	55.38 (28.91)	53.47 (29.05)	z =.168, p=.867

Table 13 shows the CDI/WS raw scores as a function of age. The participants who completed the CDI/WS inventory were first divided into seven age categories. Upon visual inspection, Table 13 reveals that CDI/WS raw scores increase with age. Large standard deviations were found for each section. This finding was also seen in the CDI/WG raw scores. The raw scores were also examined by performing an independent t-test to look at group differences. For this analysis, the CDI/WS raw scores were divided into two age groups, 16- to 23-month-olds and 24- to 30-month-olds. Individual group information can be seen in Table 14. Results of this analysis revealed significant group differences for all three sections of the CDI/WS: Words Produced, $t(54)=2.77$, $p=.008$; Irregular, $t(52)=2.10$, $p=.040$; Sentence Complexity, $t(31)=3.35$, $p=.002$.

Table 13 CDI/WS Raw Scores as a Function of Age in Months[a]

CDI/WS Section	17 months	19 months	21 months	23 months	25 months	27 Months	29 months
Words Produced	82.13	199.40	220.75	225.25	225.62	359.00	308.50
	(91.14)	(213.87)	(182.86)	(123.31)	(172.61)	(177.38)	(93.21)
	8	10	8	4	8	14	4
Irregular Usage	1.57	5.30	3.75	4.00	5.00	7.64	8.50
	(2.30)	(8.06)	(2.71)	(2.94)	(6.61)	(6.91)	(3.51)
	7	10	8	4	7	14	4
Sentence Complexity	5.25	4.60	2.17	4.67	5.29	16.62	9.67
	(5.74)	(5.18)	(2.79)	(2.08)	(6.24)	(11.36)	(14.22)
	4	5	6	3	7	13	3

[a] First row number indicates M; second row indicates SD; and third row indicates N.

Table 14 CDI/WS Data for T-Test Analysis of Age

CDI/WS Sections	16 to 23 months N = 29	24 to 30 months N = 27	Independent T-Test Results
Words Produced	177.45 (174.35)	305.07 (170.14)	$t(54)=2.77$, $p=.008$*
Irregular	3.71 (5.26)	7.00 (6.21)	$t(52)=2.10$, $p=.040$*
Sentence Complexity	3.76 (4.13)	12.04 (11.08)	$t(31)=3.35$, $p=.002$*

* indicates significance at the .05 level.

As shown in Table 15, the CDI/WS percentile scores ranged from 16.25 to 89.50. This is a much wider range of variability than found in the CDI/WG percentile scores. CDI/WS percentile scores were found to decrease slightly with age, and mean percentile scores for the 29-month-olds were considerably low in all three sections of the inventory (M = 16.25, 20.25, and 21.00). A Mann-Whitney U test was used to examine group differences in the CDI/WS percentile scores according to age. The data for this analysis was divided into two groups, 16- to 23-month-olds and 24- to 30-month-olds. Group information can be seen in Table 16. Results of the Mann-Whitney U test revealed significant group differences for Irregular and Sentence

Complexity sections; z=4.35, p=.000 and z=4.09, p=.000 respectively. However, no significant group differences were found for the Words Produced section (z=1.690, p=.091).

Table 15 CDI/WS Percentile Scores as a Function of Age in Months

CDI/WS Section	17 months	19 months	21 months	23 months	25 months	27 Months	29 months
Words Produced	43.88 (32.27)	48.80 (36.54)	48.50 (30.96)	41.75 (25.97)	31.00 (25.30)	38.36 (30.45)	16.25 (6.13)
Irregular Usage	75.14 (17.03)	71.60 (18.89)	70.00 (14.64)	59.50 (14.30)	43.29 (26.87)	39.79 (25.82)	20.25 (5.25)
Sentence Complexity	89.50 (8.43)	83.80 (11.86)	67.67 (16.87)	67.67 (2.52)	39.29 (20.09)	50.08 (22.58)	21.00 (14.18)

Table 16 CDI/WS Data for Mann-Whitney U Analysis of Age

CDI/WS Sections	16 to 23 months N = 29	24 to 30 months N = 27	Mann-Whitney U Test Results
Words Produced	47.28 (31.45)	32.33 (26.52)	z=1.69, p=.091
Irregular	70.43 (16.90)	38.81 (24.87)	z=4.35, p=.000*
Sentence Complexity	77.53 (15.34)	44.04 (22.59)	z=4.09, p=.000*

* indicates significance at the .05 level.

Another way to examine the data as a function of age is through the use of a correlational analysis. Results of a Pearson r correlational analysis with individual CDI sections can be seen in Table 17. As shown in the first column of Table 17, CDI/WG and CDI/WS raw scores revealed significant correlations with the children's ages in five of the seven sections of the inventories. In the CDI/WG, the Phrases Understood and Total Gestures raw scores were moderately correlated with age in months (r = .506 and .601, p values < .01). Weaker yet significant correlations were also found between raw scores of all three CDI/WS sections and age in months. Examination of the percentile scores revealed moderate to high negative correlations between age in months and the CDI/WS Irregular and Sentence Complexity

percentile scores (r = -.647 and -.709, all p values < .01). These findings indicate that the children's percentile ranks decreased as they aged on these sections on the CDI/WS.

Table 17 Pearson's Correlations with Age

CDI/WG	Correlation Raw Scores	Correlation Percentile Scores
Phrases Understood	.506**	-.213
Words Understood	.328	-.316
Words Produced	.254	-.175
Total Gestures	.601**	-.145
CDI/WS		
Words Produced	.443**	-.231
Irregular	.323*	-.647**
Sentence Complexity	.425**	-.709**

* Correlation is significant at p<.05. ** Correlation is significant at p< .01.

In the above analysis, the variable of age was restricted to 8-14 months for each inventory. The magnitude of a correlation can be limited if the range of scores examined are restricted. Therefore, to further examine the relation between the children's age and their scores, an ideal situation would be to combine the scores of the two inventories together. This procedure increases the range of ages and scores that can be examined with a correlational analysis. The only section that cuts across both inventories is the Words Produced section. Therefore, the Words Produced scores across the CDI/WG and the CDI/WS inventories were combined. A moderately high correlation (r = .657, p < .01) was found between Words Produced raw scores relative to age in months. Figure 1 illustrates the increase in Words Produced raw scores as the children age. A low but significant correlation was found between Words Produced percentile scores relative to age in months (r = -.298, p < .01). Figure 2 illustrates the observed low correlation between the child's age and their Words Produced percentile scores.

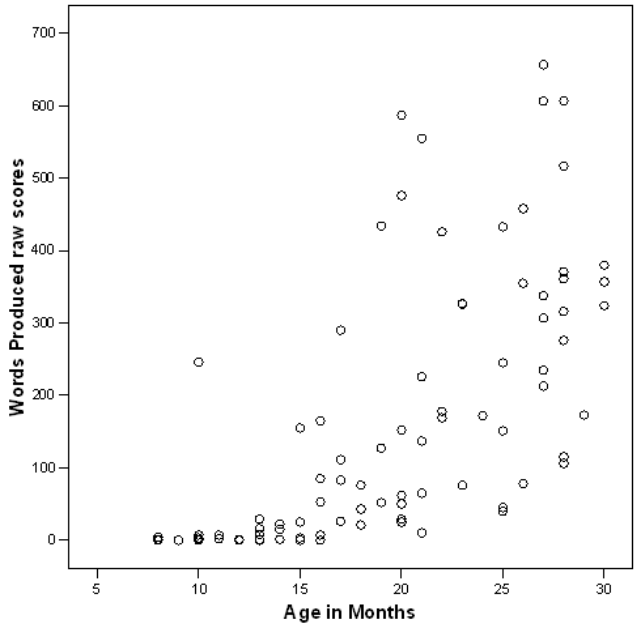

Figure 1 Correlation between Age and Words Produced Raw Scores (r = .657, p < .01)

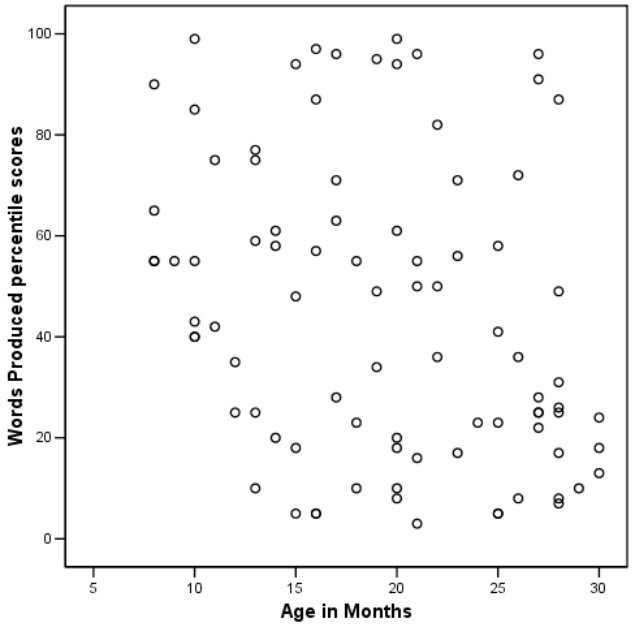

Figure 2 Correlation between Age and Words Produced Percentile Scores (r = .298, p < .01)

CDI Scores as a Function of Gender

Next, the CDI scores were examined as a function of gender. Raw scores were not included in this analysis based on the potential interactions between gender and age. Therefore, the percentiles seen in Table 18 were used for examining the variable of gender. Visual inspection of the data revealed that the CDI/WG percentile scores were higher for males on all four sections, and the CDI/WS percentile scores were higher for females across all three sections. The data were also examined for group differences using a Mann-Whitney U test. Results can be found in Table 18. For the CDI/WG, significant group differences were found for the Words Understood section (z=2.35, p=.019) and the Total Gestures section (z=2.31, p=.021). No significant group differences were seen in the CDI/WS.

Table 18 CDI/WG and CDI/WS Percentile Scores as a Function of Gender [a]

	Male	Female	Mann- Whitney U Test Results
CDI/WG			
Phrases Understood	65.00	50.36	
	(24.45)	(28.58)	z=1.43, p=.152
	17	14	
Words Understood	63.94	40.57	
	(25.59)	(27.42)	z=2.35, p=.019*
	17	14	
Words Produced	61.53	43.50	
	(26.78)	(25.43)	z=1.93, p=.054
	17	14	
Total Gestures	64.94	40.38	
	(25.01)	(27.56)	z=2.31, p=.021*
	17	13	
CDI/WS			
Words Produced	38.14	42.00	
	(29.08)	(31.07)	z=.549, p=.583
	28	28	
Irregular	49.37	61.04	
	(26.21)	(25.53)	z=1.53, p=.127
	27	27	
Sentence Complexity	57.79	58.05	
	(25.66)	(26.56)	z=.052, p=.958
	19	22	

* indicates significance at the .05 level.

CDI Scores as a Function of Birth Order

Table 19 presents the CDI percentile scores relative to the children's birth order. Although the children's birth orders for the sample ranged from the first to fourth child in the family, there were not a substantial number of children in each birth order level to examine them in isolation. Therefore, for the purposes of analysis, the children were divided into first-born (*N*=46) and later-born groups (*N*=37). Visual inspection of the percentile scores revealed that the first-born children in this sample had higher percentile scores on all CDI measures of expressive language than their later-born peers. However, a Mann-Whitney U test was used to analyze group differences as shown in Table 19, and results indicated that no birth order differences existed for either of the inventories.

Table 19 CDI/WG and CDI/WS Percentile Scores as a Function of Birth Order

	First-Born	Later-Born	Mann-Whitney U Test Results
CDI/WG			
Phrases Understood	55.06 (29.54) 16	61.08 (23.78) 13	z=.659, p=.510
Words Understood	51.38 (35.32) 16	56.62 (20.00) 13	z=.550, p=.583
Words Produced	58.94 (33.39) 16	47.31 (15.82) 13	z=1.36, p=.173
Total Gestures	52.40 (31.19) 15	52.31 (26.17) 13	z=.162, p=.872

Table 19 continued

	First-Born	Later-Born	Mann- Whitney U Test Results
CDI/WS			
Words Produced	47.20 (32.74) 30	33.25 (24.69) 24	z=1.45, p=.146
Irregular	61.75 (26.60) 28	50.38 (24.24) 24	z=1.57, p=.116
Sentence Complexity	63.45 (26.80) 29	54.53 (24.82) 19	z=1.17, p=.243

CDI Scores as a Function of Maternal Education

Based on report of maternal years of education, analysis was completed in order to examine the effect of level of maternal education on CDI raw and percentile scores. Table 20 shows the CDI/WG and the CDI/WS percentile scores as a function of maternal education. For the purposes of this analysis, maternal education was divided into three categories: less than high school graduate, high school graduate, and high school graduate plus. Upon visual inspection, the percentile scores for both inventories lowered slightly as the level of maternal education increased. Again, a Mann-Whitney U test was performed. For the Mann-Whitney U analysis, the data were divided into two groups. Mothers with 7 to 11 years of education were placed into one group, and mothers with 12 to 18 years of education were placed into a second group. No significant group differences were found based on level of maternal education. As can be seen in Table 21, lack of significance may be attributed to few and unequal numbers of mothers representing all levels of maternal education. Correlations between percentile scores and maternal education level were also not significant.

Table 20 CDI/WG and CDI/WS Percentile Scores as a Function of Maternal Education

	< High School Graduate	High School Graduate	High School Graduate +
CDI/WG			
Phrases Understood	59.74	55.91	60.00
	(24.16)	(33.49)	(00.00)
	19	11	1
Words Understood	55.26	51.55	38.00
	(28.25)	(31.21)	(00.00)
	19	11	1
Words Produced	55.05	53.73	18.00
	(26.05)	(29.74)	(00.00)
	19	11	1
Total Gestures	54.28	53.82	60.00
	(29.35)	(29.81)	(00.00)
	18	11	1
CDI/WS			
Words Produced	41.63	39.53	38.20
	(29.81)	(34.86)	(25.51)
	24	17	15
Irregular	55.65	55.71	53.86
	(28.74)	(26.00)	(24.23)
	23	17	14
Sentence Complexity	54.82	63.92	56.33
	(24.54)	(25.90)	(28.64)
	17	12	12

Note: "< High School Graduate" indicates fewer than 12 years of education. "High School Graduate" indicates 12 years of education. "High School Graduate +" indicates more than 12 years of education.

Table 21 CDI/WG and CDI/WS Data for Mann-Whitney U Analysis of Maternal Education

CDI/WG Sections	7 to 11 years	12 to 18 years	Mann- Whitney U Test Results
Phrases Understood	59.74 (24.16) 19	56.25 (31.95) 12	z=.325, p=.745
Words Understood	55.26 (28.25) 19	50.42 (30.01) 12	z=.447, p=.655
Words Produced	55.05 (26.05) 19	50.75 (30.18) 12	z=.609, p=.542
Total Gestures	54.28 (29.35) 19	54.33 (28.48) 12	z=.127, p=.899

CDI/WS Sections	7 to 11 years	12 to 18 years	Mann- Whitney U Test Results
Words Produced	41.63 (29.81) 24	38.91 (30.36) 32	z=.580, p=.562
Irregular	55.65 (28.74) 23	54.87 (24.82) 31	z=.044, p=.965
Sentence Complexity	54.82 (24.54) 17	60.13 (26.99) 24	z=.689, p=.491

Item and Subsection Analysis

For this analysis, only the items of the Vocabulary Checklist were included. Not included was the Part II Actions and Gestures portion of the CDI/WG or the Part II Sentences and Grammar portion of the CDI/WS. Visual inspection of the inventories showed that mothers did not fill out these more advanced sections of the CDI as completely as the Vocabulary

Checklist section. The decision to use only the Vocabulary Checklist was also based on practicality and the sheer number of items in the inventories (CDI/WG = 396; CDI/WS = 680).

Raw data for receptive and expressive language reported on the CDI/WG can be found in Appendix F. A total receptive language score for each item was obtained by counting the number of times an item was marked as "understands" or "understands and says" in the total of 31 CDI/WG inventories collected. A total expressive language score for each item was obtained by counting only the number of times an item was marked as "understands and says." Percentages for each subsection were calculated based on the total number of items marked by caregivers divided by the total number of possible items in the subsection. Table 22 highlights findings from the item analysis based on subsections of the CDI/WG Vocabulary Checklist.

Table 22 Item Analysis by CDI/WG Subsection

CDI/WG Section	Percentage of Receptive Items Marked	Percentage of Expressive Items Marked
Sound Effects and Animal Sounds	44	23
Animal Names	19	6
Vehicles	29	9
Toys	51	12
Food and Drink	37	8
Clothing	30	6
Body Parts	41	9
Furniture and Rooms	35	7
Small Household Items	32	7
Outside Things and Places to Go	18	3
People	39	11
Games and Routines	52	15
Action Words	27	6
Words About Time	15	1
Descriptive Words	18	3
Pronouns	16	4
Question Words	14	4
Prepositions and Locations	28	5
Quantifiers	10	1

Visual inspection of the CDI/WG subsections revealed that items in each subsection of the CDI/WG Vocabulary Checklist were marked, although the percentage of items marked

varied across subsections. A total of 9 of the 19 subsections (47%) on the CDI/WG Vocabulary Checklist yielded percentages of marked receptive items at or above 30%. As shown in Table 22, the Games and Routines, Toys, Sound Effects and Animal Sounds, and Body Parts subsections of vocabulary yielded the highest percentage of marked receptive language items (52%, 51%, 44% and 41% respectively). Similarly, the Sound Effects and Animal Sounds, Games and Routines, Toys subsections also yielded the highest percentage of expressive language items (23%, 15%, and 12% respectively). Table 22 also shows that percentages for both receptive and expressive language items tended to lower in the more advanced subsections of the CDI/WG such as Pronouns, Question Words, and Quantifiers (16%, 14% and 10%).

Visual inspection of the individual CDI/WG items showed that the items *Momma*, *Bye Bye*, *Bottle*, *Daddy*, *Ball*, and *Baa Baa* were the most commonly marked receptive language items on the CDI/WG inventory (97%, 90%, 87%, 84%, 84%, and 84% respectively). Similarly, the items *Baa Baa*, *Bye Bye*, *Mommy*, and *Daddy* were the most commonly marked expressive language items on the CDI/WG inventory. Finally, examination of the data revealed that all the items on the CDI/WG inventory were marked at least once as being understood by a child in the study sample.

Next, the subsections of the CDI/WS Vocabulary Checklist were examined. Raw data for the CDI/WS Vocabulary Checklist can be seen in Appendix G. A total expressive score for each item was calculated based on the total number of times the item was marked in the 56 CDI/WS inventories collected. The percentage of times items were marked in each subsection of the CDI/WS was calculated as shown in Table 23.

Upon visual inspection of the CDI/WS Vocabulary Checklist subsections, percentages for individual subsections ranged from 19 to 63. Though the frequency of responses in each

subsection varied, items in each subsection of the CDI/WS Vocabulary Checklist were marked. A total of 12 of the 22 subsections (55%) on the CDI/WS Vocabulary Checklist yielded percentages of marked expressive items at or above 30%. The Sound Effects and Animal Sounds subsection contained the most commonly marked items (63%) followed by Games and Routines and Body Parts (53% and 50%). Subsequent item analysis revealed that *Daddy*, *Mommy*, *Dog*, *Shoe*, and *Woof Woof* were the highest scoring items for expressive language (96%, 95%, 93%, 86% and 86% respectively). Similar to items on the CDI/WG, every item excluding one was marked by at least one of the caregivers as a word her child produced. The item *Basement* was the only item never marked in the inventories collected.

Table 23 Item Analysis by CDI/WS Subsection

CDI/WS Section	Percentage of Expressive Items Marked
Sound Effects and Animal Sounds	63
Animals	35
Vehicles	38
Toys	40
Food and Drink	36
Clothing	33
Body Parts	50
Small Household Items	42
Furniture and Rooms	34
Outside Things	28
Places to Go	26
People	36
Games and Routines	53
Action Words	35
Descriptive Words	25
Words About Time	24
Pronouns	24
Question Words	23
Prepositions and Locations	24
Quantifiers and Articles	20
Helping Verbs	20
Connecting Words	19

CHAPTER 4
DISCUSSION

The purpose of this study was to determine the usefulness of the MacArthur-Bates Communicative Development Inventory as an assessment tool for low-income, AA children. Data were obtained from a sample of 87 CDI inventories completed by low-income, AA participants, and the results were analyzed in order to answer the four main research questions that guided the study. Chapter 4 is divided into four sections. The first section discusses the results of the research questions that guided the study, and next section compares the findings of the study to previous research. The limitations of the study are outlined in the third section. Finally, the fourth section discusses the implications of the study and provides suggestions for further research.

Interpretation of Results

The first research question explored how the scores from a low-income, AA sample distributed relative to the normative database for the CDI. Strong correlations were found between the original and updated CDI normative information for obtaining percentile scores. Further analysis indicated that the present sample's percentile scores follow a normal distribution pattern with a mean overall percentile ranking of 54.87 for the CDI/WG and 51.07 for the CDI/WS. In addition, the quartiles closely approximated a normal bell curve.

The second research question examined the variables of age, gender, and birth order and their effects on the CDI raw and percentile scores. Analysis of the scores according to age, gender, and birth order revealed large standard deviations in the raw scores for each group. Visual inspection of the data indicated that children's raw scores on both the CDI/WG and the CDI/WS inventories increased as the children grew older. When the inventories were combined, raw scores and age revealed a moderate to moderate-high correlation. Correlations between

percentile scores and age were negative but low. In addition, the CDI/WS percentile scores were considerably low for the 29-month- old age group.

For gender, males were found to have higher raw and percentile scores on the CDI/WG, whereas females were found to have higher raw and percentile scores on the CDI/WS. Group differences, however, were only significant for the CDI/WG Phrases Understood and Total Gestures sections. Finally on the CDI/WS, first-born children were found to have higher percentile scores than their later-born peers, but group differences were not statistically significant.

The third question explored the effect of level of maternal education on CDI raw and percentile scores. Although CDI/WG raw scores were shown to increase along with years of maternal education, an overall pattern of decreasing percentile scores as years of maternal education increased was noted during visual inspection of the data. Nevertheless, no significant group differences for maternal education were found. These findings could be attributed to the few and unequal numbers of mothers in each group and the restricted range of maternal education levels.

Finally, the fourth research question examined the items and subsections of the CDI. Recall this analysis was limited to only the items of the Vocabulary Checklist of both inventories. For both receptive language and expressive language reported on the CDI/WG, the Sound Effects and Animal Sounds, Toys, and Games and Routines subsections of the Vocabulary Checklist resulted in the highest percentage of marked items. Findings for the CDI/WS inventory showed that the Sound Effects and Animal Sounds, Games and Routines, and Body Parts subsections resulted in the highest percentage of marked items. Additionally, all of the items on both the CDI/WG and CDI/WS checklists were marked by at least one caregiver,

with the exception of one item (*basement*) on the CDI/WS. Finally, individual item analysis revealed that the items *Momma*, *Bye Bye*, *Daddy*, and *Baa Baa* were the most commonly marked receptive and expressive language items on the CDI/WG inventory, and the items *Daddy*, *Mommy*, *Dog*, *Shoe*, and *Woof Woof* were the most commonly marked expressive language items on the CDI/WS inventory.

Comparison of Findings to Previous Work

Earlier research by Arriaga et al. (1998) revealed an overall negative shift of 20% in the distribution of CDI/WS percentile scores for a low-income sample. Table 24 shows a comparison of the data from Arriaga et al. (1998) and the findings from the current study. As shown in the table, a slight shift in the overall distribution of CDI/WS percentile scores was found for the low-income sample, but the magnitude was less dramatic (i.e., 40.07 vs. 50.04) than what was reported by Arriaga (1998). In addition, the current low-income sample had higher mean percentile scores for the Sentence Complexity section than both the low and middle-income samples in the Arriaga et al. (1998) study. It is also important to note that large standard deviations were found for all groups of collected data, a finding very similar to the pattern presented in previous research. As is interpreted by Feldman et al. (2000), large standard deviations can be attributed to the highly variable development of children's receptive and expressive language during the first three years of life.

Table 24 Comparison of Mean Percentile Scores (Arriaga et al. 1998)

	Words Produced	Sentence Complexity
Arriaga Middle Income	50.04 (27.08)	51.69 (26.30)
Arriaga Low Income	29.74 (26.17)	31.15 (25.71)
Current Study Low Income	40.07 (29.88)	57.93 (25.82)

Next, the relationship between age in months and CDI raw and percentile scores was examined. Similar to the findings of Roberts, Burchinal, and Durham (1999) and Feldman et al.

(2000), the CDI raw scores in the current sample were found to increase with age. Additionally, the CDI percentile scores decreased with age in months. Roberts, Burchinal, and Durham (1999) identified a pattern of extremely low percentile scores at 29 months of age. The same was found to be true for the 30-month-old group of children in the current sample.

Finally, current information about the effects of gender and maternal education were examined in comparison to previous research. Roberts, Burchinal, and Durham (1999) identified that females used longer utterances and more irregular forms than males on the CDI/WS. In addition, Feldman et al. (2000) previously reported that females had significantly higher scores than males on the CDI inventories. Visual inspection of the data from the current study revealed that males scored higher on the CDI/WG than females, but females had higher scores on each section of the CDI/WS. In both cases, though, no significant group differences for gender were found. Additionally, Dollaghan et al. (1999) identified significant differences in CDI scores based on level of maternal education. No significant group differences for maternal education were found in the current study. These contrary findings to previous research may be attributed to restricted range of maternal education levels in the current study. Recall that over 90% of the participants had mothers with 12 or fewer years of education.

Limitations of the Study

The study had several limitations relating to data collection and participant criteria. Data collected for the proposed study was not a truly representative, randomized sample of low-income, AA children. Only participants enrolled in specified child care centers involved in the ongoing "Tips About Talk" grant were recruited for the study.

The current study also assumed that the AA children were normally developing defined as: delivered full term (> 38 weeks) weighing at least 5.7 pounds at birth and presentation of no

reported hearing loss, no major birth or medical complications, and no diagnosed developmental disability. These measures do not ensure that the children in the study were normally developing, and no other standardized tests were administered to the AA children. Because the study was testing the utility of the CDI, results depend on the children being normally developing.

Due to the large number of items contained in the CDI inventories and the amount of time available, all the items of the CDI inventories were not analyzed. Only portions of the items in Part I of both inventories were examined; specifically, the subsections of the Vocabulary Checklist were analyzed. This portion of the CDI was chosen based on its practicality in clinical settings, yet examination of all of the items in the CDI inventories could have assisted in the further evaluation of the appropriateness of the all of the items and further evaluation of how the sections in each inventory relate to one another.

Finally, the low number of participants in the study may have affected the findings. No specific guidelines for soliciting equal numbers of children for each age range and maternal education level in the study sample were used. The few and unequal numbers of children in each of these categories could have affected the findings regarding group differences and correlations among variables. Inspection of the raw data provided descriptive information; yet in most cases, larger and equal groups representing each variable would have positively impacted analysis of group differences and the Pearson's correlations.

Implications of Research and Suggestions for Future Studies

The impetus for the current study was to address Catherine's dilemma and consider how the current study impacts her clinical practice. Recall that Catherine is faced with the decision of whether or not the CDI should be included in the assessment battery for her low-income, AA

caseload. The results of this study indicate that the CDI is a useful tool for assessing the early receptive and expressive language skills of low-income, AA children.

The CDI has previously been described as an efficient parent report instrument for use with typically developing and developmentally delayed populations, yet questions have been raised regarding its use with demographically diverse populations. The results of the study indicate that the tool provided normally distributed percentile scores for this sample of typically developing low-income, AA children with means and quartile scores closely approximating values representative of a normal bell curve. This finding suggests that the CDI is appropriate for assessing low-income, AA children. Additionally, based on strong correlations found between the original and updated percentile scores, it is recommended that test users obtain the updated normative information available on the test developer's website and use this normative data in future assessment.

Future research with larger samples and various sociodemographic groups (i.e. low-income, AA children who are developmentally delayed; low-income, white children; middle- and upper- income, AA children) would be beneficial to the validation of the CDI to differentiate normal vs. impaired children as well as provide increasing support of the CDI as an appropriate assessment tool regardless of various sociodemographic variables.

Future research is also needed to further explore the observed low scores of the children aged 29 to 30 months. Roberts, Burchinal, and Durham (1999) documented unusually low percentile scores for 30-month-old children. Similar low percentile scores were found for the 29-month-old children in the current sample (16.25 to 21.00). The reason for this finding across two studies remains unknown. Possibly low percentile scores in this age range reflect an inability of parents to accurately report on their children's language or they reflect the increasing

discrepancy in language scores of sociodemographically diverse children beyond the age of 24 months.

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APPENDIX A

NUMBER OF CHILDREN BY AGE AND GENDER IN THE ORIGINAL AND UPDATED SAMPLES: CDI/WG

	Original Sample[a]		Updated Sample[b]	
Age in months	Girls (n)	Boys (n)	Girls (n)	Boys (n)
8	32	35	32	36
9	37	32	48	41
10	35	32	64	72
11	38	46	45	50
12	45	41	79	78
13	40	36	57	59
14	42	42	58	53
15	32	33	50	44
16	33	30	41	43
17	--	--	33	40
18	--	--	37	29
Total	**334**	**325**	**544**	**545**

[a] Source: Fenson et al., 1993, Table 4-1., p. 41.

[b] Source: Personal Communication, Virginia Marchman

APPENDIX B

NUMBER OF CHILDREN BY AGE AND GENDER IN THE ORIGINAL AND UPDATED SAMPLES: CDI/WS

	Original Sample[a]		Updated Sample[b]	
Age in months	Girls (n)	Boys (n)	Girls (n)	Boys (n)
16	32	32	37	37
17	33	32	38	43
18	34	46	44	59
19	37	35	55	43
20	45	48	60	57
21	31	40	40	55
22	40	32	50	40
23	41	41	52	52
24	59	48	72	63
25	45	31	59	48
26	39	39	47	53
27	38	42	54	59
28	31	30	41	43
29	28	33	38	42
30	36	32	41	39
Total	**569**	**561**	**728**	**733**

[a] Source: Fenson et al., 1993, Table 4-2., p. 42.

[b] Source: Personal Communication, Virginia Marchman

APPENDIX C

DEMOGRAPHIC PROFILES OF THE ORIGINAL AND UPDATED CDI NORMATIVE SAMPLES

Demographic characteristic	Original Norms (%)[a]	Revised Norms (%)[b]
Ethnicity		
White	86.9	73.1
Black	4.0	10.4
Asian	2.9	3.3
Hispanic	4.6	6.5
All others	1.6	6.4
Maternal Education		
Some high school or less	4.5	7.6
High school diploma	17.9	23.9
Some college	24.3	24.8
College diploma or higher	53.3	43.8

[a] Source: Table 4-3 on page 43 of Fenson et al. (1993).

[b] Source: Personal Communication, Virginia Marchman

APPENDIX D

SCORING PROCEDURES FOR THE CDI/WG AND CDI/WS FROM FENSON ET AL. (1993)

CDI/WG	
PART I	
Section A: First Signs of Understanding	Add the number of "Yes" responses to obtain the child's total score.
Section B: Phrases	Add the number of phrases the parent indicated that the child understands.
Section C: Starting to Talk	Count each question as an affirmative response if the parent marked either "Often" or "Sometimes" for that question.
Section D: Vocabulary Checklist	Add the number of "understands and says" responses across all 19 categories to obtain the total score for vocabulary production. Add the number of either "understands" or "says" or "understands and says" across all 19 categories to obtain the total score for vocabulary comprehension.
PART II	
Section A: First Communicative Gestures	Add the number of "Sometimes" or "Often" marked by the parent.
Section B through Section E	Count the number of "Yes" responses marked by the parent.
Section F: Pretend Gestures	Qualitative Data: Use substitution criterion to judge if child substitutes one object for objects typically used in familiar cultural activities. Record "no" if parent response is "no" or if no examples are provided.
CDI/WS	
PART I	
Section A: Vocabulary Checklist	Add the items checked by the parent across each of the 22 categories to obtain the child's total score for vocabulary production.
Section B: How Children Use Words	Count each question as an affirmative response if the parent has marked either "Sometimes" or "Often".
PART II	
Section A: Word Endings/Part 1 (Use of Suffixes)	Count each question if the parent has marked either "Sometimes" or "Often".
Section B: Word Forms (Irregular Nouns and Verbs)	Add the items marked by the parent across the noun and verb sections to obtain a single total score.
Section C: Word Endings/Part 2 (Overregularizations)	Add the items marked by the parent across the noun and verb sections to obtain a single total score.
Section D: Examples of Children's Three Longest	Mean Length of Utterance: If parent indicated that the child is not producing word combinations, MLU is

Sentences	scored as 1. If fewer than three examples are provided, compute MLU based on number available. Samples should be broken down into single sentences. Regular inflectional morphemes, contractions, and negatives are counted as separate morphemes. All diminutives, irregular past tense verbs, third person singular verbs, plural nouns, catenatives, auxiliaries, compound words, proper nouns, and ritualized reduplications count as single morphemes.
Section E: Sentence Complexity	Count the number of responses for which the parent has marked the second (more complex) of the two alternatives. Treat any questions for which the parent has marked both alternatives as if only the second alternative was chosen. Do not count questions left unanswered by the parent.

APPENDIX E

RELIABILITY INFORMATION

CDI/WORDS AND GESTURES				
CDI Form	Items Possible	Items in Agreement	Percentiles Possible	Percentiles in Agreement
08	492	492	12	11
19	492	492	12	12
28	492	492	12	11
38	492	492	12	11
60	492	491	12	11
66	492	492	12	12
73	492	492	12	12
Total	**3443/3444**	**Reliability = 99.97%**	**80/84**	**Reliability= 95.24%**

CDI/WORDS AND SENTENCES				
CDI Form	Items Possible	Items in Agreement	Percentiles Possible	Percentiles in Agreement
11	801	801	6	5
13	801	801	6	6
30	801	801	6	6
33	801	799	6	6
43	801	798	6	5
49	801	800	6	5
55	801	801	6	4
57	801	801	6	6
64	801	801	6	6
77	801	799	6	6
85	801	801	6	4
90	801	801	6	6
Total	**9604/9612**	**Reliability = 99.92%**	**65/72**	**Reliability= 90.28%**

APPENDIX F

CDI/WG VOCABULARY CHECKLIST ITEM ANALYSIS

CDI/WG ITEM	RECEPTIVE TOTAL N = 31		EXPRESSIVE TOTAL N = 31	
SOUND EFFECTS AND ANIMAL SOUNDS				
Baa baa	26	(84%)	15	(48%)
Choo choo	10	(32%)	5	(16%)
Cockadoodledoo	8	(26%)	2	(6%)
Grrr	16	(52%)	11	(35%)
Meow	11	(35%)	5	(16%)
Moo	11	(35%)	5	(16%)
Ouch	15	(48%)	7	(23%)
Quack quack	9	(29%)	5	(16%)
Uh oh	20	(65%)	10	(32%)
Vroom	11	(35%)	6	(19%)
Woof woof	14	(45%)	9	(29%)
Yum yum	12	(39%)	5	(16%)
Total	**163/372**	**(44%)**	**85/372**	**(23%)**
ANIMAL NAMES				
Animal	6	(19%)	1	(3%)
Bear	6	(19%)	1	(3%)
Bee	5	(16%)	1	(3%)
Bird	10	(32%)	3	(10%)
Bug	7	(23%)	2	(6%)
Bunny	5	(16%)	2	(6%)
Butterfly	5	(16%)	1	(3%)
Cat	14	(45%)	7	(23%)
Chicken	6	(19%)	2	(6%)
Cow	10	(32%)	4	(13%)
Deer	3	(10%)	0	(0%)
Dog	18	(58%)	10	(32%)
Donkey	2	(6%)	0	(0%)
Duck	8	(26%)	4	(13%)
Elephant	5	(16%)	1	(3%)
Fish	10	(32%)	4	(13%)
Frog	4	(13%)	1	(3%)
Giraffe	3	(10%)	0	(0%)
Goose	4	(13%)	0	(0%)
Horse	7	(23%)	1	(3%)
Kitty	8	(26%)	1	(3%)
Lamb	4	(13%)	0	(0%)

Lion	4	(13%)	1	(3%)
Monkey	6	(19%)	1	(3%)
Mouse	5	(16%)	1	(3%)
Owl	4	(13%)	1	(3%)
Penguin	2	(6%)	0	(0%)
Pig	8	(26%)	5	(16%)
Pony	2	(6%)	0	(0%)
Puppy	11	(35%)	4	(13%)
Sheep	3	(10%)	1	(3%)
Squirrel	2	(6%)	0	(0%)
Teddy bear	11	(35%)	5	(16%)
Tiger	4	(13%)	0	(0%)
Turkey	2	(6%)	0	(0%)
Turtle	2	(6%)	1	(3%)
Total	**216/1116**	**(19%)**	**66/1116**	**(6%)**
VEHICLES				
Airplane	7	(23%)	1	(3%)
Bicycle	10	(32%)	4	(13%)
Bus	11	(35%)	3	(10%)
Car	14	(45%)	4	(13%)
Firetruck	5	(16%)	3	(10%)
Motorcycle	5	(16%)	1	(3%)
Stroller	14	(45%)	1	(3%)
Train	6	(19%)	3	(10%)
Truck	9	(29%)	4	(13%)
Total	**81/279**	**(29%)**	**24/279**	**(9%)**
TOYS				
Ball	26	(84%)	8	(26%)
Balloon	12	(39%)	3	(10%)
Block	14	(45%)	3	(10%)
Book	20	(65%)	5	(16%)
Bubbles	11	(35%)	2	(6%)
Doll	9	(29%)	2	(6%)
Pen	12	(39%)	2	(6%)
Toy	23	(74%)	5	(16%)
Total	**127/248**	**(51%)**	**30/248**	**(12%)**
FOOD AND DRINK				
Apple	9	(29%)	3	(10%)
Banana	14	(45%)	4	(13%)
Bread	16	(52%)	4	(13%)
Butter	4	(13%)	2	(6%)
Cake	11	(35%)	1	(3%)

Candy	16	(52%)	4	(13%)
Carrots	5	(16%)	1	(3%)
Cereal	19	(61%)	4	(13%)
Cheerios	7	(23%)	3	(10%)
Cheese	9	(29%)	5	(16%)
Chicken	15	(48%)	3	(10%)
Coffee	2	(6%)	1	(3%)
Cookie	18	(58%)	4	(13%)
Cracker	15	(48%)	4	(13%)
Drink	17	(55%)	3	(10%)
Egg	5	(16%)	1	(3%)
Fish	4	(13%)	0	(0%)
Food	18	(58%)	3	(10%)
Ice cream	11	(35%)	2	(6%)
Juice	22	(71%)	5	(16%)
Meat	15	(48%)	3	(10%)
Milk	19	(61%)	6	(19%)
Noodles	8	(26%)	1	(3%)
Orange	8	(26%)	2	(6%)
Peas	6	(19%)	0	(0%)
Pizza	7	(23%)	2	(6%)
Raisin	5	(16%)	0	(0%)
Spaghetti	11	(35%)	3	(10%)
Toast	8	(26%)	1	(3%)
Water	16	(52%)	3	(10%)
Total	**340/930**	**(37%)**	**78/930**	**(8%)**
CLOTHING				
Beads	3	(10%)	1	(3%)
Bib	11	(35%)	0	(0%)
Boots	4	(13%)	1	(3%)
Button	5	(16%)	2	(6%)
Coat	8	(26%)	1	(3%)
Diaper	20	(65%)	3	(10%)
Dress	5	(16%)	0	(0%)
Hat	15	(48%)	2	(6%)
Jacket	10	(32%)	4	(13%)
Jeans	7	(23%)	1	(3%)
Necklace	3	(10%)	0	(0%)
Pajamas	5	(16%)	0	(0%)
Pants	12	(39%)	3	(10%)
Shirt	13	(42%)	4	(13%)
Shoe	20	(65%)	5	(16%)
Shorts	10	(32%)	3	(10%)
Sock	17	(55%)	4	(13%)

Sweater	5	(16%)	0	(0%)
Zipper	3	(10%)	0	(0%)
Total	**176/589**	**(30%)**	**34/589**	**(6%)**
BODY PARTS				
Arm	12	(39%)	2	(6%)
Belly button	7	(23%)	4	(13%)
Cheek	2	(6%)	0	(0%)
Ear	18	(58%)	4	(13%)
Eye	17	(55%)	4	(13%)
Face	16	(52%)	2	(6%)
Foot	17	(55%)	4	(13%)
Finger	17	(55%)	3	(10%)
Hair	16	(52%)	3	(10%)
Hand	16	(52%)	4	(13%)
Head	14	(45%)	3	(10%)
Knee	4	(13%)	1	(3%)
Leg	12	(39%)	3	(10%)
Mouth	20	(65%)	3	(10%)
Nose	12	(39%)	4	(13%)
Owie/boo boo	10	(32%)	4	(13%)
Tooth	7	(23%)	2	(6%)
Toe	14	(45%)	3	(10%)
Tongue	12	(39%)	1	(3%)
Tummy	10	(32%)	2	(6%)
Total	**253/620**	**(41%)**	**56/620**	**(9%)**
FURNITURE AND ROOMS				
Bathroom	17	(55%)	2	(6%)
Bathtub	21	(68%)	3	(10%)
Bed	21	(68%)	5	(16%)
Bedroom	8	(26%)	0	(0%)
Chair	10	(32%)	4	(13%)
Couch	11	(35%)	4	(13%)
Crib	9	(29%)	0	(0%)
Door	16	(52%)	5	(16%)
Drawer	4	(13%)	0	(0%)
Garage	2	(6%)	0	(0%)
High chair	7	(23%)	2	(6%)
Kitchen	13	(42%)	3	(10%)
Living room	8	(26%)	1	(3%)
Oven	8	(26%)	2	(6%)
Play pen	8	(26%)	0	(0%)
Potty	8	(26%)	2	(6%)
Refrigerator	14	(45%)	1	(3%)

Rocking chair	5	(16%)	1	(3%)
Sink	7	(23%)	0	(0%)
Stairs	5	(16%)	1	(3%)
Stove	10	(32%)	2	(6%)
Table	12	(39%)	4	(13%)
TV	20	(65%)	5	(16%)
Window	13	(42%)	2	(6%)
Total	**257/744**	**(35%)**	**49/744**	**(7%)**
SMALL HOUSEHOLD ITEMS				
Blanket	18	(58%)	2	(6%)
Bottle	27	(87%)	10	(32%)
Bowl	13	(42%)	3	(10%)
Box	10	(32%)	3	(10%)
Broom	11	(35%)	3	(10%)
Brush	13	(42%)	2	(6%)
Clock	4	(13%)	0	(0%)
Comb	12	(39%)	2	(6%)
Cup	22	(71%)	4	(13%)
Dish	6	(19%)	0	(0%)
Fork	7	(23%)	2	(6%)
Glass	9	(29%)	2	(6%)
Glasses	4	(13%)	1	(3%)
Hammer	4	(13%)	0	(0%)
Keys	18	(58%)	3	(10%)
Lamp	4	(13%)	0	(0%)
Light	12	(39%)	1	(3%)
Medicine	7	(23%)	0	(0%)
Money	11	(35%)	3	(10%)
Paper	12	(39%)	3	(10%)
Penny	6	(19%)	3	(10%)
Picture	8	(26%)	2	(6%)
Pillow	11	(35%)	3	(10%)
Plant	2	(6%)	0	(0%)
Plate	7	(23%)	1	(3%)
Purse	7	(23%)	1	(3%)
Radio	11	(35%)	2	(6%)
Scissors	6	(19%)	1	(3%)
Soap	9	(29%)	1	(3%)
Spoon	12	(39%)	4	(13%)
Telephone	16	(52%)	4	(13%)
Toothbrush	11	(35%)	3	(10%)
Towel	8	(26%)	2	(6%)
Trash	9	(29%)	2	(6%)
Vacuum	7	(23%)	0	(0%)

Watch	4	(13%)	2	(6%)
Total	**358/1116**	**(32%)**	**75/1116**	**(7%)**
OUTSIDE THINGS AND PLACES TO GO				
Backyard	5	(16%)	0	(0%)
Beach	2	(6%)	0	(0%)
Church	8	(26%)	1	(3%)
Flower	5	(16%)	1	(3%)
Garden	2	(6%)	0	(0%)
Home	8	(26%)	1	(3%)
House	10	(32%)	2	(6%)
Moon	3	(10%)	1	(3%)
Outside	15	(48%)	4	(13%)
Park	6	(19%)	2	(6%)
Party	4	(13%)	1	(3%)
Pool	3	(10%)	1	(3%)
Rain	6	(19%)	1	(3%)
Rock	3	(10%)	0	(0%)
School	10	(32%)	2	(6%)
Shovel	2	(6%)	0	(0%)
Sky	5	(16%)	0	(0%)
Slide	5	(16%)	2	(6%)
Snow	2	(6%)	0	(0%)
Star	3	(10%)	0	(0%)
Store	9	(29%)	1	(3%)
Sun	4	(13%)	0	(0%)
Swing	7	(23%)	1	(3%)
Tree	5	(16%)	1	(3%)
Water	11	(35%)	2	(6%)
Work	3	(10%)	0	(0%)
Zoo	5	(16%)	0	(0%)
Total	**151/837**	**(18%)**	**24/837**	**(3%)**
PEOPLE				
Aunt	20	(65%)	3	(10%)
Baby	15	(48%)	7	(23%)
Babysitter	6	(19%)	0	(0%)
Babysitter's name	7	(23%)	1	(3%)
Boy	9	(29%)	4	(13%)
Brother	6	(19%)	1	(3%)
Child	3	(10%)	0	(0%)
Daddy	26	(84%)	13	(42%)
Girl	9	(29%)	3	(10%)
Grandma	24	(77%)	8	(26%)
Grandpa	15	(48%)	4	(13%)

Lady	3	(10%)	1	(3%)
Man	4	(13%)	1	(3%)
Mommy	30	(97%)	13	(42%)
Child's own name	21	(68%)	4	(13%)
People	4	(13%)	0	(0%)
Person	5	(16%)	0	(0%)
Sister	16	(52%)	2	(6%)
Teacher	10	(32%)	1	(3%)
Uncle	8	(26%)	1	(3%)
Total	**241/620**	**(39%)**	**67/620**	**(11%)**
GAMES AND ROUTINES				
Bath	20	(65%)	4	(13%)
Breakfast	12	(39%)	1	(3%)
Bye or bye bye	28	(90%)	14	(45%)
Dinner	9	(29%)	0	(0%)
Don't	18	(58%)	3	(10%)
Hello	15	(48%)	4	(13%)
Hi	19	(61%)	8	(26%)
Lunch	11	(35%)	1	(3%)
Nap	11	(35%)	3	(10%)
Night night	16	(52%)	5	(16%)
No	24	(77%)	10	(32%)
Patty cake	24	(77%)	6	(19%)
Peekaboo	25	(81%)	6	(19%)
Please	10	(32%)	3	(10%)
Shh/shush/hush	16	(52%)	6	(19%)
Thank you	11	(35%)	4	(13%)
Wait	12	(39%)	2	(6%)
Wanna/want to	9	(29%)	3	(10%)
Yes	14	(45%)	5	(16%)
Total	**304/589**	**(52%)**	**88/589**	**(15%)**
ACTION WORDS				
Bite	17	(55%)	4	(13%)
Blow	5	(16%)	3	(10%)
Break	4	(13%)	1	(3%)
Bring	11	(35%)	2	(6%)
Bump	3	(10%)	0	(0%)
Clean	6	(19%)	0	(0%)
Close	10	(32%)	2	(6%)
Cry	9	(29%)	3	(10%)
Dance	10	(32%)	2	(6%)
Craw	4	(13%)	0	(0%)
Drink	16	(52%)	4	(13%)

Drive	5	(16%)	2	(6%)
Eat	20	(65%)	4	(13%)
Fall	7	(23%)	0	(0%)
Feed	7	(23%)	1	(3%)
Finish	3	(10%)	2	(6%)
Get	6	(19%)	4	(13%)
Give	9	(29%)	2	(6%)
Go	11	(35%)	4	(13%)
Help	2	(6%)	1	(3%)
Hit	11	(35%)	2	(6%)
Hug	16	(52%)	3	(10%)
Hurry	2	(6%)	0	(0%)
Jump	8	(26%)	1	(3%)
Kick	5	(16%)	1	(3%)
Kiss	21	(68%)	3	(10%)
Look	14	(45%)	5	(16%)
Love	10	(32%)	1	(3%)
Open	8	(26%)	3	(10%)
Play	12	(39%)	1	(3%)
Pull	6	(19%)	0	(0%)
Push	8	(26%)	0	(0%)
Put	7	(23%)	0	(0%)
Read	6	(19%)	2	(6%)
Ride	7	(23%)	1	(3%)
Run	6	(19%)	2	(6%)
Say	6	(19%)	0	(0%)
See	9	(29%)	3	(10%)
Show	5	(16%)	0	(0%)
Sing	7	(23%)	3	(10%)
Sleep	9	(29%)	2	(6%)
Smile	9	(29%)	3	(10%)
Splash	2	(6%)	0	(0%)
Stop	18	(58%)	7	(23%)
Swim	2	(6%)	1	(3%)
Swing	3	(10%)	0	(0%)
Take	4	(13%)	0	(0%)
Throw	8	(26%)	2	(6%)
Tickle	9	(29%)	2	(6%)
Touch	9	(29%)	0	(0%)
Watch	7	(23%)	1	(3%)
Walk	12	(39%)	2	(6%)
Wash	8	(26%)	2	(6%)
Wipe	9	(29%)	3	(10%)
Write	5	(16%)	1	(3%)
Total	**453/1705**	**(27%)**	**98/1705**	**(6%)**

WORDS ABOUT TIME				
Day	3	(10%)	0	(0%)
Later	3	(10%)	0	(0%)
Morning	5	(16%)	1	(3%)
Night	5	(16%)	1	(3%)
Now	7	(23%)	0	(0%)
Today	3	(10%)	0	(0%)
Tomorrow	3	(10%)	0	(0%)
Tonight	7	(23%)	0	(0%)
Total	**36/248**	**(15%)**	**2/248**	**(1%)**
DESCRIPTIVE WORDS				
All gone	24	(77%)	3	(10%)
Asleep	8	(26%)	0	(0%)
Bad	13	(42%)	4	(13%)
Big	3	(10%)	2	(6%)
Blue	2	(6%)	1	(3%)
Broken	2	(6%)	0	(0%)
Careful	5	(16%)	1	(3%)
Clean	4	(13%)	0	(0%)
Cold	5	(16%)	1	(3%)
Cute	6	(19%)	0	(0%)
Dark	4	(13%)	1	(3%)
Dirty	6	(19%)	2	(6%)
Dry	1	(3%)	0	(0%)
Empty	5	(16%)	0	(0%)
Fast	2	(6%)	0	(0%)
Fine	2	(6%)	0	(0%)
Gentle	2	(6%)	0	(0%)
Good	12	(39%)	2	(6%)
Happy	6	(19%)	0	(0%)
Hard	3	(10%)	1	(3%)
Hot	14	(45%)	5	(16%)
Hungry	10	(32%)	1	(3%)
Hurt	7	(23%)	1	(3%)
Little	3	(10%)	1	(3%)
Naughty	1	(3%)	0	(0%)
Nice	3	(10%)	1	(3%)
Old	2	(6%)	0	(0%)
Pretty	4	(13%)	1	(3%)
Red	2	(6%)	0	(0%)
Scared	5	(16%)	1	(3%)
Sick	3	(10%)	1	(3%)
Sleepy	11	(35%)	2	(6%)

Soft	3	(10%)	1	(3%)
Thirsty	8	(26%)	2	(6%)
Tired	5	(16%)	1	(3%)
Wet	8	(26%)	1	(3%)
Yucky	4	(13%)	1	(3%)
Total	**208/1147**	**(18%)**	**38/1147**	**(3%)**
PRONOUNS				
Her	3	(10%)	0	(0%)
His	3	(10%)	0	(0%)
I	8	(26%)	2	(6%)
It	6	(19%)	1	(3%)
Me	6	(19%)	2	(6%)
Mine	5	(16%)	2	(6%)
My	5	(16%)	1	(3%)
That	4	(13%)	1	(3%)
This	3	(10%)	1	(3%)
You	9	(29%)	2	(6%)
Your	3	(10%)	0	(0%)
Total	**55/341**	**(16%)**	**12/341**	**(4%)**
QUESTION WORDS				
How	2	(6%)	1	(3%)
What	7	(23%)	2	(6%)
When	3	(10%)	1	(3%)
Where	5	(16%)	1	(3%)
Who	4	(13%)	1	(3%)
Why	5	(16%)	1	(3%)
Total	**26/186**	**(14%)**	**7/186**	**(4%)**
PREPOSITIONS AND LOCATIONS				
Away	6	(19%)	0	(0%)
Back	8	(26%)	1	(3%)
Down	11	(35%)	2	(6%)
In	7	(23%)	2	(6%)
Inside	7	(23%)	1	(3%)
Off	12	(39%)	2	(6%)
On	11	(35%)	3	(10%)
Out	9	(29%)	3	(10%)
There	5	(16%)	0	(0%)
Under	8	(26%)	0	(0%)
Up	11	(35%)	2	(6%)
Total	**95/341**	**(28%)**	**16/341**	**(5%)**

QUANTIFIERS				
All	2	(6%)	0	(0%)
Another	2	(6%)	0	(0%)
More	5	(16%)	1	(3%)
None	4	(13%)	0	(0%)
Not	5	(16%)	1	(3%)
Other	2	(6%)	0	(0%)
Same	1	(3%)	0	(0%)
Some	4	(13%)	1	(3%)
Total	**25/248**	**(10%)**	**3/248**	**(1%)**

APPENDIX G

CDI/WS VOCABULARY CHECKLIST ITEM ANALYSIS

CDI/WS ITEM	EXPRESSIVE TOTAL N = 56	
SOUND EFFECTS AND ANIMAL SOUNDS		
Baa baa	36	64%
Choo choo	30	54%
Cockadoodledoo	16	29%
Grrr	29	52%
Meow	39	70%
Moo	45	80%
Ouch	42	75%
Quack quack	31	55%
Uh oh	44	79%
Vroom	28	50%
Woof woof	48	86%
Yum yum	32	57%
Total	**420/672**	**63%**
ANIMALS		
Alligator	10	18%
Animal	14	25%
Ant	24	43%
Bear	29	54%
Bee	24	43%
Bird	36	64%
Bug	30	54%
Bunny	23	41%
Butterfly	14	25%
Cat	44	79%
Chicken	27	48%
Cow	28	50%
Deer	10	18%
Dog	52	93%
Donkey	5	9%
Duck	36	64%
Elephant	16	29%
Fish	36	64%
Frog	20	36%
Giraffe	9	16%
Goose	8	14%
Hen	10	18%

Horse	27	48%
Kitty	25	45%
Lamb	8	14%
Lion	15	27%
Monkey	27	48%
Moose	7	13%
Mouse	17	30%
Owl	11	20%
Penguin	2	4%
Pig	34	61%
Pony	13	23%
Puppy	32	57%
Rooster	8	14%
Sheep	14	25%
Squirrel	15	27%
Teddybear	23	41%
Tiger	16	29%
Turkey	10	18%
Turtle	15	27%
Wolf	12	21%
Zebra	10	18%
Total	**846/2408**	**35%**
VEHICLES		
Airplane	29	52%
Bicycle	26	46%
Boat	18	32%
Bus	38	68%
Car	43	77%
Firetruck	17	30%
Helicopter	4	13%
Motorcycle	20	36%
Sled	4	7%
Stroller	21	38%
Tractor	8	14%
Train	30	54%
Tricycle	5	9%
Truck	38	68&
Total	**301/784**	**38%**
TOYS		
Ball	46	82%
Balloon	35	63%
Bat	11	20%
Block	18	32%

Book	41	73%
Bubbles	30	54%
Chalk	5	9%
Crayon	24	43%
Doll	29	52%
Game	17	30%
Glue	11	20%
Pen	26	46%
Pencil	25	45%
Play dough	8	14%
Present	12	21%
Puzzle	10	18%
Story	17	30%
Toy	37	66%
Total	**402/1008**	**40%**
FOOD AND DRINKS		
Apple	30	54%
Applesauce	11	20%
Banana	34	61%
Beans	23	41%
Bread	32	57%
Butter	17	30%
Cake	30	54%
Candy	39	70%
Carrots	13	23%
Cereal	30	54%
Cheerios	12	21%
Cheese	31	55%
Chicken	30	54%
Chocolate	16	29%
Coffee	10	18%
Coke	13	18%
Cookie	36	64%
Corn	20	36%
Cracker	30	54%
Donut	21	38%
Drink	29	52%
Egg	24	43%
Fish	30	54%
Food	36	64%
French fries	29	52%
Grapes	22	39%
Green beans	9	16%
Gum	28	50%

Hamburger	22	39%
Ice	32	57%
Ice cream	25	45%
Jello	16	29%
Jelly	15	27%
Juice	37	66%
Lollipop	12	21%
Meat	28	50%
Melon	12	21%
Milk	34	61%
Muffin	8	14%
Noodles	22	39%
Nuts	12	21%
Orange	25	45%
Pancake	17	30%
Peanut butter	16	29%
Peas	13	23%
Pickle	20	36%
Pizza	23	41%
Popcorn	25	45%
Popsicle	21	38%
Potato	14	25%
Potato chip	36	64%
Pretzel	4	7%
Pudding	11	20%
Pumpkin	6	11%
Raisin	12	21%
Salt	13	23%
Sandwich	23	41%
Sauce	6	11%
Soda/pop	12	21%
Soup	13	23%
Spaghetti	25	45%
Strawberry	12	21%
Toast	12	21%
Tuna	6	11%
Vanilla	3	5%
Vitamins	8	14%
Water	40	71%
Yogurt	4	7%
Total	**1380/3808**	**36%**
CLOTHING		
Beads	9	16%
Belt	28	50%

Bib	13	23%
Boots	20	36%
Button	14	25%
Coat	26	46%
Diaper	35	63%
Dress	18	32%
Gloves	15	27%
Hat	37	66%
Jacket	27	48%
Jeans	14	25%
Mittens	5	9%
Necklace	10	18%
Pajamas	12	21%
Pants	31	55%
Scarf	4	7%
Shirt	28	50%
Shoe	48	86%
Shorts	18	32%
Slipper	17	30%
Sneaker	5	9%
Snowsuit	3	5%
Sock	40	71%
Sweater	10	18%
Tights	4	7%
Underpants	11	20%
Zipper	13	23%
Total	**515/1568**	**33%**
BODY PARTS		
Ankle	10	18%
Arm	32	57%
Belly button	19	33%
Buttocks/bottom	21	38%
Cheek	20	36%
Chin	20	36%
Ear	41	73%
Eye	46	82%
Face	35	63%
Feet	38	68%
Finger	31	55%
Hair	36	64%
Hand	38	68%
Head	37	66%
Knee	23	41%
Leg	31	55%

Lips	31	55%
Mouth	40	71%
Nose	40	71%
Owie/boo boo	31	55%
Penis	9	16%
Shoulder	12	21%
Tooth	30	54%
Toe	31	55%
Tongue	25	45%
Tummy	28	50%
Vagina	6	11%
Total	**761/1512**	**50%**
SMALL HOUSEHOLD ITEMS		
Basket	14	25%
Blanket	29	52%
Bottle	33	59%
Box	28	50%
Bowl	29	52%
Broom	28	50%
Brush	34	43%
Bucket	12	21%
Camera	12	21%
Can	21	38%
Clock	21	38%
Comb	31	55%
Cup	43	77%
Dish	16	29%
Fork	27	48%
Garbage	18	32%
Glass	22	39%
Glasses	19	34%
Hammer	11	20%
Jar	11	20%
Keys	40	71%
Knife	20	36%
Lamp	11	20%
Light	33	59%
Medicine	20	36%
Money	32	57%
Mop	23	41%
Nail	14	25%
Napkin	18	32%
Paper	30	54%
Penny	23	41%

Picture	27	48%
Pillow	29	52%
Plant	13	23%
Plate	26	46%
Purse	25	45%
Radio	27	48%
Scissors	16	29%
Soap	32	57%
Spoon	33	59%
Tape	11	20%
Telephone	37	66%
Tissue/Kleenex	24	43%
Toothbrush	34	61%
Towel	26	46%
Trash	25	45%
Tray	8	14%
Vacuum	17	30%
Walker	9	16%
Watch	23	41%
Total	**1165/2800**	**42%**
FURNITURE AND ROOMS		
Basement	0	0%
Bathroom	28	50%
Bathtub	30	54%
Bed	39	70%
Bedroom	16	29%
Bench	6	11%
Chair	33	59%
Closet	19	34%
Couch	23	41%
Crib	7	13%
Door	43	77%
Drawer	12	21%
Dryer	11	20%
Garage	6	11%
High chair	8	14%
Kitchen	25	45%
Living room	14	25%
Oven	16	29%
Play pen	8	14%
Porch	9	16%
Potty	34	61%
Refrigerator	23	41%
Rocking chair	8	14%

Room	28	50%
Shower	13	23%
Sink	21	38%
Sofa	18	32%
Stairs	15	27%
Stove	19	34%
Table	24	43%
TV	40	71%
Washing machine	12	21%
Window	25	45%
Total	**633/1848**	**34%**
OUTSIDE THINGS		
Backyard	14	25%
Cloud	14	25%
Flag	11	20%
Flower	25	45%
Garden	6	11%
Grass	28	50%
Hose	11	20%
Ladder	8	14%
Lawn mower	7	13%
Moon	17	30%
Pool	22	39%
Rain	35	63%
Rock	23	41%
Roof	10	18%
Sandbox	4	7%
Shovel	6	11%
Sidewalk	8	14%
Sky	21	38%
Slide	15	27%
Snow	5	9%
Snowman	6	11%
Sprinkler	3	5%
Star	23	41%
Stick	19	34%
Stone	7	13%
Street	16	29%
Sun	24	43%
Swing	19	34%
Tree	29	52%
Water	36	64%
Wind	11	20%
Total	**483/1736**	**28%**

PLACES TO GO		
Beach	8	14%
Camping	2	4%
Church	25	45%
Circus	5	9%
Country	4	7%
Downtown	4	7%
Farm	8	14%
Gas station	10	18%
Home	30	54%
House	28	50%
Movie	14	25%
Outside	25	45%
Park	22	39%
Party	11	20%
Picnic	7	13%
Playground	8	14%
School	33	59%
Store	24	43%
Woods	4	7%
Work	15	27%
Yard	12	21%
Zoo	26	46%
Total	**325/1232**	**26%**
PEOPLE		
Aunt	24	43%
Baby	43	77%
Babysitter	4	7%
Babysitter's name	9	16%
Boy	29	52%
Brother	21	38%
Child	9	16%
Clown	9	16%
Cowboy	5	9%
Daddy	54	96%
Doctor	20	36%
Fireman	8	14%
Friend	14	25%
Girl	23	41%
Grandma	42	75%
Grandpa	35	63%
Lady	10	18%
Mailman	7	13%

Man	19	34%
Mommy	53	95%
Nurse	4	7%
Child's own name	34	61%
People	10	18%
Person	4	7%
Pet's name	11	20%
Police	17	30%
Sister	24	43%
Teacher	18	32%
Uncle	20	36%
Total	**580/1624**	**36%**
GAMES AND ROUTINES		
Bath	33	59%
Breakfast	16	29%
Bye	44	79%
Call (on phone)	28	50%
Dinner	14	25%
Give me five!	30	54%
Gonna get you!	24	43%
Go potty	29	52%
Hi	39	70%
Hello	33	59%
Lunch	16	29%
Nap	29	52%
Night night	42	75%
No	45	80%
Pattycake	38	68%
Peakaboo	43	77%
Please	31	55%
Shh/shush/hush	42	75%
Shopping	11	20%
Snack	22	39%
So big	13	23%
Thank you	44	79%
This little piggy	13	23%
Turn around	23	41%
Yes	45	80%
Total	**747/1400**	**53%**
ACTION WORDS		
Bite	36	64%
Blow	26	46%
Break	17	30%

Bring	20	36%
Build	11	20%
Bump	16	29%
Buy	21	38%
Carry	19	34%
Catch	22	39%
Chase	11	20%
Clap	32	57%
Clean	20	36%
Climb	15	27%
Close	19	34%
Cook	18	32%
Cover	17	30%
Cry	32	57%
Cut	14	25%
Dance	29	52%
Draw	17	30%
Drink	29	52%
Drive	18	32%
Drop	18	32%
Dry	16	29%
Dump	8	14%
Eat	41	73%
Fall	22	39%
Feed	19	34%
Find	17	30%
Finish	19	34%
Fit	12	21%
Fix	14	25%
Get	23	41%
Give	25	45%
Go	36	64%
Hate	8	14%
Have	19	34%
Hear	20	36%
Help	19	34%
Hide	20	36%
Hit	24	43%
Hold	24	43%
Hug	35	63%
Hurry	13	23%
Jump	25	45%
Kick	27	48%
Kiss	43	77%
Knock	23	41%

Lick	21	38%
Like	18	32%
Listen	19	34%
Look	30	54%
Love	33	59%
Make	10	18%
Open	34	61%
Paint	10	18%
Pick	14	25%
Play	32	57%
Pour	12	21%
Pretend	4	7%
Pull	20	36%
Push	24	43%
Put	16	29%
Read	27	48%
Ride	23	41%
Rip	6	11%
Run	28	50%
Say	18	32%
See	28	50%
Shake	13	23%
Share	17	30%
Show	13	23%
Sing	22	39%
Sit	23	41%
Skate	6	11%
Sleep	27	48%
Slide	11	20%
Smile	24	43%
Spill	11	20%
Splash	13	23%
Stand	17	30%
Stay	18	32%
Stop	37	66%
Sweep	18	32%
Swim	13	23%
Swing	16	29%
Take	17	30%
Talk	24	43%
Taste	16	29%
Tear	13	23%
Think	7	13%
Throw	18	32%
Tickle	18	32%

Touch	17	30%
Wait	20	36%
Wake	12	21%
Walk	29	52%
Wash	21	38%
Watch	21	38%
Wipe	19	34%
Wish	8	14%
Work	13	23%
Write	25	45%
Total	**2043/5768**	**35%**
DESCRIPTIVE WORDS		
Allgone	22	39%
Asleep	14	25%
Awake	12	21%
Bad	28	50%
Better	11	20%
Big	30	54%
Black	12	21%
Blue	18	32%
Broken	13	23%
Brown	10	18%
Careful	5	9%
Clean	17	30%
Cold	30	54%
Cute	13	23%
Dark	12	21%
Dirty	19	34%
Dry	11	20%
Empty	10	18%
Fast	12	21%
Fine	5	9%
First	12	21%
Full	16	29%
Gentle	4	7%
Good	23	41%
Green	12	21%
Happy	15	27%
Hard	11	20%
Heavy	14	25%
High	7	13%
Hot	33	59%
Hungry	21	38%
Hurt	20	36%

Last	8	14%
Little	15	27%
Long	9	16%
Loud	13	23%
Mad	12	21%
Naughty	2	4%
New	12	21%
Nice	13	23%
Noisy	11	20%
Old	14	25%
Orange	13	23%
Poor	5	9%
Pretty	17	30%
Quiet	11	20%
Red	16	29%
Sad	17	30%
Scared	14	25%
Sick	14	25%
Sleepy	23	41%
Slow	11	20%
Soft	11	20%
Sticky	10	18%
Stuck	6	11%
Thirsty	19	34%
Tiny	7	13%
Tired	17	30%
Wet	25	45%
White	8	14%
Windy	6	11%
Yellow	14	25%
Yucky	9	16%
Total	**874/3528**	**25%**
WORDS ABOUT TIME		
After	5	9%
Before	4	7%
Day	17	30%
Later	12	21%
Morning	22	39%
Night	32	57%
Now	15	27%
Time	10	18%
Today	10	18%
Tomorrow	9	16%
Tonight	14	25%

Yesterday	4	7%
Total	**154/648**	**24%**
PRONOUNS		
He	18	32%
Her	11	20%
Hers	8	14%
Him	15	27%
His	11	20%
I	27	48%
It	18	32%
Me	35	63%
Mine	29	52%
My	17	30%
Myself	6	11%
Our	8	14%
She	16	29%
That	15	27%
Their	5	9%
Them	9	16%
These	6	11%
They	12	21%
This	12	21%
Those	5	9%
Us	12	21%
We	14	25%
You	26	46%
Your	7	13%
Yourself	3	5%
Total	**335/1400**	**24%**
QUESTION WORDS		
How	8	14%
What	21	38%
When	8	14%
Where	10	18%
Which	4	7%
Who	18	32%
Why	21	38%
Total	**90/392**	**23%**
PREPOSITIONS AND LOCATIONS		
About	6	11%
Above	6	11%
Around	7	13%

At	19	34%
Away	8	14%
Back	15	27%
Behind	8	14%
Beside	4	7%
By	22	39%
Down	21	38%
For	8	14%
Here	13	23%
Inside/in	20	36%
Into	7	13%
Next to	1	2%
Of	7	13%
Off	31	55%
On	35	63%
On top of	5	9%
Out	23	41%
Over	9	16%
There	9	16%
To	15	27%
Under	13	23%
Up	24	43%
With	10	18%
Total	**346/1456**	**24%**
QUANTIFIERS AND ARTICLES		
A	22	39%
All	17	30%
A lot	12	21%
An	4	7%
Another	6	11%
Any	6	11%
Each	8	14%
Every	5	9%
More	21	38%
Much	6	11%
Not	11	20%
None	11	20%
Other	7	13%
Same	5	9%
Some	16	29%
The	11	20%
Too	21	38%
Total	**189/952**	**20%**

HELPING VERBS		
Am	13	23%
Are	6	11%
Be	16	29%
Can	16	29%
Could	8	14%
Did/ didya	14	25%
Do	20	36%
Does	6	11%
Don't	15	27%
Gonna/ going to	9	16%
Gota/ got to	7	13%
Hafta/ have to	10	18%
Is	16	29%
Lemme/ let me	21	38%
Need/ need to	10	18%
Try / try to	6	11%
Wanna/ want to	16	29%
Was	7	13%
Were	5	9%
Will	7	13%
Would	7	13%
Total	**235/1176**	**20%**
CONNECTING WORDS		
And	12	21%
Because	8	14%
But	10	18%
If	7	13%
So	19	34%
Then	7	13%
Total	**63/336**	**19%**

VITA

Elizabeth Waters Wooden was born and raised in Saint Joseph, Louisiana. She received her Bachelor of Arts degree in communication disorders from Louisiana State University in May 2004. She entered graduate school in August 2004 to pursue a Master of Arts degree in speech language pathology. Mrs. Wooden worked as a graduate assistant in the Office of Graduate Records and as a teaching assistant for the Department of Communication Sciences and Disorders during her graduate program. Upon completion of her master's degree in May 2006, she plans to complete her clinical fellowship year and aspires to enter a doctorate program after gaining experience in a clinical setting.