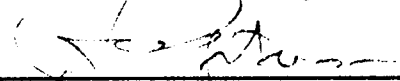


To the Graduate Council:

I am submitting herewith a thesis written by Janna C. Graber entitled "Distribution of Function Words in Mothers' Speech to Young Children." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Speech Pathology.


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Associate Vice Chancellor and
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**DISTRIBUTION OF FUNCTION WORDS
IN MOTHERS' SPEECH TO
YOUNG CHILDREN**

A Thesis
Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville

Janna Campbell Graber
August, 1997

DEDICATION

This thesis is dedicated to my parents,

Glenn and Caroline Graber

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ABSTRACT

The purpose of this study was to examine the use of function words in *motherese*, or mothers' speech to their young children. Two measures were obtained: 1) the occurrence distribution of a set of function words in three clause positions--initial, medial, and final; and 2) the occurrence distribution of clause-final function words in three utterance types--comments/statements, questions, and responses to one's own questions.

Twelve previously audiorecorded speech samples of mothers interacting with their young children (17 to 26 months; MLU: 1.00 to 1.50 morphemes) during individual free play situations were evaluated. The samples were orthographically transcribed, coded for the presence of function words, and analyzed using the Systematic Analysis of Language Transcripts (SALT) computer software program.

A repeated measures ANOVA yielded a statistically significant finding for the effect of function-word category as well as for that of clause position. Additionally, a significant interaction was found between the two variables of category and position. The result for effect of utterance type was found to be approaching significance.

Based on the results of this investigation, it was proposed that the low clause-final function-word occurrence rates found within *motherese* contribute to young children's slow, but eventual, function-word acquisition. In addition, this study revealed that mothers' use of responses to their own questions may contribute to

their children's future auxiliary verb growth. Clinical implications of the study include the development of therapeutic approaches to increase function-word awareness and comprehension by language-impaired children in order to facilitate the function-word acquisition process.

TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION AND REVIEW OF THE LITERATURE	1
Introduction	1
Motherese	1
Language Facilitation	2
Clause Position	2
Phonetic Substance	4
Review of the Literature	6
Motherese	6
Prosodic Characteristics	6
Pitch	7
Pauses	7
Vowel duration	8
Sensitivity to Input	8
Symbiotic Relationship	10
Bootstrapping	12
Semantic and Syntactic Bootstrapping	13
Prosodic Bootstrapping	13
Vowel Duration and Utterance Position	14
Content Words	14
Function Words	16
Purpose of the Study	18
Research Questions	21
 II. METHOD	 22
Subjects	22
Language Sampling Procedure	24
Transcription of Mother-to-Child Utterances	25
Transcript Analysis	26
Experimental Words	26
Coding Procedure	27
MLU Coding	28
Function-Word Coding	28
Utterance-Type Coding	30
Reliability	30

III. RESULTS	33
Reliability	33
Intrajudge Reliability	33
Orthography, Utterance Segmentation, and MLU Coding	33
Clause Segmentation and Function-Word/Utterance-Type Coding	34
Interjudge Reliability	34
Orthography, Utterance Segmentation, and MLU Coding	34
Clause Segmentation and Function-Word/Utterance-Type Coding	34
Distribution Tables and Raw Data	35
Statistical Analysis	36
Experimental-Word Data	36
Normality Testing	36
Summary Statistics	37
Variance Testing	40
Utterance-Type Data	41
Normality Testing	41
Summary Statistics	43
Variance Testing	45
Summary	45
IV. DISCUSSION	48
Category and Position	49
Utterance Type	51
Crosslinguistic Acquisition	53
Importance of Final Position	55
Methodological Limitations	56
Future Research	58
Summary	63
REFERENCES	65
APPENDICES	80
Appendix A	81
Appendix B	82
Appendix C	84
Appendix D	85
Appendix E	87
Appendix F	91
VITA	92

LIST OF TABLES

TABLE	PAGE
1. Means and Standard Deviations of Category and Position Data	38
2. Means and Standard Deviations for Function Words According to Clause Position	39
3. 3-by-3 Repeated Measures ANOVA of Category and Position Effects	41
4. Means and Standard Deviations of Utterance-Type Data	43
5. Means and Standard Deviations for Clause-Final Function Words According to Utterance Type	44
6. One-Way Repeated Measures ANOVA for Utterance-Type Effects	47

LIST OF FIGURES

Figure	PAGE
1. Estimated marginal means of function-word-category and clause-position data	42
2. Estimated marginal means of utterance-type data	46

Chapter I

INTRODUCTION AND REVIEW OF THE LITERATURE

Introduction

Motherese

Motherese, or *parentese*, refers to a form of speech used by mothers and other caregivers to address young children (Newport, Gleitman, & Gleitman, 1977).¹ Stylistic characteristics of this type of speech differ from the speech style used to address older children and adults--the speech is modified syntactically, semantically, phonologically, and prosodically. Although some of these modifications vary across cultures, characteristics such as the use of slower rate, exaggerated intonation, and higher pitch have been observed in several different languages (Blount & Padgug, 1976; Ferguson, 1964). In English-speaking societies, characteristics of motherese generally include: slower rate of speech; greater fluency; clearer articulation or enunciation; simpler and more concrete words used in shorter, simpler utterances; and greater pitch variations, as well as the use of a higher-pitched voice overall

¹ For the purposes of consistency, the term *motherese* will be used throughout this document.

(Owens, 1992). Motherese often contains semantically related utterances pertaining to the "here and now," which focus primarily on the child's actions and attempts to communicate; approximately 70% of mother-to-young child utterances are based on the child's verbal, vocal, and nonverbal behaviors (Cross, 1977; Snow, 1977b). Additionally, motherese is often highly redundant as the adult attempts to describe, explain, clarify, and comment on ongoing contextual occurrences in the child's environment. Utterances are sometimes repeated verbatim for emphasis, or in slightly different forms to facilitate comprehension (Owens, 1991).

Language Facilitation

Clause Position

There are a multitude of factors that contribute to language learning by young children. One of the influencing factors appears to be the position of words within utterances in the speech that children hear in their environment. Young children appear to pay particular attention to words that they hear in the final position of utterances (Fernald & McRoberts, 1993). Several researchers have suggested that this is due to the fact that, in child-directed speech, the vowels within words used in the final position of phrases and clauses are generally lengthened and even exaggerated over those in initial- and medial-position words, making them more perceptually salient to the listener (Bernstein Ratner, 1986; Morgan, 1986; Swanson & Leonard, 1994; Swanson, Leonard, & Gandour, 1992). A child may first notice

some words--especially those with low phonetic substance--in the final position of phrases or clauses when she is at the developmentally appropriate language level to learn words from a given category (e.g., articles, modals). Later, after she becomes somewhat familiar with a word in final position, she may begin to notice it in the less salient non-final positions as well (Swanson & Leonard, 1994). This rudimentary awareness of how the word is used in utterance structure may help the child to begin to categorize words according to type or class (Morgan, 1986). The importance of final position in the language learning process was demonstrated in a study by Fernald and McRoberts (1993). An auditory-visual matching procedure using familiar words was employed in which children's looking time was measured. Word recognition performance by 15-month-olds proved to be significantly better for familiar words in sentence-final position than for the same words in sentence-medial position. In a subsequent experiment within the same study, Fernald and McRoberts (1993) attempted to eliminate the possible confounding factor of longer within-word vowel durations in final-position words by presenting the infants with both long and short target words in both medial- and final-sentence positions. The shortened final-position words did not appear to adversely affect their recognizability, and the extended medial-position words were recognized at similar rates to the final-position words. These findings suggest that both word position and duration are integral factors in infants' ability to recognize words in continuous speech.

More evidence that utterance-final position words appear to be particularly salient to young language-learners can be found in the analysis of the children's imitation of adult speech. Several studies of imitation patterns have reported that young children more often imitate final-position words from adult utterances than the words in non-final positions (e.g., Rondal, 1980).

Phonetic Substance

Researchers have reported that young language-learning children from English-speaking families generally begin to produce content words before function words in their early expressive language (e.g., Gleitman, Gleitman, Landau, & Wanner, 1988). *Content words* comprise an infinite class of words which often have clear semantic referents (e.g., nouns). Conversely, *function* or *functor words* compose a small set of words whose grammatical roles in utterances are more obvious than their semantic content. The category of function words can include articles, prepositions, modal and auxiliary verbs, conjunctions, copulas, determiners, clause introducers, pronouns, and *wh-* question markers (Bernstein Ratner, 1984; Nicolosi, Harryman, & Kresheck, 1989). These words occur frequently in speech and are used primarily to give order to utterances (Nicolosi et al., 1989), often by marking clause boundaries. Function words can occur in initial, medial, or final positions of an utterance (although not all words can occur in all positions). Function words found in the initial position of utterances usually introduce *yes-no* questions (e.g., *Did you have fun?* or *Would you like to eat now?*). Function words can be used in the medial

position of utterances in a number of ways, such as to link clauses (e.g., *He went to the dentist because he had a toothache.*), or to show the number, voice, mood, or tense of a main verb (e.g., *She was gardening when we arrived.*). Final-position function words can occur in comments, statements, and questions, as well as in responses to one's own questions (e.g., *Is he hungry? He is.*).

One reason for the apparent delay in function-word acquisition by young children could be that many function words have *low phonetic substance*. In other words, these words are less perceptually salient and/or less semantically salient to the listener than content words which are more transparent and therefore have more phonetic substance (de Villiers & de Villiers, 1985; Leonard, 1991). From Leonard's (1989) *surface properties theory* (which was developed in an attempt to determine why children with language-learning difficulties often continue to omit grammatical inflections and function words) the following description of *low phonetic-substance* morphemes and words has emerged: short, unstressed syllables that can often be phonetically reduced, and which are produced with low fundamental frequency (F_0) and low amplitude or loudness. Gleitman et al. (1988), among others, have proposed that these characteristics of grammatical inflections and function words provide some insight into the *telegraphic* style of young language learners' early speech in which these grammatical elements are frequently omitted (e.g., *Mommy purse* for *That's Mommy's purse*). Young children's attention is apparently drawn to content words because of their transparency and high phonetic

substance, and subsequently, these words are chosen by children to create their early expressive speech.

Review of the Literature

Motherese

Prosodic Characteristics

The prosodic characteristics of motherese, in comparison to those of adult-to-adult speech, generally include: exaggerated use of intonation or melody--greater range of pitch variation, as well as the use of a higher pitch level overall (Fernald & Simon, 1984; Stern, Spieker, Barnett, & MacKain, 1983; Stern, Spieker, & MacKain, 1982); slower rate of speech due to fewer words per minute (Fernald & Simon, 1984; Morgan, 1986); and extended duration of vowels within words (Bernstein Ratner, 1986; Morgan, 1986; Swanson & Leonard, 1994; Swanson et al., 1992); increased duration and more frequent use of pauses, particularly between utterances and following content words (Fernald & Simon, 1984; Morgan, 1986); more varied loudness pattern; and more fluent speech--one disfluency per 1,000 words as opposed to 4.5 disfluencies per 1,000 words in adult-directed speech (Newport et al., 1977). The following discussion will focus on three of these motherese characteristics--pitch, pauses, and vowel duration--in more detail.

Pitch. Fernald and Simon (1984) and Stern et al. (1983) examined and compared pitch levels and variability in child-directed and adult-directed speech. Both studies found that mothers used a higher fundamental frequency (F_0) level and a greater frequency range when speaking to young children than to adults. Further, Stern et al. (1983) found that the greatest pitch changes occurred at the ends of utterances and between utterances. Interestingly, the F_0 contour patterns found in motherese, although exaggerated, appear to be similar to adult-to-adult patterns (Stern et al., 1982). These exaggerated patterns are hypothesized to serve the purpose of gaining and holding the young child's attention (Fernald & Simon, 1984; Stern et al., 1983). They alone do not appear to make particular types of words (e.g., content words) any more salient than others to the listener (Swanson, 1990). However, words that occur in certain utterance positions (e.g., final position), regardless of word type, do appear to be highlighted through the use of higher F_0 or greater F_0 variability (Swanson, 1990).

Pauses. Fernald and Simon (1984) and Morgan (1986) reported that there is an increase in the incidence and duration of pauses in motherese as compared to adult-directed speech. Morgan (1986) also examined the phrase position of pauses and found that phrase-final pauses were more frequent and greater in duration in adult-to-child speech than in adult-to-adult speech. Again, this component of motherese does not appear to increase the saliency of content words over function words. Instead, they serve to highlight the location of phrase or clause endings for children.

Vowel duration. Despite some inconsistencies in reports from early studies of vowel duration in mothers' speech (Bernstein Ratner, 1984, 1985), several researchers in more recent investigations have reported that within-word vowel durations in mother-to-young child speech (both read and spontaneous) are often longer than in mother-to-adult speech, particularly when the words occur in the final position of phrases and clauses (Bernstein Ratner, 1986; Morgan, 1986; Swanson & Leonard, 1994; Swanson et al., 1992). Although this holds true for both content words and function words in child-directed speech, content words are lengthened more in terms of absolute duration in all positions (Bernstein Ratner, 1986; Morgan, 1986; Swanson et al., 1992). It is postulated that this aspect of motherese may highlight content words and any words in utterance-final position, making them more salient to young language learners.²

Sensitivity to Input

Most mothers and other caregivers (i.e., fathers, older siblings, day care workers, other family members and acquaintances) are not formally taught to use motherese, but many do so naturally when interacting with an infant or young child (Newport, et al., 1977; Gelman & Shatz, 1977). The children, consequently, appear to be aware of, and prefer, these speech style modifications. Responsiveness to acoustic stimuli in humans begins as early as the third trimester of pregnancy and

² A more detailed discussion of vowel duration in motherese is provided in the *Bootstrapping* subsection of this chapter.

becomes a highly refined skill by birth (e.g., Eisenberg, 1976), particularly with respect to speech (Eimas, 1975). These sophisticated auditory skills may serve to facilitate developmental functions such as mother-infant bonding (Bell, 1974) and language acquisition (e.g., Eimas, 1996; Eisenberg, 1976). DeCasper and Fifer (1980) found, through the use of a nonnutritive sucking experiment, that neonates less than three days old preferred to listen to their own mothers' voices over the voices of other females. Specifically, DeCasper and Fifer reported that the infants apparently learned to discriminate between the sucking patterns (defined by interburst intervals) which produced their own mothers' voices and the pattern which produced the other females' voices, and subsequently chose to access their own mothers' voices more frequently, even when the response requirements were reversed. Eimas (1996) suggested that this propensity was due to a prenatal familiarity with the fundamental-frequency patterns of the mothers' speech. Mehler, Bertoncini, Barriere, and Jassik-Gerschenfeld (1978) evaluated 1-month-old infants and found the same preferential pattern, even when the speech was processed through a low-pass filter, thus providing only prosodic information to the listeners. The results of these two investigations suggest that very early in life, children are auditorily aware of, and sensitive to, variations in rhythm (Condon & Sander, 1973), intonation (e.g., Morse, 1972), frequency (Eisenberg, 1976), and phonetic components of speech (e.g., Butterfield & Cairns, 1974).

This heightened sensitivity to the prosodic elements of speech is also apparent in older infants, as Hirsh-Pasek et al. (1987) found when they evaluated 7- to 10-month-old children. In this investigation, the children showed a preference (by direction and duration of eye gaze) for taped samples of a mother speaking to her child with 1-second pauses inserted at *natural* clause boundaries over tapes of motherese in which pauses had been inserted within clauses and within words. In a subsequent study, Kelmer Nelson, Hirsh-Pasek, Jusczyk, and Wright Cassidy (1989) also found that 7- to 10-month-old infants appeared to be sensitive to segment-marking cues (pauses), and to prefer *natural* cues over *unnatural* ones in motherese; however, the infants did not appear to make the same discriminations in adult-directed speech. The findings of these studies suggest that not only are young children capable of identifying important linguistic information by means of prosodic cues, but also that the prosodic patterns of motherese provide more of these cues to young listeners than do those of adult-directed speech.

Symbiotic Relationship

Although caregivers perform very little direct language instruction with young children, researchers have suggested that the use of motherese in everyday interactions appears to greatly facilitate language acquisition (e.g., Fernald & Simon, 1984; Stern et al., 1982). Fernald (1982, 1985) found that 4-month-old infants attended more closely to motherese than to the type of speech that is directed

towards adults. In addition, caregivers may continue to exhibit characteristics of motherese in their speech because of this reinforcement from the children.

Snow (1977a) hypothesized that parents use motherese to facilitate a conversational model of interaction with their young children. The purposes of this model are to maximize verbal interactions and to control the child's behavior (see also McDonald & Pien, 1982). The model is similar to adult interaction patterns in which turn-taking behavior occurs, however, the parent provides most of the verbal conversation while initially interpreting the child's many nonverbal behaviors as conversational turns. According to this model, as the child's language and turn-taking skills improve, the parent begins to require more participation from the child.

Rondal (1985) proposed that motherese is used as part of an implicit language-teaching model, based on the fact that parental speech complexity is consistently maintained at a level slightly higher than that of the children (Gelman & Shatz, 1977; Newport, 1976; Newport et al., 1977; Snow, 1979). Although a few linguistic elements such as the use of tense markers and copulas are not changed when motherese is employed (Smolak & Weinraub, 1983), this complexity level relationship is illustrated in such aspects as Mean Length of Utterance (MLU). In fact, Rondal (1985) reported that mothers' MLUs appeared to be positively correlated (in a linear way) with their children's MLUs from the time the children were about 18 months old until they reached approximately 10 years of age; the mothers' MLUs also consistently exceeded their children's MLUs by approximately

one to three morphemes/words over this time period (see Rondal, 1985 for a review).

Cross (1977) postulated that it is the child's receptive language level that primarily determines the parent's language modifications. In a study of 16 young children (19 to 32 months) and their mothers, Rondal (1985) found that 32 of 62 measured indexes of maternal speech were significantly correlated with both the productive and receptive variables in the children's speech; however, the highest correlations were found between several maternal indexes and the children's receptive language levels. In a 1978 study of mentally-impaired children, Rondal determined that the child's verbal production level is also an integral determinant in parental speech modification.

Bootstrapping

Since caregivers' child-directed speech is adjusted in the manner described above--consciously or not--young children are constantly introduced to new linguistic information, but are presumably not overwhelmed with more than they can comprehend at a given time. It has been proposed that young children are able to use this input to facilitate the early stages of language learning through the process of *bootstrapping*--using pre-existing knowledge about language to decipher new linguistic information (Gleitman et al., 1988; Hirsh-Pasek et al., 1987). Children are able to begin identifying words, phrases, and clauses that they hear in their

caregivers' speech by relying on semantic, prosodic, and/or syntactic cues that co-occur with these units (Bedore & Leonard, 1995).

Semantic and Syntactic Bootstrapping

The notions of semantic and syntactic bootstrapping refer to the young language-learner's use of semantic and syntactic information gleaned from typical motherese-type utterances that she is exposed to in her environment in order to decode meaning and grammar. Children are able to extract this information from motherese more easily than they could from adult speech because child-directed speech generally includes the use of many semantically transparent words in short, simple sentences that refer to current, ongoing events. Furthermore, caregivers may use restricted identifiable semantic classes for grammatical elements (e.g., people and objects for nouns, actions for verbs, attributes for adjectives) in predictable syntactic frames, which helps to narrow the field of possible interpretations (Gleitman, 1990; Grimshaw, 1981; Landau & Gleitman, 1985; MacNamara, 1982).

Prosodic Bootstrapping

In addition to semantic and syntactic cues, prosodic cues are also extremely useful to the young language learner, particularly for the task of separating linguistic units within continuous speech. Therefore, in addition to the two aforementioned types of bootstrapping, children may also employ prosodic bootstrapping by attending to cues such as changes in pitch, pauses, and within-word vowel durations

in caregivers' speech to identify boundaries of words, sentences, and other grammatical units (Garnica, 1977; Gleitman et al., 1988; Morgan, 1986). These changes often assist the listener in delimiting important linguistic boundaries in motherese--particularly the ends of phrases and clauses. Further, prosodic cues can facilitate detection of particular words when they occur at these syntactic boundaries (Bedore & Leonard, 1995).

The current investigation is based on research regarding mothers' use of within-word vowel lengthening as a means of drawing children's attention to particular linguistic units (Bernstein Ratner, 1984, 1985, 1986; Morgan, 1986; Swanson & Leonard, 1994; Swanson et al., 1992). In several of these studies, the researchers attempted to determine whether the degree of within-word vowel durations in mother-to-child speech is dependent upon word category--e.g., content words or function words (Bernstein Ratner, 1985, 1986; Morgan, 1986; Swanson et al., 1992), and/or utterance position of the words--e.g., non-clause-final (initial and medial) or clause-final position (Bernstein Ratner, 1986; Morgan, 1986; Swanson & Leonard, 1994; Swanson et al., 1992).

Vowel Duration and Utterance Position

Content Words

Bernstein Ratner (1984) analyzed vowel duration in non-specified-position content words that were present in mothers' spontaneous utterances directed to

children who were at one of three language levels--pre-verbal, holophrastic, or combinatorial (MLUs of 2.00 to 3.50 morphemes)--as well as to an adult. Content-word vowels in speech to both holophrastic and combinatorial children appeared to be generally shorter than those addressed to adults; content-word vowel duration in speech to pre-verbal children, however, appeared to be similar to speech used with adults. In fact, only one of the nine mothers in the study used longer vowel durations in child-directed speech than in adult-directed speech. Further, in a 1985 study of mothers paired with their young children whose MLUs ranged from 2.00 to 3.00 morphemes, Bernstein Ratner found similar results: vowel duration in content words appeared to be longer when compared to function words, but again there were no statistically significant differences between adult-to-child vowel duration patterns and adult-to-adult patterns. However, in a third study (Bernstein Ratner, 1986) that included children at the same three previously examined stages of early language development (1984), content-word vowels in clause-final position of spontaneous mother-to-child utterances were found to be significantly longer to pre-verbal children than those found in spontaneous mother-to-adult utterances; however, content-word vowel durations were only slightly lengthened in speech to children at holophrastic and combinatorial language levels. Bernstein Ratner suggested that there appeared to be an inverse linear relationship between clause-final vowel lengthening and the conversational addressee's age and language ability level (1986). The duration of clause-medial vowels remained relatively unchanged in speech

addressed to all groups of children and adults in the study. Morgan (1986) reported that content words in both phrase-final and non-phrase-final positions were lengthened in mothers' read speech to children (2- and 4-year-olds) versus their read speech to adults, and that vowel duration was significantly longer in phrase-final position than in non-phrase-final position in both child-directed and adult-directed speech. Swanson et al. (1992) examined and compared vowel durations within content words and function words during the read speech of fifteen mothers to their young children (aged 1;6 to 2;4, with an MLU range of 1.00 to 1.50 morphemes) and to adults. They subsequently reported that content-word vowel durations in both phrase-final and phrase-nonfinal positions were longer in read speech to children than in the same read speech to adults. Furthermore, vowel durations were significantly lengthened in phrase-final position to both groups of addressees, but were particularly exaggerated in child-directed speech.

Function Words

Bernstein Ratner's results from her earlier work (1984) regarding function-word vowel duration in spontaneous speech to children versus adults revealed some inconsistencies. Mothers' function-word vowel durations were slightly longer in utterances to pre-verbal children than to adults; durations to holophrastic children were of similar length to those in adult-directed speech; and finally, vowel durations were shorter in speech to combinatorial children than to adults. In her 1985

investigation of vowel modification in motherese, Bernstein Ratner again concluded that function-word vowel durations in spontaneous speech to young children did not differ significantly from function-word vowel durations in spontaneous speech to adults. However, utterance position of the function words examined in both of these studies was not specified, and consequently, vowel duration differences in these words were not compared across positions. Morgan (1986) examined and compared vowel duration in only a few (number not stated) function words in mother-to child and mother-to-adult read speech and also concluded that there were no apparent differences. Swanson et al. (1992) found that function-word vowel durations were lengthened in child-directed read speech as opposed to adult-directed read speech, but the changes were so slight that they might actually be undetectable to the listener (only phrase-medial function words were analyzed). In a related investigation focusing solely on function words, Swanson and Leonard (1994) concluded that function-word vowel durations in the phrase-final position of utterances following both statements and questions were significantly longer in read speech to children than in read speech to adults; function-word vowel durations in initial and medial positions in child-directed read speech were only slightly longer on average than in adult-directed read speech.

In summary, conclusions from the most current research in the area of vowel characteristic examination suggest that content-word vowel durations in mothers' speech to both adults and children are generally longer than function-word vowel

durations, particularly when they occur in phrase- and clause-final position. Further, this lengthening of final-position content-word vowel durations is often exaggerated in speech directed toward children. Similarly, function words that occur in phrase-final position are lengthened more than those in other positions in mothers' speech to both adults and children, but are exaggerated in child-directed speech, albeit to a lesser degree than are content words. In other words, the absolute durations of content words are lengthened more than function words in all positions in speech to children, whereas the relative durations of vowels within phrase-final function words are lengthened (in comparison to the same within-word vowels in non-phrase-final-position words).

Purpose of the Study

Further investigation in this area of language learning appears to be warranted. If function words are indeed lengthened more in clause-final position than in non-clause-final (initial and medial) positions by speakers of motherese, the next logical question appears to be: How often do function words occur in the final position of clauses in comparison to non-clause-final positions in motherese? Even though function words in final position are highlighted by longer durations than those in other positions, a low occurrence rate of final-position function words might be an integral factor in their slow acquisition by young language learners. The purpose of this study, then, is to examine the occurrence distribution of function words in clause-initial, clause-medial, and clause-final positions in mothers' spontaneous

speech to their young children. The primary hypothesis is that mothers will produce a significantly greater number of function words in non-clause-final positions (most frequently in clause-medial position, followed by clause-initial position) than in the final position of clauses when employing motherese to speak to their young children. Previously, Morgan (as cited in Morgan, Shi, and Allopenna, 1996, p. 279) examined the types of words (content words or function words) that occurred in the initial and final positions of utterances in parental speech to three children--Adam, Eve, and Sarah--and found that 64 % of utterances began with a function word, whereas 34 % ended with a function word. Similar results in the present investigation (i.e., low occurrence of final-position function words in maternal speech), would support the fact that English-speaking children do acquire function words, but that the acquisition process occurs over a fairly long period of time (Brown & Bellugi, 1964; Gleitman et al., 1988).

Another purpose of this study is to determine how often clause-final function words occurred in three types of child-directed utterances: 1) comments/statements, 2) questions, and 3) responses to one's own questions. Thus, a second hypothesis of the current investigation is that mothers will use clause-final function words most often in comments/statements and questions directed towards children, but that clause-final function words will also occur in an utterance type more atypical of adult speech--responses to one's own questions (e.g., *Did it turn? It did.*). Several researchers have examined the relationship between motherese and the growth of a

child's auxiliary verb system. For example, Nelson, Denninger, Kaplan, and Bonvillian (1979) found that the frequency of occurrence of auxiliary verbs in mothers' speech--regardless of word position--was positively correlated with later growth in children's auxiliary use; Newport et al. (1977) determined that the frequency of maternal *yes-no* questions (in which auxiliary words are presented in utterance-initial position) was highly correlated with auxiliary growth; and Hoff-Ginsberg (1985) found that the frequency of *wh*-questions in mothers' speech was a meaningful predictor of children's later auxiliary growth. However, Shatz, Hoff-Ginsberg, and MacIver (1989) suggest that the implications of these studies remain unclear, partly due to the fact that, although the nature as well as the frequency of input appear to affect auxiliary acquisition, the influences of particular structural properties of utterances or the nature of the input has not been fully addressed. The present study will examine specific types of maternal utterances which contain clause-final function words. Of particular interest is the occurrence of clause-final function words in responses to one's own questions. The presence of such utterances in motherese may indicate that mothers sometimes prompt themselves--primarily through the use of auxiliary-fronted questions--to provide answers which contain utterance-final function words, thereby providing their children with increased exposure to function words in a lengthened state. The projected results of this study could add strength to the previously stated theory (Hoff-Ginsberg, 1985; Nelson et al., 1979; Newport et al., 1977) that a correlation exists between an

increased use of child-directed questions that contain auxiliaries and auxiliary growth in young children.

Research Questions

1. What is the frequency distribution of function words across three clause positions--initial, medial, and final--in mothers' spontaneous speech to their young children?

2. What is the frequency distribution of clause-final function words in three utterance types--comments/statements, questions, and responses to one's own questions--in mothers' spontaneous speech to their young children?

Chapter II

METHOD

Subjects

Twelve mothers of young children (six males and six females), randomly chosen from a larger group who participated in a previous study (Swanson & Leonard, 1994), served as subjects for this investigation. For the original study, audiotapes and videotapes were made of 22 individual interactions involving mother-child dyads. All dyads were members of middle- to upper-middle class families living in Tuscaloosa, Alabama at the time of data collection. Directors of local childcare centers provided the names of potential subjects to the original researchers. A brief written description of the study was then sent to the families of each of these potential subjects. Investigators provided further detail about the study (in person or over the phone) to parents (mother or father of each child) who expressed an interest in having their children participate in the study.

The children ranged from 17 to 26 months of age ($M = 21$ months). Each of the 13 male and 9 female children was either an only child or a youngest sibling to ensure that a more exaggerated infant-oriented form of motherese was not being used

in the household. All of the children were approaching or had just entered the expressive language stage of two-word combinations. The children each had an MLU of 1.00 to 1.50 morphemes and a productive vocabulary of approximately 75 to 275 words. The children's utterances were composed almost exclusively of content words. Thirteen of the children passed a hearing screening consisting of 20 dB HL tones presented at 500, 1000, 2000, and 4000 Hz (ANSI, 1989); five of the children passed the screening with tones 20 to 30 dB HL; the remaining four children responded to speech awareness testing at 20 dB HL and demonstrated age-appropriate behavioral responses to sounds. Each child scored within 6 months of his or her chronological age level on the Cognitive Area of the Lexington Developmental Scales (Irwin et al., 1973). Parents reported that all of the children had achieved each of the major milestones for motor and social development on a normally-developing schedule. Standard American English was spoken by all parents and siblings of the children.

The subject-selection process for the current investigation proceeded as follows: numbers were assigned to the 22 original subjects (mothers of 13 males and 9 females), after which the project director randomly selected six of the 13 mothers of male children as well as six of the 9 mothers of female children. Next, each mother's Mean Length of Utterance (MLU) was calculated (see *Coding Procedure* subsection for detailed description) to help ensure that the chosen subjects did indeed use motherese during the 12 observed mother-child dyad interactions from which the

speech sample transcripts were obtained. The resulting MLU range for the 12 mothers was found to be 2.65 to 5.35 morphemes, with a mean MLU of 3.93 morphemes. These findings, in comparison to the MLU range of the mothers' children (1.00 to 1.50 morphemes), are in keeping with the results of Retherford, Schwartz, and Chapman (as cited in Rondal, 1985) who observed mother-child interactions and found that a group of mothers who had young children ($M = 21$ months) had MLUs of approximately 4.24 morphemes, while the children averaged 1.32 morphemes per utterance.

Language Sampling Procedure

The 22 mother-child dyad interactions were observed and recorded as part of the preliminary subject selection procedure for the original study (Swanson & Leonard, 1994). The following recording procedure was employed. Each mother-child language sample was collected during a one-session visit to the child's home. A standard set of toys, objects, and books was provided during each session. Each mother-child dyad was encouraged to play with the toys in any order for as long as the child desired each toy. The dyads were allowed to play with the children's own toys if they became bored with those of the researchers or if the mother or child indicated a strong preference to do so. All of the mothers were encouraged to interact naturally with their children and to attempt to ask a typical number of questions. They were, however, asked to repeat their children's utterances when possible, to augment the researchers' interpretation efforts. Each mother was told

that the purpose of this play period was to allow the researchers an opportunity to determine whether or not her child's language level was appropriate for him or her to serve as a subject in the study. A research assistant audiotaped and videotaped each sample while the project director recorded contextual notes and orthographically transcribed all of the children's utterances as well as most of the mothers' utterances. Each sample was audiotaped in stereo with a Sony cassette deck (model TC-RX70ES) and Sony ECM-155 electret microphones. The samples were videorecorded using a Panasonic video camera and recorder (model AG-180) in order to facilitate interpretation of unintelligible child utterances. Recording was discontinued when at least 100 nonimitative child utterances had been obtained. Each session, therefore, lasted approximately 1 to 1½ hours. The tapes were later analyzed to determine each child's Mean Length of Utterance (MLU). This measure was consequently used as one of the eligibility criteria in the subject selection process for this original investigation.

Transcription of Mother-to-Child Utterances

For the purposes of the present study, all of the mothers' utterances--those directed to the child as well as to other adults or siblings--included in the 12 randomly-selected language samples, as well as occasional child utterances and contextual notes, were orthographically transcribed from the audiotapes by two graduate research assistants. The mothers' speech was also segmented into individual utterances based on intonational contours and pauses. The orthographic

transcription and utterance segmentation of these samples were then verified by the project director, who was the original collector of the data; they were verified again later by the current PI.

Transcript Analysis

Experimental Words

The following set of 11 function words was identified and chosen for the present investigation: prepositions--*in* and *on*; auxiliary verbs--*is*, *are*, *do*, and *did* (*is* and *are* also fall into the category of copulas); and modals (a subset of auxiliary verbs)--*can*, *could*, *should*, *will*, and *would*. The word selection process was based on several factors, including 1) distribution of words according to function-word type, in that words were chosen from several categories (e.g., prepositions) in an attempt to more fully represent the class of function words, 2) clause position, in that only words that can occur in all three clause positions (i.e., initial, medial, and final) were selected so that rates of occurrence could be compared, and 3) level of complexity according to a developmental hierarchy. This third factor requires further elaboration: parental speech complexity is consistently maintained at a level slightly higher than that of their children (Gelman & Shatz, 1977; Newport, 1976; Newport et al., 1977; Snow, 1979). Therefore, function words that are typically beginning to emerge in the expressive language of children at language levels slightly higher than those of the mothers' children (whose MLU range = 1.00 to

1.50 morphemes) were chosen. For example, according to a literature review by Miller (1981), copulas (e.g., *is* and *are*), as well as the prepositions *in* and *on*, begin to emerge in the speech of children with an MLU range of 2.00 to 2.49; children at the 2.50 to 2.99 MLU range level begin to use auxiliary verbs (e.g., *can* and *will*); the use of present tense modals (e.g., *could* and *should*) begins to be observed in children with MLUs of 3.00 to 3.74.

Coding Procedure

The Systematic Analysis of Language Transcripts (SALT) computer software program (Miller & Chapman, 1985b) was used to examine and analyze the transcriptions of the mothers' child-directed speech. First, the transcripts were orthographically entered into computer files by three research assistants new to the project, using exact intended words (e.g., *little pumpkin* for *lil punkin*) and specified SALT spelling conventions (see Appendix A) to ensure consistency within each transcript as well as among transcripts. The transcripts were then coded according to SALT guidelines to determine each mother's Mean Length of Utterance (MLU), as part of the subject selection process for this study. After it was determined that the original 12 randomly chosen transcripts met the subject selection criterion (i.e., the use of motherese--determined primarily by MLU), they were segmented into clauses and then further coded in two distinct ways (for function words and utterance types) so that they could be analyzed by SALT in an attempt to address the research

questions of this investigation. All three of the coding procedures (MLU, function-word, and utterance-type) will be described.

MLU Coding

In order for Mean Length of Utterance (MLU) to be calculated, 100 child-directed utterances in each of the 12 randomly selected speech samples (beginning with the 51st child-directed utterance in each transcript) were coded according to SALT MLU coding guidelines to indicate the presence of final bound morphemes and multiple free morphemes within words (Miller & Chapman, 1985a). For example, *Dad's* was entered as *Dad/z* to indicate the presence of a possessive bound morpheme at the end of the word; and *bookcase* was entered as *book/case* to mark the two free morphemes within that compound word. Brown's MLU guidelines and conventions (1973) for identifying and segmenting morphemes were utilized with slight modifications for adult speech as illustrated in Miller, 1981 (see Appendix B). The mothers' MLUs were calculated in morphemes and were compared with the MLUs of the children in order to aid in the determination that motherese was used during the speech-sampling interactions.

Function-Word Coding

In order for the experimental function words to be coded according to clause position, the 12 chosen transcripts were then segmented into clauses based on the identification of clause boundaries by conventions of grammar (Perrin, 1987) as well

as by the following perceptual changes in the prosodic structure of the speech wave: extended pauses (Cooper & Paccia-Cooper, 1980; Martin, 1970), lengthened final-position syllables (Cooper & Paccia-Cooper, 1980; Klatt, 1975, 1976), rise or fall in fundamental frequency (Garnica, 1977; Stern, Spieker, Barnett, & MacKain, 1983), and/or stress markings (Garnica, 1977). For example, the following utterance was segmented into two clauses: "I'll move the box and you can let your car go." → "I'll move the box." + "And you can let your car go."³ Next, all of the child-directed utterances in each of the 12 transcripts were coded for the presence of the 11 experimental function words, according to clause position. A distinct code was used for each of the words to indicate the clause position in which it occurred--clause-initial, clause-medial, or clause-final. For example, the code [*i-should*] was entered directly after the word *should* when it occurred in the initial position of a clause (e.g., "Should[*i-should*] we get it?"), while the code [*m-will*] was entered next to the word *will* when it occurred in the medial position of a clause (e.g., "You will[*m-will*] like it."), and the code [*f-is*] immediately followed the word *is* when it occurred in a clause-final position (e.g., "It really is[*f-is*].").

³ Introducers (e.g., *Look*, that's big!), and tags (e.g., That's big, *huh?*) were also segmented from main clauses; and some child-directed utterances were clause fragments (e.g., one word utterances).

Utterance-Type Coding

Finally, those utterances that included clause-final experimental function words were further coded to indicate utterance type. Each of these utterances was classified as one of the following three utterance types (each followed by its respective code): comment/statement--[C], question--[Q], and response to one's own question--[R] (e.g., *Is it in[f-in][Q]? It is[f-is][R].*). An utterance containing a clause-final-position function word was labeled as a *response to one's own question* if it fell into one of the following three categories: 1) repeated question--e.g., *Do you think we should? Do you think we should?*; 2) rephrased question--e.g., *You know what that is? Tell Mommy what that is.*; and 3) question-answer pair--e.g., *Do you want to go upstairs? I don't think you do.*

Continuous read speech (present toward the end of some of the interactions when mothers were asked to read books to their children), utterances containing unintelligible or inaudible portions, interrupted or unfinished utterances, and utterances to persons other than the child were excluded from all analyses. See Appendix C for a sample coded transcript.

Reliability

The reliability of three aspects of the transcriptions was evaluated: 1) orthography, 2) segmentation--for utterances as well as clauses, and 3) coding--for MLU, function words, and utterance types. To assess intrajudge reliability of the

orthography, utterance segmentation, and MLU coding, the PI re-examined and re-transcribed the first 100 complete and intelligible mother-to-child utterances in each of five randomly selected language samples (from the 12 samples used in the current study). She did the same for clause segmentation, function-word codes, and utterance-type codes in the first 300 complete and intelligible mother-to-child clauses in each of five randomly selected language samples. The PI subsequently compared her results item-by-item with those that she verified originally and computed the intrajudge reliability scores. To assess interjudge reliability of these three areas, a speech-language pathologist, who was completing her clinical fellowship, independently transcribed, segmented into utterances, and coded for MLU, the first 100 complete and intelligible mother-to-child utterances in five randomly chosen language samples (from the 12 samples used in the current study). She then transcribed, segmented into clauses, and coded for experimental function words and utterance types, the first 300 complete and intelligible mother-to-child clauses in five randomly selected language samples. The PI then compared the interjudge participant's results item-by-item with her own original transcriptions and computed the interjudge reliability scores.

A specified training procedure was utilized to instruct the interjudge participant about appropriate and consistent techniques for orthographic transcription, segmentation (utterance and clause), and coding (MLU, function-word, and utterance-type) before formal reliability assessment began: guidelines were written

by the PI for each of the areas to be evaluated (see Appendix B for an example).

These guidelines were reviewed with the interjudge participant, at which time questions regarding segmentation and coding were addressed. After this instruction, the interjudge participant practiced segmenting and coding portions from transcripts (20 utterances at a time) that had not been selected for formal reliability assessment, until the following minimal levels of agreement were achieved: 90% point-by-point agreement for orthographic transcription and all three types of coding (MLU, function-word, and utterance-type); and 85 % agreement for both types of segmentation (utterance and clause). After training was completed, the interjudge participant formally evaluated the five previously selected samples. As previously mentioned, the PI then compared the interjudge's results with her own to determine interjudge reliability scores.

Chapter III

RESULTS

Reliability

Following clause segmentation and coding (function-word and utterance-type) of the 12 chosen transcripts in their entirety, intra- and interjudge reliability measures were performed by the PI and an interjudge participant. Agreement scores for all areas of reliability were calculated by comparing results point-by-point with the orthography, segmentation and coding present in the PI's original transcriptions.⁴

Intrajudge Reliability

Orthography, Utterance Segmentation, and MLU Coding

The intrajudge reliability assessment of 100 utterances in each of the five randomly selected transcripts revealed the following overall means and ranges of agreement: orthography-- $M = 99\%$, range = 98% to 99%; utterance segmentation--

⁴ Specified minimum accepted levels of agreement (satisfied by mean agreement across samples for each area) can be found at the end of the Method section.

$M = 96\%$, range = 93% to 98%; and MLU coding-- $M = 96\%$, range = 92% to 100%.

Clause Segmentation and Function-Word/Utterance-Type Coding

The intrajudge assessment of 300 clauses in each of five randomly selected transcripts produced the following agreement scores: clause segmentation-- $M = 98\%$, with a range of 97% to 99%; function-word codes and utterance-type codes-- $M = 98\%$, with a range of 92% to 100%.

Interjudge Reliability

Orthography, Utterance Segmentation, and MLU Coding

Interjudge reliability for these three areas in 100 utterances of five randomly selected transcripts produced the following overall means and ranges of agreement: orthography-- $M = 97\%$, with a range of 94% to 99%; utterance segmentation-- $M = 93\%$, with a range of 90% to 96%; and MLU coding-- $M = 94\%$, with a range of 91% to 98%.

Clause Segmentation and Function-Word/Utterance-Type Coding

Interjudge reliability scores for these areas were as follows: clause segmentation-- $M = 97\%$, with a range of 96% to 98%; function-word codes and utterance-type codes-- $M = 92\%$, with a range of 89% to 94%.⁵

⁵ No individual inter- or intra-reliability score fell below the 80% agreement level which had been specified as unacceptable for any area. Differences of agreement that occurred above the set levels were retained as acceptable.

Distribution Tables and Raw Data

A distribution table was generated from raw data for each of the 12 speech samples to report the frequency distribution of the 11 function-word codes individually in each of the clause positions (initial, medial, and final). This table also listed the specific words that were coded with each function-word code, and reported each of the word's occurrence rates according to clause position. For example, the code *[m-is]* may have occurred three times--once in the uncontracted word *is*, and twice in the contraction *it's*.⁶ These distribution tables also listed the specific clause-final words that were coded with each of the three utterance-type codes (see Appendix D for a sample expanded distribution table).

The 12 distribution tables were compiled into four raw data tables (found in Appendix E) which list individual occurrence rates for each subject in the following areas: Table E1--function-word categories (i.e., *prepositions*, *auxiliaries*, *modals*), Table E2--clause positions (i.e., *clause-initial*, *clause-medial*, *clause-final*), Table E3--categories and positions (e.g., *prepositions-initial*, *modals-final*), and Table E4--utterance types (i.e., *comments/statements*, *questions*, *responses*).

⁶ *In* was also coded when it occurred in *into* or *inside*, *on* was coded in *onto*, and *do* was coded in *doing*, but experimental function words in these forms were not used in the statistical analysis.

Statistical Analysis

Statistical analyses were performed using SPSS for Windows statistical analysis software (SPSS, 1997). Analysis of the function-word occurrence data will initially be discussed in response to the first research question of the current investigation: "What is the frequency distribution of function words across three clause positions--initial, medial, and final--in mothers' spontaneous speech to their young children?", followed by a discussion of the analysis of utterance-type data addressing the second research question of this study: "What is the frequency distribution of clause-final function words in three utterance types--comments/statements, questions, and responses to one's own questions--in mothers' spontaneous speech to their young children?"

Experimental-Word Data

Normality Testing

Experimental word distribution data were log transformed to more closely approximate a normal distribution. Analysis of the data, using a combination of the Shapiro-Wilk Test of Normality (SPSS, 1997) and the graphical method of normal quantile plots, revealed that the log-transformed data were normally distributed. Subsequently, a parametric analysis of variance (ANOVA) was performed using the data which had been log-transformed from the original raw data.

Summary Statistics

Means and standard deviations per sample, calculated from raw data, for each of the nine variables (three sets of experimental function words in each of three clause positions) are presented in Table 1. These statistics show that the most prevalent function-word category represented in the mothers' speech overall was auxiliaries in clause-medial position ($M = 70.75$), while the least frequently occurring words were modals in clause-final position ($M = 0.58$). Table 1 also lists the means and standard deviations for each of the category and position variables separately. These statistics reveal that the function words belonging to the auxiliary category occurred the most frequently overall ($M = 114.42$), followed by prepositions ($M = 59.42$), and finally, modals ($M = 32.25$). The experimental words, as a group, occurred most frequently in clause-medial position ($M = 122.92$), then in clause-initial position ($M = 61.33$), and least frequently in clause-final position ($M = 22.33$). In addition, Table 2 lists means and standard deviations per sample, calculated from raw data, for each of the 11 experimental function words according to clause position.⁷ The words that occurred most frequently in each clause position were: clause-initial-- *can* (21.92), *is* (17.00), *do* ($M = 9.08$), *are* ($M = 6.08$), and

⁷ Table 2 shows summary statistics for all codes in uncontracted words. A similar table, created from raw data including contracted words and all other coded words (e.g., *into*, *doing*), is presented in Appendix F.

Table 1
Means and Standard Deviations of Category and Clause-Position Data

Category — clause position	<i>M</i>	<i>SD</i>
Prepositions — initial	1.83	1.40
Prepositions — medial	44.75	23.92
Prepositions — final	12.50	7.97
Auxiliaries — initial	35.33	19.40
Auxiliaries — medial	70.75	41.28
Auxiliaries — final	8.33	5.00
Modals — initial	24.25	22.32
Modals — medial	7.42	7.53
Modals — final	0.58	1.24
Prepositions — all positions	59.42	30.28
Auxiliaries — all positions	114.42	35.83
Modals — all positions	32.25	26.62
All categories — initial	61.33	30.13
All categories — medial	122.92	59.78
All categories — final	22.33	7.80

Note. *N* = 12. Means and standard deviations calculated with raw data.
 Prepositions = *in* and *on*; auxiliaries = *is*, *are*, *do*, and *did*; and modals = *can*,
could, *should*, *will*, and *would*.

Table 2
Means and Standard Deviations for Function Words According to Clause Position

Function word	Clause-initial		Clause-medial		Clause-final	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
In	1.08	1.00	26.50	12.89	2.92	3.32
On	0.75	0.62	18.25	12.89	9.58	7.40
Is	17.00	10.90	44.83	38.74	4.92	3.78
Are	6.08	4.06	13.67	9.67	1.42	1.38
Do	9.08	7.15	10.75	6.78	1.67	2.61
Did	3.17	3.54	2.42	2.64	0.33	0.49
Can	21.92	21.09	5.42	5.47	0.50	1.24
Could	0.25	0.45	0.67	1.07	0.00	0.00
Should	0.08	0.29	0.08	0.29	0.08	0.29
Would	0.50	0.90	0.25	0.45	0.00	0.00
Will	1.50	2.68	1.00	1.71	0.00	0.00

Note. $N = 12$. Values calculated from raw data.

did ($M = 3.17$); clause-medial--*is* ($M = 44.83$), *in* ($M = 26.50$), *on* ($M = 18.25$), *are* ($M = 13.67$), and *do* ($M = 10.75$); clause-final--*on* ($M = 9.58$), *is* ($M = 4.92$), *in* ($M = 2.92$), *do* ($M = 1.67$), and *are* ($M = 1.42$).

Variance Testing

Mauchly's Test of Sphericity (SPSS, 1997) revealed that sphericity could be assumed for this set of log-transformed data; therefore no further adjustments were performed on the data. A 3-by-3 two-way ANOVA for repeated measures was performed using an alpha confidence level of .05 as the criterion for significance. The repeated measures ANOVA was used to evaluate the variance and significance of the occurrence distribution of the 11 experimental function words (divided into the three subcategories of prepositions, auxiliary verbs, and modals) within the 12 subjects' speech samples. The ANOVA was calculated with two within-subjects factors which each contained three levels: 1) function-word category (prepositions, auxiliary verbs, and modals); and 2) clause position (initial, medial, and final). Only function-word codes that occurred in uncontracted words were included in the statistical analysis (e.g., *is*[*m-is*] was included whereas *it's*[*m-is*] was not).

Results of the repeated measures ANOVA for the function-word-category and clause-position data, presented in Table 3, yielded statistically significant findings for the effect of category: $F(2,22) = 56.84$, $p < .001$, as well as for the effect of position: $F(2,22) = 59.91$, $p < .001$. In addition, a significant interaction was

Table 3
3-by-3 Two-Way Repeated Measures ANOVA of Category and Clause-Position Effects

Source	<i>df</i>	<i>F</i>
Category	2	56.84*
Error	22	(0.40)
Position	2	59.91*
Error	22	(0.41)
Category/position	4	34.78*
Error	44	(0.45)

Note. Values calculated with log-transformed data. Values enclosed in parentheses represent mean square errors.

* $p < .001$

found between the function-word-category and clause-position factors: $F(4,44) = 34.78, p < .001$. Figure 1 provides a graphic representation of these results.

Utterance-Type Data

Normality Testing

As in the case of the experimental word data, the utterance-type data was log transformed to produce a more normal distribution. After analysis of this data by the Shapiro-Wilk Test of Normality (SPSS, 1997) and normal quantile graphic plots, a parametric repeated measures ANOVA was chosen as the preferred method to analyze the variance and significance of this log-transformed data.

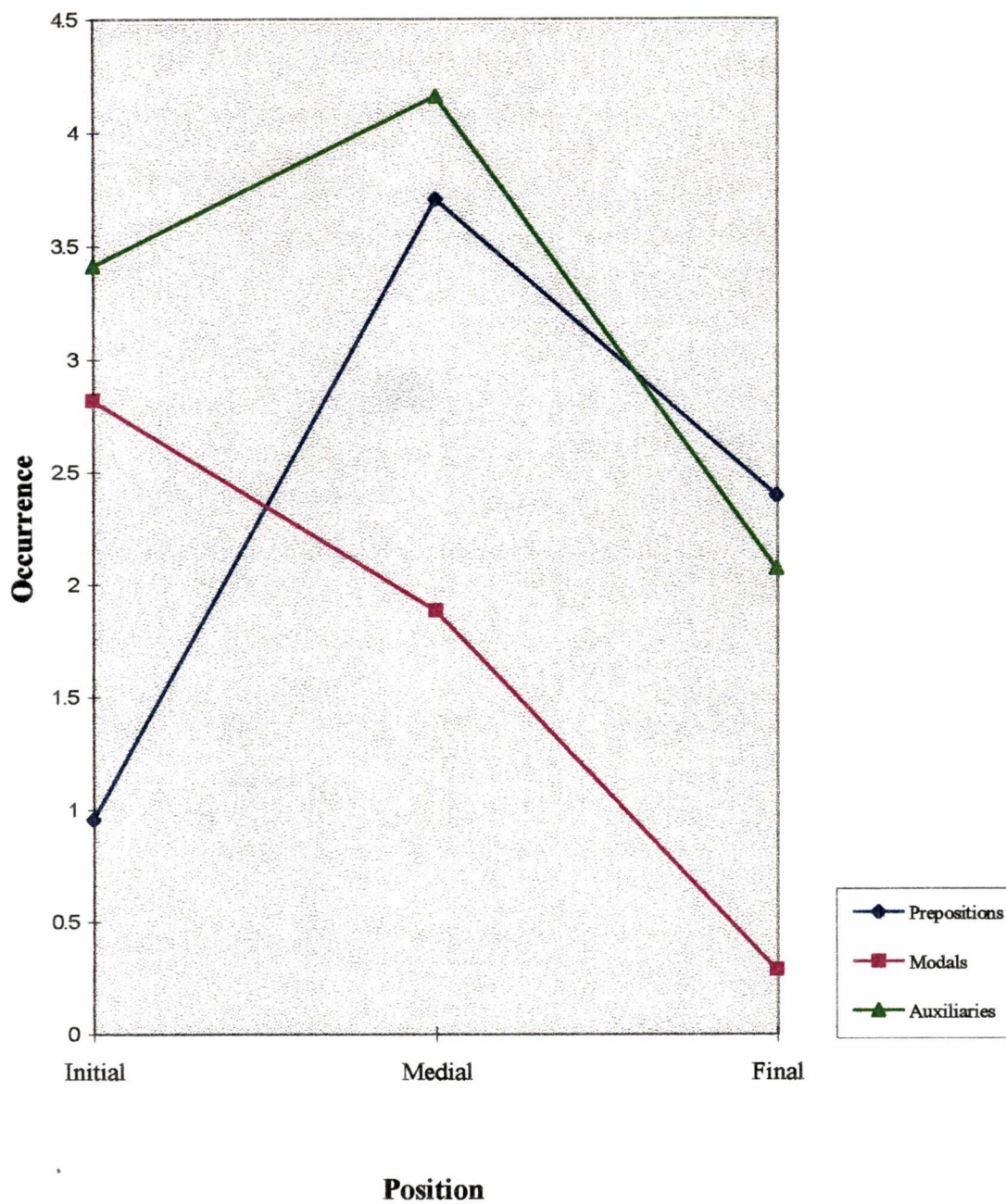


Figure 1. Estimated marginal means of function-word-category and clause-position data.

Summary Statistics

Using the raw data, means and standard deviations per sample for the occurrence of each type of utterance containing clause-final function-word codes (i.e., comments/statements, questions, responses) were calculated. These statistics, presented in Table 4, reveal that the most prevalent utterance type containing clause-final experimental function words in the examined transcripts was comments/statements ($M = 10.67$), followed by responses to one's own questions ($M = 5.92$), and finally, questions ($M = 4.83$). In addition, Table 5 lists means and standard deviations per sample, calculated from raw data, for each of the 11 experimental function words in clause-final position, according to utterance type.

Table 4
Means and Standard Deviations of Utterance-Type Data

Utterance type	<i>M</i>	<i>SD</i>
Comments/statements	10.67	7.46
Questions	4.83	3.24
Responses	5.92	3.55

Note. Values calculated from raw data.

Table 5
Means and Standard Deviations for Clause-Final Function Words According to Utterance Type

Function word	Comments/ statements		Questions		Responses	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
In	1.83	3.01	0.83	1.19	0.25	0.62
On	6.42	6.24	1.83	2.69	1.33	1.07
Is	1.17	1.40	0.67	1.30	3.08	2.87
Are	0.33	0.65	0.42	0.67	0.67	1.15
Do	0.17	0.39	1.00	1.86	0.50	0.80
Did	0.17	0.39	0.08	0.29	0.08	0.29
Can	0.50	1.24	0.00	0.00	0.00	0.00
Could	0.00	0.00	0.00	0.00	0.00	0.00
Should	0.08	0.29	0.00	0.00	0.00	0.00
Would	0.00	0.00	0.00	0.00	0.00	0.00
Will	0.00	0.00	0.00	0.00	0.00	0.00

Note. $N = 12$. Values calculated from raw data.

The clause-final-position words that occurred most frequently in each utterance type were: comments/statements--*on* ($M = 6.42$), *in* ($M = 1.83$), *is* ($M = 1.17$), *can* ($M = 0.50$), and *are* ($M = 0.33$); questions--*on* ($M = 1.83$), *do* ($M = 1.00$), *in* ($M = 0.83$), *is* ($M = 0.67$), and *are* ($M = 0.42$); responses--*is* ($M = 3.08$), *on* ($M = 1.33$), *are* ($M = 0.67$), *do* ($M = 0.50$), and *in* ($M = 0.25$).

Variance Testing

It was revealed through the use of the Mauchly's Test of Sphericity (SPSS, 1997) that sphericity could be assumed. A one-way repeated measures parametric ANOVA was completed for this data set to evaluate the variance and significance of utterance types containing clause-final function words. The .05 alpha level of confidence was used as the significance criterion for this analysis. The ANOVA was calculated with one within-subjects factor--utterance type, which had three levels--comments/statements, questions, and responses to one's own questions.

Results of the repeated measures ANOVA for this data set, presented in Table 6, did not yield significant findings for the effect of utterance type: $F(2,22) = 2.98$, $p = .072$. Figure 2 illustrates these results.

Summary

A 3-by-3 two-way repeated measures ANOVA yielded significant findings ($p < .001$) for the effects of function-word category and clause position, as well as for an interaction between these two variables. Summary statistics revealed that the

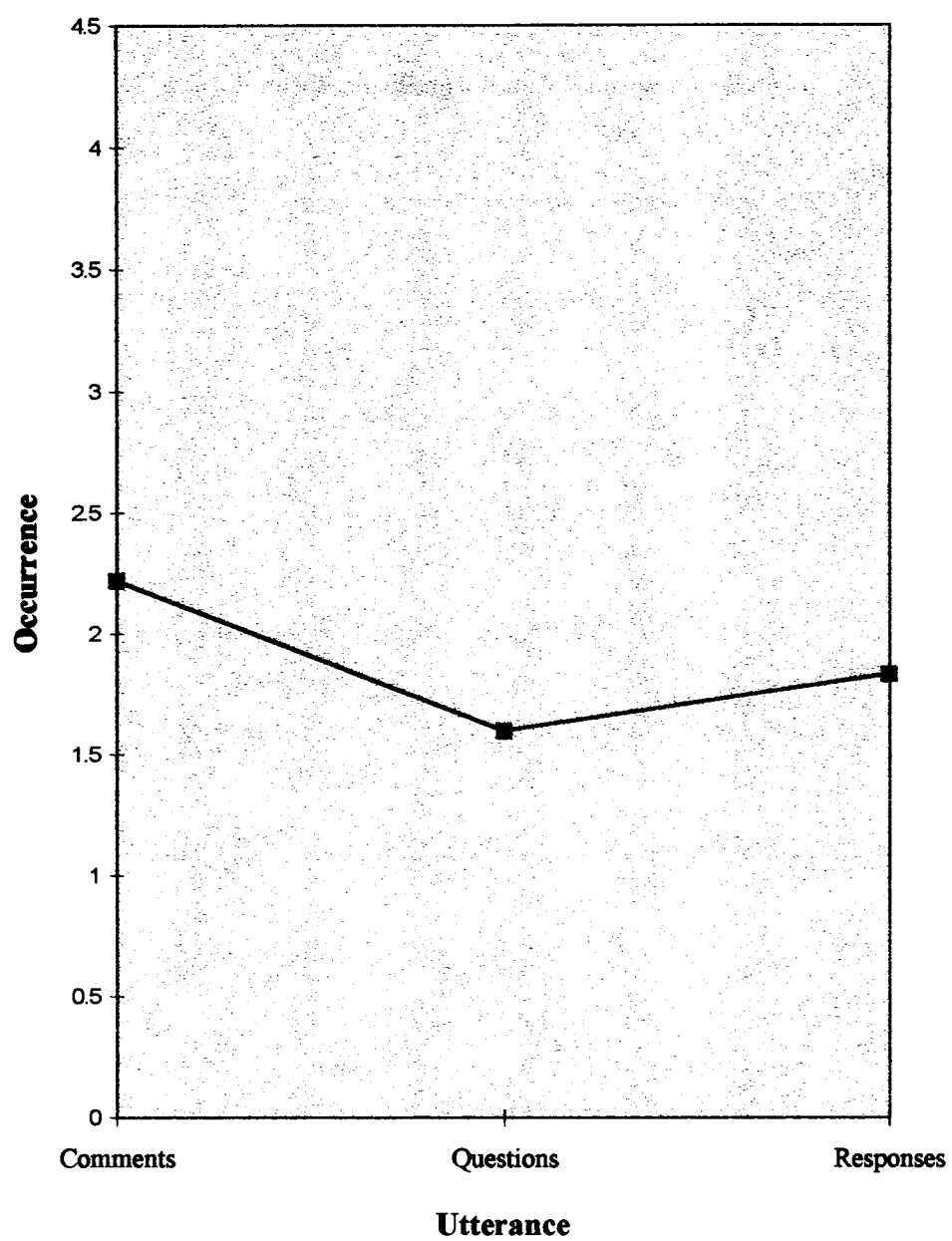


Figure 2. Estimated marginal means of utterance-type data.

Table 6
One-Way Repeated Measures ANOVA for Utterance-Type Effect

Source	<i>df</i>	<i>F</i>
Utterance	2	2.98
Error	22	(0.39)

Note. Values calculated with log-transformed data. Value enclosed in parentheses represents mean square error. No statistical difference found for utterance-type effect.

experimental words occurred most often in clause-medial position, followed by clause-initial position, and lastly, in clause-final position.

A one-way repeated measures ANOVA found that *F* was approaching significance for the effect of utterance type ($p = .072$). Summary statistics revealed that clause-final experimental function words were most frequently found in comments/statements, followed by responses to one's own questions, and finally, questions.

Chapter IV

DISCUSSION

The primary purpose of this investigation was to examine the occurrence distribution of a set of function words in mothers' speech to their young children. The occurrence of each of the words was measured in three separate clause positions (i.e., clause-initial, clause-medial, and clause-final) within the child-directed utterances of 12 maternal speech samples obtained during individual mother-child dyad play interactions. It was hypothesized that the mothers, when employing a motherese style of speech to interact with their young children, would produce a significantly greater number of function words in non-clause-final position (most frequently in clause-medial position, followed by clause-initial position) than in the final position of clauses.

Another purpose of this study was to examine the mother-to-child utterances identified as containing clause-final function words, categorize each of them into one of three distinct utterance-type groups--1) comments/statements, 2) questions, or 3) responses to one's own questions--and determine which utterance type occurred most

frequently. Not surprisingly, clause-final function words occurred most frequently in comments/statements; however, it was interesting to find that responses to one's own questions contained more clause-final function words than questions themselves.

Category and Position

The statistical analysis performed with the function-word category and clause-position data in this investigation yielded statistically significant findings for the effects of both function-word category and clause position. Auxiliary verbs (i.e., *is*, *are*, *do*, and *did*) were the most prevalent function words found within the examined mother-to-child utterances, followed by prepositions (i.e., *in*, and *on*), and finally, modals (i.e., *can*, *could*, *should*, *will*, and *would*). Individual raw data revealed that the same five words (*in*, *on*, *is*, *are*, *do*) occurred most frequently in medial and final positions. In initial position, where prepositions are less apt to occur, auxiliaries (*is*, *do*, *are*, *did*) and the modal *can* were the five most frequently occurring words. This order of prevalence is consistent with young children's order of acquisition of the given experimental words: the auxiliary verbs *is* and *are*, as well as the prepositions *in* and *on* are the earliest words from the experimental group to emerge in early expressive language (MLU - 2.00 to 2.49), followed closely by other auxiliaries (MLU - 2.50 to 2.99). Modals are the last of these categories to emerge (MLU - 3.00 to 3.74) in children's speech (Miller, 1981). The fact that young children begin to produce function words from certain categories shortly after their mothers expose them to these words in increased numbers suggests that the children

are aware of, and benefit from, this increased exposure by identifying and comprehending these words earlier than other words that are not as prevalent.

A similar occurrence pattern was found in the clause-final-position data. However, in this case, prepositions exceeded auxiliaries somewhat in prevalence (except for the auxiliary *is* which was the second most frequently occurring word), but modals still lagged far behind. Remembering that final-position function words are lengthened up to three times over those in other positions (Bernstein Ratner, 1986; Morgan, 1986; Swanson & Leonard, 1994; Swanson et al., 1992), it is not surprising that children begin to produce particular function words shortly after they are presented in increased numbers in final position within their mothers' speech. Again, this suggests that children do detect function words within speech and begin to comprehend them before they begin to produce them.

Two words that occurred more frequently in clause-final position than in clause-initial position (although they occurred most frequently in clause-medial position) were *in* and *on*.⁸ These words are more semantically salient than the other experimental words, in that they can be accompanied with visual referents (e.g., placement of objects). Perhaps their tendency to occur in lengthened clause-final position and their increased semantic saliency contribute to the early appearance of

⁸ Prepositions were not expected to occur very frequently in initial position based on typical grammatical constructions used in informal speech.

position and their increased semantic saliency contribute to the early appearance of these words in expressive speech.

As expected, the experimental function words as a group occurred most frequently in clause-medial position (59%), followed by clause-initial position (30%), and then clause-final position (11%). These findings are congruent with those of Morgan (as cited in Morgan et al., 1996, p. 279), who examined parental speech to three young children and found that function words occurred more frequently in utterance-initial position (64% of utterances) than in utterance-final position (34% of utterances).⁹

A significant interaction was also found between category and position factors: modals in clause-final position had the lowest rate of occurrence, while auxiliary verbs in clause-medial position occurred most frequently. This clause-medial auxiliary verb rate may have been inflated, however, by many mothers' overuse of requests for labeling from their young children, (e.g., *What is that?* and *What are those?*), perhaps in part due to the somewhat unnatural play situation involving observers and recording equipment as well as the mothers' desire for their children to perform for the investigators.

Utterance Type

⁹ Percentages for utterance-medial position function words were not reported (Morgan et al., 1996, p. 279).

The results of this investigation revealed that clause-final function words were found to be present most often in mothers' child-directed comments/statements, followed by responses to their own questions, and finally, in questions. It should be noted that although a statistically significant result for the effect of utterance type was not produced, *F* did approach significance.

Unexpectedly, responses to one's own questions was found to be the second most prevalent utterance-type category to contain clause-final function-words. Comments/statements and questions are routinely found in both adult-directed and child-directed speech, but responses to one's own questions are probably fairly rare in adult-directed speech because the conversational partner is often a more active participant than a young language learner may be. The increased occurrence of responses to one's own questions in motherese (over adult-directed speech) may contribute to young children's language development. In particular, the presence of these utterances containing clause-final function words in caregiver speech may facilitate the child's acquisition of function words by providing increased opportunities for function words to be heard in their more salient, lengthened, final-position state. This hypothesis would support the theory that frequency of auxiliary verb use by mothers is positively correlated with their children's later auxiliary growth (Hoff-Ginsberg, 1985; Nelson et al., 1979; Newport et al., 1977). The current investigation sought to examine specific types of maternal utterances (i.e., comments/statements, questions, and responses to one's own questions) which

contained clause-final function words, in an attempt to address the concerns of Shatz et al. (1989) that the influences of the input's structural properties in studies of this kind had not been specifically addressed. Specifically, whereas several other studies have examined the attribution of maternal auxiliary-laden questions (e.g., *yes-no questions*) to later auxiliary growth in children (Hoff-Ginsberg, 1985; Newport et al., 1977), the results of this study suggest that perhaps the use of these questions alone does not hasten auxiliary growth; rather, perhaps it is question-use along with the presence of responses to one's own questions that can be attributed to increased auxiliary learning. The results of this study, therefore, might serve to help clarify the implications of the previous studies--something that Shatz et al. (1989) suggested was sorely needed in order to generalize the results more reliably.

Crosslinguistic Acquisition

The results of this investigation support a possible cause, from a crosslinguistic perspective, for the slow function-word acquisition rates of English-speaking children. It has been proposed that function words in the English language are acquired later than content words in the language-learning process because of their low phonetic substance (short, unstressed syllables produced with low F_0 and low amplitude) and infrequent occurrence in the more salient final position of speech segments such as phrases, clauses and utterances (de Villiers & de Villiers, 1985; Leonard, 1989, 1991). However, function words and grammatical inflections in some other languages are made more salient to listeners by speakers' manipulation of

prosodic cues and more frequent use of these words in lengthened final positions. In fact, in families who speak Turkish, for example--a language in which grammatical morphemes are stressed and often occur in final position--young children begin to produce these words and morphemes quite early in their language-learning journey. The Turkish language contains a complex inflectional system in which noun and verb inflections exist as stressed suffixes. In addition, Turkish is primarily a verb-final language with a neutral word order of subject-object-verb (Aksu-Koc & Slobin, 1985), indicating that young language-learners are very often exposed to grammatical morphemes in the final position of utterances. In contrast, according to the results of the present study, English-speaking children are not exposed to a great number of final-position function words; therefore, they have fewer chances to become aware of and learn these words. Turkish children begin to learn and even use these functor inflections as early as the one-word stage of language production, and much of the system is mastered by the age of 24 months or earlier (Aksu-Koc & Slobin, 1985). In contrast, according to Brown's (1973) stages of language development, English speaking children are typically still acquiring grammatical morphemes in Stage V (age: 41 to 46 months; MLU: 3.75 to 4.50 morphemes). Because Turkish children learn grammatical morphemes so early and because inflections are incorporated into content words, the speech of these young children is not *telegraphic*, as it is in English. Aksu-Koc and Slobin (1985) postulated that these children's adult-like speech style provides evidence that "grammatically

relevant notions are accessible to quite young children if the means of expression are sufficiently salient and analyzable (p.845)."¹⁰

Importance of Final Position

Several researchers have proclaimed the importance of final position in the process of language learning. Hirsh-Pasek et al. (1987) and Kelmer Nelson et al. (1989) reported that young infants (7 to 10 months of age) were able to identify clause boundaries by attending to prosodic cues. In addition, Fernald and McRoberts (1993) suggested that the young children appear to pay particular attention to words that they hear in the final position of utterances. Further evidence for young children's attention to final-position can be found in their imitation patterns which reveal that they more often imitate final-position words from caregiver speech than words heard in non-final positions (e.g., Slobin & Welsh, 1973).

The results of several studies have indicated that children are drawn to final-position words because these words are lengthened or exaggerated within child-directed speech (Bernstein Ratner, 1986; Morgan, 1986; Swanson & Leonard, 1994; Swanson et al., 1992). Rondal (1985) proposed that young children's attraction to final-position words is based on the *recency effect*, meaning that the most recent

¹⁰ See *Future Research* subsection for discussion of a proposal to test this theory with English-speaking children by manipulating function-word exposure in a therapy setting.

word that the child has heard in a clause or utterance (the word which was presented in final position) is more readily remembered than words that were heard in other positions.

Therefore, it is fairly easy to see why function words, which according to this investigation occur very infrequently in final position within motherese, are acquired at a much slower rate than content words, which are frequently heard in final position. However, it is also clear that the importance of final-position function words is emphasized for young listeners. Finally, Swanson and Leonard (1994) suggested that children take advantage of this highlighting, in that they may first notice particular function words in the final position of phrases or clauses, and later, after they become somewhat familiar with a word in final position, they may begin to notice it in the less salient non-final positions as well.

Methodological Limitations

One concern regarding this investigation involves the number of function words analyzed. Although the 11 experimental words that were selected to be examined within mothers' speech in this investigation represented a cross-section of several function-word categories (i.e., prepositions [2], auxiliary verbs [4], and modals [5]), they comprise only a portion of the broad overall category. However, even though a larger set of analyzed experimental words may have increased the overall reported number of function words within the samples, it is hypothesized that occurrence rate patterns would remain the same as those found in this study (i.e., more non-clause-

final function words than clause-final-position words). An alternative to examining a closed set of function words would be to analyze the utterances within the transcripts and label each clause-initial, clause-medial, and clause-final-position word as either a function word or a content word, as Morgan did in his analysis of parental speech (Morgan et al., 1996, p. 279). Again, however, it is hypothesized that the results would not be dissimilar to those of the present investigation.

Another issue of concern to the interpretation of the current study is one of differing methodologies. Not only do various researchers approach the examination of function words differently, but at this time there does not appear to be a generally accepted definition of function words among professionals. Some researchers, for example, describe function words as including the following: articles, prepositions, modal and auxiliary verbs, and conjunctions (Nicolosi et al., 1989), whereas others include: determiners, clause introducers, auxiliaries, modals, prepositions, pronouns and *wh*-question markers (Bernstein Ratner, 1984). Although there are often similarities among definitions and methodological approaches, the differences make it somewhat difficult to compare results across studies within the field.

Another concern regarding this study pertains to the naturalness of the speech-sampling procedure. In other words, were the maternal speech samples that were obtained during the 12 mother-child dyad interactions realistic representations of typical play interactions? Efforts that were made to create a natural environment included: conducting the sessions at the child's home, and purposeful nonactive

participation by the researchers during the sessions. In addition, each mother was instructed to interact as she normally would during a typical play session with her child, avoiding an overuse of questions. However, several mothers used a large number of requests for labels in their speech (e.g., *What's that?*, *What are those?*), perhaps due to a desire for their children to perform. The large occurrence rates of auxiliary verbs (including *is* and *are*) may be attributed to this questioning behavior, however, one must keep in mind that the use of many questions is not atypical of speech to young children regardless of setting or circumstances.

A final limitation of the current study concerns the small number of utterances containing clause-final function words that were present within the transcripts. Although over 12,000 child-directed utterances were examined, only 257 of those (approximately 2%) ended with one of the study's experimental function words. One factor that may have contributed to this small proportion of clause-final function-word utterances was that many of the mothers' utterances were one-word imitations of children's utterances. However, although a larger sample of analyzed utterances may have provided the power needed to yield a significant result, the sample size used was sufficient to show that a previously unexamined type of utterance is perhaps an integral component of child-directed speech.

Future Research

Based on the results of this study and others involving typically-developing children, future research appears to be warranted in the area of clinical application.

Several researchers have begun to explore this frontier in ways that could be adapted to improve the function-word skills of language-impaired children. Tallal and Merzenich (1996), for example, have developed a computer-based therapy approach based on their theory that the central cause of language impairment in children is an auditory processing deficit affecting the ability to recognize and process the short-duration sounds of speech. Specifically, Tallal conducted a study using the Tallal Repetition Test with a group of 7-to-9-year-olds and determined that the language-learning-impaired children in the group required an inter-stimulus interval of up to 350 ms in order to identify and discriminate between two nonverbal 75 ms tones, whereas the children with no language delay only required about 8 ms to perform this task. Tallal proposed that this slow pattern of auditory recognition by language-learning-impaired children is the basis of their difficulty, since much critical language information (e.g., regarding coarticulation) is often present in the first 40 ms or so after the end of a given stimulus.

In response, Tallal and Merzenich (1996) developed a remediation program which appears to significantly improve the language skills of children with severe language delays. They used computer synthesizers to produce speech sounds with extended inter-stimulus intervals over which the crucial formant changes occur, while shortening the vowel duration, thereby retaining the overall duration of the syllables. The highly-structured, every day, several-week-long program is comprised of computer games which present these computer-synthesized speech

sounds to language-impaired children and reinforce them for correct identification of sounds. The computer adapts the stimuli based on the skill level of the child. For example, at the beginning of the program, the computer presents longer and louder sounds until the child can discriminate them, at which time the sounds are shortened by single milliseconds at a time in order to train the children to create new auditory processing patterns. Tallal has conducted several studies to measure the effectiveness of this five-week training program and has reported statistically significant gains of up to 2-3 years in language skill levels, as well as temporal threshold shifts.

A future study based on the results of the current investigation could involve an adaptation of these computer-based studies (Tallal & Merzenich, 1996). Tallal stated that simply extending the duration of presented speech sounds by tens of milliseconds appears to significantly improve language-impaired children's memory span for sets of sounds. Perhaps this principle would also apply to extended function words. For instance, using a similar computer-based therapy approach, researchers could present lengthened and/or louder non-clause-final position function words to language-delayed children, who typically exhibit poor skills in the area of function-word use. Subsequently, the efficacy of this use of contrastive stress in an attempt to increase the saliency of non-clause-final function words could be measured by evaluating the children's resultant function-word proficiency levels.

Another extension of the present study could involve a therapy program in which clinicians would provide language-delayed children with increased exposure to function words in clause-final position in order to increase the children's function-word competence. Beverly, Swanson, and Eby (1997) conducted a similar study with four typically-developing children (21 to 30 months of age with an MLU range of 2.00 to 3.00 morphemes) who were exposed to a high density of phrase-final function words (900 tokens) across a series of 10 sessions. However, when the children's function-word production levels were measured at the end of the study, the results showed that, although function-word use had increased for all of the children, there were no significant differences between the subjects in the experimental group and those in the control group (who had been exposed to the same number of function words in non-phrase-final positions). A replication of the Beverly et al. 1997 study using a larger subject group might provide the power to yield a significant finding. A similar investigation could then be conducted with language-delayed children serving as subjects in order to compare their improvements in function-word use to those of typically-developing children.

However, before conducting studies to expose children to more frequent or lengthened function words, researchers may want to determine if young children are able to recognize and identify function words as different from other words. In other words, do very young children comprehend function words even before they begin to produce them? Gerken and McIntosh (1993) found that young children

($M = 25$ months) exhibited improved noun comprehension when the nouns were paired with appropriate articles (e.g., *a*, *the*) than when they were paired with omitted articles, ungrammatical articles or nonsense words.

Beverly (in preparation) is currently conducting a similar investigation from a slightly different angle. She has theorized that young, typically-developing 2-year-olds will perform better on a similar picture-matching verb-comprehension task, using the auxiliary verb *is* (with four conditions--auxiliary present, auxiliary omitted, ungrammatical auxiliary, and nonsense word) than will 3- and 4-year-old children with specific language impairment (SLI).

In a related series of studies examining omission patterns during imitation tasks, Gerken (1994) found that familiar English functors were omitted significantly more often than weakly stressed nonsense words by young children ($M = 1.73$, $M = 2.07$, $M = 2.20$). These results suggest that children who have not yet mastered production of function words, may indeed be able to recognize and comprehend them.

Hirsh-Pasek, Golinkoff, and Naigles (1996) attempted, in one of a series of experiments, to determine whether two groups of young children ($M = 24$ months and 29 months) were better able to identify and comprehend an intransitive verb within a sentence (e.g., *See Cookie Monster turning Big Bird?* [transitive] vs. *See Cookie Monster and Big Bird turning?* [intransitive]) when an auxiliary verb--a type of function word--marked for number (e.g., *are*) was included in the intransitive

sentence (e.g., *See, Cookie Monster and Big Bird are turning*). Their results from this study were inconclusive; however, the 24-month-old subjects did perform better than the 29-month-olds.

If future studies of this kind show that children do indeed comprehend function words before they begin to produce them, and that they can use this knowledge in important linguistic processes such as speech segmentation and syntax decoding, the efficacy of proposed therapy approaches described at the beginning of this subsection, which improve function-word competence by increasing the saliency of function words to children in pre-production stages (through increased exposure or use of contrastive stress), appears very promising.

Summary

The purpose of this study was twofold: 1) to examine the occurrence distribution of a set of function words (prepositions, auxiliaries, and modals) in clause-initial, clause-medial, and clause-final positions of child-directed speech; and 2) to examine the occurrence distribution of clause-final function words in comments/statements, questions, and responses to one's own questions.

Twelve previously audiorecorded speech samples of mothers interacting with their young children (17 to 26 months; MLU: 1.00 to 1.50 morphemes) during individual free play situations were evaluated. The samples were orthographically transcribed, coded for the presence of function words, and analyzed using the Systematic Analysis of Language Transcripts (SALT) computer software program.

As expected, a repeated measures ANOVA yielded statistically significant findings for the effects of function-word category and clause position. Additionally, a significant interaction was found between the two variables of category and position. A second repeated measures ANOVA showed the result for effect of utterance type to be approaching significance.

The results of this investigation indicate that the slow rate of function-word acquisition by young language learners may not only be due to the low phonetic substance of these words, but also to their infrequent occurrence in clause-final position within motherese. However, the occurrence of function words in their lengthened clause-final state, although infrequent, may be the key to children's eventual mastery of these words.

A second important conclusion from this study is that *responses to one's own questions* within motherese to young children, which are fairly uncommon in adult-directed speech, may be critical to children's language development. Specifically, mothers' responses containing clause-final function words, paired with *yes-no questions* may be directly related to children's later auxiliary verb growth.

Future clinical applications of the results of this investigation could include the development of therapeutic approaches to increase awareness and comprehension of function words by language-learning impaired children in order to subsequently facilitate their function-word acquisition skills.

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APPENDICES

Appendix A

SALT Spelling Conventions

ain't
Doctor or *Dr*
hey
hi
huh (as in requesting clarification)
mhm (as in indicating assent)
Mister or *Mr*
Misses or *Mrs*
Miss or *Ms*
nope
oops
oopsy
OK (for *okay*)
psst
uhhuh (as indicating *yes*)
uhuh (as indicating *no*)
yeah (for *yes*)
yep (for a short, clipped *yes*)

****No apostrophes at the beginning of a word****

because (not *'cuz*)
you (not *'ya*)

aah, *um*, etc. are excluded unless they are used to indicate affirmation, negation, or interrogation

word or phrase repetitions are placed in parentheses

Ex. *I want (I want) a piece!*

unintelligible or inaudible words are represented by *XXX*

Appendix B

MLU Coding Guidelines

Separate free morphemes with a slash (/)

e.g., *rain/coat*

Mark possessive inflections with /z

e.g., *yours = your/z*

Mark plural inflections with /s

e.g., *babies = baby/s*

Mark plural and possessive inflections with /s/z

e.g., *fathers' = father/s/z*

Mark third person singular verb forms with /3s

e.g., *goes = go/3s*

Mark other verb tense inflections (-ed, -d, -ing) with /ed & /ing

e.g., *loved = love/ed*

having = have/ing

Mark contracted verb forms (-'m, -'s, -'ll, -'re, -'ve) with a slash (/) between the root word and the verb stem

e.g., *you'll = you/'ll*

Mark negative contractions (-n't, -'t) with a slash (/) after the root word

e.g., *didn't = did/n't*

Change catenatives to intended words and code appropriately

e.g., *gonna = go/ing to*

Words that contain bound morphemes in an adjectival form which cannot be used in that context without the bound morpheme should be entered without a slash

e.g., *scrambled egg, bowling pin, swimming pool*

Words that contain bound morphemes to form predicate adjectives should be entered without a slash

e.g., *I am tired; The door is closed*

(appendix continues)

Words that contain bound morphemes to form gerunds should be entered without a slash

e.g., *Swimming is fun*

End interrupted utterances with ^ & unfinished utterances with >

(Brown, 1973; Miller, 1981; Miller & Chapman, 1985b)

Appendix C

Sample Coded Transcripts

Speech Sample Coded for MLU

M Look/3s like it/'s time to play!
 M That's a >
 M Put the sail/boat in?
 M Look at the (at the) little dog.
 M You want to pull the dog on his leash?
 M I think you do.
 M Can you do it?
 C Dog.
 M Yeah that/'s a dog!
 M My good/ness!
 M He/'s bark/ing.
 M Look that/'s a clown.
 M That/'s like your/z.

Speech Sample Coded for Function Words and Utterance Types

M Looks.
 M Like it's[m-is] time to play!
 M That's a >
 M Put the sailboat in[f-in][Q]?
 M Look at the (at the) little dog.
 M You want to pull the dog on[m-on] his leash?
 M I think.
 M You do[f-do][R].
 M Can[i-can] you do it?
 C Dog.
 M That's[m-is] a dog!
 M My goodness!
 M He's[m-is] barking.
 M Look.
 M That's[m-is] a clown.
 M We have to turn him on[f-on][C].
 M That's[m-is] like your/z.

Appendix D
Sample Expanded Distribution Table

<u>Code</u>	<u>Word</u>	<u>Frequency of code</u>	<u>Frequency of word</u>
[i=are]		11	
	are		11
[i-can]		76	
	can		74
	can't		2
[i-did]		5	
	did		3
	didn't		2
[m-do]		13	
	do		10
	doing		3
[m-in]		14	
	in		14
[m-is]		262	
	is		31
	everything's		1
	here's		5
	it's		13
	she's		1
	that's		97
	there's		3
	what's		93
	where's		6
	who's		13

(table continues)

<u>Code</u>	<u>Word</u>	<u>Frequency of code</u>	<u>Frequency of word</u>
[m-on]		16	
	on		16
[m-will]		2	
	will		2
[f-are]		4	
	are		4
[f-in]		1	
	in		1
[f-is]		15	
	is		15
[f-on]		1	
	on		1
[C]		13	
	on		8
	can		2
	is		3
[Q]		1	
	in		1
[R]		5	
	on		2
	are		1
	is		2

Note. i = clause-initial position, m = clause-medial position, f = clause-final position; C = comment, Q = question, R = response.

Appendix E

Raw Data

Table E1
Function-Word-Category Raw Data

Subject	Number of words		
	Prepositions	Auxiliaries	Modals
#1	36	130	11
#2	45	135	7 ^b
#3	119 ^a	205 ^a	23
#4	42	105	28
#5	90	128	18
#6	41	102	13
#7	36	70 ^b	77
#8	61	86	17
#9	25 ^b	76	9
#10	76	111	45
#11	102	129	82 ^a
#12	40	96	57

Note. Prepositions = *in* and *on*; auxiliaries = *is*, *are*, *do*, and *did*; and modals = *can*, *could*, *should*, *will*, and *would*. ^aHighest occurrence within the category;

^blowest occurrence within the category.

Table E2
Clause-Position Raw Data

Subject	Number of experimental function words		
	Clause-initial	Clause-medial	Clause-final
#1	29	129	19
#2	38	130	18
#3	35	284 ^a	28
#4	92	68 ^b	15
#5	56	139	41 ^a
#6	53	83	20
#7	81	78	24
#8	38	113	13 ^b
#9	23 ^b	78	16
#10	103	110	19
#11	108 ^a	176	29
#12	80	87	26

Note. ^aHighest occurrence within the category; ^blowest occurrence within the category.

Table E3
Function-Word Category and Clause-Position Raw Data

Subject	Number of experimental function words								
	PI	PM	PF	AI	AM	AF	MI	MM	MF
#1	0	25	11	26	98	6	3	6	2
#2	2	33	10	34	93	8	3	4	0
#3	1	96	22	15	184	6	19	4	0
#4	3	28	11	64	37	4	25	3	0
#5	4	58	28	38	77	13	14	4	0
#6	1	34	6	47	45	10	5	4	4
#7	0	33	3	10	40	20	71	5	1
#8	3	47	11	26	58	2	9	8	0
#9	3	17	1	11	61	4	9	0	0
#10	2	62	12	68	36	7	33	12	0
#11	3	77	22	52	70	7	53	29	0
#12	0	27	13	33	50	13	47	10	0

Note. P = prepositions, A = auxiliaries, M = modals, I = initial position, M = medial position, F = final position.

Table E4
Utterance-Type Raw Data

Subject	Number of utterances containing clause-final function words		
	Comments/ statements	Questions	Responses
#1	13	1	5
#2	7	6	5
#3	13	9	6
#4	11	1	3
#5	25 ^a	9	7
#6	15	3	2
#7	7	5	12
#8	6	3	4
#9	1	1	3
#10	1	10 ^a	8
#11	22	4	3
#12	7	6	13 ^a

Note. ^aHighest occurrence within the category.

Appendix F

Means and Standard Deviations for Function-Word Codes in All Words According to Clause Position

Function word	Clause-initial		Clause-medial		Clause-final	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
In	1.08	1.00	27.25	13.05	2.92	3.32
On	0.75	0.62	18.25	12.56	9.58	7.40
Is	19.92	13.25	176.58	64.30	5.25	3.98
Are	7.33	4.74	25.25	11.73	1.42	1.38
Do	9.25	7.15	13.75	7.80	1.67	2.61
Did	4.00	4.07	4.58	3.65	0.33	0.50
Can	22.42	20.97	8.17	6.52	0.50	1.24
Could	0.33	0.65	0.75	1.06	0.00	0.00
Should	0.08	0.29	0.25	0.62	0.08	0.29
Would	0.50	0.90	0.83	0.72	0.00	0.00
Will	1.50	2.68	7.42	7.86	0.00	0.00

Note. *N* = 12. Values calculated from raw data.

VITA

Janna Campbell Graber was born on November 25, 1968 in Knoxville, Tennessee. She attended Knoxville Public Schools and graduated from Bearden High School in 1987.

Ms. Graber attended Transylvania University in Lexington, Kentucky where she was awarded a four-year Dean's Scholarship. She was inducted into the Psi Chi Psychology Honor Society in 1990 and the Holleian Honor Society in 1991. She graduated *magna cum laude* in 1991 with a Bachelor of Arts degree in Psychology.

From 1991 to 1996, Ms. Graber worked as a mental health counselor at the Children's Hospital Intensive Psychiatric Services (CHIPS) unit of East Tennessee Children's Hospital. In Fall of 1996, she was employed by the University of Tennessee as a *First Year Studies* course instructor.

In Spring of 1994, Ms. Graber began her graduate studies in the University of Tennessee, Knoxville master's program in Speech-Language Pathology. In 1996, she was inducted in the Phi Kappa Phi Honor Society. She received the Patrick J. Carney Leadership Award for the 1996-1997 academic year. In August of 1997, she received a Master of Arts degree with departmental honors and began a clinical fellowship in the field.