FREQUENTLY OCCURRING WORD FORMS AND PATTERNS IN INFANT-DIRECTED SPEECH PRODUCED BY MOTHERS WITH AND WITHOUT SYMPTOMS OF DEPRESSION

BY

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Abstract

FREQUENTLY OCCURRING WORD FORMS AND PATTERNS IN INFANT-DIRECTED SPEECH PRODUCED BY MOTHERS WITH AND WITHOUT SYMPTOMS OF DEPRESSION

by

Anthea Vivona

Advisor: Valerie Shafer, Ph.D.

This study examined the most frequently occurring word forms and patterns (i.e., words surrounding the most frequently occurring words) in infant-directed speech produced by mothers with and without symptoms of depression during play interaction with their 4-5 month olds. The word "you" was the most frequently occurring word for both the Control and Elevated Score Groups. Overall, the words that most frequently preceded and followed "you" varied across samples, but the sequences "are you", "*what* form + you" and "you want/wanna" were frequently used by both Groups. In contrast, the sequence "you like" was frequently used by the Elevated Score Group only. Examination of the communicative functions of the utterances containing the highest frequency word (i.e.,"you") revealed that samples in both Groups most frequently used utterances containing "you" in the Speech Acts y*es/no questions* or s*tatements*. However, form-function differences between the Control and Elevated Score Groups were noted with the "you want/wanna" sequence. In addition, in samples produced by the Control Group utterances containing "you" were most frequently used in Interchange Types geared toward directly shaping the immediate activity. This was not the case for samples produced by the

Elevated Score Group. Rather, in samples produced by the Elevated Score Group utterances containing "you" were most frequently used to discuss the infant's thoughts and feelings. It is proposed that this different Interchange Type use for utterances containing the highest frequency word suggests a less active role by mothers with mild symptoms of depression during play with their infants, although further study with a larger sample size and mothers with varying degrees of depressive symptoms is needed.

DEDICATION

This dissertation is dedicated to my nephew, Anthony Joseph. He is a true joy. Spending time with him always brings a smile to my face and makes my heart sing. He consistently helps me see “where the problem is” and “how to solve this situation”, putting things into perspective. His strong work ethic, meticulousness, gracious ways and kind heart are an inspiration. Thanks, Buddy!

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INTRODUCTION

Research demonstrates that the prosodic and lexical properties of maternal infant-directed speech (IDS) differ from those of adult-directed speech (ADS). Further, the quality and content of maternal infant-directed input modulates early speech segmentation abilities and later lexical development. For example, the highly frequent lexical content of maternal speech plays a facilitative role in infants' task of segmenting the input (Bortfeld, Morgan, Golonkoff, & Rathbun, 2005). Considerable research has documented connections between language input and language development (e.g., Goldfield, 1993; Hoff and Naigles, 2002). These findings suggest that differences in input of caregiver speech could have significant effects on language development.

Studies have demonstrated that maternal depression has an impact on the development of child language (e.g., Pan, Rowe, Singer, & Snow, 2005), mother-infant nonverbal interaction (e.g., Field, Healy, Goldstein, & Guthertz, 1990), book-reading and mother-child discourse (e.g., Herrera, Reissland & Shepherd, 2004). Additionally, research has shown that the prosodic patterns of the input by mothers with depression are different from those without depression and suggests that these differences have consequences on infant associative learning (e.g., Kaplan, Bachorowski, Smoski, and Hudenko, 2002). Sohr-Preston and Scaramella (2006) suggest that these consequences on infant learning may be partly due to limited exposure to the facilitative components of maternal IDS. No research, however, has examined the frequently occurring word forms and patterns (i.e., words surrounding the most frequently occurring words) of maternal IDS or the communicative function of this content by mothers with symptoms of depression and whether it differs in a significant manner from that produced by mothers without symptoms of depression. In particular, highly frequent word patterns aid in segmenting the

speech signal and in indexing syntactic categories in language input (Mintz, 2003a). A difference in the type and/or frequency of word patterns in IDS by mothers with symptoms of depression would change the quantity and quality of information available to infants for speech segmentation, and therefore, possibly language learning. Additionally, the communicative function of utterances has been found to be differentially related to language learning (e.g., Rollins, 2003). Therefore, even if the quantity of input is consistent for mothers with and without symptoms of depression, if the communicative function of the utterances containing highly frequent word forms and patterns differs, the language learning environment could be negatively impacted. Given the influence of the content of language input on language development, and a known impact of maternal depression on later cognitive and language development, this gap in the literature must be addressed. Therefore, the goals of this dissertation are to help better describe the actual word forms and patterns present in IDS and the communicative functions of this content for mothers with and without symptoms of depression.

Input and Language Learning

A number of studies suggest that the word forms and patterns in the input influence how language is learned. Huttenlocher and colleagues (1991) found a correlation between the number and types of words used by parents with their children and the content of the children's lexicon. Goldfield (1993) found a correlation between the number of noun types used by mothers with their one year olds and the number of noun types observed in the children's first 50 words. More recently, Pan and colleagues (2005) found that for one to three year olds from low-income homes, the variety of word types in maternal input was a stronger predictor of a child's vocabulary growth than was the number of speech tokens in the sample. A word "type" is a

particular word, while a word "token" is an instance of that particular word. They found that although number of word types and tokens were associated, the number of word tokens was not independently related to growth in a child's vocabulary production. In examining mother's speech to their two year olds during play, mealtime and dressing, Hoff and Naigles (2002) found that the number of word types and Mean Length of Utterance (MLU) were strong predictors of child's vocabulary size, with MLU ultimately being the most significant predictor. The researchers point out that these findings are consistent with the notion that lexical development is a result of the data-providing feature of children's conversational experience as well as the social context that that conversation provides. The term "data-providing" feature refers to the quantitative nature of the input (i.e., number word tokens, number of word types, and the linguistic contexts in which the words are placed). Further demonstrating this, Rollins (2003) found that vocabulary comprehension at 12 months was related to the total number of words (TNW) produced by mothers during contingent comments (i.e., communicative acts in which mother discusses an object of joint attention or narrates an ongoing activity) to their 9 month olds, but not the TNW used during other child-centered (i.e., communicative acts that are routines or when mother discusses her own or infant's feelings) or child-directive acts (i.e., communicative acts in which mother negotiates action, directs infant's attention or action, or discusses immediate past events). As stated above, even if the quantity of input is consistent for mothers with and without depression, the communicative function of the utterances produced may differ.

Distributional Properties of Input and Speech Segmentation

The literature clearly indicates that speech segmentation abilities of infants are already developing and are affected by input from an early age. Aslin, Saffran, and Newport (1998) found that eight-month-old infants can learn transitional probabilities of a sequence of syllables with brief exposure. This is evidence that infants are sensitive to the distributional properties of speech stimuli. In a series of experiments, Jusczyk and Aslin (1995) examined the ability of infants to recognize familiarized words in isolation and running speech. Infants seven and 1/2 months of age listened longer to passages containing 1-syllable words that they were familiarized to in isolation, compared to passages not containing the familiarized words. Such results were not found with six month olds. The seven and 1/2 month olds also listened longer to repeated productions of words in isolation that they were familiarized to in sentence contexts. Interestingly, these infants did not listen longer to passages containing words which sounded similar to a list of familiarized words (e.g., "zup" rather than "cup"). The researchers point out that this latter finding indicates that this age group has a rather detailed representation of familiar words. Mandel, Jusczyk & Pisoni, (1995) found that four to five month olds listened longer to their own names compared to "other" names, regardless of whether the "other" name was prosodically similar to (e.g., "Corey" compared to "Lucy") or prosodically different from (e.g., "Corey" compared to "Nicole") their own name. This is additional evidence for the fairly sophisticated representation that infants seem to have of familiar words. Such recognition of a frequently occurring word is the first step in making the word-referent connection. Expanding on this, Bortfeld, Morgan, Golonkoff, and Rathbun (2005) found that infants at 6 months of age recognized words that followed familiar words, such as their names or "mommy" in running speech (e.g., "The girl laughed at *Mommy's feet*", "*Mommy's feet* were different sizes"). It

further gives support to the notion that highly frequent lexical forms in maternal speech can play a facilitative role in infants' task of segmenting the input. These findings highlight the importance of what infants are hearing via maternal speech input prior to the production of their first word (Soderstrom, 2007). The literature does not provide information about whether infants whose mothers are depressed hear a similar set and distribution of frequent forms.

Function Words and Speech Segmentation

Function words are a special category of words that occur highly frequently in a language. These words are often defined as playing an important role in grammatical functions and as having very general semantic content (Shafer, Shucard, Shucard & Gerken, 1998). The grammatical role leads to high token frequency for most words classified as function words (e.g., "the", "is", "a", "was"). On a prosodic level in English, function words are unstressed and brief, playing a role in creating the typical strong-weak rhythm of the language. On a semantic level, because function words (e.g., articles, determiners) tend to occur in set positions with respect to content words (e.g., nouns, adjectives) in sentences, they may help to signal linguistic boundaries, also opening the door for word learning. For example, articles typically occur at the start of phases, with pauses occurring between phrases. Infants could use such information to infer the beginning and end of phrases. While learning a content word increases the infant's lexicon directly, the use of that content word to learn other words is more limited because content words occur in narrowly-defined contexts. For example, the content word "cat" will only be found in discourse in which "cat" is part of the topic. Function words, however, are found in a wider variety of contexts because their meaning is more general in nature. For example, pronouns, such as "you", "me", and "he" occur across situations whenever animate

beings are part of a topic. A learned function word may help the infant acquire additional words in a greater number of situations, via helping with speech segmentation. A longitudinal study examining high frequency words in IDS produced by mothers during free play with their 4-month-old infants found that on average, the most frequently occurring words were "you", "your", "look", "the" and the baby's name (Vivona & Shafer, in preparation). All of these high frequency words, with the exception of the baby's name, are function words. In addition, an interesting outcome was seen with "your" and "you're" productions. Although these productions are nearly phonologically identical, they are morphosyntactically and semantically different. The form "your" is made up of one free morpheme (i.e., "your"). In contrast, "you're" is made up of two free morphemes (i.e., "you" "are") that are in a contracted form. These two words "your" and "you're" have completely different meanings. "Your" is a possessive pronoun, while "you're" is a contraction of a subject pronoun and a verb. IDS productions of these forms were differentiated via the pause length preceding them. The form "your" was rarely preceded by a pause (i.e., 0%-12%), while "you're" was frequently preceded by a pause (i.e., 42%-80%). The large difference in the pause incidences preceding the two forms can be attributed to the morphosyntactic and semantic properties of these forms. "Your" typically occurred in sentence-medial position (e.g., "Don't put your hands in there"). In contrast "you're" typically occurred in sentence-initial position (e.g., "You're not smiling or laughing"). The pause differences, coupled with associated position in sentences, could be used to indicate different functions in the sentence. "Your" is consistently followed by a noun, while "you're" is consistently followed by a predicate. Further, it could be suggested that the pause pattern differences with these phonetically similar forms sets up the following two contrasting frames: "*pause* you're *adjective/verb* " versus "-- your *noun* ". These differential patterns could create predictable

contexts, similar to the frequent frames (Mintz, 2003a; Mintz, 2003b) discussed below, which could lead to word-type categorization and awareness of novel words. In contrast to the IDS, the adult-directed speech (ADS) had greater lexical diversity, That is, there was a greater variety of vocabulary (i.e., types) with fewer repetitions of each (i.e., tokens). In ADS, on average, the most frequently occurring words were "the", "I", "and" and "a". It is unknown whether mothers with symptoms of depression show these same grammatical patterns in their input to infants. If they do not, it could result in compromised input to infants that could affect speech segmentation skills.

Indexed via ERP measures, eleven-month-old infants have demonstrated sensitivity to replacement of function words (e.g., "was", "is", "the", "a") with nonsense syllables (e.g., "ko", ku") in running speech (Shafer, Shucard, Shucard & Gerken, 1998). This sensitivity could be due to the segmental differences and/or prosodic difference, since most English functions words have a fricative plus reduced vowel portion and the replacement syllables were stop consonants plus full vowels. This finding indicates sufficiently detailed representation of function words in infants to allow their use in the segmentation process. These early sensitivities to the sound patterns of a language would be an asset in speech segmentation. Differences in function word use by mothers with symptoms of depression could result in less-than-optimal input to infants that could affect speech segmentation skills.

Frequent Frames and Speech Segmentation

Highly frequent words could also work as units or frames in helping segment the speech signal and learning novel words. Mintz (2003a, 2003b) discusses "frequent frames" in child-directed speech with toddlers. Frequent frames, defined as "two jointly occurring words with

one word intervening", can function as cues to children, helping them to identify adjacent word categories (Mintz, 2003b, p.91). For example, in the frame "you – it" the intervening word will always be a verb, whereas, in the frame "the – in" the intervening word will always be a noun. Mintz found consistent use of such frames in child-directed speech corpora. Further, the frames were found to effectively categorize words (e.g., nouns versus verbs). Mintz (2003a) points out that these frequent frames may serve to focus the learner by providing a relatively smaller number of contexts that can have an exponential effect on the number of word types that can be categorized. These frequent frames may also set up a predictable context in which word segmentation and then recognition can take place via use of distributional information. Mintz (2003b) reported that the following frequent frames were present in 6/6 corpora of child-directed speech used with toddlers: do__want, put__ on, the__in, the__on, to__it, want__to, what__you, you__a, you__it, you__me, you__the, and you__to. Childers and Tomasello (2001) found that children learned novel verb meanings better in the context of frequently occurring lexical frames. The literature does not provide information as to whether frequent frames are present in input to infants and additionally, whether mothers with symptoms of depression use frequent frames in their infant-directed speech.

It will be highly useful to investigate the frequently and infrequently occurring word forms and patterns in IDS produced by mothers with symptoms of depression. The literature suggests that the quality, such as the frequently occurring lexical content in the input, seems to hold special value to the infant. In particular, it plays a role in speech segmentation and therefore, lexicon development. If the word forms and/or patterns in the input presented by mothers with symptoms of depression differ from that provided by mothers without symptoms of

depression, infants of mothers with symptoms of depression could lack sufficient exposure to elements needed for speech segmentation and word identification, as discussed above.

Communicative Function of Child-Directed Input

The structure of speech in a communicative situation is undoubtedly constrained by the communicative intent of the speaker. Thus, the formal properties (i.e., phonology, morpho-syntax) of IDS should also be examined with relation to communicative intent to better understand these patterns. Ninio and Wheeler developed a taxonomy that codes communicative intent at the level of the utterance (i.e., speech act), the verbal interchange in which the utterance occurs (i.e., social context) and thirdly inter-utterance relations (Ninio & Wheeler, 1984; Ninio & Wheeler, 1988; Ninio et al., 1994). Two studies that have used parts of the taxonomy and are relevant to the current discussion are presented here. In a longitudinal study examining the communicative intents of utterances used by mothers during play interactions with their 14, 20 and 32 month olds, researchers found that mothers used utterances for the following types of interchanges at all three age levels: *direct hearer's attention* (DHA), *negotiate the immediate activity* (NIA), *discuss the joint focus of attention* (DJF), and *marking event* (MRK) (Pan, Imbens-Bailey, Winner & Snow, 1996). Examples of DHA, NIA, DJF and MRK are the following: DHA: "Look at the bunny.", NIA: Do you wanna play with this?", DJF: "What does he have?", MRK: "Uh-ho". At a given age, approximately 40% of IDS utterances were categorized as NIA, 15%-26% as DJF, 10%-13% as DHA, and 7% as MRK. Further, they found age-related changes. The proportion of child-centered Interchange–Speech Act Types (e.g., *discuss joint focus of attention* using a *statement*) increased with the child's age, while the proportion of directive Interchange-Speech Act Types (e.g., *direct hearer's attention* using a

request/propose) decreased with the child's age. More recently, a longitudinal study found that NIA, DJF and MRK were among the Interchange Types used by a mother in all analyzed mealtime interactions with her infant during the first 18 months of life, with the earliest data obtained when the infant was only 14 days old (Rivero, 2010). Other interchange types, such as *directing the hearer's attention* (DHA) and *discussing related-to-present* (DRP) were not used by the mother until the infant was 10-11 months of age. Further, Rivero (2010) found infant age-related changes in the Speech Acts used during a particular Interchange Type. For example, less directive Speech Acts, such as *questions about the hearer's wishes and intentions which functions as a suggestion* (RQ) and *statements* (ST) did not occur with NIA until after the infant was 10 months of age. The Speech Acts *statement* (ST), *yes/no question* (YQ) and *wh-question* (QN) were associated with DJF at all ages and also seen with the later-occurring Interchange Type DRP. Both studies interpret the infant-age-related changes to be the result of maternal responsiveness to the communicative level of her child at a given age.

In summary, child-directed speech can be characterized in terms of the mother's communicative intent (e.g., Speech Act and Interchange Type) and the formal properties that the mother chooses to convey that intent. It seems that maternal responsiveness to her child shapes these choices. Research indicates that mothers with depression may be less responsive to their infants during both nonverbal and verbal interaction and less sensitive to their child's current and changing developmental level (see **Impact of Maternal Depression on Nonverbal Interaction** and **Impact of Maternal Depression on Discourse and Book Reading** below for a discussion). Therefore, even if the IDS produced by mothers with and without symptoms of depression have similar frequently occurring word forms and patterns, mothers with symptoms of depression may use this content in different Speech Acts and Interchange Types. To date no research has

examined the communicative intent for which the most frequently occurring word forms and patterns in IDS have been used by typical mothers and those with symptoms of depression.

Impact of Maternal Depression on Child Language

There is evidence that maternal speech is affected by maternal depression and has consequences for linguistic and cognitive development. Murray, Kempton, Woolgar and Hooper (1993) studied mother-infant play-language interaction in three groups of mothers. These groups were 29 mothers who, since childbirth, had experienced depression, 10 mothers who had a history of depression before childbirth, but no depression postpartum, and 20 control mothers. Murray and colleagues found that mothers with depression expressed more negative affect during play with their 2-month-old infants than either mothers with a history of depression but no depression postpartum, or mothers in the control group. Gender differences were found with respect to use of infant-focused utterances. Mothers with depression with male infants used fewer infant-focused utterances than either mothers with a history of depression but no depression postpartum or mothers in the control group, who had male infants. In contrast, use of infant-focused utterances was similar for all three groups of mothers who had female infants. Use of infant-focused utterances was related to cognitive performance at 18 months of age, as measured by the Bayley Scales. Breznitz and Sherman (1987) examined natural discourse between fourteen mothers with depression and eighteen mothers without depression and their 3-year-old toddlers. They found that the strongest measure correctly classifying 84% of the mother-toddler dyads regarding maternal depression status was the amount of language produced by the child while eating lunch with their mothers. Children whose mothers were depressed spoke significantly less than children of mothers who were not depressed. The researchers

hypothesize that children whose mothers are depressed have adopted this style of interaction as a result of not having their initiations reinforced.

One study suggests that maternal depression can also affect the rate of lexical growth. In a longitudinal study of 108 children from low income families at 14 months, 24 months and 36 months and their mothers, Pan and colleagues (2005) found that maternal depression was associated with reduced expressive vocabulary (fewer word types) at 24 months compared to controls, with a more pronounced reduction by the time the child was 36 months old. On average the mothers were "mildly depressed" and there was no change in depression over the course of the study. Pan and colleagues note the possibility of chronicity of depression as a factor in the further pronounced reduction in vocabulary noted at 36 months, but also suggested that perhaps the early effects of maternal depression asserted themselves to a greater extent as the children aged.

Protracted negative effects on child development appear to be a consequence of chronic or recurrent maternal depression rather than a single incidence of post-partum depression (see Grace, Evindar and Stewart, 2003, for review). However, Sohr-Preston and Scaramella (2006) point out that research has not yet defined the relationship between timing of maternal depression and effects on infant cognitive and language development. In addition, it is important to know exactly what factors contribute to delays in language development related to maternal depression. The goal of the current study will focus on three aspects of maternal speech: the most frequently occurring word(s), words surrounding the most frequently occurring word(s) (i.e., word patterns) and the communicative function of utterances containing the most frequently occurring word(s) and word patterns.

Impact of Maternal Depression on Nonverbal Interaction

Nonverbal interaction is intimately connected to verbal interaction. Mother-infant interaction in which mother adjusts and responds to an infant's bids facilitates cognitive and language learning (Sohr-Preston & Scaramella, 2006). The research suggests that the nonverbal affective communication between mothers with depression and their infants can be described as less responsive and atypical. Nonverbal interaction in mother-infant dyads in which the mother is depressed has been found to be qualitatively more negative than that in mother-infant dyads in which the mother is not depressed. Field, Healy, Goldstein, & Guthertz (1990) used the behavior-state system developed by Cohn and colleagues (1986) to code free-play interactions between mothers with and without depression and their three-month-old infants. Behavior states were *anger/poke* (i.e., mother is speaking or handling infant in angry or rough manner), *disengage* (i.e., mother is neutral in affect & not interacting with infant), *elicit* (i.e., rapid actions used to get infant's attention) and *play* (i.e., instances of positive affective expression). Compared to controls, mothers with depression spent more time in *anger/poke* state (i.e., 21% and 3% for mothers with depression and controls respectively) and *disengage* state (i.e., 22% and 2% for mothers with depression and controls respectively) and a smaller percentage of time in *play* state (i.e., 13% and 61% for mothers with depression and controls respectively). Infants' behavior states were coded as *protest, look away, attend* or *play.* Compared to control infants, infants of mothers with depression spent a greater percentage of time in the *protest* state (i.e. 38% and 9% for infants of mothers with depression and control infants respectively) and less time in the *play* state (i.e., 11% and 42% for infants of mothers with depression and control infants respectively). Consistent with this, Cohn, Campbell, Matias, & Hopkins (1990) found that during play with their two month olds, mothers with depression exhibited a higher

proportion of negative affect (e.g., facial or vocal expressions of anger, sadness, or irritation) than mothers without depression. A lower proportion of positive affect (e.g., simple smile) was found for depressed mothers of boys compared to depressed mothers of girls and non-depressed mothers of boys or girls.

A number of studies also show that infant behavior is altered for children of mothers with depression (e.g., Cohn and Tronick, 1983; Tronick and Gianino, 1986; Field, 2002; Herrera, Reissland, & Shepherd; 2004). For example, Field (2002) used the "simulated depression" paradigm (Cohn and Tronick, 1983), in which mothers are directed to "look depressed", to examine the nonverbal interaction outcomes for mothers with and without depression and their 3 month olds. The "simulated depression" paradigm involves three interactions, "spontaneous" (mom asked to behave naturally), "look depressed" (mom asked to "look depressed") and "reunion" (mom asked to behave naturally). Field found that during the "look depressed" interaction, infants of mothers without depression attempted to reinstate the engagement, and when unsuccessful, became distressed, and that distress carried over into the "reunion" interaction. In contrast, the behavior of mothers with depression and the behavior of their infants changed very little across the interactions. The infants did not become distressed during the "look depressed" interaction. Field suggests that infants of mothers with depression did not become distressed because they may see flat affect/disengagement as typical. She further suggests that the infants may have adopted this passive coping/interactive style as a result of experiencing a lack of control in interactions with their mother. The current project will not directly examine the relationship between infant behavior and mother's affect. However, pragmatic functions of language may differ in response to infant distress, and mothers with depression may differ from those without depression in these situations. The proposed analyses

in the current study, examining frequency of different pragmatic functions for utterances containing the most frequently occurring words, may reveal such differences.

Impact of Maternal Depression on Prosody of Infant-Directed Speech

The prosodic organization of infant-directed speech (IDS) is dramatically different from that of adult-directed speech (ADS). Compared to ADS, IDS has the following characteristics: higher fundamental frequency, greater pitch excursions, shorter utterances, longer pauses, tighter, more regular tempo and slower articulation rate (Stern, Spieker, Barnett & MacKain, 1983; Fernald & Simon, 1984). Further, mothers have been found to modify the quality of their IDS directed to infants of different ages, with the most exaggerated pitch contours noted with 4 month olds (Stern, Spieker, Barnett & MacKain, 1983). With respect to timing, in contrast to ADS, in IDS duration of pauses exceeds the duration of vocalizations. In addition, prosodic repetition (i.e., prosodic contour type repeated across utterances) was double (i.e., 16% versus 8%) that of linguistic repetition (i.e., phrases repeated verbatim across utterances) (Fernald & Simon, 1984). This is potentially important because prosodic repetition may be more accessible to infants than semantic repetition early in development. The sounds of maternal speech are organized in long, smooth continuous pitch contours, with greatly expanded fundamental frequency, and phrases separated by extended pauses. This is in contrast to the more complex, variable, relatively narrow fundamental frequency range and multiple shifts in ADS. These characteristics may make the prosody of IDS more accessible to infants because the prosody seems to be more attention-getting (Fernald, 1989).

As assessed via a variety of paradigms, infants as young as one month old have demonstrated longer looking times/more frequent looking for IDS compared to ADS (e.g.,

Fernald, 1985; Cooper & Aslin, 1990). Infants four to five months of age and infants seven to nine months of age have been found to exhibit more positive affect while watching videos of IDS compared to ADS (Werker & McLeod, 1989). Further, longer looking time was found in response to the isolated vocal parameters of IDS, as compared to the isolated visual parameters of the adult's facial expression during IDS (Werker & McLeod, 1989). Thiessen, Hill & Saffran (2005) found that infants demonstrated better segmentation for nonsense words produced with IDS prosody compared to ADS prosody, as assessed via listening time. This indicates that even with similar content, the prosodic qualities of IDS make the input more accessible to infants in some way.

The prosodic organization of IDS produced by mothers with depression is dramatically different than that produced by mothers without depression, possibly reducing the saliency of IDS to the infant. Infant-directed speech produced by mothers with depression has been found to consist of longer utterances, longer latencies to respond to infant's productions and less use of exaggerated pitch contours (Bettes, 1988). Further, Bettes (1988) found that the atypical quality of mother's IDS was correlated with her score on the *Beck Depression Inventory* (BDI).

The literature shows that the difference in the prosodic quality of the speech input produced by mothers with and without depression, negatively affects infant learning. Kaplan and colleagues (e.g., Kaplan, Bachorowski, & Zarlengo-Strouse, 1999; Kaplan, Bachorowski, Smoski, & Hudenko, 2002; Kaplan, Dungan, & Zinser, 2004) did a series of studies using a conditioned attention paradigm to assess associative learning. Associative learning took place if "auditory stimuli that reliably predict reinforcing visual stimuli can acquire the ability to control infant visual attention" (Kaplan et al., 1999, p. 561). In this paradigm during the training phase, infants were presented with IDS followed by a presentation of a photograph of a female smiling

face. In the test phase, infants received four presentations of a checkerboard pattern. The first and fourth presentations of the pattern occurred simultaneously with IDS, whereas the second and third presentations of the checkerboard occurred in silence. Looking time for each presentation was noted and the looking times for the second and third presentations were subtracted from the looking times for the first and fourth presentations. Associative learning was demonstrated if this subtraction yielded a positive result. This positive result "indicated that speech segments increased the looking time at the checkerboards and were interpreted to reveal the formation of voice-face associations" (Kaplan et al., 2009, p. 152). The studies found that infant-directed speech produced by mothers with depression to their four month olds failed to promote associative learning. However, input to these infants produced by mothers without depression did promote associative learning, indicating that the infants were competent learners. With older, infants (5-13 months of age) who had mothers with depression, however, associative learning took place only with infant-directed speech produced by an unfamiliar non-depressed male.

One study suggested that prosodic quality itself was not related to infant learning. Rather, the parent's general emotional responsiveness to the infant influenced ability to learn. Specifically, Kaplan and colleagues (2009) found that parental sensitivity (defined as parent's responsiveness to the child, ability to attend to the child's cues, ability to be warm and soothing when the baby is in distress, and ability to play creatively and have high-quality affective exchanges) as assessed via the *Emotional Availability Scale*, correlated with infant learning in an associative learning paradigm. Differences in prosody did not correlate with infant learning. Kaplan and colleagues (2009) propose that reduced maternal sensitivity may lead to a reduction in the learning-promoting qualities of IDS. The IDS used in the studies done by Kaplan and colleagues was scripted, therefore the lexical content was consistent across participants. If the

current study reveals that the frequent word forms and patterns of spontaneously produced IDS by mothers with symptoms of depression differs significantly from that of mothers without symptoms of depression, the relative contributions of maternal sensitivity and content of IDS to infant learning would need to be explored further.

Impact of Maternal Depression on Book Reading and Discourse

The literature suggests that mothers with depression do not adjust their input to the age and changing language level of their infant. For example, during book reading with their six and ten month olds, unlike mothers without depression, mothers with depression showed no difference in sentence length for the two ages. In comparison, non-depressed mothers used longer sentences with older compared to younger children. Mothers without depression read portions of the written sentence and then produced novel utterances with six month compared to ten month olds. In contrast, mothers with depression read more printed words per page with both age groups (Reissland, Shepherd & Herrera, 2003).

The focus of child-directed utterances produced by mothers with depression is qualitatively different from that produced by mothers without depression. Herrera, Reissland & Shepherd (2004) did a cross-sectional study of mother-infant interaction in 36 mothers with and without depression and their 6- and 10-month- old infants (n=72). Herrera and colleagues found that when interacting with their 6-month-old infants, mothers with depression used fewer affect-salient utterances (i.e. feeling-oriented – expressive, fulfilling affective function, such as greeting, encouraging, e.g. “Clever girl”, “Hi John”) and information-salient utterances (i.e. object-oriented – direct statements, questions, reports, e.g. “Which toy do you want?”, “You’ve got my finger”) compared to controls. Mothers without depression tended to use more affect-salient utterances with six month olds compared to ten month olds. In contrast, mothers with

depression interacting with their six month olds and ten month olds produced affect-salient utterances with similar frequencies. Information-salient utterances were used with ten month olds with similar frequency for mothers with and without depression. This demonstrates that mothers with depression failed to modify the focus of utterances (i.e., affect-salient, information-salient utterances) based on their infant's age. The extent of the differences was correlated with the severity of mother's depression. Breznitz and Sherman (1987) found that during natural discourse between mothers with depression and their 3-year-old toddlers, mothers produced fewer utterances and had longer turn-switching pauses (i.e., the duration of silence after the child stops talking and the mother begins speaking), compared to mothers in the control group. Similarly, the switching-pause duration has been found to be longer and less predictable in mothers with depression, compared to controls interacting with their 4-month-old infants (Zlochower & Cohn, 1996). Murray, Kempton, Woolgar and Hooper (1993) found that compared to mothers without depression, mothers with depression tended to use fewer infant-focused utterances and expressed more negative affect.

In summary, the literature demonstrates that the content in infant-directed input may hold unique value to the infant, playing a role in speech segmentation and correlating with the quality of later language development. The highly frequent lexical content of maternal speech plays a facilitative role in the infants' task of segmenting the input. The qualities of the input (e.g., number of noun types) are correlated with the qualities in lexical development. Children of mothers with depression exhibit cognitive and language differences compared to children of non-depressed mothers. Research examining the nonverbal interactions between mothers with depression and their infants has found that the interactions are less engaging and reciprocal. Regarding child-directed speech and depression, to date research has focused on the prosodic

quality of utterances, the functions of utterances with toddlers, book reading, and associative learning. However, the literature has not examined the frequently occurring word forms and patterns in the language input received by infants of mothers with symptoms of depression. If these frequently occurring word forms and patterns present in the input are atypical, these infants could have less exposure to the information needed to begin the process of speech segmentation and therefore, lexicon development. Further, if the communicative functions (e.g., Speech Acts, Interchange Types) of the frequently occurring word forms and patterns differ for mothers with symptoms of depression relative to mothers without symptoms of depression, the content, though present, may be less facilitative to language learning. Since the literature indicates that children of mothers with depression demonstrate differences in language development, information about the word forms and patterns available in maternal input could help explain these language development differences. The present dissertation aimed to investigate the consistency of the word forms and patterns (i.e., words surrounding the most frequently occurring words) by mothers with and without symptoms of depression. The results of this study will begin to tell us whether infants of mothers with symptoms of depression are receiving typical lexical and grammatical content and whether that content is used to convey similar communicative intents. Such information is important given the documented influence of IDS on later lexical development. The questions examined with the related hypotheses based on the literature follow.

Question 1: What are the frequently occurring word forms in IDS to four-and five-month-old infants in mothers without and with symptoms of depression?

Hypothesis 1A: Compared to IDS produced by mothers without symptoms of depression, IDS produced by mothers with symptoms of depression will have greater variety of word

types with fewer tokens produced. This pattern mirrors that seen in adult-directed speech (ADS) samples. This hypothesis is supported by the literature indicating that mothers with depression talk less to their children and less frequently modify their input based on their child's developmental level.

Hypothesis 1B: The most frequently occurring word in IDS produced by mothers without symptoms of depression will be "you" or the baby's name. In contrast, in IDS produced by mothers with symptoms of depression the highest frequency word will be an article ("the", "a"), mirroring the pattern seen in adult-directed speech (ADS) samples. These hypotheses are supported by the literature's findings that mothers with symptoms of depression less frequently modify their input based on their child's developmental level.

Question 2: What are the pragmatic uses of the utterances containing the highest frequency word forms in IDS to four- and five- month old infants in mothers without and with symptoms of depression?

Hypothesis 2A*:* Both mothers with and without symptoms of depression will use utterances with the highest frequency word forms primarily for Interchange Types *negotiate immediate activity* (NIA), *discuss joint focus of attention* (DJF) and *mark event* (MRK), however, mothers with symptoms of depression will use Interchange Types typically used with older infants {e.g., *direct hearer's attention* (DHA), *discuss related to present* (DRP)} to a greater extent than mothers without symptoms of depression. These hypotheses are supported by the literature regarding the Interchange Types most frequently seen in maternal IDS to infants from 2 weeks old to 18 months old (i.e., Rivero, 2010) and the finding that mothers with symptoms of depression less frequently match their input to the child's developmental level.

Hypothesis 2B: Both Groups of mothers will use utterances with the highest frequency word forms in the Speech Acts *statement* (ST) and *marking* (MK), but mothers without symptoms of depression will use *request/propose* (RP), whereas, mothers with symptoms of depression will use y*es/no question about hearer's wishes that functions as a suggestion* (RQ). These hypotheses are supported by the literature regarding the Speech Acts most frequently seen in maternal IDS with an infant from 2 weeks old to 18 months old (i.e., Rivero, 2010) and the finding that mothers with symptoms of depression less frequently match their input to the child's developmental level.

Question 3: Are frequent frames present in IDS to four- and five- month old infants in mothers without and with symptoms of depression?

Hypothesis 3: Both mothers with and without symptoms of depression will use frequent frames, however, mothers without symptoms with depression will use frames with the word "you" more frequently than mothers with symptoms of depression. This hypothesis is supported by the following: the literature's finding that "you" was highly frequent in IDS with 4 month olds, reports of the frequent frames typically used with toddlers and the finding that mothers with symptoms of depression less frequently modify their input based on their child's developmental level.

The results of this dissertation will contribute to our general knowledge of the range of the typical input directed to infants that allows for robust language acquisition and the extent to which this input varies from the norm under conditions of maternal depression.

METHOD

Participants

Ten mother-infant dyads participated in this study (5 mothers with symptoms of depression and 5 mothers without symptoms of depression). Inclusion criteria were being the biological mother of a four to five month old infant, having an infant born full term, with unremarkable birth and developmental histories, and having English as the home language. Exclusion criteria were having a history of Bipolar Disorder and taking mood stabilizing drugs. History of depression and use of antidepressant medication were **not** exclusion criteria, as supported by the literature. The literature, although limited, seems to indicate that it is the *presence* of depression, rather than a *history* of depression, that negatively affects mother-infant interaction. Murray, Kempton, Woolgar, & Hooper (1993) found that mothers with depression expressed more negative emotion (i.e. utterances that were criticisms, corrections, or negative statements) while interacting with their two month olds than did either the control group or mothers with a history of depression, but no post-partum episode. Further, mothers with depression in partial or full remission who were taking antidepressant medication exhibited similar mean change in fundamental frequency as a control group, compared to mothers with depression, regardless of whether they took antidepressant medication (Kaplan, Bachorowski, Smoski, & Zinser, 2001).

In total 25 mothers contacted this researcher to participate in the study. One mother cancelled her appointment and one mother was not eligible because she was not her infant's biological mother. Therefore, 23 mothers met criteria and were tested. Of these, five showed elevated scores (i.e., score = $\geq$ 10) on the *Beck Depression Inventory II* (BDI-II) and therefore, composed the Elevated Score Group. From the group of eighteen mothers remaining, ten had BDI-II scores between 5 and 9 and eight had BDI-II scores below 5. Only mothers from this

larger group with BDI-II scores below 5 were considered as potential controls in the study because the goal was to have a large separation in BDI-II scores. Of the mothers with a BDI-II score below 5, one was used as a "trainer" for pragmatic coding and of the remaining seven mothers, those most similar in age and socioeconomic status to mothers in the Elevated Score Group were selected for the Control Group. All mothers were recruited in New York City from the general population via a flyer that advertised a study examining "how infants learn language".

The demographic characteristics of the mothers in the sample are displayed in Table 1. Mothers in the Elevated Score Group had a mean age of 38 years (Range = 36-40 years). Mothers in the Control Group had a mean age of 33.2 years (Range = 30-37 years). Mothers in the Control Group had a mean Hollingshead Score of 59 (Range = 55-66). Mothers in the Elevated Score Group had a mean Hollingshead Score of 53.8 (Range = 31-63). In the Control Group, four mothers were Caucasian and one mother was Asian. In the Elevated Score Group all mothers were Caucasian. All mothers were married. All mothers were native English speakers. Mothers in the Control Group had an average BDI score of 1.8 (Range = 0-3, SD = 1.3). Mothers in the Elevated Score Group had an average BDI score of 16.6 (Range = 10-35, SD = 10.4). The BDI scores for 4/5 mothers in the Elevated Score Group indicated mild depressive symptoms. None of the mothers in either group reported a history of Bipolar Disorder. One mother in the Control Group reported one acute depressive episode when she was 23 years old (age at study 35 years). Two mothers in the Elevated Score Group reported a history of depression and one mother reported a history of panic attacks. None of the mothers in either group reported taking mood-stabilizing drugs. One mother in the Elevated Group reported taking the antidepressants Wellbutrin and Celexa. Infants in the Control Group were 4 girls and 1 boy. Infants in the

Elevated Score Group were 1 girl and 4 boys. All infants were four to five months of age, and were full-term and had unremarkable birth and developmental histories as per mother's report. All infants, with the exception of one infant in the Control Group and one infant in the Elevated Score Group, were first in birth order.

Table 1. Demographic Characteristics of Participants

	Age	SES Level (Hollingshead Score)	Marital Status	BDI-II Score	History	Medication Taken
Control Group						
Baby WA	37	upper (55)	Married	3	NA	NA
Baby GA	31	upper (56)	Married	1	NA	NA
Baby FA	35	upper (59)	Married	2	Acute depressive episode 1x	NA
Baby ZA	30	upper (66)	Married	0	NA	NA
Baby CA	33	upper (59)	Married	3	NA	NA
	M= 33.2 SD= 2.9	M=59 SD= 4.3		M= 1.8 SD=1.3		
Elevated Score Group						
Baby KA	36	middle (31)	Married	35	Depression	NA
Baby MA	38	upper-middle (54)	Married	13	NA	NA
Baby AB	36	upper (63)	Married	10	NA	NA
Baby PB	40	upper (63)	Married	13	Depression	Wellbutrin, Celexa
Baby DA	40	upper (58)	Married	12	Panic attacks	NA
	M=38 SD= 2.0	M=53.8 SD=10.4		M=16.6 SD= 10.4		

Procedure

All mothers completed informed consent procedures as approved by the CUNY Graduate Center Institutional Review Board. All mothers completed the *Beck Depression Inventory II* (BDI II), which was used to classify the mothers into the Control Group or Elevated Score Group. Mothers were asked questions regarding highest level of education and occupation of the head(s) of household in order to complete the Hollingshead's Four-Factor Index of Social Status, which was used to index socioeconomic status (SES).

Mothers and infants were videotaped during a 30 minute free play session. This consisted of 15 minutes with the child's own toys (i.e., Infant Toy Set) and 15 minutes with a standard set of toys (i.e., Standard Toy Set). The Standard Toy Set consisted of the following: Lamaze *Freddie The Firefly*, Lamaze *Play and Grow Pupsqueak,* Fisher Price *Crinkle & Clack Butterfly,* First Years *Animal Sounds Frog* and *Animal Sounds Duck,* and a set of plastic keys. Mothers were instructed to "Do what you usually do when you are playing with your baby". Sessions took place in the infant's home. During data collection the order of play with the Toy Sets was counterbalanced across participants. Three mothers in each group (Control, Elevated Score) used the Infant Toy Set first. The mothers were not required to play with all the toys and the pace of play with a given toy set was determined by the mother and baby. The sessions were videotaped using a Sony Handycam Camcorder, with a Sony Bluetooth Wireless Microphone. As a benefit to participate, mothers received the following: $20.00, a copy of her DVD, a packet of infant-language stimulation ideas, and an offer of a 30-minute infant play language stimulation session provided by this researcher, who is a licensed Speech-Language Pathologist. In addition, all mothers received a list of providers specializing in women's mental health in NYC.

Measures

Depression

The presence of depressive symptoms was assessed by the *Beck Depression Inventory-II* (BDI-II). The BDI-II is a 21-item self-report depression screening measure. Each item is rated on a 4-point Likert-type scale ranging from 0 to 3, with higher scores indicating higher levels of depressive symptoms. The measure asks respondents to endorse statements characterizing how they have been feeling throughout the past 2 weeks. The maximum total score for all 21 items is 63. For this study, the test item inquiring about suicidality was excluded because the interest of this study was the presence or absence of depressive symptoms and this item was not needed to make that distinction.

Socioeconomic Status

Socioeconomic status (SES) was measured by using Hollingshead's Four-Factor Index of Social Status. This method uses the head(s) of the household's occupation and income to measure SES and is the most widely used method for assessing SES. Scores on this measure are distributed across five categories corresponding to low, lower middle, middle, upper middle and upper socioeconomic class.

Language Variables

Each 30-minute IDS sample was transcribed for utterances and pauses. The following data were coded from each transcription for each Toy Set (Infant Toy Set, Standard Toy Set): number of words used, number of word types, measurement of lexical diversity D (defined below), the most frequently occurring words, distribution of the most frequently occurring word

across utterance positions, number of and content of word types preceding and following the most frequently occurring word, and the pragmatic function of the utterances containing the highest frequency word. Morphologically inflected variations of a word (e.g., *dog* and *dogs*) and alternative forms of a word (e.g., *TV* and *television*) were counted as different word types. Utterance boundaries were based on pause duration and intonation contour. Each measure is described in Table 2 below.

Table 2. Language Variables

Measure	**Description**
Number of words used	Total number of words produced
Number of word types	Total number of different word types used. Words having the same root, if inflected differently, were counted separately
"D"	A measurement of linguistic diversity. That is, the variety of different word types in relation to the total number of words used.
Most frequently occurring words	Word types most frequently used
Distribution of the most frequently occurring word across utterance positions	The percentage of occurrence of the most frequently occurring word across utterance positions (i.e., initial, medial, final).
Content of word types preceding the most frequently occurring words	A listing of the word types that most often precede the highest frequency word
Content of word types following the most frequently occurring words	A listing of the word types that most often follow the highest frequency word
Percentage of word types preceding the most frequently occurring words	A measure of the percentage of occurrence of given word types preceding the highest frequency word
Percentage of word types following the most frequently occurring words	A measure of the percentage of occurrence of given word types following the highest frequency word
Categorization of the pragmatic function of the utterances containing the most frequently occurring words	The language function (categories described below) of the utterance containing the most frequently occurring word.
The frequency & nature of Frequent Frames present in the samples	The frequency of two co-occurring words with one word intervening, and the content of these.

Linguistic Diversity-Measurement "D"

McKee, Malvern & Richards, (2000) describe the software they developed, called VOCD that generates the measure of vocabulary diversity, called *D*. McKee and colleagues highlight the limitations of using Type-Token Ratio (TTR) to measure vocabulary diversity, how using the measure D addresses these limitations, and how *D* is derived. With TTR, as sample size (number of tokens) increases, the probability of new word types being introduced decreases. Once the speaker is using most of her active vocabulary for a context, additional sampling (i.e., additional tokens), will result in the TTR decreasing. Even with smaller sample sizes, the total number of novel types will grow at a slower rate than the number of tokens, and TTR will decrease. Attempts to overcome these problems in the form of using a universal sample size have been unsuccessful because researchers often use different criteria for token counting and exclude data in order to reduce sample size. The advantages of the measure *D* are that it is not influenced by sample size, uses all data obtained, and provides a measure of how TTR changes over a range of token size for a particular speaker. To calculate *D*, the computer program uses random sampling. Calculation involves measuring the chances that new vocabulary will be introduced as the language sample becomes longer. This is done via repeated calculation of TTR and involves curve fitting to demonstrate how TTR changes related to sample size. This relationship is compared to the mathematical model of TTR, which yields the *D* score. The higher the *D* value, the greater the lexical diversity. To test the effects of sample size on the measure *D*, McKee and colleagues (2000) calculated the lexical diversity in 38 child language transcriptions from CHILDES. Outcomes for *D* were not statistically different for analysis of the whole sample, the even numbered words and odd numbered words. This demonstrates that sample size did not affect this measure of lexical diversity.

Pragmatic Measures

The Inventory of Communicative Acts-Abridged (INCA-A; Ninio, Snow, Pan & Rollins, 1994) was used to code the communicative intent of utterances. The INCA-A is a shortened and modified version of the system developed by Ninio and Wheeler (1984). The INCA-A system codes the communicative intent at two levels, the utterance (i.e., speech acts), and the verbal interchange (i.e., social context) in which the utterance occurs. An interchange is defined as "one or more rounds of talk, all of which serve a unitary interactive function" (Ninio, et.al., 1994, p. 166). At the utterance level, INCA-A distinguishes among 65 Speech Act codes. At the interchange level the system distinguishes among 22 Interchange Codes. Appendix A provides the INCA-A codes with examples from the current study.

Reliability

A second rater independently reviewed 20% of the transcriptions and coded 20% of the data sets for pragmatic measures (i.e., Interchange Codes & Speech Act Codes). Reliability for the transcriptions was 99%. The point by point reliability for the Interchange and Speech Act Codes were 88% and 92% respectively.

Statistical Analysis

Analyses used the SPSS 20 statistical package. Statistical tests are two-tailed, and a *P* value of .05 or less was chosen as the level of statistical significance. T-tests were used to compare the following for mothers with and without symptoms of depression during play with their four-five month old infants: number of word tokens, number of word types, VOCD, VOCD Difference for Toy Sets, percentage of occurrence of the highest frequency word, percentage of

occurrence of the highest frequency word in each utterance position, percentage of occurrence of the word that most frequently preceded the highest frequency word, percentage of occurrence of the word that most frequently followed the highest frequency word, percentage of use of Interchange Types for utterances containing the highest frequency word, and percentage of use of Speech Acts for utterances containing the highest frequency word.

RESULTS

Number of Word Tokens & Word Types and VOCD

As seen in Table 3, the average total number of word tokens and total number of word types were higher for the Control Group compared to the Elevated Score Group for both Toy Sets. However these differences were not significant for either Toy Set [*Total Number of Word Tokens* -- Infant Toy Set: (t (8) = 0.80, p=.45); Standard Toy Set: (t (8) =.47, p=.65); *Total Number of Word Types* -- Infant Toy Set: (t (8) = 0.64, p=.54); Standard Toy Set: (t (8) =.10, p=.93)].

As stated above, VOCD measures linguistic diversity, with higher VOCD indicating greater diversity. The data in Table 3 demonstrates that the average VOCD for each Toy Set was higher for the Control Group compared to the Elevated Score Group, indicating greater lexical diversity for both Toy Sets by the Control Group. However, these differences were not significant for either Toy Set [Infant Toy Set: (t (8) = 1.3, p=.23); Standard Toy Set: (t (8) =.27, p=.79)]. Additionally, as indicated by the VOCD Difference (VOCD Diff), for 4/5 mothers in the Control Group the VOCD was higher in samples produced during play with the Infant Toy Set compared to the Standard Toy Set. This indicates that there was greater linguistic diversity in samples produced during play with the Infant Toy Set compared to the Standard Toy Set. The opposite was true for 4/5 mothers in the Elevated Score Group. That is, for 4/5 mothers in the Elevated Score Group there was greater linguistic diversity in samples produced during play with the Standard Toy Set compared to the Infant Toy Set. However, these differences were not significant (t (8) =1.7, p=.14).

Table 3. Individual & Group Data for Total Number of Tokens, Total Number of Word Types, VOCD & VOCD Difference Across Toy Sets

	Infant Toy Set			Standard Toy Set			VOCD Diff. Across Toy Sets
Control Group	**Total Tokens**	**Total Types**	**VOCD**	**Total Tokens**	**Total Types**	**VOCD**	
Baby WA	582	137	54.7	314	100	43	11.7
Baby GA	1265	343	95.3	1316	342	92.8	2.5
Baby FA	784	194	69.2	748	185	68.5	0.7
Baby ZA	744	163	49.6	1078	192	47.6	2
Baby CA	837	243	94	754	250	98.5	-4.5
	M=842 SD=255	*M=216 SD=81*	*M=72.6 SD=21.4*	*M=842 SD=379*	*M=214 SD=89*	*M=70.1 SD=25.3*	*M=2.5 SD=5.9*
Elevated Score Group							
Baby KA	804	203	62.8	794	192	50.1	12.7
Baby MA	847	173	51	679	189	61.7	-10.7
Baby AB	377	102	26.6	504	135	39.5	-12.9
Baby PB	544	170	65.3	733	189	72.4	-7.1
Baby DA	1003	283	74.7	1050	339	105.1	-30.4
	M=715 SD=251	*M=186 SD=66*	*M=56.1 SD=18.5*	*M=752 SD=199*	*M=209 SD=77*	*M=65.8 SD=25.2*	*M=-9.7 SD=15.4*

Note: All results regarding frequency of occurrence will be reported as percent.

Top Five Words

For both the Control and Elevated Score Groups the word "you" was in the Top Five most frequently occurring words across both Toy Sets. For both Groups, all other words were in the Top Five for 3/5 mothers or fewer during play with a given Toy Set, with the exception of "the", which was in the Top Five for 4/5 mothers of the Elevated Score Group during play with the Standard Toy Set (See Table 4).

Most Frequently Occurring Word

As seen in Table 4, during play with the Infant Toy Set, the most frequently occurring word was "you" for 5/5 mothers in the Control Group, accounting for an average of 6% of words produced (i.e., tokens) within a given sample, and 4/5 mothers in the Elevated Score Group, accounting for an average of 7% of words produced (i.e., tokens) within a given sample. The word "that" was the most frequently occurring word for 1/5 mothers in the Elevated Score Group, accounting for 10% of the words produced ("you" as the second most frequently occurring word for this mother). During play with the Standard Toy Set, the word "you" was the most frequently occurring word for 4/5 mothers in the Control Group, accounting for an average of 6% of words produced (i.e., tokens) within a given sample, and 4/5 mothers in the Elevated Score Group, accounting for an average of 7% of words produced (i.e., tokens) within a given sample. The word "the" was the most frequently occurring word for 1/5 mothers in the Control Group, accounting for 5% of the words produced ("a" and "you" were the second and third most frequently occurring words respectively for this mother). The word "shake" was the most frequently occurring word for 1/5 mothers in the Elevated Score Group, accounting for 6% of the words produced ("*baby's name*" and "you" were the second and third most frequently occurring

words respectively for this mother). There was no significant difference in the average frequency of occurrence of “you” for the Control and Elevated Score Groups for either Toy Set [Infant Toy Set: ($t(8) = 1.7$, $p=.13$); Standard Toy Set: ($t(8) =.17$, $p=.87$)]. Sample utterances containing “you” produced by each mother are found in Table 5.

Table 4. Top Five Most Frequently Occurring Words for Each Mother-Infant Pair and Each Toy Set.

Control Group					Elevated Score Group				
	Infant Toy Set		**Standard Toy Set**			**Infant Toy Set**		**Standard Toy Set**	
Baby	**Word**	**Frequ.**	**Word**	**Frequ.**	**Baby**	**Word**	**Frequ.**	**Word**	**Frequ.**
Baby WA	you	5%	you	7%	**Baby KA**	you	8%	shake	6%
	is		go			NAME		NAME	5.8%
	this		oh			the		you	4.5%
	what		this			look		the	
	oh		ok			I		your	
Baby GA	you	6%	you	6%	**Baby MA**	you	9%	you	8%
	the		a			this		this	
	your		that			you're		at	
	and		the			it		look	
	*with		it			to		*you’re	
	*see							*yeah	
	*a							*it	
								*guy	
Baby FA	you	6%	you	7%	**Baby AB**	that	10%	you	8%
	that		that			you	8%	the	
	the		a			who's		like	
	it		is			it		that	
	wanna		yeah			baby		frog	
Baby ZA	you	7%	you	9%	**Baby PB**	you	8%	you	7%
	NAME		one			the		duck	
	ok		that			kitty		to	
	oh		NAME			fly		the	
	is		oh			you're		a	
Baby CA	you	5%	the	5%	**Baby DA**	you	4%	you	5%
	the		a	4.5%		the	4%	the	
	a		you	3%		one		a	
	and		and			yeah		that	
	*yeah		yeah			that		yeah	
	*oh								
	*little								

**More than 5 words are listed when the percentage for the 5th most frequently occurring word overlapped with the percentage for the word(s) that followed*

Table 5. Sample Utterances Containing "you" Produced by Each Mother

Control Group		Elevated Score Group	
	Sample Utterances		**Sample Utterances**
Baby WA	Do *you* hear your sister crying?	Baby KA	*You* don't wanna play this morning, uh?
	You want the doggie?		Yes, I'm glad *you* like this.
	Look at *you*!		Excuse *you*.
Baby GA	*You* have a duck that sounds just like that.	Baby MA	*You* don't know which one to go for.
	Let's open it up so *you* can see your friends.		Are *you* gonna hit it?
	I'm so proud of *you*!		Hey, look at *you*!
Baby FA	*You* wanna stand over here?	Baby AB	*You* wanna eat that?
	Which should *you* play with?		Now *you* want the froggie.
	OK, I see *you*.		Who's that smiling at *you*?
Baby ZA	*You* can just roll over if you want again	Baby PB	*You* don't know if you're more interested in the fly or the lady who's taping you
	Are *you* getting tired, uhm?		Sometimes it makes *you* dance.
	Look at *you*!		Oh, you're really curious, aren't *you*?
Baby CA	*You* got his foot.	Baby DA	*You* remember this, right?
	Are *you* in a playful mood?		Oh *you* see the leaves on my shirt?
	Mom's gonna help *you*.		You want out of the bumbo, don't *you*?

Most Frequently Occurring Utterance Position of "you"

Analysis of samples produced during play with the Infant Toy Set and the Standard Toy Set reveals a similar pattern for both Toy Sets. As seen in Table 6, for play with each Toy Set, the most frequently occurring utterance position for "you" was medial position for least 4/5 mothers in the Control Group, but only 3/5 mothers in the Elevated Score Group. Utterance-initial was the most frequently occurring position for all other mothers. Averaging across the ten samples produced by each Group (i.e. five participants in each Group produced one sample during play with each of two Toy Sets = 10 samples per Group), the average frequency of

occurrence of “you” in the utterance-medial position was 61% for the Control Group and 50% for the Elevated Score Group. The differences in frequency of occurrence for “you” in utterance-medial position were not significantly different for the Control and Elevated Score Groups for either Toy Set [Infant Toy Set: ($t(8) = 1.6$, $p=.15$); Standard Toy Set: ($t(8) = 1.0$, $p=.35$)].

Rank order of samples for the frequency of occurrence of “you” in utterance-medial position indicates that 60%-80% of samples produced by mothers in the Elevated Score Group fell in the bottom half for each Toy Set (See Table 7). Across Toy Sets, the rank of a given sample was fairly consistent. That is, 80% of samples in each Group (Control & Elevated Score) maintained their rank within 2 rank positions.

Table 6. Distribution of "you" by Utterance Position

	Infant Toy Set			Standard Toy Set		
Control Group	**Initial**	**Medial**	**Final**	**Initial**	**Medial**	**Final**
Baby WA	19%	77%	3%	39%	61%	0%
Baby GA	21%	70%	9%	24%	69%	7%
Baby FA	36%	58%	6%	26%	68%	6%
Baby ZA	30%	52%	18%	37%	58%	5%
Baby CA	44%	51%	5%	55%	45%	0%
Elevated Score Group						
Baby KA	37%	51%	12%	39%	44%	17%
Baby MA	20%	71%	9%	25%	68%	7%
Baby AB	71%	23%	6%	59%	41%	0%
Baby PB	32%	51%	17%	52%	46%	2%
Baby DA	50%	38%	12%	21%	66%	13%

Note: The largest percentage for each mother is shaded

Table 7. Rank Order of Samples Based on Percentage of Occurrence of "you" in Utterance-Medial Position

Infant Toy Set			Standard Toy Set		
Rank	Baby	% of "you" in utterance-medial position	Rank	Baby	% of "you" in utterance-medial position
1	Baby WA	77%	1	Baby GA	69%
2	**Baby MA**	71%	2	**Baby MA**	68%
3	Baby GA	70%	2	Baby FA	68%
4	Baby FA	58%	3	**Baby DA**	66%
5	Baby ZA	53%	4	Baby WA	61%
6	Baby CA	51%	5	Baby ZA	58%
6	**Baby KA**	51%	6	**Baby PB**	46%
6	**Baby PB**	51%	7	Baby CA	45%
7	**Baby DA**	38%	8	**Baby KA**	44%
8	**Baby AB**	23%	9	**Baby AB**	41%

Note: Samples produced by mothers in the Elevated Score Group are bold. Shading indicates Bottom Half.

Words That Most Frequently Preceded "you"

The word that most frequently preceded "you" was analyzed for utterance-medial and utterance-final productions only, since utterance-initial "you" was always preceded by a pause. Therefore, percentages provided for frequency of occurrence are based on the total number of utterance-medial and utterance-final productions for a given sample. Although the specific word that most frequently preceded "you" differed across mothers, the frequency of the most frequently occurring word was similar across Toy Sets and across the groups of mothers. During play with the Infant Toy Set the average frequency of occurrence for the word that most frequently preceded "you" was 22% (Range=15%-34%) for the Control Group and 16% (Range = 11%-22%) for the Elevated Score Group, however, these average frequencies were not significantly different ($t(8)=1.44$, $p=.19$). During play with the Standard Toy Set the average

frequency of occurrence for the word that most frequently preceded "you" was 20% (Range= 10%-29%) for the Control Group and 24% (Range = 35%-12%) for the Elevated Score Group, however, these average frequencies were not significantly different ($t(8)=.76$, $p=.47$).

Due to limited power because of small sample size, data regarding the **specific** words that preceded "you" were analyzed qualitatively only. Data were examined for the ten samples produced by each Group (i.e. five participants in each Group produced one sample during play with each of two Toy Sets, leading to ten samples per Group). The word that most frequently preceded "you" varied across samples in each Group, with little overlap. For the Control Group these words were "do", "are", "can", "oh", "what d' ", "what ch' ", "here", "yes", "then" and "at"; with "do" most frequently preceding "you" in 2/10 samples. For the Elevated Score Group the words that most frequently preceded "you" were "love", "excuse", "can", "do", "give", "there", "what", "are", and "aren't"; with "are" most frequently preceding "you" in 4/10 samples. The majority of words preceding "you" were function words, including auxiliary verbs in full or contracted form (e.g., "what d' you"), deictics ("here you") and a few discourse forms ("oh, you", "yes, you"). But the samples also included a few lexical verbs ("love", "excuse", "give"). Examination of the Top Five words that most frequently preceded "you", reveals use of the auxiliary verbs "are", "do" and "can" across samples for both the Control and Elevated Score Groups. Seventy percent of samples produced by each of the Groups (Control Group & Elevated Score Group) had least two of these auxiliary verbs in the Top Five. All mothers, regardless of Group, had at least one sample in which one of these auxiliary verbs was in the Top Five words preceding "you". See Table 8 for the words that most frequently preceded "you" for each Group, with percentage of occurrence.

Table 9 presents all WORD + “you” sequences present in at least 5/10 samples for either the Control or Elevated Score Group with the proportion of samples containing the sequence and proportion of samples with a given sequence in the Top Three. Focusing on the proportion of samples with a given sequence in the Top Three, rather than the proportion of samples with a sequence present provides a more accurate picture of use because although a sample may contain a given sequence, the frequency of use might be low. Sequences in the Top Three were consistent for the two Groups, with the exception of “there you”.

Use of “What” either alone or in a contracted form (i.e., “What’ch”, “What d’”, “What’re”) preceded “you” in 9/10 samples in the Control Group and 8/10 samples in the Elevated Score Group. Looking at “What” forms cumulatively, the average frequency of occurrence was 12% (Range = 0%-24%) for the Control Group and 11% (Range = 0%-22%) for the Elevated Score Group. All mothers used a “What” form with infants during play with at least one Toy Set and most used it during play with both Toy Sets (i.e., 4/5 mothers in Control Group, 3/5 mothers in Elevated Score Group).

Table 8. The Words That Most Frequently Preceded "you" With Percentage of Occurrence

Control Group									
Baby WA		**Baby GA**		**Baby FA**		**Baby ZA**		**Baby CA**	
oh	29%	are (I)	15%	can (I)	34%	at (I)	25%	then	20%
can	29%	are (S)	10%	do (S)	22%	do	17%	what d'	20%
here	16%	what d'	10%	what d'	16%	at (S)	15%	yes	20%
do	12%			are	14%	there	14%	what'ch	18%
what d'	12%			do (I)	13%	are	11%	are	14%
				can (S)	11%	here	10%	here	14%
						if	10%	decided	10%
								oh	10%
								out	10%
								yeah	10%
Elevated Score Group									
Baby KA		**Baby MA**		**Baby AB**		**Baby PB**		**Baby DA**	
love (S)	18%	can (S)	19%	do (S)	35%	give	33%	are	15%
excuse	18%	are	18%	are (I)	22%	oh	13%	there	12%
are	12%	do	14%	what	22%	what	13%	do (I)	10%
see	10%	can (I)	13%	what d'	18%	aren't	11%	here	10%
loves (I)	10%	what d'	12%	are (S)	12%	do	11%	yes	10%
look	9%	there	10%	at	11%			do (S)	10%
				do (I)	11%				
				face	11%				
				no	11%				
				yeah	11%				

*Note: All words occurring $\geq$ 9% within a sample in either Toy Set are listed. When a word occurred $\geq$ 9% in samples produced during **both** Toy Sets, (I)=Infant Toy Set, (S)=Standard Toy Set are used to differentiate the Toy Set in which the frequency occurred.*

Table 9. Number of Samples in Each Group Containing a Given WORD + "you" Sequence

Sequence	Control Group		Elevated Score Group		Examples
	Samples with Sequence Present	**Samples with Sequence in Top Three**	**Samples with Sequence Present**	**Samples with Sequence in Top Three**	
are *you*	8/10	6/10	8/10	6/10	Are you giving me the stink face?
can *you*	7/10	3/10	4/10	2/10	How much butterfly can you eat?
do *you*	7/10	6/10	10/10	8/10	I don't think you want it on either foot, do you?
here *you*	5/10	3/10	5/10	4/10	Here you go, a fly.
there *you*	8/10	6/10	4/10	3/10	There you are.
oh *you*	9/10	3/10	7/10	3/10	Oh, you wanna eat this, huh?
yah/yeah/yes *you*	7/10	3/10	6/10	3/10	Yeah, you can make more music when you bounce. Can you get it?
what/what're/ what'ch/what d' *you*	9/10	6/10	8/10	6/10	What d' you see? Oh, what're you saying?
if *you*	6/10	1/10	3/10	1/10	What happens if you hit this?

Note: Data are for WORD + "you" sequences occurring in at least 5/10 samples for either the Control or Elevated Score Group. Data were examined for the 10 samples produced by each Group (i.e., 5 participants in each Group produced 1 sample during play with each of 2 Toy Sets = 10 samples per Group).

Words That Most Frequently Followed "you"

The word that most frequently followed "you" was analyzed for utterance-initial and utterance-medial productions only since utterance-final "you" was always followed by a pause. Therefore, percentages provided for frequency of occurrence are based on the total number of utterance-initial and utterance-medial productions for a given sample. During play with the Infant Toy Set the average frequency of occurrence for the word that most frequently followed "you" was 17% (Range=13%-20%) for the Control Group and 21% (Range = 11%-35%) for the Elevated Score Group; however, these average frequencies were not significantly different ($t(8)=.80$, $p=.45$). During play with the Standard Toy Set the average frequency of occurrence for the word that most frequently preceded "you" was 18% (Range=13%-23%) for the Control Group and 24% (Range = 15%-42%) for the Elevated Score Group, however, these average frequencies were not significantly different ($t(8)=1.27$, $p=.24$).

Due to limited power because of small sample size, data regarding the **specific** words that followed "you" were analyzed qualitatively only. Data were examined for the ten samples produced by each Group (i.e. five participants in each Group produced one sample during play with each of two Toy Sets, leading to ten samples per Group). The word that most frequently followed "you" varied across samples in each Group. For the Control Group these were "go", "see", "wanna"/"want", "can", "lookin'", "get", "got", and "like"; with "want"/"wanna" most frequently following "you" in 2/10 samples. For the Elevated Score Group the words that most frequently followed "you" were "go", "wanna"/"want", "got", and "like". The words "want"/ "wanna" most frequently followed "you" in 4/10 samples and "like" most frequently followed "you" in 4/10 samples. These words are primarily auxiliary verbs and high frequency content

verbs (e.g., “like”, “get”, “go”, “see”). See Table 10 for the words that most frequently followed “you” for each Group, with percentage of occurrence.

Table 11 presents all “you” + WORD sequences present in at least 5/10 samples for either the Control or Elevated Score Group with the proportion of samples containing the sequence and proportion of samples with a given sequence in the Top Three. Focusing on the proportion of samples with a given sequence in the Top Three, rather than the proportion of samples with a sequence present provides a more accurate picture of use because although a sample may contain a given sequence, the frequency of use might be low. As Table 11 shows, “you want/wanna” sequences were used by all mothers. Both forms “you want” and “you wanna” were used by 9/10 samples and 7/10 samples for the Control Group and Elevated Score Group respectively. The average combined frequency of occurrence for the forms “you want” and “you wanna” was 18% (Range = 5%-32%) for the Control Group and 21% (Range = 7%-34%) for the Elevated Score Group. The sequence “you like” was in the Top Three for 9/10 samples of the Elevated Score Group, but only 3/10 samples of the Control Group. A discussion of the Interchange Types and Speech Acts for utterances containing “you want/wanna” and “you like” will follow.

Table 10. The Words That Most Frequently Followed "you" With Percentage of Occurrence

Control Group									
Baby WA		**Baby GA**		**Baby FA**		**Baby ZA**		**Baby CA**	
go	20%	can	13%	got	19%	can	19%	want	23%
get	17%	see	13%	wanna (I)	19%	like	17%	don't	14%
don't	17%			wanna (S)	15%	want (I)	14%	lookin	14%
got	13%			want	13%	want (S)	14%	go	11%
like	13%			could	11%	wanna	13%	got	11%
want	10%							sleepy	11%
								wanna	11%
Elevated Score Group									
Baby KA		**Baby MA**		**Baby AB**		**Baby PB**		**Baby DA**	
like (S)	30%	wanna (S)	17%	like (S)	42%	wanna (S)	18%	go (S)	15%
like (I)	26%	wanna (I)	13%	like (I)	35%	want (I)	18%	got (I)	11%
wanna	17%	getting	12%	wanna (I)	28%	like (I)	15%	like (I)	11%
don't	10%	got	12%	wanna (S)	27%	wanna (I)	15%	like (S)	11%
		think	10%			want (S)	12%		

*Note: All words occurring $\geq$ 9% within a sample in either Toy Set are listed. When a word occurred $\geq$ 9% in samples produced during **both** Toy Sets, (I)=Infant Toy Set, (S)=Standard Toy Set are used to differentiate the Toy Set in which the frequency occurred.*

Table 11. Number of Samples in Each Group Containing a Given "you" + WORD Sequence

Sequence	Control Group		Elevated Score Group		Examples
	Samples with Sequence Present	**Samples with Sequence in Top Three**	**Samples with Sequence Present**	**Samples with Sequence in Top Three**	
you want/wanna	10/10	9/10	10/10	9/10	That one's over there, if you want it. Do you wanna pick that up?
you like	5/10	3/10	10/10	9/10	Oh boy, there's something else over here that you like. You like to eat your toys.
you got	9/10	4/10	7/10	3/10	You got it!
you can	9/10	5/10	6/10	4/10	Let's put something out so you can play.
you go	9/10	3/10	7/10	2/10	Wow, there you go!
you think	5/10	2/10	5/10	2/10	Whatd' you think about this guy?
you know	5/10	0/10	4/10	0/10	You know how to do that.
you have	6/10	1/10	3/10	1/10	You have a duck that sounds just like that.
you don't	7/10	3/10	5/10	2/10	You don't wanna be on your tummy.
you did	3/10	0/10	5/10	1/10	You did it!
you are	5/10	2/10	3/10	0/10	Wow, you are very busy!

Note: Data are for "you" + WORD sequences occurring in at least 5/10 samples for either the Control or Elevated Score Group. Data were examined for the 10 samples produced by each Group (i.e., 5 participants in each Group produced 1 sample during play with each of 2 Toy Sets = 10 samples per Group).

Content Surrounding "you want/wanna"

Because "you want/wanna" on average accounted for approximately 20% of "you" + WORD sequences, it was of interest to know the content following "you want/wanna". Although nouns (e.g., toy name), pronouns (e.g.,"your", "this"), and determiners (e.g., "this", "these") followed "want/wanna" for both Groups (Control Group, Elevated Score Group), verbs most frequently followed "you want/wanna". A total of 22-24 verb types were used by each Group in "you want/wanna" sequences, with the most frequently used verb(s) being "play" for the Control Group, and "play" and "try" for the Elevated Score Group. See Table 12 for all verbs that followed "you want/wanna" for each Group. Fifty percent (11/22) of the verbs used by the Control Group and thirty eight percent (9/24) of the verbs used by the Elevated Score Group are listed on *The MacArthur Communicative Development Inventory: Words & Gestures.* These verbs are all fairly high frequency verbs that are likely to be learned early.

Table 12. Verbs That Followed "you want/wanna"

	Control Group	**Elevated Score Group**
be		X
bite	**X**	
come out		X
dive	X	
(to) do	X	X
(to) **eat**	**X**	**X**
feel		X
get	**X**	**X**
(to) **give**		**X**
go		**X**
grab		X
have	X	
help		**X**
hold		X
lay		X
lie		X
look		**X**
make	X	
move		X
name	X	
out		X
pick	X	
(to) **play**	**X**	**X**
put	**X**	**X**
reach	X	
read	**X**	
roll	X	X
say	**X**	
see	**X**	
share		X
sit	X	X
sleep	**X**	
stand	X	
take	**X**	
talk		X
touch	**X**	**X**
try	X	X

Note: X indicates that the verb followed "you want/wanna" in samples for that Group. Verbs on the MacArthur Communicative Development Inventory: Words and Gestures are in bold.

Interchange Types for Utterances Containing "you"

Due to limited power because of small sample size, data regarding the Interchange Types for utterances containing "you" were analyzed qualitatively only. Data were examined for the ten samples produced by each Group (i.e. five participants in each Group produced one sample during play with each of two Toy Sets, leading to ten samples per Group). Utterances containing *"you"* were most frequently used to *negotiate immediate activity* (NIA) for 9/10 samples in the Control Group. In the remaining sample *discuss hearer's thoughts and feelings* (DHS) was the most frequently occurring Interchange Type for utterances containing "you". On average 38% of utterances containing "you" were used to NIA (Range = 23.8%-56.2%) and 20% of utterances containing "you" were used to DHS (Range = 5.3%-30.4%). In contrast, in the Elevated Score Group utterances containing "you" were most frequently used to DHS for 6/10 samples. Utterances containing "you" were most frequently used to NIA in only 2/10 samples (i.e., same mother during the two Toy Sets). In 1/10 samples NIA and DHS occurred with equal frequency and in the remaining sample most utterances containing "you" were used to *discuss fantasy world* (DFW). On average 24% of utterances containing "you" were used to NIA (Range =8.6%-50%) and 36% of utterances containing "you" were used to DHS (Range = 19.2%-75.6%). It was noted that all five mothers in the Control Group used the NIA function for over one third of utterances with "you" for at least one (and often both) samples. In contrast, only one of the five mothers in the Elevated Score Group used "you" utterances for NIA at such a high rate. The other four mothers in the Elevated Score Group used NIA for less than 1/4 of "you" utterances. Individual data are presented in Table 13. The Top Three Interchange Types listed for each sample on average accounted for 78% of the Interchanges for utterances containing "you" (Range=58%-90%) in samples produced by the Control Group and 79% of the

Interchanges for utterances containing "you" (Range=67%-100%) in samples produced by the Elevated Score Group. Rank order of each participant's average percentage of use of the Interchange Type NIA across Toy Sets indicates that 80% of mothers in the Elevated Score Group fell in the bottom half (See Table 14).

As represented in Table 13, the Interchange Types *discuss joint focus of attention* (DJF), *mark event* (MRK), *direct hearer's attention* (DHA) and *discuss related to present* (DRP) were used with similar frequencies by the Control and Elevated Score Groups. That is, they were in the Top Three Most Frequently Occurring Interchange Types for the following number of samples produced by the Control Group and Elevated Score Group: DJF: 6/10 samples in each Group, MRK: 0/10 & 1/10 respectively, DHA: 0/10 for each Group, DRP: 3/10 & 1/10 respectively.

According to the definition, the Interchange Type *discuss hearer's thoughts and feelings* (DHS) deals the "hearer's non-observable thoughts and feelings" (Ninio et al., 1994, p. 170). In this study utterances containing "you" classified as DHS dealt with the baby's intentions, baby's like or dislike of toys/activities, and feelings, such as frustration, curiosity and hunger. Interestingly, for the Control Group an average of 26% (Range = 0%-57%) of utterances containing "you" classified as DHS focused on whether the infant liked a given toy, while in contrast, for the Elevated Score Group an average of 47% (Range = 6%-71%) of DHS utterances focused on whether the infant liked a given toy. Further, for samples in the Elevated Score Group with DHS as the most frequently occurring Interchange Type for utterances containing "you" (i.e., 6/10 samples), an average of 57% of utterances referred to whether the infant "liked" a given toy/activity, with the highest frequencies (i.e., 70% & 71%) noted for samples produced with Baby KA (i.e., mother with highest BDI score). Whereas, in the one

sample in the Control Group for which DHS was the most frequently occurring Interchange Type for utterances containing “you”, only 16% of utterances referred to whether the infant “liked” a given toy. In the other cases, the mother referred to the baby’s “opinion” (i.e., “What d’ you think?) or the baby’s interests (e.g., “You want some of these toys.” as the baby is exploring the toys).

Table 13. Top Three Interchange Types for Utterances Containing "you"

Control Group					Elevated Score Group				
	Infant Toy Set		Standard Toy Set		Infant Toy Set			Standard Toy Set	
Baby	**Interchange**	**Frequ.**	**Interchange**	**Frequ.**	**Baby**	**Interchange**	**Frequ.**	**Interchange**	**Frequ.**
Baby WA	NIA	26%	NIA	35%	**Baby KA**	DHS	33%	DHS	39%
	DHS	19%	DHS	30%		PRO	21%	NIA	19%
	DCA	13%	DJF	17%		NIA	15%	MRK	11%
								DFW	11%
Baby GA	NIA	40%	NIA	34%	**Baby MA**	NIA	41%	NIA	50%
	DJF	21%	DHS	19%		DHS	23%	DHS	19%
	DCA	13%	DRP	15%		DCA	16%	DJF	10%
Baby FA	NIA	56%	NIA	36%	**Baby AB**	DHS	52%	DHS	76%
	DHS	19%	DJF	32%		NIA	23%	NIA	20%
	CMO	10%	DHS	14%		DJF	10%	DJF	2%
								DCA	2%
Baby ZA	NIA	49%	NIA	45%	**Baby PB**	DHS	49%	DFW	31%
	DJF	20%	DHS	30%		DJF	14%	NIA	25%
	DHS	14%	DJF	11%		DCA	11%	DHS	18%
Baby CA	NIA	39%	DHS	29%	**Baby DA**	NIA	21%	DHS	27%
	DHS	21%	NIA	24%		DHS	21%	DJF	23%
	DRP	15%	DRP	19%		DRP	16%	NIA	17%
	DJF	15%				DJF	16%		
						DCA	11%		

Note: More than 3 Interchange Codes are listed when the percentage for the 3rd most frequently occurring code overlapped with the percentage for the for codes(s) that followed. NIA=negotiating immediate activity; DHS= discuss hearer's thoughts & feelings; DRP=discuss related to present; DJF=discuss joint focus; DCA=discuss clarification of action; CMO=comfort; DFW=discuss fantasy world; PRO=perform verbal move.

Table 14: Rank Order of Each Participant's Average Percentage of Use of the Interchange Type NIA Across Toy Sets.

Rank	Baby	Average Percentage of Use of NIA Across Toy Sets
1	Baby ZA	47%
2	Baby FA	46%
3	**Baby MA**	45%
4	Baby GA	37%
5	Baby CA	31%
6	Baby WA	30%
7	**Baby AB**	21%
8	**Baby DA**	19%
9	**Baby KA**	17%
10	**Baby PB**	17%

Note: Samples produced by mothers in the Elevated Score Group are bold. Shading indicates Bottom Half

Speech Acts for Utterances Containing "you"

Due to limited power because of small sample size, data regarding the Speech Acts for utterances containing "you" were analyzed qualitatively only. Data were examined for the ten samples produced by each Group (i.e. five participants in each Group produced one sample during play with each of two Toy Sets, leading to ten samples per Group). For the Control Group, the most frequently occurring Speech Act for utterances containing "you" was y*es/no questions* (YQ) in 5/10 samples, *statements* (ST) in 2/10 samples, and *Yes/No questions about the hearer's wishes or intentions that acted as a question* (RQ) in 1/10 samples. For the remaining two samples, there were equal frequencies for utterances containing "you" for YQ and RQ; and YQ and ST. The average frequency of occurrence for YQ, ST and RQ was 26%, 21%, and 15% respectively. Similarly, in the Elevated Score Group, the most frequently occurring Speech Act for utterances containing "you" was YQ in 6/10 samples, ST in 3/10 samples, and RQ for 1/10 samples. The average frequency of occurrence for YQ, ST and RQ was 32%, 25%

and 11% respectively. The combination of YQ, RQ and ST on average accounted for 62% (Range=46%-76%) of the Speech Acts for utterances containing "you" in samples produced by the Control Group and 67% (Range=38%-89%) of the Speech Acts for utterances containing "you" in samples produced by the Elevated Score Group. Individual data are presented in Table 15. The Top Three Speech Act types listed for each sample on average accounted for 75% (Range=64%-87%) of the Speech Acts for utterances containing "you" in samples produced by the Control Group and 76% (Range=60%-100%) of the Speech Acts used for utterances containing "you" in samples produced by the Elevated Score Group.

Yes/No questions (YQ) was one of the Top Three most frequently occurring Speech Acts for utterances containing "you" for 10/10 samples in the Control Group and 8/10 samples in the Elevated Score Group, but was used with slightly higher average frequency by the Elevated Score Group (31% compared to 26%). Regarding the Interchange Types in which YQ utterances were used, both Groups most frequently used YQ to *discuss hearer's thoughts and feelings* (DHS). In the Control Group that is 6/10 samples, plus 1/10 samples in which YQ was used equally to *discuss hearer's sensations* (DHS) and *discuss clarification of action* (DCA). In the Elevated Score Group that is 7/10 samples, plus 1/10 samples in which YQ was used equally to *discuss hearer's thoughts and feelings* (DHS) and *discuss joint focus of attention* (DJF). Mothers in the Elevated Score Group showed a slightly higher average percentage of use of DHS Interchange Types, which is in line with the demonstrated higher average percentage of use of YQ utterances.

Regarding the Speech Act most frequently used with the *negotiate immediate activity* (NIA) Interchange Type, 5/10 samples in the Control Group most frequently used y*es/no question about the hearer's wishes & intentions that functions as a suggestion* (RQ), 2/10 most

frequently used *request/propose/suggest action for hearer or hearer & speaker* (RP), and in another two samples, RQ occurred with equal frequency as *state intent to carry out act by speaker/description of one's ongoing activity (*SI); and *request/propose/suggest action for hearer or hearer & speaker* (RP) occurred with equal frequency as *praise motor acts* (PM). In the remaining sample, *mark transfer of object* (TO) was the most frequently used Speech Act with NIA. For the Elevated Score Group, the Speech Act most frequently used with NIA was RQ for 4/10 samples, PM in 2/10 samples, and YQ, RP and SI in 1/10 samples each. In the remaining sample, RQ, TO, and TQ (*limited alternative Yes/No question*) co-occurred with NIA with equal frequency.

Table 15. Top Three Speech Act Codes for Utterances Containing "you"

Control Group					Elevated Score Group				
	Infant Toy Set		Standard Toy Set		Infant Toy Set			Standard Toy Set	
Baby	**Speech Act**	**Frequ.**	**Speech Act**	**Frequ.**	**Baby**	**Speech Act**	**Frequ.**	**Speech Act**	**Frequ.**
Baby WA	YQ	23%	YQ	26%	**Baby KA**	YQ	39%	YQ	38.9%
	TO	19%	RQ	26%		ST	18%	ST	16.7%
	ST	19%	ST	22%		PR	8%	MK	13.8%
	QN	19%				EN	8%		
Baby GA	YQ	29%	ST	34%	**Baby MA**	YQ	37%	RQ	27%
	ST	27%	YQ	28%		PM	20%	YQ	19%
	SI	11%	QN	11%		RQ	16%	ST	15%
	RQ	11%							
Baby FA	RQ	33%	YQ	32%	**Baby AB**	YQ	48%	YQ	44%
	YQ	13%	QN	22%		ST	19%	QN	20%
	RP	13%	RQ	18%		RQ	13%	RQ	15%

Table 15. Top Three Speech Act Codes for Utterances Containing "you" continued

Baby ZA	YQ	20%	YQ	30%	**Baby PB**	ST	51%	ST	41%
	ST	20%	ST	22%		YQ	34%	RQ	20%
	RP	18%	RP	12%		TQ	3%	SI	16%
						TO	3%		
						RQ	3%		
						QN	3%		
						MK	3%		
Baby CA	YQ	39%	ST	33%	**Baby DA**	YQ	42%	ST	29%
	RQ	18%	YQ	24%		ST	32%	QN	21%
	QN	10%	RQ	19%		TO	5%	SI	10%
						RQ	5%		

Note: More than 3 Speech Act Codes are listed when the percentage for the 3rd most frequently occurring code overlapped with the percentage for the code(s) that followed. RQ=yes/no question about hearer's wishes or intentions which functions as a request; RP = request/request/propose/suggest action for hearer or hearer & speaker, YQ=yes/no question; QN=product question; TQ=limited alternative question.; ST=statement; TO=mark transfer of object to hearer; MK=mark occurrence of an event; PR=perform a verbal move in a game; SI= state intent to carry out act or description of one's own ongoing activity; PM=praise for motor acts; EN=express positive emotion

Interchange Types and Speech Acts for Utterances Containing "you want/wanna"

Data were examined for the ten samples produced by each Group (i.e. five participants in each Group produced one sample during play with each of two Toy Sets, leading to ten samples per Group). As reported, the syntax "You want/wanna… *"* was present in all samples, with 70%-90% of samples across Groups containing both "you want" and "you wanna". The utterances containing "you want/wanna" were most frequently used for the *discuss hearer's thoughts and feelings* (DHS), *negotiate immediate activity* (NIA) or *discuss clarification of action* (DCA) functions for both Groups during play with both Toy Sets. Cumulatively these Interchange Types accounted for an average of 96% (Range=75%-100%) of Interchanges for utterances containing the "you want/wanna" sequences in samples produced by the Control Group and 94% (Range=75%-100%) of Interchanges for utterances containing the "you want/wanna" sequences in samples produced by the Elevated Score Group. Although during play with the Standard Toy Set the distribution of percentage of use across DHS, NIA and DCA was similar for the Control and Elevated Score Groups (i.e., highest percentage of use was for NIA for 4/5 samples for the Control Group and 3/5 samples for the Elevated Score Group), differences in distribution were noted with the Infant Toy Set. During play with the Infant Toy Set, 3/5 samples for the Control Group most frequently used NIA, but 3/5 samples in the Elevated Score Group most frequently used DHS. See Table 16 for individual data for each Toy Set.

Table 16. Percentage of Utterances Containing "you want/wanna" Used to DHS, NIA & DCA

	Infant Toy Set			Standard Toy Set		
	Interchange Type with % of Occurrence			Interchange Type with % of Occurrence		
	DHS	**NIA**	**DCA**	**DHS**	**NIA**	**DCA**
Baby WA	25%	0%	50%	33%	68%	0%
Baby GA	17%	67%	17%	50%	50%	0%
Baby FA	50%	43%	0%	22%	67%	11%
Baby ZA	25%	63%	13%	39%	52%	0%
Baby CA	0%	100%	0%	33%	67%	0%
Baby KA	75%	0%	0%	40%	60%	0%
Baby MA	50%	29%	21%	0%	89%	11%
Baby AB	67%	33%	0%	64%	29%	7%
Baby PB	40%	20%	40%	27%	60%	0%
Baby DA	0%	40%	40%	67%	33%	0%

Note: Most frequent Interchange Type of utterances containing "you want/wanna" for each sample is shaded. NIA=negotiating immediate activity; DHS= discuss hearer's thoughts and feelings; DCA=discuss clarification of action.

Consistent with the differing distribution of use of DHS, NIA, and DCA during play with the Infant Toy Set, the Speech Acts most frequently used for the utterances containing "you want/wanna" differed for the Control and Elevated Score Groups as well. As presented in Table 17, for the Control Group, during play with the Infant Toy Set on average 48% of utterances containing the syntax "you want/wanna" were y*es/no question about the hearer's wishes & intentions that functions as a suggestion* (RQ) and 21% were *Yes/No questions* (YQ). In contrast, for the Elevated Score Group on average 22% of utterances were RQ and 68% of utterances were YQ. The difference in frequency of YQ Speech Acts containing "you want/wanna" during play with the Infant Toy Set for the Control and Elevated Score Groups was statistically significant ($t(8)= 4.18$, $p=.003$). However, the difference in use of RQ was not statistically significant ($t(8)=1.40$, $p=.20$). During play with the Standard Toy Set for samples produced by the Control

Group on average 53% of utterances were RQ and 30% were YQ. For the Elevated Score Group on average 52% of utterances were RQ and 16% were YQ. The differences in frequency for use of RQ and YQ between the two groups during play with the Standard Toy Set were not significant (YQ: $t(8)=1.36$, $p=.21$; RQ: $t(8)=.10$, $p=.92$). Looking at the relative frequency of RQ and YQ for a given Group, the Control Group more frequently used "you want/wanna" in RQ rather than YQ utterances during play with **both** Toy Sets. In contrast, the Elevated Score Group used "you want/wanna" in RQ more frequently than YQ during play with the Standard Toy Set only. See Table 17 for individual data.

Table 17. Percentage of YQ and RQ Speech Acts for Utterances Containing "you want/wanna"

Baby	Infant Toy Set		Standard Toy Set	
	Speech Act with % of Occurrence		Speech Act with % of Occurrence	
	YQ	RQ	YQ	RQ
Baby WA	25%	0%	33%	67%
Baby GA	33%	67%	50%	50%
Baby FA	21%	36%	33%	56%
Baby ZA	25%	38%	35%	26%
Baby CA	0%	100%	0%	67%
Control Grp. Avg.	21%	48%	30%	53%
Baby KA	100%	0%	0%	60%
Baby MA	71%	29%	11%	78%
Baby AB	67%	33%	29%	29%
Baby PB	40%	10%	7%	60%
Baby DA	60%	40%	33%	33%
Elevated Score Grp. Avg.	68%	22%	16%	52%

RQ=yes/no question about hearer's wishes or intentions which functions as a request; YQ=yes/no question.

For the Control Group, the most frequently occurring Interchange Type:Speech Act combination for utterances containing "you want/wanna" was NIA:RQ for 4/5 samples for the Infant Toy Set and 3/5 samples for the Standard Toy Set. Additionally, in one sample produced

during play with the Standard Toy Set NIA:RQ occurred with equal frequency as DHS:YQ. For the Elevated Score Group, during play with the Infant Toy Set the most frequently occurring Interchange Type:Speech Act combination was DHS:YQ for 3/5 samples and in an additional sample DCA:YQ occurring equally with NIA:RQ. During play with the Standard Toy Set, NIA:RQ was the most frequent combination for 4/5 samples. Table 18 lists sample utterances for each of the above-mentioned Interchange Type:Speech Act combinations.

Table 18. Examples of "you want/wanna" Utterances for Interchange Type: Speech Act Combinations for Each Group.

Interchange Type: Speech Act Combination	**Control Group**	**Elevated Score Group**
NIA:RQ	Do you wanna sit up?	Do you wanna roll over?
DHS:YQ	*(baby grabbing firefly)* Do you want firefly?	Oh now you wanna grab for this?
DCA:YQ	*(baby fussy)* What, you wanna stand up?	*(baby squirming down)* You wanna lay down?

Interchange Types and Speech Acts for Utterances Containing "you like"

As reported above, the sequence "you like" was present in 10/10 samples and in the Top Three for 9/10 samples produced by the Elevated Score Group, but *present* in only 5/10 samples of the Control Group. Given this marked difference in frequency, the Interchange Types and Speech Acts associated with this syntax were examined for the samples in each Group containing the sequence (i.e., 5 samples in the Control Group & 10 samples in the Elevated Score Group). Regarding the Interchange Type, for the Control Group on average 78% of utterances containing "you like" were used to *discuss hearer's thoughts and feelings* (DHS) (Range = 33%-100%). For the Elevated Score Group on average 83% of these utterances were used to DHS (Range = 25%-100%). For 3/5 samples in the Control Group and 5/10 samples in the Elevated Score Group the

Speech Act for most utterances containing "you like" was y*es/no questions* (YQ). For 4/10 samples in the Elevated Score the Speech Act for most utterances with this syntax was s*tatement* (ST). Overall, the characteristics of use of "you like" were similar for the Control and Elevated Scores Groups, therefore, the higher prevalence of "you like" in the Elevated Score Group appears to be related to the higher incidence of utterances used for DHS.

Frequent Frames

For analysis of frequent frames data were collapsed across Toy Sets. Table 19 lists the two most frequently occurring frequent frames for each mother. Frames that occurred with only one intervening word because they were part of a nursery rhyme (e.g., "this little piggie") or an expression ("proud of you") were excluded from the ranking of frames. For the Control Group an average of 10% of frequent frames occurred at least three times in a corpus, while for the Elevated Score Group an average of 8% of frequent frames occurred at least three times in a given corpus. Table 20 presents the occurrence of frequent frames found to occur in at least 4/6 corpora in Mintz (2003b). The Control and Elevated Score Groups used an average of 9 and 10 frequent frames reported in Mintz (2003b) respectively. Further, looking at the particular frequent frames used, the Control and Elevated Score Groups shared the use of frequent frames containing "you", such as "you ___ it" (4/5 mothers in Control Group, 5/5 mothers in Elevated Score Group) and "you ___ the" (5/5 mothers in each Group). In addition, 5/5 mothers in the Control Group and 4/5 mothers in the Elevated Score Group had at least one frequent frame in the Top Two most frequently occurring frequent frames that contained "you". For the remaining mother in the Elevated Score Group, "you" was an intervening word.

Table 19. The Two Most Frequently Occurring Frequent Frames for Each Mother With the Intervening Words.

	Frequ. Frame	Intervening Word
Control Group		
Baby WA	there ___ is	she, he, it
	what __ you	do, are
Baby GA	you ___ see	wanna, can , couldn't
	you___ your	want, got, see, use, on
	you __ it	got, believe, put, get
	that ___ like	I, you, sound, sounds, taste
	I ___ you	know, tickle, show, think, give
Baby FA	you ___ it	did, got, make, pick
	can ___ make	you, we
Baby ZA	you ___ that	want, like
	oh___ ok	it's, that's
	like ___ one	that, this
Baby CA	you ___ a	have, got, found, being, in
	the___ and	one, water, flowers, field mice, right
Elevated Score Group		
Baby KA	I ___ you	think, see, love, want
	you ___ it	do, did, make, feeling, got
Baby MA	you ___ it	got, did, get, spin, follow, grab, hamming
	try ___ get	to, and
Baby AB	you ___ the	like, want
	you ___ that	like, want
Baby PB	you ___ like	really, look
	here___ go	you, we
	give ___ a	you, dog
Baby DA	there ___ go	we, they, you
	here ___ go	you, we

Note: More than 2 Frequent Frames are listed when the frequency of the 2nd most frequently occurring frequent frame overlapped with the frequency of the frequent frame that followed. Only frames that had at least two different intervening words are listed.

Table 20. The Occurrence of Frequent Frames Found in at Least 4/6 Corpora in Mintz (2003b) Found for Each Mother in the Current Study.

	Control Group					Elevated Score Group				
	Baby WA	**Baby GA**	**Baby FA**	**Baby ZA**	**Baby CA**	**Baby KA**	**Baby MA**	**Baby AB**	**Baby PB**	**Baby DA**
Frame										
do___want			X	X					X	X
put___ on										X
the ___ in		X								X
the ___ on				X	X	X				X
to ___ it										X
want ___ to						X				X
what ___ you	X		X	X				X	X	X
you ___ a	X	X	X	X	X			X	X	X
you ___ it	X	X	X	X		X	X	X	X	X
you ___ me		X		X		X				
you ___ the	X	X	X	X	X	X	X	X	X	X
you ___ to		X	X	X		X	X		X	X
a __ of					X					X
put ___ in		X	X				X			
to __ the		X					X		X	
I ___ think		X			X	X			X	X
I ___ you		X	X		X	X	X		X	X
are ___ going										X
is ___a		X	X		X					X
it ___ the		X								
to ___ a					X					
would ___ like		X								
you ___ that	X	X	X	X		X	X	X	X	X

Note: X indicates that the Frequent Frame was present in the corpus.

DISCUSSION

This study examined the frequently occurring word forms and patterns and their communicative function in IDS produced by mothers with and without symptoms of depression with their 4-5 month old infants. Five hypotheses were made regarding the quantity, quality, and pragmatic use of the frequently occurring word forms and patterns in IDS produced by these two groups. A discussion of the results of this study relative to each hypothesis follows. Although only the difference in frequency of *Yes/No question* (YQ) Speech Acts containing "you want/wanna" during play with the Infant Toy Set for the Control and Elevated Score Groups reached significance, the findings of this study reveal interesting trends that bear further investigation.

Firstly, it was hypothesized that compared to IDS produced by mothers without symptoms of depression, IDS produced by mothers with symptoms of depression would have greater variety of word types with fewer tokens produced. Results indicated that on average samples produced by mothers with symptoms of depression did contain fewer tokens, but also had fewer word types compared to samples produced by mothers without symptoms of depression. As measured by VOCD, overall these samples had less lexical diversity compared to those produced by mothers without symptoms of depression. This was the finding for samples produced during play with both Toy Sets. Additionally, as indicated by the difference in VOCD measures across Toy Sets, 80% of mothers in the Control Group used greater lexical diversity during play with the Infant Toy Set compared to the Standard Toy Set. The opposite pattern was true for 80% of the mothers in the Elevated Score Group. The production of fewer word tokens by mothers with symptoms of depression is consistent with studies indicating that mothers with depression talk less to their children (e.g., Breznitz & Sherman, 1987). A possible consequence

of this is that infants of mothers with symptoms of depression receive less exposure to the frequent forms present in the input.

Secondly, it was hypothesized that the most frequently occurring word in IDS produced by mothers without symptoms of depression will be "you" or the baby's name, while in contrast, in IDS produced by mothers with symptoms of depression the highest frequency word will be an article ("the", "a"). This was not the case. For 80%-100% of mothers from both Groups during play with both Toy Sets, the most frequently occurring word was "you". Further, the average frequency of occurrence of "you" across Toy Sets was similar for the Control and Elevated Score Groups (i.e., 6% and 7% for the Groups respectively). In addition, for all mothers (regardless of Group) nearly all of the most frequently occurring words preceding "you" were function words. These results are similar to those of a preliminary study of maternal IDS with 4-month olds conducted by this researcher (Vivona & Shafer, in preparation). These results indicate that infants of mothers with mild symptoms of depression are receiving similar lexical elements in the input so that they can potentially begin to extract lexical information.

The importance of function words is that as a special category of words that occur highly frequently in a language, these words can play an important role in grammatical functions (e.g., Shafer, Shucard, Shucard & Gerken, 1998). On a prosodic level in English, function words are unstressed and brief, playing a role in creating the typical strong-weak rhythm of the language. On a semantic level, because function words (e.g., articles, determiners) tend to occur in set positions with respect to content words (e.g., nouns, adjectives) in sentences, they may help to signal linguistic boundaries, also opening the door for word learning. While learning a content word increases the infant's lexicon directly, the use of that content word to learn other words is more limited because content words occur in narrowly-defined contexts. A learned function

word may help the infant acquire additional words in a greater number of situations, via helping with speech segmentation.

Turning to the content that surrounded "you", all mothers used "What", either alone or in a contracted form, in at least one sample. However, a marked difference was noted for the frequency of the sequence "you like". It was one of the Top Three "you" + WORD sequences in 90% of samples produced by mothers with symptoms of depression, but **present** in only 50% of samples produced by mothers without symptoms of depression. This disparity is in line with the frequent use of DHS Interchange Type exhibited by the Elevated Score Group. This relationship of the "you" + WORD sequence and Interchange Type use will be discussed later. In addition, for all mothers (regardless of Group), with one exception (i.e., Baby KA), 50%-100% of the most frequently occurring words preceding "you" were function words. The mother of Baby KA had the highest score on the BDI (i.e., 35). In her IDS sample only 16% of the words that most frequently preceded "you" were function words. Samples produced with Baby KA had a high frequency of content words, specifically lexical verbs, such as "love", "look", "excuse" and "see" preceding "you". The importance of function words was discussed above. Lexical verbs will be heard only in specific contexts. Additional study with a larger sample size of mothers with more severe symptoms of depression is needed in order to determine whether the pattern of words preceding "you" seen here is characteristic of IDS by mothers with severe depression. If so, infants of mothers with severe depressive symptoms may be presented with a compromised environment for starting the task of speech segmentation.

The third hypothesis was that both mothers with and without symptoms of depression will use utterances with the highest frequency forms primarily for Interchange Types *negotiate immediate activity* (NIA), *discuss joint focus of attention* (DJF) and *mark event* (MRK),

however, mothers with symptoms of depression will use Interchange Types typically used with older infants {e.g., *direct hearer's attention* (DHA), *discuss related to present* (DRP)} to a greater extent than mothers without symptoms of depression. Interestingly, the Interchange Type most frequently used for utterances containing "you" was *negotiate immediate activity* (NIA), for the Control Group, but *discuss hearer's thoughts and feelings* (DHS) for mothers in the Elevated Score Group. The Interchange Type DHS was first demonstrated at 11 months in Rivero (2010). Overall, 90% of samples produced by the Control Group, but only 20% of samples produced by the Elevated Score Group most frequently used "you" in NIA Interchange Types. All five mothers in the Control Group used the NIA function for over one third of utterances with "you" for at least one (and often both) sample. In contrast, only one of the five mothers from the Elevated Score Group used "you" utterances for NIA at such a high rate. Eighty percent of mothers in the Elevated Score Group fell in the bottom half of a rank ordering of samples for use of NIA Interchange Type. Use of the Interchange Types *discuss joint focus of attention (*DJF), *mark events,* (MRK), *direct hearer's attention* (DHA) and *discuss related to present* (DRP) was similar for the two Groups.

The frequent use of NIA is consistent with findings of Rivero (2010), who examined communicative intents of maternal IDS longitudinally, including at 5 months of age. The lack of use of MRK Interchange Type and the presence of DRP Interchange Type, however, are inconsistent with the findings of Rivero (2010). In that study, MRK was present at all ages, including 5.0 months, but DRP was not noted until 11 months of age. This inconsistency may be attributed to the fact that Rivero obtained IDS samples during meal time, whereas the samples in this study were obtained during play. Yont et al., (2003) reported differing communicative

intents based on context and stressed the importance of considering context when interpreting communicative intents conveyed.

Regarding the use of DRP in this study, mothers may have been more likely to discuss the attributes of toys used, particularly in the case of the novel toys in the Standard Toy Set. Penman and colleagues (1983) found that in maternal IDS to six month old infants during play, the focus of utterances was most frequently the infant's actions (including intentions), then the external environment, then the infant's feelings and least frequently the mother's behavior. The most frequent focus of IDS produced by the Control Group (i.e., NIA) was consistent with that. However, the tendency for mothers in the Elevated Score Group to use DHS to focus on "likes" rather than "wants" (intentions) was inconsistent with the findings of Penman and colleagues. Recall though, that looking specifically at "you want/wanna" sequences, all mothers used that syntax to talk about the infant's actions, including intentions.

Comparing the most frequently used Interchange Types for utterances containing "you" by the Control and Elevated Score Groups (i.e., NIA and DHS respectively), given that the infants were pre-verbal, *negotiate immediate activity* (NIA) can be seen as active and *discuss hearer's thoughts and feelings* (DHS) can be viewed as passive. The Interchange Type NIA serves to influence the current activity by suggesting, directing, or offering a counter suggestion for the termination, initiation or continuation of the activity, gaining information to advance/continue the activity, or approving or disapproving the current action. The Interchange Type *discuss hearer's sensations (*DHS) refers to the hearer's thoughts or feelings. It does not influence the current activity directly. Rather, it is an exchange of information, a description. In samples in the Elevated Score Group with DHS as the most frequently occurring Interchange Type for utterances containing "you" (i.e., 6/10 samples), an average of 57% of utterances

referred to whether the infant "liked" a given toy/activity, with the highest frequencies (i.e., 70% & 71%) noted for samples produced with Baby KA (i.e., mother with highest BDI score). Interestingly, in the one sample in the Control Group for which DHS was the most frequently occurring Interchange Type, only 16% of utterances referred to whether the infant "liked" a given toy. In the other cases, the mother referred to the baby's "opinion" (i.e., "What d' you think?) or the baby's interests (e.g., "You want some of these toys." as the baby is exploring the toys). The frequent use of DHS demonstrated by the Elevated Score Group in this study has not been reported by other studies examining Interchange Type use during play with older infants (e.g., Pan et al., 1996; Yont et al., 2003), or meal time with similar aged infants (e.g., Rivero, 2010). Although Rivero (2010) was a single-participant longitudinal study, she reported that DHS was demonstrated for the first time at 11 months. The Interchange Type use demonstrated by the mothers with symptoms of depression in this study may be seen as a means of maintaining the play interaction, although more as an "observer" rather than a "participant". Note that in addition to using "you like" very frequently during play with the Infant Toy Set, the sequence "you want/wanna" was most frequently used to comment on the infant's toy choices, not suggest or propose toy/activity options. These findings are consistent with each other and seem to indicate an overall focus on the infant's feelings by mothers with symptoms of depression.

It was hypothesized that both Groups of mothers will use utterances with the highest frequency forms in *statement* (ST) and *marking* (MK) Speech Acts, but mothers without symptoms of depression will use *request/propose* (RP), whereas, mothers with symptoms of depression will use y*es/no question about hearer's wishes that functions as a suggestion* (RQ). The findings of this study did not support this hypothesis. Both Groups had a similar distribution of y*es/no question (YQ*), *statement* (ST), and y*es/no question about hearer's wishes and*

intentions that functions as a suggestion (RQ), with YQ being the most frequently occurring Speech Act for 50-60% of mothers regardless of Group. Additionally, both Groups in this study most frequently used their Yes/No Questions for the Interchange Type *discuss hearer's sensations* (DHS). For the Interchange Type *negotiate immediate activity* (NIA), RQ was the most frequently occurring Speech Act in 50%-60% of samples in both the Control and Elevated Score Groups. This indicates that to negotiate the activity at hand, both Groups used the less directive means of asking a question about the infant's wishes that functioned as a suggestion, rather than a direct *request/propose/suggest* (RP) Speech Act. The use of RQ rather than RP in NIA Interchange Types is inconsistent with the findings of Rivero (2010), perhaps due to a difference in context (i.e., play in this study, mealtime in Rivero, 2010)

The sequence "you want" or "you wanna" was used by all mothers, regardless of Group, however, the Speech Act and Interchange Type in which it was used differed for the Control and Elevated Score Groups, particularly during play with the Infant Toy Set. For the Control Group during play with the Infant Toy Set on average 48% of utterances containing the syntax "you want/wanna*"* were used in the Speech Act *Yes/No question about hearer's wishes or intentions which functions as a request* (RQ) and 21% were used in the Speech Act *Yes/No question* (YQ). In contrast, for the Elevated Score Group on average 22% of utterances were RQ and 68% of utterances were YQ. The difference in frequency of YQ Speech Acts containing "you want/wanna" during play with the Infant Toy Set for the Control and Elevated Score Groups was statistically significant. Looking at the relative frequency of RQ and YQ for a given Group, the Control Group more frequently used "you want/wanna" in RQ rather than YQ utterances during play with **both** Toy Sets. In contrast, the Elevated Score Group used "you want/wanna" in RQ more frequently than YQ during play with the Standard Toy Set only. For both Groups, "you

want/wanna" was most frequently followed by the verb "play", although the verb "try" followed the sequence with equal frequency for the Elevated Score Group. These findings indicate that the Control and Elevated Score Groups used the same lexical form for differing functions.

Lastly, it was hypothesized that both mothers with and without symptoms of depression will use frequent frames, however, mothers without symptoms with depression will use frames with the word "you" more frequently than mothers with symptoms of depression. The results confirmed that both Groups of mothers used frequent frames and with similar frequency. The Groups shared the frequent use of frequent frames containing "you", such as "you ___ it" and "you ___ the" reported by Mintz (2003b). In addition, 80-100% of mothers, regardless of Group, had at least one frequent frame in the top two most frequently occurring frequent frames that contained "you". These similarities between the Groups were not hypothesized. These findings are further evidence that mothers with and without symptoms of depression use similar frequently occurring word patterns.

This was the first study to date to examine the frequently occurring word forms and patterns in maternal IDS with 4-5 month olds and their communicative role in the interaction for both mothers with and without symptoms of depression. Looking at the findings of this study, some trends emerge. Mothers with and without symptoms of depression use similar frequently occurring word forms with similar frequency and a high frequency of function words. These similarities are reassuring, as they indicate that infants of mothers with mild symptoms of depression receive lexical content comparable to that received by infants of mothers without symptoms of depression. This is can positively impact the infant's task of segmenting the signal. However, the lexical environment with respect to function word use in WORD + "you" sequences was diluted for the one infant in this study whose mother had more severe symptoms

of depression. Additional study with mothers with severe depression is needed. A second trend was that although mothers in both Groups had similar lexical content, this shared content was used for different communicative intents. This difference in intents is evident in the Interchange Type most frequently used [*negotiate immediate activity* (NIA) for the Control Group, *discuss hearer's thoughts and feelings* (DHS) for the Elevated Score Group]. Using overall similar "you"+ WORD combinations, mothers without symptoms of depression used utterances to shape the activity at hand (NIA), whereas, mothers with symptoms of depression used utterances to discuss the infant's feelings, such as whether they enjoyed a given toy or activity (DHS). The most frequently used Interchange Type DHS by the mothers with symptoms of depression in this study may be seen as a means of maintaining the play interaction, although more as an "observer", rather than "participant". The Interchange Type NIA, most frequently used by mothers without symptoms of depression, may be seen as more "active", as its purpose is to influence the ongoing activity, not describe or discuss it. The most striking evidence of "same form-different function" is the use of a Yes/No question (i.e., RQ, YQ) with "you want/wanna", for the differing Interchange Types NIA (Control Group) and DHS (Elevated Score Group) during play with the Infant Toy Set. Recall that differing frequency of YQ in that context was statistically significant (p=.003). Additionally, the focus on infant's feelings by mothers with symptoms of depression is evident in the high frequency of the syntax "you like" (i.e., in Top Three for 3/10 samples by Control Group, but 9/10 samples in Elevated Score Group).

Examination of the frequent forms without examination of the communicative functions in which the forms are involved would present an incomplete picture of IDS produced by mothers with and without symptoms of depression. Information about prosody was not obtained in this study, however, use of a yes/no question for differing communicative functions can give

rise to different prosodic patterns. For example, "You wanna chew on it?" and "You wanna chew on it, huh?" share lexical forms, but the first uses a question to suggest/propose an action (NIA) and the latter uses a question to comment on an action in which the infant is already engaged (DHS). The result is different prosodic contours. The interaction of communicative intent and prosody is an area to be explored. The trends of difference revealed in this study, with the exception of YQ use with "I want/wanna" sequences during play with the Infant Toy Set, did not reach significance, possibly due to small sample size.

Limitations

As stated above, one limitation of this study is small sample size. Although eighteen potential participants for the Control Group were tested, efforts to recruit mothers with symptoms of depression, although extensive, were much less successful. It would be fruitful to investigate further whether the trends found in this study are consistent with a larger sample size, in mothers with more severe symptoms of depression, and in dyads with older infants. A second limitation is that 80% of mothers with symptoms of depression had mild symptoms. Study of the frequently occurring word forms and patterns in IDS by mothers with more severe depressive symptoms is warranted. Thirdly, the current data was obtained only in the context of toy play. An additional area to be explored is IDS produced in different contexts, such as mealtime and bath time, as the pragmatic intents conveyed by child-directed speech have been found to differ depending on context (Yont, Snow & Vernon-Feagans, 2003).

Appendix A

Examples of Utterances for Interchange Types Present in Samples Analyzed

Interchange Code	Sample Utterances
NIA: Negotiate immediate activity	**RQ:** Can you get the bug? **RP:** Let's see if you could sit up. **SI:** I'll show you something. **QN:** What'd you think? (previous utterance: "Wanna play with the cups?") **PM:** Look at you standing! **TQ:** You want the dog or you want the duck?
DHS: Discuss hearer's sensations	**ST:** Oh, you don't wanna lay down. **QN:** Whatd' you think about this guy? **YQ:** You like that?
DSS: Discuss hearer's thoughts and feelings	**ST:** Wish he had ears that you could play with.
DJF: Discuss joint focus	**ST:** You got a duck. **YQ:** Are you talking to the cat? **QN:** What do you have?
DCA: Discuss clarification of action	**YQ:** (baby fussy) You done in this chair already?
DRP: Discuss related to present	**ST:** You eat frogs it's like eating French food.
DRE: Discuss recent event	**ST:** Oh, you found a good piece.
DFW: Discuss fantasy world	**ST:** You could make all sorts of noises. (mom talking for animal)
CMO: Comforting	**ST:** OK, I see you.

Appendix A continued

PRO: Performing verbal moves in an activity	**PR:** You got him! (within a game) **YQ:** Are you a munchkin? **ST:** Peek-a-boo, I see you Mister Sunshine.
SAT: Showing attentiveness	**XA:** Look at you!
MRK: Marking	**MK:** Here you go. **TO:** There you go.
DHA: Direct hearer's attention	**QN:** What you got there?

Speech Act Codes Used: RQ=yes/no question about hearer's wishes or intentions which functions as a request; **RP**=request/propose/suggest action for hearer or hearer & speaker, **YQ**=yes/no question; **QN**=product question; **TQ**=limited alternative question; **ST**=statement; **TO**=mark transfer of object to hearer; **MK**=mark occurrence of an event; **PR**=perform a verbal move in a game; **SI**= state intent to carry out act by speaker, description of one's own ongoing activity, **PM**: praise motor act.

Appendix B

Informed Consent Infant – Caregiver Interactions

The purpose of this information is to help you decide whether you want to volunteer for a research study. Please read carefully and ask the investigator about anything that you do not understand.

Person in Charge: Anthea Vivona, M.A.,M.Phil.,CCC-SLP
Researcher: Anthea Vivona, M.A.,M.Phil.,CCC-SLP
Study Location: Home of Participant or CUNY Graduate Center

Frequently Occurring Language Elements in Infant-Directed Speech by Mothers With and Without Depression

General Information:
The purpose of this research is to study the language used by mothers with & without depression with their infants during play. The time you will spend in this study is about: **60 minutes**

Experimental Procedure:
This is study involves one session when your infant is 4 months old.

You will be asked to fill out the *Beck Depression Inventory II*, which will take about 10 minutes to complete, and the *Hollingshead Four Factor Index of Social Status,* which will take 5 minutes to complete. In addition, you will be asked questions about your history with depression because this study is looking at mothers with and without symptoms of depression. The *Hollingshead* questionnaire will be used in order for me to match mothers in the two groups (mothers with symptoms of depression & those mothers without symptoms of depression) on socioeconomic level.

With you permission, you will be recorded with a video camera for about 30 minutes while interacting with your child, and then 5 minutes while having a conversation with the investigator. While interacting with your child you will be asked to use provided toys, as well as other playthings your child particularly enjoys.

Breaks from recording can be taken anytime for any reason. This procedure is safe and there is no known risk of personal injury. However, you and your child are free to stop at anytime during the study for any reason.

Benefits of Volunteering
This research will contribute to our understanding of the language mothers with & without depression use with their infants. You will be paid $20 for your participation and you will receive a copy of the tape of you & your child interacting.

Risks of Volunteering
There are no anticipated risks to you or your child. All toys provided are specifically designed for infants under the age of 12 months. Please inform the researcher if you or your child is uncomfortable, or you wish to stop participating. You and your child are free to stop participating at any time.

Confidentiality of Your Records
Your research records will be kept in a locked file cabinet in the Developmental Neurolinguistics Laboratory at the CUNY Graduate Center to protect you and your child's privacy. Only researchers directly involved with the study will have access to the research information in your records. Results of this study may be published but will not include you or your child's name or any information that may identify you or your child. Please provide your name and address if you would like a copy of the completed study sent to you.

Appendix B continued

Volunteering
You should only take part in this research study if you want to and for no other reason.
You and your child may stop participating in this study at any time.

Contact Information
If you have any questions about this research, you may contact Anthea Vivona or Dr. Valerie Shafer at (212) 817-8805. To learn about your rights as a volunteer, you can contact Kay Powell, IRB Administrator, The Graduate Center, CUNY, at (212) 817-7525 or kpowell@gc.cuny.edu.

Consent – If you agree to the following terms, please sign below:
You have fully read this consent form or have had the content explained to you in your native language. You have had the opportunity to question a person in charge of this research and have received satisfactory answers.
You understand that you are being asked to participate in research. You understand the risks and benefits, and you freely give you consent to participate in the research project outlined in this form, under the conditions indicated in it.
You will receive a signed copy of this consent form, which is yours to keep.

Please circle YES or NO to the following statements.

I agree to have the session videotaped.	*Yes*	*No*
I agree to have the session audio recorded.	*Yes*	*No*
I would like a copy of the video sent to me.	*Yes*	*No*

_____	_____	_____
Signature of Participant	Printed Name of Participant	Date

Investigator Statement
The nature of the above protocol has been carefully explained to the participant. The person signing this consent form, to the best of my knowledge, understands the nature, risks, and benefits involved in participating in this study, and there is no medical problem or language or educational barrier that has precluded a clear understanding of the participant's involvement in this study.

_____	_____	_____
Signature of Investigator	Printed Name of Investigator	Date

Appendix C

Questionnaire for Frequent Word Forms & Patterns Study (6/2007)

Date Tested: _____
Location of Testing: *Home*_____ *Other* _____

Participant's Code: _____ Mother's Age _____Infant's D.O.B: _____ Age___

Languages at home _____

Infant's History:

Birth: Any remarkable events?_____

Developmental: Any remarkable events? _____

"Additional Information I should know" _____

Mother's History:

I. *Work outside the home* since birth of baby? _____

If "yes", how many hours weekly?_____

Who cares for infant while mother's at work?_____

II. *History of depression*

Occurrence of first episode? _____

Occurrence of related disorders A*nxiety (e.g., phobias, panic attacks, generalized anxiety)* ❑
OCD ❑

Any depression while pregnant?_____
If "yes", any treatment?_____

Currently taking medication? _____

If "yes", name _____

Receiving therapy? _____

If "yes", when initiated? _____

Support Group? _____When initiated? _____How frequently attend? _____

"Additional Information I should know?"

ASK "Any questions?"

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