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Interactions between depressed mothers and their infants:

Joint attention behaviors

by

Taiko Hirose

A dissertation submitted in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

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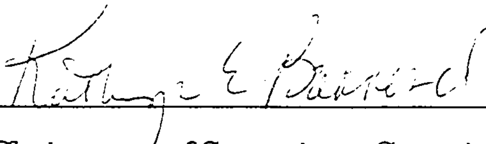
Approved by 

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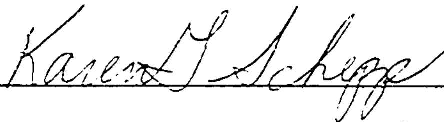

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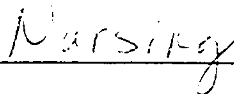
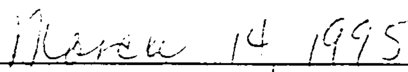
to Offer Degree 

Date 

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Date March 14, 1995

University of Washington

Abstract

Interactions between depressed mothers and their infants: Joint attention behaviors

by Taiko Hirose

Chairperson of the Supervisory Committee: Professor Kathryn E. Barnard

Department of Parent Child Nursing

Maternal depression is a major health problem in the US. A growing number of studies link maternal depression to negative outcomes in infant development. However, there is little research on how nurses can help a depressed mother to interact with her child in ways that promote the child's development. This study was a first step toward establishing a nursing intervention based upon studies in nursing science which promotes healthy interactions between depressed mothers and infants, and thereby enhances beneficial development in the child.

The purpose of this study was to compare the interactions of depressed mothers and their infants between 13 months and 18 months, and to the interactions of a control group of nondepressed mothers and their infants. The major variable analyzed in the interaction was joint attention. The cognitive development of the child was also measured and analyzed as an outcome of the interactions.

The study was conducted by observing and coding videotaped 6-minute sessions of mother-infant play in a laboratory setting, using a coding schema developed for this study. The sample consisted of 41 mothers, and their infants who were 13 and 18 months of age. Twenty-three mothers were depressed and 18 mothers were nondepressed. The results showed there were differences in child's vocalization and child's vocal joint attention between 13 and 18 months. Also, in the total sample (the control plus depressed group) maternal vocal joint attention about and toward a female infant was more frequent than toward a male infant. In the depression group alone maternal verbal joint attention about and toward a female infant was more frequent than toward a male infant. However, maternal verbal scaffolding was not different between male and female infants. In the control group alone there were no differences in maternal vocal joint attention and maternal verbal scaffolding between boys and girls. In addition, for the total sample, there was a correlation for boys between maternal verbal joint attention and the Bayley MDI, but no correlation for girls. In the control group alone, there was a correlation between maternal vocal joint attention and the Bayley MDI for both boys and girls. However, in the depression group alone, there was no correlation between maternal verbal joint attention and the Bayley MDI for both boys and girls. There were no other differences in the variables of this study between 13 and 18 months and between depressed and nondepressed groups.

TABLE OF CONTENTS

Page

List of Tables iii

Chapter I: Introduction 1

Interactions Between Depressed Mothers and Infants 1

Statement of the Problem 2

Purpose and Significance 3

Limitations 4

Chapter II: Conceptual Framework 5

Mother-Infant Interaction 5

Interaction as a Foundation for Language 7

Joint Attention and Scaffolding 10

Mother-Infant Interaction and Cognitive Development 14

Maternal Depression 17

Maternal Depression and Early Mother-Infant Interaction 19

Maternal Depression and Later Mother-Infant Interaction 25

Chapter III: Method 32

Design 32

Definitions of Terms 33

Sample 35

Instruments 36

Coding Schema 36

Definitions of Dependent Variables Using Combinations of Codes 39

The Bayley Scales of Infant Development 39

The Schedule for Affective Disorder and Schizophrenia 40

CODER2 40

Procedures 40

Methods of Analyses 42
Chapter IV: Results 43
Description of the Sample 43
Data Reduction 47
Hypothesis 1 48
Hypothesis 2 49
Hypothesis 3 52
Hypothesis 4 53
Hypothesis 5 54
Hypothesis 6 57
Hypothesis 7 59
Hypothesis 8 60
The Occurrence of Joint Attention 60
Chapter V: Discussion 62
Age Differences 62
Differences Between Depression and Nondepression Groups 62
Gender Differences 63
Discussion of the Age Difference 64
Discussion of the Association Between Maternal Depression
and the Dependent Variables of This Study 66
Discussion of the Gender of the Infants and Maternal Depression 68
Summary of Findings 69
Implications for Future Research and for Nursing Intervention 71
Limitations and Conclusions of This Study 75
References 76
Appendix A: Tables of Descriptive Statistics 84

LIST OF TABLES

Number Page

1. Composition of Independent Variables in the Related Cases Group and the Independent Cases Group 43
2. Construction of Two Independent Cases Groups 44
3. Composition of Independent Variables in the Related Cases Group and the Second Independent Cases Group 45
4. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Depression (Related Cases) 84
5. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Child's Age (Related Cases) 85
6. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Child's Sex (Related Cases) 86
7. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Age (Related Cases) 87
8. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Sex (Related Cases) 88
9. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Depression (Independent Cases) 89
10. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Child's Age (Independent Cases) 90

11. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Child's Sex (Independent Cases) 91

12. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Age (Independent Cases) 92

13. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Sex (Independent Cases) 93

14. T- tests for Paired Samples of Coordinated Joint Attention and Passive Joint Attention 48

15. T- tests for Independent Samples of Coordinated Joint Attention and Passive Joint Attention 49

16. Means and Standard Deviations for Child's Vocalization and Mother's Vocalization at 13 and 18 Months (Related Cases) 50

17. T- tests for Child's Vocalization and Mother's Vocalization Between 13 and 18 Months (Independent Cases) 50

18. Means and Standard Deviations for Child's Vocalization with All Joint Attention and Mother's Vocalization with All Joint Attention (Related Cases) 51

19. T- tests for Child's Vocalization with All Joint Attention and Mother's Vocalization with All Joint Attention (Independent Cases) 51

20. Means and Standard Deviations for All Joint Attention by Depression and Age in Related Cases and Independent Cases 52

21. Repeated-Measures ANOVA for All Joint Attention by Depression and Age (Related Cases) 53

22. ANOVA for All Joint Attention by Depression and Age (IndependentCases) 53
23. T- tests for Mother's Vocalization to Child with Engagement and Mother's Vocalization to Others Between Control and Depressed Groups (Independent Cases) 54
24. T- tests for Mother's Vocalization with Joint Attention Between Male and Female Infants (Independent Cases) 55
25. T- tests for Mother's Verbal Scaffolding Between Male and Female Infants (Independent Cases) 55
26. T- tests for Mother's Vocalization with Joint Attention and Verbal Scaffolding Between Male and Female Infants in the Control Group 56
27. T- tests for Mother's Vocalization with Joint Attention and Verbal Scaffolding Between Male and Female Infants in the Depression Group 57
28. Correlations between Bayley MDI and Mother's Vocalization with Joint Attention by Child's Sex (Independent Cases) 58
29. Correlations Between Bayley MDI and Mother's Vocalization with Joint Attention by Child's Sex and Control versus Depression Group (Independent Cases) 59
30. T- tests for Mother's Scaffolding Between Control and Depression Groups (Independent Cases) 59
31. T- tests for Mother's Visual Scaffolding Between 13 and 18 Months (Related Cases) 60
32. T- tests for Mother's Visual Scaffolding Between 13 and 18 Months (Independent Cases) 60

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Chapter I: Introduction

Interactions Between Depressed Mothers and Infants

Face-to-face interaction with mothers may be the first step in infant socialization. In the early stages of infancy, mother-infant interactions create a context for not only socioemotional development, but behavioral and language development as well. However, if the mother is depressed, mother-infant interactions may be altered, and these altered interactions can affect the infant's development. Many studies have reported associations between maternal depression and emotional, behavioral, and developmental problems in the child (e.g., Cox, Puckering, & Mills, 1987; Donovan & Leavitt, 1978; Field, Healy, Goldstein, & Guthertz, 1990; Gross, 1989; Hamman, Gordon, Burge, Adrian, Jaenicke, & Hiroto, 1987; Karl, 1991; Lyons-Ruth, Zoll, Connell, & Gruenbaum, 1986; Weinberg, 1991). However, the direct pathways between maternal depression and these aspects of development are not so well understood.

Maternal and child psychosocial care are well within the practice of nursing. Although nursing studies on maternal depression have been reported (e.g., Beck, 1993; Berchtold & Burrough, 1990; Boyer, 1990; Hansen, 1990), there is little research on how nurses can help a depressed mother to interact with her child in ways that promote the child's development (for reviews and suggestions on the issue see Gross, 1989; Karl, 1991). Fundamental studies on the interactions between depressed mothers and their infants have not been conducted in nursing science. This study is a beginning toward establishing a nursing intervention which promotes healthy interactions between depressed mothers and infants, and thereby enhances beneficial development in the child.

Statement of the Problem

For more than half a century clinicians such as physicians, psychiatrists, nurses, and psychologists have been aware of the association between mental disorder in parents and disturbance in their children (Quinton & Rutter, 1985). The link between maternal depression and emotional, behavioral, and developmental disorders in children has been reported in both clinical and epidemiological studies in England and the United States (Cox, Puckering, & Mills, 1987; Garrison & Earls, 1986; Puckering, 1989). Since the early 1980's in the United States, studies of depressed mothers and their infants have contributed a considerable amount of evidence linking maternal depression to affective, cognitive, and social difficulties during infancy (Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Cohn & Tronick, 1989; Field, Healy, Goldstein, & Guthertz, 1990; Field, Healy, Goldstein, Perry, & Debra, 1988; Weinberg, 1991).

There is also a sizable amount of research that has identified risk factors for maternal depression such as marital discord, low socioeconomic status (SES), single parenthood, and high stress and low social support (Barnard, Magyary, Sumner, Booth, Mitchell, & Spieker, 1988; Teti, Gelfand, & Pompa, 1990). In the United States, marital discord, low SES, and single parenthood have been major and growing social problems. Since 1979, the median income of families with children has decreased by 5 percent, while the cost of housing, health care, transportation, and education has risen (Center for the Study of Social Policy, 1992). In addition, the number of people in poverty who are single parents and single teen parents has increased. One in five children, or almost 13 million, live in a single-parent family. In 1989, 3 out of 10 infants, or over 1 million, were born to single mothers—and almost a third

of the single mothers were teenagers (Center for the Study of Social Policy, 1992). These single mothers and teen mothers are increasingly at risk for depression and thereby negatively affecting their children. Health care professionals such as nurses are in a position to intervene to reduce the mother's risk. In order to help these families with children, basic studies for successful strategies in nursing intervention need to be done.

Purpose and Significance

The purpose of this study was to compare and contrast the interactions between depressed mothers and their infants at 13 and 18 months of age with the interactions between a control group of nondepressed mothers and their infants. The major variable analyzed in the interactions was joint attention during mother-infant play, especially maternal verbal joint attention. In addition, maternal scaffolding during mother-infant play was examined (as a key element in facilitating joint attention and childrens' cognitive development). The cognitive development of the child was also measured and analyzed as an outcome of the interactions.

The three main questions of the study were:

1. Are there differences between the mother-infant interactions of 13-month-old dyads and the mother-infant interactions of 18-month-old dyads in relation to joint attention behaviors, maternal scaffolding, and the cognitive development of the child?

2. Are there differences between mother-son interactions and mother-daughter interactions in relation to joint attention behaviors, maternal scaffolding, and the cognitive development of the child?

3. Are there differences between the interactions of the depressed dyads and nondepressed dyads in relation to joint attention behaviors, maternal scaffolding and the cognitive development of the child?

The study was conducted by videotaping mother-infant play in a laboratory setting, enabling the researcher to observe molecular behaviors in the interactions between the mother and infant. These behaviors are difficult to observe in daily nursing practice. Thus the study provided quantitative data from a micro level analysis of the interactions to answer the research questions. Results should contribute to nursing theory and to the promotion of a nursing intervention strategy.

Limitations

This study has several limitations. First, because the videotapes were obtained from another research group, the study involved secondary analysis. As a consequence, not all the data needed could be obtained because the goals of the original study differed from this study. Second, the available sample was small enough to question whether it was representative of depressed and nondepressed mothers and their infants in this country. Third, it is possible that the mothers and their infants did not interact as usual due to an unfamiliar situation and the experience of being videotaped. Fourth, the use of videotaped observations with limited camera angles may have hindered observation and interpretation for coding. As a result, the generalizability of the study's outcome may be limited.

Chapter II: Conceptual Framework

In this chapter, the major concepts of this study (maternal depression, infant cognitive development, joint attention, and scaffolding) will be defined through a literature review on mother-infant interaction, language development, joint attention, maternal depression, and the associations between maternal depression and child development.

Mother-Infant Interaction

Mother-infant interaction is one of the most important elements influencing the development of an infant. If one assumes that the mother is part of the environment for the infant, then the dyad's interaction becomes a process of adaptation in which these two living systems create reciprocal relationships. Thus the infant's adaptive development is accomplished through mother-infant interactions (Sander, 1962).

Studies have shown how interactions between the mother and infant foster cognitive development in the infant, and specifically how the mother's sensitivity and responsiveness to the infant perform a key role in the interactions. Brazelton, Koslowski, and Main (1974) observed interactions between mothers and their 1- to 4-week-old newborns. They found that reciprocity between the mother and infant was maintained by the mother's sensitivity to the infant's signs of attention or withdrawal. A sensitive mother realizes her infant's capacity to receive and respond to stimuli; therefore the sensitive mother gives optimal stimuli only when the infant is ready to respond. As a result, infants can learn their own pacing and facilitate their own cognitive development in interacting with their mothers. Brazelton et al.

suggested that "the mothers were 'programmed' to seek attention from their infants " (p. 69).

At 2 months of age, infants develop more skillful interactions with their mothers. Trevarthen (1985) suggested that, beginning at 2 months of age, infants are able to synchronize their emotional and vocal expression systems (although they are not matured) with their mothers' expressions. By 3 months of age, their facial movements and expressions become clearer and more sensitive. Following these behavioral changes in infants, mothers become more active and lead the further development of infants' emotional, vocal, and posture expressions. Through this process, infants also learn to interpret their mothers' subtle qualities of emotion.

Stern (1974) studied gaze interaction between mothers and their 3- to 4-month-old infants. He found that gazing behavior between the mother and infant was very different from that between adults. In their gazing interaction, the mother behaved as a listener even when she was speaking. She altered her normal interpersonal behavior in order to elicit her infant's gazing behavior. When the infant initiated the gaze, the mother increased her gaze. The less the infant averted his gaze, the more the mother increased hers. This synchrony in mother-infant gaze interaction was created by the mother's sensitivity and responsiveness to her infant's gazing behavior.

Around the age of 9 months, infants begin to locomote and the structure of mother-infant interaction changes. Clarke-Stewart (1973) observed infants from 9 to 18 months of age interacting with their mothers. She found that infants at 14 months reduced their proximity-seeking behaviors and increased their physical independence from their mothers. Following these behavioral changes in the infants, mothers decreased their attention and increased

rejection behaviors such as punishing and scolding. In addition, maternal responsiveness to the infants' social behavior was related to the infants' cognitive development. Maternal attention affected the infants' intellectual competence and motivation. Thus the mothers' responsiveness and positive attitudes toward their infants not only created optimal interaction between them but also promoted cognitive development.

Schaffer (1977) summarized mother-infant interactions in the infants' first year in terms of communication in a prelinguistic stage. He stated that the major achievements in communication in this stage are reciprocity and intentionality. The first dialogues between the mother and infant are "pseudo-dialogues"——one-sided communications which the mother initiates. But by the end of the first year, the infant learns reciprocity and realizes that his behavior affects others. Then the infant will intentionally develop the reciprocity which leads to two-sided dialogues.

These findings establish that optimal or healthy mother-infant interactions are one of the most crucial components of child development, even in the neonatal period. The findings showed that infants have the ability to synchronize interaction with their mothers. Furthermore, a mother's sensitivity in seeking her infant's attention and her responsiveness to her infant's cues are important indicators for optimal mother-infant interaction, and for the healthy cognitive development of the child.

Interaction as a Foundation for Language

Language is also developed through mother-infant interactions——the first interpersonal relationship in life. At birth, the infant's only vocalization is crying. However, Condon (1979) discovered that newborns, even as early as

20 minutes after birth, reacted to adult speech as an adult listener would. Condon referred to this mother-infant interaction as interactional synchrony or responsive entrainment: a beautiful, rhythmic motion that may help establish the fundamental interpersonal communication from which language develops in the child.

In order to understand the development of this communication, Trevarthen (1979) observed very young infants and their mothers and obtained detailed records of their close communication. He assumed that infants needed two skills to share mental control with other people. One was subjectivity, defined as the ability to show others the rudiments of one's own individual consciousness and intentionality. The other was intersubjectivity, defined as the linking of individuals who are transmitting their understanding to each other. By the end of the first month of life, Trevarthen observed that the infant's expressions which led to interpersonal communication became obvious, such as defensive or distressing behavior, signals of physiological state, cooing, and smiling. Smiling and vocalized cooing developed in the second month, and infants became able to choose things to look at or to look away. These complex actions enabled them to have intentional communication with their mothers.

During the second half of the first year, infants can share with someone else the anticipation of simple and predictable sequences of events. For example, the infant drops a rattle on the floor, and the mother picks it up from the floor and gives it back. The infant repeats throwing the rattle again and again. The importance of this event is that it shows a high level of shared meaningful communication at a completely nonverbal level. It seems that human infants are biologically preprogrammed to emit signals which can elicit

their mothers' attention long before they acquire spoken language. Additionally, it seems that mothers also have programmed behaviors to respond to their infants' signals. In other words, there may be a built-in or biologically-based foundation for preverbal communication between mothers and infants (Newson, 1979).

Another study on mother-infant interaction underscores the maternal role in the development of communication and language. Kaye (1979) observed mother-infant interaction at birth in the hospital, at 6 months of age, and again at 22 months of age. Through these observations, he noted three different dimensions by which mothers processed information. The first dimension was timing. Mothers seemed to watch for the time they could react with their behavior, such as jiggling the infant while nursing to elicit a burst of sucking. The second dimension was the infants' arousal level. Mothers tried to maintain their infants at moderate levels of wakefulness in order to continue the interaction between them. A third dimension was the balance between a mother's own agenda and that of her infant. Mothers thought of new things to try and they expected to see or to hear new initiatives from their infants. Kaye observed that some mothers responded quickly and sensitively on all three of the dimensions. On the other hand, there were mothers who suffered from insensitivity or inconsistency regarding one or more dimensions. Some mothers seemed unable to go along with their infants' cycles and failed to leave space for their responses. Other mothers tried to obtain inappropriately high levels of excitement, or tried to enforce their own agendas upon their infants while missing the infants' initiatives.

If this problem of insensitivity or inconsistency continues, does it have any consequences? Kaye (1979) assumed that the grammatical linguistic

features of all children will end up the same, but some will acquire language faster than others. Furthermore, the mode of acquisition will vary across different dyads, and this in turn may affect the socialization and knowledge gained about the world which children undergo in their preschool years.

In summary, language development in infancy begins well before the infant is capable of speech. The infant has nonverbal communication skills to elicit the mother's attention. The mother has sensitivity and responsiveness to foster the infant's skills. Infants are learning a great deal about language and communication during the prelinguistic period. Mother-infant interactions play a major role in the period and lead the infant to the linguistic stage.

In the next section, more details about how mother-infant interaction facilitates cognitive development, particularly language development, will be discussed using the concepts of joint attention and scaffolding.

Joint Attention and Scaffolding

Joint attention is a concept suggested by Bruner (1981) as important to language development at the prelinguistic stage. Bruner hypothesized that there are four basic communication skills in an infant. The first is joint attention, which begins with eye-to-eye contact with the mother. The second is seeking help from others in carrying out goal-directed acts. The third is reciprocity between the infant and mother. The fourth is the ability to pretend and to mimic others. Joint attention is an especially important milestone in early communicative development (Bakeman & Adamson, 1984).

In language development, joint attention is present at the start. Mundy and Sigman (1989) stated that an initial phase of nonverbal communication is face-to-face exchanges of affective signs between infants and mothers from 0

to 5 months of age. From 6 to 9 months, infants begin to use conventional gestures (pointing or showing), eye contact, and direction of eye gaze to coordinate attention with others. Referential looking is a particularly common activity at this age. Bruner (1981) suggested that 6 or 7 months is the age at which infants understand the attentional vocative from the mother.

Other researchers have also shown developmental changes in joint attention behaviors. Bretherton, McNew, and Beeghly-Smith (1981) assumed that infants try to communicate intentionally from about 9 months of age when they show conventional gestures such as shaking the head, giving, showing, and pointing. However, infants follow the pointing of their mother in to their sides and front, but not behind themselves. They begin to understand these pointing gestures directed across their body at 14 months (Bretherton, 1992; Seibert, Sliwin, & Hogan, 1986). They are able to pay attention during a three-way exchange that involves their mother, themselves, and an object around 9 or 10 months (Bretherton, 1992; Murphy & Messer, 1977; Rocissano & Yatchmink, 1983). At approximately 12 months, infants are able to follow a caregivers' visual direction, and are able to respond to caregivers' pointing or gestures which refer to objects not currently attended to (Rocissano & Yatchmink, 1983). At 12 to 14 months, once infants' pointing gestures appear, they begin to play "where" and "what" games in which they point to a specific object. At 15 months, they may point to body parts and use this "what's that" pointing to request the specific name of the body part (Bruner, 1981). The infant in one-word stage seems to know that joint attention established by a word or by pointing is a prerequisite for verbal comment about a topic between the infant and the mother. Through this developmental process of joint

attention, the child acquires language and carries out linguistic communication with others.

The concept of metarepresentation should be considered in line with the development of joint attention. Mundy and Sigman (1989) pointed out that nonverbal joint attention skills emerge before the onset of metarepresentation skills. The ability to engage in pretend play (or symbolize) develops in the infant by 12 months. Metarepresentation develops toward the end of the second year. Joint attention with pointing seems a precursor for the development of metarepresentation. In early face-to-face interactions (from 3 to 7 months), infants learn that their own smiling is often associated with their mothers' smiling. This association fosters the infants' sense of relatedness to their mothers, i.e., they share a positive affective experience. At 6 to 12 months, the infant's sharing affective experience expands to interactions with others. Metarepresentation appears around 18 months of age. At this age, the infant shares or acts with reference to another person's various ways of attending and seems to have an implicit awareness of the other's mind. By 12 months, joint attention, especially visual referencing, plays an important role in sharing experiences with others in regard to objects and events. This ability to recognize one's affective sharing with others may be a basis for fostering the capacity to adopt multiple joint attention to a given object or situation. For example, a child manipulates a matchbox as if it were a toy car. This ability for metarepresentation makes the child understand another's mind as subjects of experience (Hobson, 1989). Trevarthen (1979) calls this intersubjectivity or reciprocal personal relatedness. The child experiences and represents another's mind with it, and differentiates persons from things with it.

In a similar vein, Bretherton (1992) discussed social referencing, following definitions of social referencing by Feinman (1982) and Campos (1983). Feinman defined social referencing as an infants' reference to another person's cognitive and/or emotional responses to formulate their own response. Campos narrowed the definition to only apply to ambiguous situations where the infant needs the adult's emotional expression to help in interpreting the situation. Bretherton felt that social referencing emerges at around 9 months when infants have the ability to establish joint attention with their mothers. In addition, they are able to perform triadic joint attention— —where they look up from objects to their mothers during joint play. At 12 months, infants have multiple ways of playing reciprocal games with others. They begin to understand their intersubjective communication with adults, which may be achieved by sharing their mental world with others. As a result, at approximately the end of the first year, the infant begins to acquire and comprehend communication systems in their affective and linguistic exchanges with adults.

In order to help infants' joint attention, social referencing, and language acquisition, mothers have a unique tool: scaffolding. For example, mothers use motherese in talking to their infants, which provides scaffolding for language development. Motherese is defined as language that contains simple, well-formed sentences, exaggerated intonation, high pitch, and clear pauses between segments of speech. In addition, motherese contains repetitions of what a child has said as well as her questions. When the mother repeats the child's vocalizations and then asks a question, she facilitates the occurrence of turn taking that is an important component of communication (Bukatko &

Daehler, 1992). At 4 months of age, infants already prefer motherese over adult-directed speech (Fernald, 1988).

In conclusion, mother-infant interaction and joint attention are the foundation of human language and cognitive development. The more mothers engage in joint attention with their infants, the larger their infants' vocabularies become (Rocissano & Yatchmink, 1983; Tomasello & Todd, 1983). When mothers are directive or intrusive with their infants, the infants' language development is slowed down. On the other hand, when mothers elicit language or follow their infants' lead with responses that are questioning or turn-taking, language develops rapidly (Hoff-Ginsberg, 1986; Nelson, 1973). In the end, joint attention between the mother and infant is not only the foundation of communication but also facilitates linguistic acquisition by the child. In this context, scaffolding is one facilitator that the mother provides to her infant with sensitivity, responsiveness, and reciprocity.

Mother-Infant Interaction and Cognitive Development

According to Piaget, cognitive development depends on neurological maturation, experience with an adequate social environment, and the capacity for ongoing reorganization. In early infancy, the majority of cognitive functioning consists of primitive or innate reflexive activities. As an infant matures, experiences modify these reflexive activities into intentional activities. Piaget's theory of cognitive development has two major principles: the tendency of the individual to organize its mental and physical activities, and the tendency to adapt to the environment (Sahler & McAnarney, 1981).

Piaget theorized that a child constructs knowledge by assimilation: incorporating new information into already existing knowledge structures (or

schemes). Newly constructed schemes are modified or expanded through accommodation: adapting to fit the current situation. The goal is equilibrium or balance between the processes of knowledge that create the child's understanding. Piaget also theorized that children pass through four major stages of cognitive development: the sensorimotor, preoperational, concrete operational, and formal operational stages. Through these stages, the child moves from early action-based schemes to symbolic schemes, from symbolic to logical schemes, and finally to abstract mental schemes.

The sensorimotor stage takes place in the first two years of life. The first substage is that of reflex activity (0-1 months), in which infants movements such as sucking, looking, and grasping are purely reflexive. The second substage is that of primary circular reactions (1-4 months). An example of a primary circular reaction is when an infant learns to bring his hand to his mouth and suck on his fingers or thumb. The third substage is that of secondary circular reactions (4-8 months) in which infants repeat behavior that produces pleasurable results in the external world. For example, an infant may accidentally kick the side of her bassinet, which makes cloth dolls on a mobile swing. She then deliberately kicks the bassinet in order to enjoy the swinging dolls. At this stage, her behavior can now be called means-ends behavior: the deliberate use of an action to accomplish a goal. The fourth substage is that of coordination of secondary circular reactions (8-12 months), in order to form more complex schemes. During this stage, infants acquire the concept of object constancy or object permanence. They realize that objects continue to exist even though they are not in sight or reach. In the fifth substage, tertiary circular reactions (12-18 months), infants use different actions to achieve the same goal. Infants are able to follow and find a toy

moved from location A to location B, even though the displacement from A to B is done without them seeing it. Finally, infants complete the sensorimotor stage in the final substage, that of invention of new means through mental combinations (18-24 months). Infants now have the ability to imitate a model which is no longer present and can mentally represent objects. They can form beliefs based upon their mental representation (Bukatko & Daehler, 1992; Smart & Smart, 1978). In other words, they can now carry on interactive behavior with others based upon metarepresentation or intersubjectivity.

Rogoff (1991) suggests an association between infant cognitive development and the joint attention of mother-infant interaction. She cites several studies that relate advanced cognitive development of infants (such as expanded vocabulary and higher Bayley scores) to skillful maternal use of joint attention or scaffolding in interaction. She suggests that although infants at birth have only reflexive physical activities, soon their innate behavioral repertoire will evolve to purposeful knowledge and behavior, due to their experience or learning in interactions with their mothers on a day-to-day basis. Infants' mothers are their first encounters in this world and thus play an instrumental role in helping infants adapt to their new environment by assimilation and accommodation.

In summary, infants acquire knowledge and skills to process their daily experiences through their interactions with their mothers. In these interactions mothers mediate infants' exposure to new objects and experiences, and help give meaning to their infants' external environment.

Maternal Depression

Depression is a disorder of mood which is classified as depressive disorders (unipolar depressions) or bipolar disorders (bipolar depressions, Thompson, 1989; Turner & Link, 1991). The depressive disorders include major depression and dysthymia (a chronic mood disturbance which lasts for at least two years).

Major depression is a mood disturbance which manifests itself in a depressed mood and loss of interest or pleasure in almost all activities. Symptoms include sleep and appetite disturbances, weight change, loss of energy, psychomotor agitation or retardation, feelings of helplessness, hopelessness, and worthlessness, excessive or inappropriate guilt, decreased ability to concentrate, and suicidal ideation or attempts. Bipolar disorders are characterized by mood swings from elated, expansive, or irritable moods with erratic hyperactivity to severely depressed moods (Turner & Link, 1991).

Postpartum depression is a mood disorder unique to mothers. Postpartum depression is a general term that describes three types of illnesses: postpartum blues, postpartum depression, and postpartum psychosis (Hansen, 1990; Kendall-Tackett & Kanter, 1993). The difference between the three is the severity of symptoms. Postpartum blues are transient emotional disturbances, typically occurring on or around the 4th or 5th day postpartum and lasting for a few hours (1-2 days at most). Postpartum blues are very common, occurring in up to 75% of new mothers. Postpartum depression is a more serious condition than postpartum blues. Its symptoms are more severe and last longer. The most severe postpartum illness is postpartum psychosis, which has an intense and vivid presentation of symptoms (Kendall-Tacket & Kanter, 1993). The majority of cases of

postpartum psychosis have an onset within a few weeks or, at most, 3 months postpartum.

Not all of the women already diagnosed with unipolar depression experience depression during the postpartum period. However, it is highly likely that women who experience depression for the first time during the postpartum period will have another period of depression later in life (Kendall-Tackett & Kanter, 1993).

Women are at high risk for depression. Twice as many women as men are diagnosed with unipolar depression. Women's role in society may produce life stress under which they tend to develop and maintain depressive moods and symptoms. Mothers with numerous young children are particularly at risk for depression (McGrath, Keita, Strickland, & Russo, 1990). Notman (1986) reported that women more than men experienced such difficulties as single parenthood, social isolation, financial difficulties, and health problems. Depressive symptoms were reported by 35% to 59% of a sample of mothers with young children, and the group having the most depression were mothers who were single and low-income (Gross, 1989).

Currently, postpartum depression is one of the growing health problems of women. In the 1960's, it was reported that 3-6% of childbearing women had postpartum depression. The figure of childbearing women affected to some degree by depressive symptoms has now risen to 20% (Affonso, 1992).

The causes of postpartum mood disorder are divided into three categories: biological (involving primarily hormonal, genetic, and neurotransmitter theories); psychological (including psychoanalytic, personality, and attribution-style theories); and environmental or cultural (including social support, and preparation for childbearing theories, Boyer,

1990). Risk factors such as marital discord, low socioeconomic status, spousal absence, and high stress combined with low social support, have also been associated with maternal depression (Barnard, Magyary, Sumner, Booth, Mitchell, & Spieker, 1988; Teti, Gelfand, & Pompa, 1990).

In this study, maternal depression is defined as the diagnosis of unipolar depression or bipolar depression on the Schedule for Affective Disorder and Schizophrenia (SADS) for women who have children, particularly infants (regardless of their marital status). The definition of maternal depression in this study does not have detailed subgroups or subcategories of depressive disorders based upon family history, onset times, or severity of symptoms.

Maternal Depression and Early Mother-Infant Interaction

A growing number of studies have suggested links between maternal depression and deleterious outcomes of infant development (Gelfand & Teti, 1990). The negative relationships between maternal depression and child development have been extensively shown in research on the development of preschool-age children (e.g., Caplan, Cogill, Alexandra, Robson, Katz, & Kumar, 1989; Radke-Yarrow, Nottelman, Belmont, & Welsh, 1993; Rubin, Both, Zahn-Waxler, Cummings, & Wilkinson, 1991; Webster-Stratten & Hammond, 1988), and adolescents (Forhand & McCombas, 1988; Hamman, Gordon, Burge, Adrian, Jaenicke, & Hiroto, 1987). These studies have identified mediating factors and determined specific effects on development (Cramer, 1993). However, little information has been found on mechanisms: precisely how maternal depression affects child development. In addition, there are few models from which to hypothesize mechanisms.

In this section, associations among maternal depression, mother-infant interaction, and child development will be discussed. The relationship of the gender of the infant with maternal depression, with mother-infant interaction and with cognitive development of the infant, will also be discussed.

The relation of pregnancy problems, postpartum depression, and mother-infant interaction was investigated by Field, David, Garcia, Vega-Lahr, Goldstein, and Guy (1985). Their sample consisted of 24 women who were referred for an ultrasound assessment at the third trimester. Twelve women had scores that predicted postpartum depression symptomatology and another twelve women served as a control group. All were married and low-income. Their infants were all healthy full-term. Ten minutes of face-to-face play interaction of the mothers and infants was videotaped when the infants were 3 to 5 months of age. The depressed mothers had more controlling and punitive childrearing attitudes, more anxiety, and more externalizing locus of control. In their play interactions, depressed mothers showed more depressed or anxious expressions, less activity, more emotionless expressions, fewer imitative behaviors, less responsiveness, and less game-playing. There were no differences between the mothers in head orientation, gaze behavior, silence during infant gaze aversion, or vocalization. On the other hand, the infants of depressed mothers spent less time in an alert state, had less relaxed activity, and less engagement. Again there were no differences on head orientation, gaze behavior, or vocalizations between infants of the two groups. Thus Field et al. (1985) found that mothers who had experienced pregnancy problems were more depressed postpartum, and that the interaction between the depressed mothers and infants was less optimal.

Hoffman and Droter (1991) examined the same issue of whether depressed mothers and infants show less optimal interactional behavior than nondepressed dyads. Their subjects were 11 mothers with 2-month-old infants. They observed mother-infant interaction during a play session for 10 minutes, and found that mothers with depressed moods had wider ranges of behavior on a continuum from withdrawal to controlling/intrusive. However, maternal stimulation, extreme disengagement or flat affect, and the infant activity of the dyads with depressed mothers were not different from those with nondepressed mothers.

In the same line of research, Cohn, Campbell, Matias, and Hopkins (1990), and Field, Healy, Goldstein, and Guthertz (1990) compared the videotaped face-to-face interactions of depressed mothers and infants with those of nondepressed mothers and infants, when the infants were all 3 months old. Cohn et al. discovered similar results to the findings of the studies mentioned before: that the behavior of the depressed mothers and their infants tended to be rated less positively than that of nondepressed dyads. Cohn et al. concluded that the mothers' depressed moods were transferable to the infants through the mothers' affective expressions and negative responses, and that the influence of the mothers' depressions may endure throughout the first year. Field et al. also found that depressed mothers spent more time in negative behavior (specifically anger/poke and disengagement) than positive behavior (play). The infants of the depressed mothers showed similar behavior patterns to their mothers', whereas infants of nondepressed mothers were more responsive to their mothers' positive behavior. Field et al. suggested that mother-infant interaction at 3 months may be a model for infants in forming their own style of interpersonal interaction.

In addition, Tronick, Cohn, and Shea (1986) observed mother-infant interaction at the age of 3 months and concluded that if the mother was sensitive to the infant during this interaction, the infant could then continue to make efforts to improve stressful interactions with the mother when the infant was 6 months and 12 months of age. However, if the mother was withdrawing or intrusive in controlling the interaction with her infant at 3 months, the infant tended to fail in the interaction with the mother at 6 months and 12 months. The study of Tronick et al. again indicates that the age of 3 months is a particularly sensitive time for the infant in forming skills in mother-infant interaction.

In other words, the age of 3 months may be a crucial stage for acquiring interpersonal skills. As mentioned before, Trevarthen (1985) has suggested that while infants at 2 months develop more skillful interactions with their mothers, by 3 months they are able to interpret their mothers' subtle qualities of emotion. Therefore, the age of 3 months may be a starting point for learning these interpersonal skills, and a sensitive period for mother-infant interaction. If infants do not have optimal interactions with their mother at this age, they may have difficulties in interactional skills and cognitive development later.

A study by Murray, Kempton, Woolgar, and Hooper (1993) also examined interactions between mothers and infants who were 2-3 months old. Murray et al. studied not only effects of maternal depression on the mother-infant interaction and cognitive development of the infants, but also the differences between mother-son interaction and mother-daughter interaction. The subjects were 59 mother-infant dyads who were drawn at random from an original study by Murray (1992). The 59 mothers made up three groups: (a) mothers suffering from postpartum depression, (b) mothers having

experienced depression before childbirth but not in the postpartum period, and (c) nondepressed mothers. Mother-infant interaction was assessed when the infants were 8-11 weeks of age. The infants' cognitive development was assessed at 9 and 18 months of age. Mother-infant play, during which the mother was asked to play with the infant without toys for 5 minutes, was videotaped, and mother-infant interaction and maternal speech during the play session were analyzed. Analysis of maternal speech showed that maternal depression affected the quality of communication, such as the content and emotional tone of speech (although the degree of complexity, repetition, and syntax were not different between any of the mothers). Depressed mothers' focuses were more on themselves than their infants' experiences, and they showed more negative acts such as criticism and hostility. There was also a difference between maternal speech to male infants and female infants in the postpartum depression group. In the nondepressed groups, the mothers focused more on their sons' experience than their daughters', and tended to refer more to their sons' agenda. However in the depressed group, the mothers focused less on their sons' experiences and referred less to their sons' agendas than nondepressed mothers, but they focused on their daughters' experience and tended to refer to their daughters' agenda the same as nondepressed mothers. The mothers with a history of depression but no depression postpartum did not show the differences from nondepressed mothers that related to the infants' gender. As a result, the male infants of the two nondepressed groups performed better on the Bayley Scales than the female infants, and the male infants of the depressed group scored lower than the female infants.

Murray, Kempton, Woolgar, and Hooper (1993) concluded that the lower level of infant-focused maternal speech contributed to the poorer cognitive development of the male infants of depressed mothers. In their research, maternal speech of depressed mothers to their sons was different from that of nondepressed mothers, but it was not shown by the mothers of female infants. Murray et al. commented that a common belief of male infants being more vulnerable and potentially difficult may have made the depressed mothers feel it would take an additional effort to reach harmonious interactions with their sons. This onus of additional effort overburdened the mothers with postpartum depression. However, there are few studies on this issue.

In the same period, Bettes (1988) studied depressed mother-infant interaction with a focus on verbal interaction. She examined the effect of maternal depression on two features of motherese: intonational exaggeration and timing. Subjects were mothers and their 3- to 4-month-old infants. Verbal interaction was recorded by an audiocassette recorder for 3-15 minutes. Four variables of verbal interaction of both infant and maternal vocalization and mutual silence were measured: mean duration of utterance, variability of duration of utterance, mean duration of pause, and variability of duration of pause.

Bettes (1988) found that depressed mothers' verbal interaction as measured by the four variables was very different from that of nondepressed mothers. The depressed mothers' latency to respond to the infants was twice as long as the control mothers'. The depressed mothers' mean duration of utterance was one-third second longer than the control group's. The more severe the mother's depression, the less she used an exaggerated contour in speech. Additionally, infants of depressed mothers tended to follow the

mothers' nonexaggerated manner of utterance. Bettes pointed out that the infant with a depressed mother may be deprived of the verbal cues which develop knowledge of and skills in social interaction with the mother.

In other words, 3- and 4-month-old infants with depressed mothers have less verbal scaffolding to learn from in acquiring knowledge and skills in interpersonal interaction. This may be a major disadvantage for these infants, because they are at an important stage in this acquisition.

Maternal Depression and Later Mother-Infant Interaction

There are many studies on the association of maternal depression and child development. The studies of middle or late infancy often have a broader perspective by including in their investigations the behavioral problems of the child in later years and the environmental factors of the depressed mothers.

Cohn, Matias, Tronick, Connell, and Lyons-Ruth (1986) theorized that face-to-face interactions may be a primary way in which behavior and personality disorders can be transmitted from a mother to her infant. They observed 6 minutes of face-to-face interaction in 13 depressed mothers and their infants who were 6 to 7 months old. It was found that the mothers were extremely variable in two overlapping states: positivity or level of engagement, and intrusiveness or anger. The infants' behavior had much less variability than their mothers'. The infants were highly withdrawn and rarely showed positive affect. Cohn et al. concluded that the distorted face-to-face interactions transferred the mothers' depressed mood to the infants and affected the infants' behavior.

Lyons-Ruth, Zoll, Connell, and Grunebaum (1986) studied the effect of maternal depression as a risk factor on child development. Subjects were

depressed mothers and their infants from birth to 12 months of age. A naturalistic mother-infant interaction at home was videotaped for 40 minutes when the infants were 12 months old. The Bayley Mental and Motor Scales were also administered to the infants when they were 12 months old. The mothers showed increased affectivity, hostility, and interference in their interactions. Also, the infants whose mother-infant interactions exhibited these negative qualities showed lower mental and motor development scores. Additionally, the more severe the mothers' depression, the less secure the infants' attachment.

Teti, Gelfand, and Pompa (1990) investigated the relationship between maternal depression and psychopathology in infants whose mothers were depressed, using an epidemiological viewpoint. Subjects were 59 depressed mothers and their infants who were 3 to 13 months of age. Teti et al. sent interviewers to visit the mothers' homes three times for 1.5-2 hours each visit. The interviewers asked the mothers if they were pregnant now and questioned recent pregnancies, labor, delivery, demographics, psychosocial functioning, and depression history. Teti et al. found that there was no association between maternal competence and the duration of a present depression episode. No associations were found between maternal competence and severity of depression, the women's marital status, and the sex or age of the infants. On the other hand, there were positive relations between maternal competence and social support, maternal harmony, and maternal self-efficacy. There were also negative relations between maternal competence and life stress, and between maternal competence and infant temperamental difficulty. Maternal competence was strongly related to annual family income and the hours/weeks mothers worked outside the home.

Murray (1992) studied mothers with postpartum depression and their infants in order to identify differences in cognitive, social, and emotional development between infants whose mothers had unipolar postnatal depression (non-psychotic) and infants with nondepressed mothers. The mothers were recruited when they were 37-42 weeks pregnant and were followed for 18 months after the birth of their babies. The mothers' depression was assessed by the Edinburgh Postnatal Depression Scale (EPDS) at 6 and 12 months postpartum, and the SADS at 18 months. Cognitive development, language development, object concept development, and the attachment of the infants were assessed at 18 months of age. Also, attachment, life events and difficulties, and behavioral problems of the mothers were assessed at 6, 12, and 18 months postpartum.

Using these assessments, Murray (1992) found no effects of general maternal depression on infants' cognitive and language development over all the subjects. However, maternal depression in the postnatal period was associated with poor cognitive development (especially for low SES subjects), and less language development (especially for low SES and for male infants). The length of time of infants' exposure to maternal depression did not relate to any outcome measures of the infants. Based upon these results, Murray suggested that there is a sensitive period for the influence of maternal depression in an early stage of development. Once the cognitive development of the infant has been affected through an impaired pattern of interactions in the early postnatal period, the impact continues through to 18 months of age. She also found that the cognitive development of male infants of depressed mothers was delayed compared to that of female infants of depressed mothers, and suggested that boys might be more sensitive to environmental stress or

maternal depression than girls. In addition, she commented that marital discord was reflected in the relationships of depressed mothers with their sons.

Smith (1991) found a different result from Murray's (1992) on the vocabulary of infants whose mothers were in a depressed mood. Smith had 52 mothers watch a videotape in which 15-month-old infants engaged in 8 minutes of solitary free play with toys. The mothers' SES was middle-class. The mothers' depression was assessed by the Beck Depression Inventory (BDI), the Self-Consciousness Scale (SCS), and the Schedule for Affective Disorders and Schizophrenia-Lifetime Version (SADS-L). The mothers were asked about two aspects of their responses to the infants: (a) their interpretation of the infants' actions, and (b) their tendency to want to intervene in the infants' activities. The vocabulary of the mothers' infants was also measured.

Smith (1991) found that the mother's depressed mood was not associated with the size of her infant's vocabulary. A mother's frequency in interpreting the observed infant's acts had an unpredicted effect on vocabulary: Infants whose mothers' frequencies of selecting the infants' acts for interpretation were midrange had a larger vocabulary than infants whose mothers' frequencies of the selection were in the lowest and highest ranges. A mother's tendency to intervene in the observed infant's acts was associated with their depressed mood, but again not with the size of their own infant's vocabulary. Further, these analyses did not reveal differences between mother-son dyads and mother-daughter dyads.

There are several points which may explain the differences between the results of the two studies. First, they used different scales to assess maternal depression. Second, the SES of subjects were different: The subjects of

Murray's (1992) study seemed to belong in several social classes but the mothers of Smith's (1991) study belonged to only the middle class. The third and most important point is that Smith did not separate the mother groups and infant groups in the same manner Murray did. Murray analyzed infant gender differences in cognitive development within each group, depressed and nondepressed. In addition to these points, there are other differences such as sampling method, observational method, nationality (British versus American) and statistical analyses. More specific studies are needed to identify the factors that mediate the negative effects of maternal depression on infant language development and the possible association with gender.

The last study discussed here is an intervention study, which is very rare in this research area. Cramer (1993) reported on a team study (Cramer, Robert-Tissot, Stern, Serpa-Rusconi, Muralt, Besson, et al., 1990) in which he and his colleagues treated mothers with postpartum depression whose infants were under 30 months of age (the mean age was 17.4 months, ranging between 2 and 30 months). The mothers were divided into three groups: (a) no depression, (b) mild depression, and (c) medium to severe depression. The researchers compared two kinds of therapy in their intervention. One was "a psychodynamic brief mother-infant therapy that aims at modifying the maternal representations of her child and of herself, mainly through interpreting what mothers project onto the child, and the link between present and past conflict" (p. 289). The other was "a therapy of interactional coaching aimed at modifying interactive patterns by making mothers more aware of their interactive styles, and emphasizing harmonious interactions over pathological ones" (p. 289).

Infants of mothers who were moderately to severely depressed showed more distress and less joy than infants of nondepressed mothers. However, therapy modified the depressed mother-infant interaction and the mother's depression improved. Mothers who were treated by the psychodynamic brief therapy showed greater amelioration of intrusive control, while mothers who were treated by the interactional coaching showed greater increase in self-esteem. The interactional coaching was also effective for improving interactions, and the psychodynamic brief therapy was also effective for increasing self-esteem (in this case, lowering a feeling of guilt and ameliorating the depressive affect). Both therapies lowered the distress level of the infants and diminished their sleep disorders.

Cramer (1993) concluded that conflictive mother-infant interaction might be a primary cause of postpartum depression. Thus mending the mother-infant relationship could contribute to improving both maternal depression and the infant's problems.

In summary, mother-infant interaction has important aspects such as joint attention and scaffolding, involving both processing information and having the mother focus on the infant's activity, which seem to be salient for the child's development. If mothers are depressed, joint attention behavior may have extreme variability, from high frequency to low frequency. The mother may try to direct the infant's attention to herself or to objects by positive or intrusive behaviors. Some of the mothers may make more attempts than nondepressed mothers to elicit the infant's attention. On the other hand, there are those who may make fewer attempts to draw the infants' attention to themselves or to objects. In either case, the infant experiences

difficulty in regulating joint attention systems and evolving coordinated communication systems.

The behaviors of depressed mothers as a group vary widely, both from withdrawn to intrusive behaviors, and from positive to extremely negative or hostile behaviors. It is also common that with depression there is less control or regulation of emotional responses to the environment and other people. Depressed mothers' cognitive or emotional responses to the environment may be so ambiguous that their infants do not have enough cues to learn by social referencing or scaffolding. Or when their cognitive or emotional responses are too strong or occur too frequently, infants may be misled by social referencing or scaffolding. As a consequence, infants would have difficulty in sharing their experience with others, and would not develop the desired intersubjectivity. Cognitive development may be delayed, and evolving affective and linguistic communication skills with others may become problematic.

Another important issue is the influence of the gender of the infant: whether there really are differences in cognitive development and linguistic acquisition between male and female infants when the mother is depressed or not. If there is a difference, does the male infant suffer more deleterious effects on his cognitive and language development than the female?

After the discussion of the theoretical background in this Chapter, and based upon the findings about the relationship of verbalization of depressed mothers and their infants' developmental outcome, eight hypotheses for this study were created. They are summarized in the next Chapter.

Chapter III: Method

Design

The design of the study was an exploration of relationships between maternal depression and joint attention behaviors, maternal scaffolding, and cognitive development of the infant. It adopted both a cross-sectional and a longitudinal design to identify the relationships. Since the study was a secondary analysis, both methods were used in order to conduct the most effective statistical analyses on the limited sample size. Additionally, it was a non-experimental descriptive design.

Independent variables. The following were the major independent variables used for achieving the study's purposes: (a) maternal depression, (b) gender of the infant, (c) age of the infant.

Dependent variables. The following were the dependent variables: (a) coordinated joint attention, (b) passive joint attention, (c) maternal verbal scaffolding, (d) maternal visual scaffolding, and (e) cognitive development.

Hypotheses. Based upon the findings of past studies, and the discussion of concepts and variables mentioned before, the following hypotheses were posited.

1. Thirteen-month-old infants will show fewer episodes of joint attention than 18-month-olds.
2. Joint attention episodes at 18 months will contain more maternal and infant verbalization than at 13 months.
3. Compared to control dyads, there will be less joint attention between depressed mothers and their infants at both 13 and 18 months.

4. Joint attention of depressed mothers will contain less affect, less child-focused, or more other-focused verbalization than nondepressed mother dyads.
5. Verbal joint attention and maternal verbal scaffolding will be greater in mother-daughter dyads than in mother-son dyads.
6. Male infants whose mothers were depressed with less maternal verbal joint attention episodes will do least well on measures of cognitive performance compared to female infants.
7. There will be less scaffolding by depressed compared to nondepressed mothers.
8. There will be more visual (i.e., nonverbal) scaffolding at 13 months than at 18 months.

Definitions of Terms

Cognitive development. Cognitive development is operationally defined as the Mental Development Index of the Bayley Scales of Infant Development (Bayley, 1969): a summary of tasks designed to measure sensory-perceptual discrimination, the acquisition of "object constancy", memory, learning, and problem-solving abilities, vocalizations and the beginnings of verbal communication, and early evidence of the ability to form generalizations and classifications (recognized as the basis of abstract thinking, Yang, 1979).

Joint attention. Terms used in the coding schema for joint attention were adopted from Bakeman and Adamson (1984; 1985) as follows.

1. Coordinated joint attention: The infant and mother are actively involved with one another and coordinate their attention to one

another and to objects. Coordinated attention must have eye contact.

2. Passive joint attention: The infant and the mother are actively involved in the same object, but the infant and mother do not have eye contact. The dyads' awareness of one another is less than during coordinated joint attention.

3. No joint attention: There is neither coordinated attention nor passive joint attention.

Maternal scaffolding. Mother's scaffolding occurs when the mother acts on objects with actions that provide a structure to play with the objects. Scaffolding includes verbal scaffolding and visual scaffolding. In verbal scaffolding, the mother is verbally directing the infant's attention to the action with objects. In visual scaffolding, the mother is nonverbally directing the infant's attention to the action with objects.

Additional categories of interaction.

1. Eye contact: The mother and the infant are looking at one another.

2. Vocalization: The mother or infant vocalizes.

3. Caretaking: The mother engages in feeding, pacifying, diapering, or picking up the infant to comfort.

4. Engagement: The mother's or infant's affect is positive, as reflected in voice tone, smiling, or laughing. Engagement includes surprise and turning heads toward the other.

5. Disengagement: The mother's or infant's affect is negatively directed toward the other. Disengagement includes looking away,

turning the head, crying, fussing, and moving away from the other.

Sample

This investigation had access to a sample from the National Institute of Mental Health (NIMH) of depressed and nondepressed mothers that was being studied collaboratively by Dr. Marian Radke-Yallow at NIMH and Dr. Kathryn Barnard at the University of Washington. The sample consisted of 41 mothers and their infants, 38 of whom had visited the laboratory when their infants were 13 months of age. Seventeen dyads were subsequently observed again at 18 months of age. Twenty-one dyads were only observed at 13 months of age. Three additional dyads were observed only at 18 months of age. Therefore, subjects for this study were 41 dyads (16 with female infants, 25 with male infants). Twenty-one mothers were diagnosed with unipolar depression and two mothers were diagnosed with bipolar depression, using the Schedule for Affective Disorders and Schizophrenia (SADS). The 18 mothers in the control group were also given the SADS, and were considered healthy. All mothers were married. The majority of the mothers were Caucasian, with one African American, one Asian, and one Hispanic. Most of them had a higher than college level education, and had an annual income over $30,000. The mothers ranged in age from 23 to 43 years old, and the mean age was 31.11 years (four mothers' ages were unknown). Seventy-one percent were at-home mothers, twenty-four percent had full-time or part-time jobs outside the home, and one was a student (four mothers' work status was unknown).

The researcher was blind to the classification of depression in the mothers until the entire data collection was completed.

Instruments

Coding schema. The coding schema for the study were the following:

MV: Mother's vocalization

MV1: About child. The mother vocalizes to the child to communicate, or to amuse.

MV2: About self. The mother talks about her idea, thought, or situation.

MV3: About objects. The mother talks about objects and teaches her child about objects.

MO: Mother's attention to objects

MO1 and CO1: Same objects. The mother and the child look at, or pay attention to the same objects.

MO2 and CO2: Different objects. The mother and the child look at, or pay attention to different objects.

ML: Mother's looking

ML1: Child's face. The mother looks at child's face.

ML2: Child's activity. The mother looks at child's activity.

ML3: Child's activity and objects. The mother looks at child's activity and objects.

ML4: Objects. The mother looks at objects.

MG: Mother's gesture

MG1: Pointing. The mother points at objects.

MG2: Giving. The mother gives an object to the child.

MG3: Showing. The mother shows an object to the child, shows her hands to receive an object from the child, or shows how to manipulate an object.

MG4: Manipulating. The mother manipulates an object without showing the object to the child.

MG5: Positioning the child. The mother positions the child (e.g., carrying the child from one place to another or holding the child to let him see an object.)

MG6: Positioning an object. The mother positions an object for the child's play.

ME: Mother's engagement

ME1: Smiling/Laughing. The mother smiles or laughs.

ME2: Surprise. The mother shows the child surprise.

MDE: Mother's disengagement

MDE: Turning head away. The mother turns her head away from the child to an object.

MCT: Care taking. The mother takes care of the child (e.g., wiping the child's nose, changing his clothes, rubbing child's body, etc.)

CV: Child's vocalization. The child vocalizes.

CO: Child's attention to objects

CO1:	Same objects that the mother looks at.
CO2:	Different objects that the mother looks at.

CL: Child's looking

CL1:	Mother's face
CL2:	Mother's activity
CL3:	Mother's activity and objects
CL4:	Objects

CG: Child's gesture

CG1:	Pointing. The child points at objects.
CG2:	Giving. The child gives an object to the mother.
CG3:	Showing. The child shows an object to the mother.
CG4:	Manipulating. The child manipulates an object.

CE: Child's engagement

CE1:	Smiling/Laughing. The child smiles or laughs.
CE2:	Turning head toward mother. The child turns the head toward the mother.

CDE: Child's disengagement

CDE1:	Turning head away. The child turns the head away from the mother.
CDE2:	Crying. The child cries.
CDE3:	Moving away. The child moves away from the mother.

Definitions of dependent variables using combinations of codes:

1. Coordinated joint attention: There must be ML1 + CL1.
2. Passive joint attention: There must be at least one of ML1, 2, or 3 + one of CL1, 2, or 3. If there is ML3 + CL3, a mother and child must look at the same object.
3. Vocal joint attention: There must be MV/CV with coordinated joint attention or passive joint attention.
4. No joint attention: Neither coordinated joint attention nor passive joint attention.
5. Scaffolding: The mother and child must look at the same objects. There must be coordinated joint attention or passive joint attention. There must be at least one of MV1 or MV3 (vocal scaffolding) or one of MG1, 2, 3, 4, 5, or 6 (visual scaffolding). The three conditions above must be satisfied at the same time.
6. Eye contact: There must be ML1 + CL1.
7. Vocalization: There must be at least one of MV1, 2, or 3 / CV.
8. Engagement: There must be at least one of ME1, or 2 / CE1, or 2.
9. Disengagement: There must be one of MDE1, 2, or 3 / CDE1, or 2.
10. Care taking: There is MCT.

The Bayley Scales of Infant Development. The Bayley Scales of Infant Development (Bayley, 1969) consist of a mental scale, a motor scale, and a behavioral scale. The applicable age for the Scales is 1 month to 2.5 years. It has been standardized on 1,262 children who were 2 to 30 months of age. For inter-observer reliability, the mean percentage of observer agreement was 89.4 % on the Mental Scale and 93.4 % on the Motor Scale. Test-retest reliability by the same observer on 28 children one week later was 76.4 % for

the Mental Scale, and 75.3 % for the Motor Scale (Self & Horowitz, 1979). This study used only the Mental Scale in the analysis.

The Schedule for Affective Disorder and Schizophrenia. The Schedule for Affective Disorders and Schizophrenia (SADS) is an assessment scale based on a structured diagnostic interview done by clinically trained health professionals. It was developed for use in the NIMH Collaborative Program on the Psychobiology of Depression in 1976. The primary purpose of the SADS was as a tool for research investigators. It is especially useful in depression research, because it contains criteria to categorize 11 subgroups of the major depressive disorder. The SADS consists of two parts. The first part examines current symptoms and episodes, and the second part identifies any previous history of mental disorder (Cimirero, Calhoun, & Adams, 1986; Rabkin & Klein, 1987).

CODER2. The CODER2 (Kappas, 1992) is a software program for the direct input of observation data from a videotape into a computer ASCII file. The minimum unit of time observers can code for is 1/30 of a second. The CODER2 allows for acquisition of timed events on the videotape. Observers can code the videotaped behaviors on the CODER2 with exact time intervals, and can directly transfer the data into the computer ASCII file.

Procedures

The original tapes were recorded at a laboratory at NIMH (furnished to resemble an apartment) during a sequence of events: (a) solitary play of the infant for 2 min, (b) mother-infant playing together for 6 min, (c) a research member's interview with the mother, (d) the Ainsworth Strange Situation procedure, (e) a feeding session, and (f) the Bayley Developmental Scales. The

whole session had a duration of 1.5 to 2 hours. The mother and infant were taken into the room by a research staff person. The staff person gave the mother instructions on how to proceed in the room before the staff person left. First, the mother was instructed to let her child sit on the floor facing toys (a bear hand puppet, a baby doll, a telephone, a jack-in-the-box in a shape of a ball, chain links to be fitted in a pail, a toy car, a doll rattle, a teddy bear, a picture book, a ring stacker, a twirling activity box, and a liquid-filled toy in a shape of a dumb-bell). Next, the mother was instructed to sit on a chair and read a magazine for 2 min while the child played alone. At a pre-arranged signal (knocking on the door by the staff person), she and the child were expected to begin playing together with the toys for 6 min. These mother-infant play sessions at 13 months and 18 months were observed by the researcher of this study, and were coded with the coding schema previously described. The behavior of the mother and infant in their play was coded continuously and recorded in time intervals of one second by the computer software, CODER2. Nonverbal behavior was coded during slow-motion viewing, and verbal behavior was coded during real-time viewing.

Intra-observer reliability was assessed by Cohen's kappa statistic (Bakeman & Gottman, 1986; Cohen, 1960) on the same researcher's recoding of 6 tapes selected at random from 58 tapes. The first 2 min of two of the six tapes, the second 2 min of the two tapes, and last 2 min of the rest of the tapes were recoded. The values of kappa on each coding item ranged from .43 to 1.00, with a mean value of .73.

The measure of cognitive development at 13 months and 18 months was assessed by having a psychologist trained with the Bayley Scales view and score the Mental Development Index from the videotaped administration

of the Bayley Mental Scales at the NIMH laboratory. The psychologist was blind to the classification of depression in the mothers.

Methods of analyses

Dependent variables for testing hypotheses were created by combining the coding categories previously described, and the following variables were entered in the analyses

1. Cognitive development: Mental Development Index (MDI)
2. Coordinated joint attention
3. Passive joint attention
4. All joint attention: coordinated joint attention + passive joint attention
5. Mother's vocalization
6. Child's vocalization
7. Mother's vocalization with all joint attention
8. Mother's vocalization about child with engagement
9. Mother's vocalization about others
10. Verbal scaffolding
11. Visual scaffolding
12. All scaffolding: verbal scaffolding + visual scaffolding

As mentioned before, the independent variables were mother's depression classification, child's age, and child's gender.

Statistical analyses computed descriptive statistics such as means, standard deviations, and ranges, and tested for the significance of group differences and associations between variables with t-tests, ANOVAs, repeated-measure ANOVAs, and correlation coefficients.

Chapter IV: Results

Description of the Sample

As mentioned in Chapter II, this study used both a longitudinal and a cross-sectional design. Because of the limited number of the sample, two data sets were created. The longitudinal dataset consisted of related cases that were measured both at 13 months and again at 18 months (n =17 cases, with each case consisting of a mother and infant dyad). The cross-sectional dataset consisted of independent cases measured either at 13 months (n = 21 cases) or at 18 months (n = 3 cases). The numbers in these groups are presented in Table 1.

Table 1. Composition of Independent Variables in the Related Cases Group and the Independent Cases Group

	Related Cases (n = 34)		Independent Cases (n = 24)	
	13 months	18 months	13 months	18 months
Variables	n	n	n	n
Control	12	12	6	0
Depression	5	5	15	3
Male	10	10	13	2
Female	7	7	8	1
Total	17	17	21	3

In order to have a larger and more balanced sample, two independent cross-sectional case groups were created by taking cases for each from both

the cross-sectional and longitudinal datasets. A first group was composed of the related cases at 13 months (n = 17) plus the independent cases at 13 months (n = 21) and 18 months (n = 3). (See Table 2, top half.) The second group was composed of the independent cases at 13 months (n = 21) and the related cases at 18 months (n = 17) plus the independent cases at 18 months (n = 3). (See Table 2, bottom half).

Table 2. Construction of Two Independent Cases Groups

	Group 1: Related cases at 13 months + all independent cases	
	13 months	18 months
Variables	n	n
Control	12(R) + 6(I) = 18	0(I)
Depression	5(R) +15(I) = 20	3(I)
Male	10(R) + 13(I) = 23	2(I)
Female	7(R) + 8(I) = 15	1(I)
Total	17(R) + 21(I) = 38	3(I)

	Group 2: Related cases at 18 months + all independent cases	
	13 months	18 months
Variables	n	n
Control	6(I)	12 (R) + 0(I) = 12
Depression	15(I)	5 (R) + 3(I) = 8
Male	13(I)	10(R) + 2(I) = 12
Female	8(I)	7(R) + 1(I) = 8
Total	21(I)	17(R) + 3(I) = 20

Note. R = related cases; I = independent cases.

This study adopted the second cross-sectional group as the independent case group for further analysis because the numbers comprising the control versus depression group, male versus female group, and 13 months versus 18 months group were more balanced than in the first group. Therefore, the study used the following two data sets for testing hypotheses; the related case group (n = 34) and the second independent case group (n = 41). These numbers are presented in Table 3.

Table 3. Composition of Independent Variables in the Related Cases Group and the Second Independent Cases Group

	Related Cases Group		Independent Cases Group	
	13 months	18 months	13 months	18 months
Variables	n	n	n	n
Control	12	12	6	12
Depression	5	5	15	8
Male	10	10	13	12
Female	7	7	8	8
Total	17	17	21	20

By using these groupings for data analyses, the related cases at 18 months were analyzed twice, once in the related cases group and again in the independent case group. If there was a statistical difference in variables examined between 13 months and 18 months that occurred in both the related and independent groups, the differences could have caused by either a difference of age or the sample itself. In order to avoid this confound, a 2

(related cases at 13 months vs. independent cases at 13 months) x 2 (control group vs. depression group) x 2 (male vs. female) ANOVA was performed on all the dependent variables analyzed in the study. The results showed that there were no significant main effects on the variables analyzed in this study, except for one: the group effect (related cases at 13 months vs. independent cases at 13 months) on visual scaffolding, $F(1) = 22.44$, $p < .001$. Because the variance of all scaffolding (visual scaffolding + verbal scaffolding) was heterogeneous, a log transformation was made in order to obtain homogeneity, and with this transformation the difference between groups was no longer significant.

In conclusion, the study adopted the two data sets: (a) the related cases group ($n = 34$) and the independent cases group composed of independent cases at 13 months and independent plus related cases at 18 months ($n = 41$).

As mentioned before, the subjects of this study were originally recruited by NIMH researchers for a different study, therefore the researcher of this study did not know if the depressed mothers of this study actually had a depressed mood at the time of data collection (when their infants were 13 and/or 18 months old), when their 6-minute play sessions were recorded. Some depressed mothers might have undergone treatment and no longer been depressed. There was no information available on treatment status nor on the mother's mood on the day of observation, and no knowledge of what they knew about the depression. In addition, 3 mothers out of 58 observations did not start to play with their infants at the beginning of the play session, because they misunderstood an instruction by the research staff. Since the research staff soon told mothers to play with their infants when the mothers did not start on their own, the sessions were retained for coding.

The depression group of this study consisted of 21 unipolar cases and 2 bipolar cases. Because psychopathology of the two types of depression and mechanisms of intergenerational transmission may be different (Radke-Yarrow, Nottelman, Belmont, & Welsh, 1993), the same analyses were repeated on the two data sets, unipolar cases group ($\underline{n}$ = 39), and unipolar and bipolar combined group ($\underline{n}$ = 41). The results of the two analyses were the same. Thus the analyses for the combined group are reported from hereon.

Data Reduction

Summary frequencies of variables were first computed based upon the coding schema of this study (discussed in Chapter III) and reduced to the variables of interest in the hypotheses of the study. Means, minimums, maximums, and standard deviations of the reduced variables were computed for the related cases group (Tables 4, 5, and 6 in Appendix A). Cross tables showing the means, minimums, maximums, and standard deviations of the variables were made by combining variables: once with state of depression and infant age, and again with state of depression and infant sex (Tables 7 and 8 in Appendix A). Each variable had a maximum frequency of 360 except all joint attention (coordinated joint attention + passive joint attention), and all scaffolding (verbal scaffolding + visual scaffolding).

The same descriptive statistics were computed for the independent cases group (Tables 9, 10 and 11 in Appendix A). The same cross tables for the independent cases are shown in Tables 12 and 13 (in Appendix A).

Based upon these statistics, t-tests, ANOVAs, repeated-measures ANOVAs, and correlation coefficients were computed to analyze the data and

test the hypotheses of this study. From now on, the results of the study will be described according to each of the hypotheses.

Hypothesis 1: Thirteen-month-old infants will show fewer episodes of joint attention than 18-months-olds.

In the related cases group, there were no significant differences in coordinated attention between 13 months and 18 months, $t(16) = -0.46$, $p > .65$, and passive joint attention, $t(16) = -1.22$, $p > .24$ (see Table 14). In the independent cases group, there were also no significant differences in coordinated attention between 13 months and 18 months, $t(39) = -0.55$, $p > .58$, and passive joint attention, $t(39) = -0.84$, $p > .40$ (see Table 15). There were no differences in the means of coordinated attention and passive joint attention, however the means at 18 months tended to be higher.

Table 14. T-tests for Paired Samples of Coordinated Joint Attention and Passive Joint Attention (n = 34)

Variables	n	Mean	SD	t-value	df	p-value
COJOAT at 13	17	15.88	12.58	-0.46	16	.65
COJOAT at 18	17	17.65	19.16			
PSJOAT at 13	17	293.41	32.33	-1.22	16	.24
PSJOAT at 18	17	304.65	28.20			

Table 15. T-tests for Independent Samples of Coordinated Joint Attention and Passive Joint Attention (n = 41)

Variables	n	Mean	SD	t-value	df	p-value
COJOAT at 13	21	14.76	9.79	-0.55	39	.58
COJOAT at 18	20	17.25	18.01			
PSJOAT at 13	21	298.38	23.17	-0.84	39	.40
PSJOAT at 18	20	304.90	26.21			

Hypothesis 2: Joint attention episodes at 18 months will contain more maternal and infant verbalization than at 13 months.

First, all vocalizations of the infants and mothers were compared between 13 and 18 months. Means and standard deviations of the infant's vocalization and mother's vocalization at 13 months and 18 months are shown in Table 16. For the infant's vocalization, a t-test yielded a significant difference in vocalization between 13 and 18 months, $t(16) = -4.90$, $p < .001$, in the related cases group. For the mother's vocalization, the Wilcoxon Matched-Pairs Signed-Ranks Test was performed due to lack of normality of the distribution. There was a marginal difference in mother's vocalization between 13 and 18 months, $z = -1.63$, $p = .05$, one-tailed. For the independent cases group, t-tests yielded similar results (see Table 17).

Table 16. Means and Standard Deviations for Child's Vocalization and Mother's Vocalization at 13 and 18 Months (Related Cases, n = 34)

Variables	13 months (n = 17)		18 months (n = 17)	
	Mean	SD	Mean	SD
CHILD VOCAL	23.65	11.34	43.06	17.74
MOTHER VOCAL	97.82	37.79	108.06	38.06

Table 17. T-tests for Child's Vocalization and Mother's Vocalization Between 13 and 18 Months (Independent Cases, n = 41)

Variables	n	Mean	SD	t-value	df	p-value
CHILD VOCAL at 13	21	23.62	16.68	-3.07	39	.01
CHILD VOCAL at 18	20	40.15	17.80			
MOTHER VOCAL at 13	21	102.91	33.62	-0.17	39	.86
MOTHER VOCAL at 18	20	104.80	36.92			

Second, comparisons were examined between 13 and 18 months for infant's vocalization with all joint attention and mother's vocalization with all joint attention. Means and standard deviations are shown in Table 18. In the related cases group, there was a significant difference in infant's vocalization with all joint attention between 13 and 18 months, $t(16) = -4.63$, $p < .001$. A difference in mother's vocalization with all joint attention between 13 and 18 months was examined by the Wilcoxon Matched-Pairs Signed-Ranks Test due to lack of normality of the distribution. Again there was a marginal difference in mother's vocalization with all joint attention between 13 and 18 months, z =

-1.68, p = .05, one-tailed. In the independent cases group, t-tests were conducted for both of the variables, and the same results were obtained (see Table 19).

Table 18. Means and Standard Deviations for Child's Vocalization with All Joint Attention and Mother's Vocalization with All Joint Attention (Related Cases, n = 34)

Variables	13 months (n = 17)		18 months (n = 17)	
	Mean	SD	Mean	SD
CHILD VOCAL WITH ALL JOINT ATTENTION	21.00	10.42	39.77	17.77
MOTHER VOCAL WITH ALL JOINT ATTENTION	87.18	34.89	98.35	33.70

Table 19. T-tests for Child's Vocalization with All Joint Attention and Mother's Vocalization with All Joint Attention (Independent Cases, n = 41)

Variables	n	Mean	SD	t-value	df	p-value
CHILD VOCAL WITH ALL JOINT ATTENTION at 13	21	19.76	15.12	-3.28	39	.001
CHILD VOCAL WITH ALL JOINT ATTENTION at 18	20	36.75	17.96			
MOTHER VOCAL WITH ALL JOINT ATTENTION at 13	21	89.81	31.54	-0.57	39	.57
MOTHER VOCAL WITH ALL JOINT ATTENTION at 18	20	95.55	32.80			

In conclusion, it appears that most of the vocalization occurred when the dyad had joint attention. As expected, there were more infant vocalizations at 18 months than 13 months, and the mother's attention at 18 months was higher than at 13 months (although the difference was not significant).

Hypothesis 3: Compared to control dyads, there will be less joint attention between depressed mothers and their infants at both 13 and 18 months.

Table 20 shows means and standard deviations of all joint attention by depression and age in the related and independent cases groups. For both the related and independent cases groups, two-way repeated-measure ANOVAs were conducted to examine effects of depression and age on joint attention. There were no main effects and no interactions of depression and age on joint attention (see Tables 21 and 22).

Table 20. Means and Standard Deviations for All Joint Attention by Depression and Age in Related Cases and Independent Cases

	13 months			18 months		
Groups	Mean	SD	n	Mean	SD	n
Related cases						
CONTROL	303.00	34.21	12	322.67	29.81	12
DEPRESSION	324.40	16.82	5	321.40	28.81	5
Independent cases						
CONTROL	302.67	28.37	6	322.67	29.81	12
DEPRESSION	317.33	19.85	15	321.38	23.52	8

Table 21. Repeated-Measures ANOVA for All Joint Attention by Depression and Age (Related Cases, n = 34)

Source	SS	df	MS	F	p-value
DEPRESSION	715.33	1	715.33	0.64	.43
AGE	490.20	1	490.20	0.70	.41
DEPRESSION x AGE	906.67	1	906.67	1.30	.27

Table 22. ANOVA for All Joint Attention by Depression and Age (Independent Cases, n = 41)

Source	SS	df	MS	F	p-value
DEPRESSION	405.04	1	405.04	0.65	.42
AGE	1308.68	1	1308.68	2.09	.15
DEPRESSION x AGE	576.61	1	576.61	0.91	.34

Hypothesis 4: Joint attention of depressed mothers will contain less affect, less child-focused, or more other-focused verbalization than non-depressed mother dyads.

Mother's vocalization to or about the child with the mother's engagement to the child and mother's vocalization about others were compared between the depression group and the control group. These comparisons were done by t-tests using only the independent cases, because depression was not a repeated measure. The results did not show any significant differences in the dependent variables between the depressed group and the nondepressed group (see Table 23). Additionally, the means of mother's vocalization to child with

engagement of the depressed group were larger than the nondepressed group, which was in the opposite direction from what was hypothesized. On the other hand, the difference between means of mother's vocalization about others was in the predicted direction. However, neither difference was significant.

Table 23. T-tests for Mother's Vocalization to Child with Engagement and Mother's Vocalization to Others Between Control and Depressed Groups (Independent Cases, n = 41)

Variables	n	Mean	SD	t-value	df	p-value
MOTHER VOCAL TO CHILD WITH ENGAGEMENT						
Control	18	3.06	2.73	-0.58	39	.56
Depression	23	3.61	3.29			
MOTHER VOCAL TO OTHERS						
Control	18	13.72	8.90	-0.21	39	.83
Depression	23	14.43	12.10			

Hypothesis 5: Verbal joint attention and maternal verbal scaffolding will be greater in mother-daughter dyads than in mother-son dyads.

In order to examine the hypothesis, t-tests were performed between the male and female infants on two variables: (a) mother's vocalization with joint attention, and (b) mother's verbal scaffolding. Again these analyses only used the independent cases group, because the independent variable, gender of the infants, was not a repeated measure. In the independent cases, there was a marginally significant difference in mother's vocalization with joint attention between the male and female infants, $t(39) = -1.68$, $p = .05$, one-tailed. Thus in

the independent cases, the mother's vocalization with joint attention to the female infants was greater than to the male infants (see Table 24).

Table 24. T-tests for Mother's Vocalization with Joint Attention Between Male and Female Infants (Independent Cases, n = 41)

Variable	n	Mean	SD	t-value	df	p-value
MOTHER VOCAL WITH JOINT ATTENTION						
Male infant	25	80.47	29.18	-1.68	39	.053
Female infant	16	99.44	33.52			

Note. P-value is for one-tailed t-test.

The mother's verbal scaffolding between male and female infants in the independent cases was not significantly different (see Table 25). However, the difference in the means of verbal scaffolding was in the same direction as mother's vocalization with joint attention: The mean of the mother's verbal scaffolding to the female infants was greater than that to the male infants.

Table 25. T-tests for Mother's Verbal Scaffolding Between Male and Female Infants (Independent Cases, n = 41)

Variable	n	Mean	SD	t-value	df	p-value
MOTHER'S VERBAL SCAFFOLDING						
Male infant	25	80.84	28.82	-1.33	39	.19
Female infant	16	93.44	30.68			

Next, differences between genders of the infants within the control group and the depression group were examined by t-tests. In the control group, there were no significant differences in both of the dependent variables between the male and female infants (see Table 26). However, the mean of mother's vocalization with joint attention to the male infants was larger than to the female infants. In the depression group, there was a marginally significant difference in mother's vocalization with joint attention between the male and female infants, $t(21) = -1.69$, $p = .05$, one-tailed. The depressed mothers talked to their male children, or talked about their male children, less than their female children. There was not a significant difference between the male and female infants on mother's scaffolding in the depressed group, but again the mean for the male infants was smaller than for the female infants (see Table 27).

Table 26. T-tests for Mother's Vocalization with Joint Attention and Verbal Scaffolding Between Male and Female Infants in the Control Group (n = 18)

Variables	n	Mean	SD	t-value	df	p-value
MOTHER VOCAL WITH JOINT ATTENTION						
Male infant	10	94.30	20.22	0.43	16	.67
Female infant	8	88.88	33.45			
MOTHER'S VERBAL SCAFFOLDING						
Male infant	10	36.50	8.49	-0.92	16	.37
Female infant	8	40.50	10.07			

Table 27. T-tests for Mother's Vocalization with Joint Attention and Verbal Scaffolding Between Male and Female Infants in the Depression Group (n = 23)

Variables	n	Mean	SD	t-value	df	p-value
MOTHER VOCAL WITH JOINT ATTENTION						
Male infant	15	84.20	36.16	-1.69	21	.05
Female infant	8	110.00	32.16			
MOTHER'S VERBAL SCAFFOLDING						
Male infant	15	36.47	19.28	-1.57	21	.13
Female infant	8	49.13	16.74			

Note. P-value is for one-tailed t-test.

Hypothesis 6: Male infants whose mothers were depressed with less maternal verbal joint attention episodes will do least well on measures of cognitive performance compared to female infants.

First, correlation coefficients analyzed the relationship between the Bayley MDI and mother's vocalization with joint attention for all male infants, and the Bayley MDI and mother's vocalization with joint attention for all female infants. The results showed a significant correlation between the Bayley MDI and mother's vocalization during joint attention for the male infants, $r = .35$, $p < .05$, one-tailed, but not for the female infants, $r = .25$, $p > .35$ (see Table 28). Therefore, if mothers vocalized well with joint attention to their male infants, their sons had higher MDIs. On the other hand, this relationship found in the male infants was not significant with the female infants.

Table 28. Correlations Between Bayley MDI and Mother's Vocalization with Joint Attention by Child's Sex (Independent Cases, n = 41)

Variable	n	r	p-value
MDI x MOTHER VOCAL WITH JOINT ATTENTION			
Male infant	25	.35	.05(1-tailed)
Female infant	16	.25	.35

Next, the correlations between the Bayley MDI and mother's vocalization with joint attention for male and female infants were computed separately for the control and depression groups. The results were different from that of the combined group (see Table 29). In the control group, boys and girls who had more joint attention with maternal verbalization had higher MDIs. Although in the depression group, boys and girls did not reach significance, this relationship was in a similar direction.

Table 29. Correlations between Bayley MDI and Mother's Vocalization with Joint Attention by Child's Gender and Control versus Depression Group (Independent Cases, n = 41)

Variable	n	r	p-value
MDI x MOTHER VOCAL WITH JOINT ATTENTION			
Control			
Male infant	10	.66	.04
Female infant	8	.71	.05
Depression			
Male infant	15	.30	.28
Female infant	8	.15	.72

Hypothesis 7: There will be less scaffolding by depressed mothers compared to non-depressed mothers.

A t-test comparing all scaffolding between the control group and the depression group found no significant difference (see Table 30).

Table 30. T-tests for Mother's Scaffolding Between Control and Depression Groups (Independent Cases, n = 41)

Groups	n	Mean	SD	t-value	df	p-value
Control	18	212.78	34.40	0.56	39	.57
Depression	23	204.87	55.08			

Hypothesis 8: There will be more visual scaffolding at 13 months than at 18 months.

This hypothesis was examined by t-tests for mother's visual scaffolding between 13 months and 18 months in both the related cases and independent cases groups (see Tables 31 and 32). There were no significant differences in maternal visual scaffolding between 13 and 18 months in both of the groups.

Table 31. T-tests for Mother's Visual Scaffolding Between 13 and 18 Months (Related Cases, n = 34)

Variable	n	Mean	SD	t-value	df	p-value
VISUAL SCAFFOLDING						
13 months	17	124.59	52.20	-0.05	16	.96
18 months	17	125.24	47.79			

Table 32. T-tests for Mother's Visual Scaffolding Between 13 and 18 Months (Independent Cases, n = 41)

Variable	n	Mean	SD	t-value	df	p-value
VISUAL SCAFFOLDING						
13 months	21	126.43	33.37	0.61	39	.54
18 months	20	118.55	48.01			

The Occurrence of Joint Attention

The percentages of all joint attention, maternal vocal joint attention, and all scaffolding for the entire observational period of 360 seconds were calculated for both the control and depression independent cases. Frequencies

of all joint attention were calculated by summing coordinated joint attention and passive joint attention, and frequencies of all scaffolding were calculated by summing verbal scaffolding and visual scaffolding occurring at the same time. Therefore some coordinated joint attention and passive joint attention overlapped in all joint attention, and some verbal scaffolding and visual scaffolding overlapped in all scaffolding. The percentages across the entire observation segments were: all joint attention, 88-89%; maternal vocal joint attention, 26%; and verbal-visual scaffolding, 57-59%. When joint attention occurred, maternal vocal occurred 29% of the time, and verbal-visual scaffolding occurred 66 - 67% of the time (see Table 9 in Appendix A).

In other words, regardless of mother's depression, joint attention was occurring during about 90% of the play session. The occurrence of maternal vocal joint attention was 26%, and verbal-visual scaffolding of the child's activity occurred during about 60% of their play session. Further, an occurrence rate of maternal vocal joint attention during joint attention was about 29%. Based upon the coding schema, scaffolding occurred about 70% of the time in episodes of joint attention. Therefore this play situation clearly elicited a very intensive period of maternal attention to the child.

Chapter V: Discussion

Age Differences

Hypotheses 1, 2, and 8 predicted age differences in joint attention, verbalization, and scaffolding. Results from testing hypothesis 1 showed no significant differences in coordinated joint attention and passive joint attention between 13 and 18 months of age. For hypothesis 2, there were no significant differences in mother's vocalization and in mother's vocalization with joint attention between 13 and 18 months. However, there were significant differences in child's vocalization and child's vocalization with joint attention between 13 and 18 months. Joint attention activity and verbal activity of the infants both increased with age, but the mothers' did not change. In addition, since the two dependent variables showed the same differences between 13 and 18 months, it can be assumed that in general, the dyads vocalized most of the time during joint attention. The results from testing hypothesis 8 also did not show a significant difference in visual scaffolding between 13 and 18 months.

In conclusion, age as an independent variable did not contribute to the dyads' joint attention or to the mothers' vocalization. The children exhibited developmental changes in vocalization, i.e., they vocalized more at 18 months than at 13 months.

Differences Between Depression and Nondepression Groups

Hypotheses 3, 4, and 7 predicted effects of depressed mothers on joint attention and scaffolding. The results from testing these three hypotheses did not show significant differences in the dependent variables between the control

group and depression group. Thus the depression status of the mothers did not influence the dyads' joint attention or the mothers' scaffolding behavior.

Gender Differences

Hypotheses 5 and 6 predicted differences in joint attention and verbal behavior of mothers according to the gender of their infants. The results from testing hypothesis 5 showed that maternal vocalization in mother-daughter dyads was greater than in mother-son dyads. However, maternal verbal scaffolding did not show a difference between genders.

Additionally, the difference predicted by hypothesis 5 was tested for within both the control group and the depression group. In the control group, there was no difference in maternal joint attention and maternal verbal scaffolding between mother-son and mother-daughter dyads. However, in the depression group, there was a difference in maternal vocal joint attention and verbal scaffolding between mother-son and mother-daughter dyads. In the depression group, mother-daughter dyads had more maternal verbal joint attention than mother-son dyads. There was not a difference in maternal verbal scaffolding between the boys and girls in the depression group.

Hypothesis 6 predicted that the differences in hypothesis 5 would be related to the cognitive development of the infants: Depending on their gender, the infants might have lower cognitive development scores due to less maternal verbal joint attention. If so, it also predicted a difference between the control and depression groups in this relationship between cognitive development and maternal verbal joint attention.

The results showed that, in the combined sample of both the control group and the depression group, there was a significant correlation between the

Bayley MDI and maternal verbal joint attention, but only for mother-son dyads. However, within the control group, both the boys and girls had a significant correlation between maternal verbal joint attention and Bayley MDI. Within the depression group, neither the boys nor girls had a significant correlation between maternal verbal joint attention and Bayley MDI (although the correlations were in the same direction as in the control group).

Therefore, in the control group, when the mothers' verbal joint attention was greater, the cognitive development scores of both sons and daughters were higher. The relationship was in the same direction for the mothers and infants in the depression group but did not reach a .05 significance level.

In conclusion, the depressed mothers gave more verbal joint attention and verbal scaffolding to girls than to boys. The frequency of maternal joint attention influenced cognitive development of the male and female infants in the control group, but it did not significantly influence cognitive development of either the males or females in the depression group.

Discussion of the Age Difference

The infants exhibited an age difference in their vocalization and vocalization with joint attention. In general, children do not become jointly engaged until they are able to focus on some aspect of the environment, which occurs near the end of infancy (Bakeman & Adamson, 1984). Therefore, mothers need to monitor their children's focus and to use it as a source for shared topics before the end of infancy (Rocissano & Yatchmink, 1983). It seems that the mothers in this study provided joint attention, verbal interaction, and visual scaffolding appropriately according to their infants' developmental stage.

This study did not find an age effect on joint attention and maternal verbalization and scaffolding. Bakeman and Adamson (1984) found in their study of infants and their mothers (in which subjects were observed at 6, 9, 12, 15, and 18 months of age) that with the older infants the dyads exhibited more and longer episodes of coordinated joint play. However, the occurrence of episodes of passive joint play was not different between younger and older infants. Bakeman and Adamson measured joint attention play at five time points along a range of 12 months from the start to the end of data collection. This study, on the other hand, had only two points of data collection along a range of 5 months (from 13 to 18 months). Therefore this study was less able to evaluate an age difference.

This study adopted a coding schema based upon the Bakeman and Adamson (1984) study, but it was not exactly the same. For example, coordinated joint attention in this study was defined as the mother and the infant looking at each other's face. This behavior was also defined as eye-to-eye contact. Eye-to-eye contact occurred in both coordinated attention and in passive joint attention, but did not have to occur to meet this study's definition of passive joint attention. The technology used let the researcher observe many behaviors during each second. Thus, the coding schema of the study was not mutually exclusive and exhaustive (Bakeman & Gottman, 1987). The study by Bakeman and Adamson did use a mutually exclusive and exhaustive coding schema in which they separated coordinated joint play and passive joint play. In their study the two types of joint attention never occurred in the same time segment, but in this study both types could occur in one segment. This may be another reason why the occurrence of coordinated joint attention and passive joint attention between 13 and 18 months did not differ in this study.

Discussion of the Association Between Maternal Depression and the Dependent Variables of this Study

As mentioned before, there were no significant differences in joint attention, maternal verbal behavior, and scaffolding between the control group and the depression group. The mean values of joint attention and mother's vocalization were actually larger in the depression group than the control group. These results seem inconsistent with the studies discussed in Chapter II, many of which have reported affective and behavioral differences between nondepressed and depressed dyads. But there are also some studies which did not find these differences. For example, Hoffman and Droter (1991) observed the interaction between depressed and nondepressed mothers and their infants. They found that maternal stimulation, extreme disengagement or flat affect, and infant activity of the mothers with depressed mood were not different from nondepressed mothers. Another study by Fleming, Ruble, Flett and Shaul (1988) examined whether mothers with mild depression and anxious mood during pregnancy and/or the postpartum period had less positive interactions with their infants. They observed mother-infant interactions at birth, and at 1, 3, and 16 months of age. They found that depressed mood of the mothers was related to less positive feelings of maternal adequacy and attitudes to caretaking and less optimal mothering behavior, but only up to 3 months. These results were not found at 16 months.

The current study did not directly measure maternal affect, nor maternal interaction behaviors in terms of withdrawal and intrusiveness or positivity and negativity. Therefore the differences in results may be due to the different variables studied. In addition, the effect of passage of time should be considered. The study of Fleming et al. (1988) showed that effects of

maternal depression in the early postpartum period were not evident in either the mothers' or infants' behavior by 16 months postpartum, regardless of the outcome of the infants' cognitive development. The current study observed dyads at 13 and 18 months postpartum and did not have information about the onset time of maternal depression. The depressed moods of some mothers might not have existed at the time of the observation, or might have been ameliorated by treatment.

Furthermore, it should be considered that the mothers in this study might have been aware of their depression before the observations by the original researchers were conducted. Therefore, the depressed mothers might have made an effort to have better interactions with their infants during the observations. Unfortunately, the researcher of this study had no further information about the mothers' depression. Also, there may have been too few subjects to adequately test these hypotheses.

The most important point to be considered about the lack of an age effect or maternal depression effect on maternal verbal behavior is that there is not enough information in the literature on maternal depression from viewpoints of joint engagement, maternal verbal joint attention, and verbal scaffolding. Most studies on interactions between depressed mothers and their children measured affective behaviors and childrearing attitudes of the mothers, and affective behaviors, development, and behavioral problems of the infants. None of these other studies measured joint attention, verbal behaviors, and scaffolding behaviors between depressed mothers and their infants. Thus, more studies investigating the effect of age and depression on joint engagement, verbal joint attention, and verbal scaffolding are needed to

identify the factors related to the cognitive development of infants of depressed mothers.

Discussion of the Gender of the Infants and Maternal Depression

Based upon this study's results and findings from studies described in Chapter II, it seems reasonable to conclude that boys are more vulnerable to maternal depression. There are a few other studies on gender-related differences in maternal behavior. Malatesta and Haviland (1982) examined mothers' verbal responses tc the expressions of infants 3 to 6 months of age. They found that mothers showed more contingent responses to older boys' smiles than to girls' smiles, and followed more boys' expressions than girls'. Tronick and Cohn (1989) found similar results. They observed interactions of mother-son and mother-daughter pairs so that they could understood how mothers and infants were able to coordinate their behavior through matching and synchrony. The pairs were observed when the infants were 3, 6, and 9 months of age. The mothers and their infants increased their degree of coordination as the infants became older. However, the mother-son pairs spent more time in a matching state than the mother-daughter pairs. The subjects of both of these studies were normal mothers and infants. In these normal mother-infant dyads, mothers showed more favorable interactions with boys. However, the interactions of the depressed mother-son dyads in the current study were less favorable than the depressed mother-daughter dyads.

The reason for these findings is unknown, but another researcher has offered interesting hypotheses for similar findings. Murray (1992, 1993) has reported that depressed mothers' male infants had more negative effects from their mothers' depression than female infants. She theorized that mothers in

general give more effort to interacting with sons because it is commonly believed that a boy is more vulnerable and difficult to raise. However, when a mother is depressed, these believed characteristics of the boy overburden the mother in her interactions with him. As a result, interactions between the mother and son become more negative, and impact the son's cognitive development. Furthermore, Murray commented that a depressed mother tends to have more marital discord or spousal conflict. These problems may also be reflected more strongly in interactions with a son than with a daughter.

In addition to maternal factors that could contribute to the differences between boys and girls, factors of the infants should be considered. It has been reported that there are several differences in the behavior of boys and girls even in the newborn period: Girls do more mouthing than boys, girls suck on their fingers more rhythmically, boys startle with bigger physical movements than girls, etc. (Stossel, 1995). These different early behavior patterns may influence interactions with their mothers, and may be interpreted differently by depressed mothers compared to nondepressed mothers. Therefore, it would be of interest to study how gender differences in infants' behavior relate to their interactions with their mothers. There are not enough studies to identify the factors which create gender-related effects of maternal depression on infant development. More studies on this issue are needed to understand the mechanisms.

Summary of Findings

1. There were no differences in coordinated joint attention, passive joint attention, maternal vocalization, maternal vocal joint attention, and maternal visual scaffolding between 13 and 18 months of age. However, there were

differences in child's vocalization and child's vocal joint attention between 13 and 18 months.

2. There were no differences between depressed and nondepressed mothers on these variables: joint attention, maternal vocalization about or toward child with engagement, maternal vocalization about others, and maternal scaffolding.

3. There was a difference between genders of the infants: In the total sample (the control plus depressed group) maternal vocal joint attention about and toward a female infant was more frequent than toward a male infant, but there was no difference in maternal verbal scaffolding between male and female infants.

In the depression group alone the maternal verbal joint attention about and toward a female infant was more frequent than toward a male infant. However, maternal verbal scaffolding was not different between male and female infants. In the control group alone there were no differences in maternal vocal joint attention and maternal verbal scaffolding between boys and girls.

4. For the total sample (the control group plus depression group) there was a correlation between maternal verbal joint attention and the Bayley MDI for boys, but no correlation for the girls.

In the depression group alone, there was no correlation between maternal verbal joint attention and the Bayley MDI for either boys or girls. However, in the control group alone, there was a strong correlation between maternal vocal joint attention and the Bayley MDI for both boys and girls. Thus, for the depression group, maternal vocal joint attention did not appear to influence cognitive development as significantly as in the control group.

Implications for Future Research and for Nursing Intervention

This section will discuss the problems which should be considered for the next step in studying joint attention behavior in interactions between depressed mothers and their infants. It will also offer suggestions for nursing intervention with mother-infant dyads who have difficulty with joint attention in their play, and for those who have problems in the child's language development.

For future studies, it is important that there is an adequate sample size in order to have enough statistical power to detect differences. Most of the descriptive statistics of this study showed differences in the same directions that the hypotheses of this study predicted, but the inferential statistics did not find these differences to be significant. Thus replications of this study with a larger sample size are needed to more carefully examine joint attention behaviors in mother-infant interaction and their effect on the child's language development. Especially, relationships among maternal depression, joint attention, and children's cognitive development have not yet been adequately studied.

Second, the coding schema for this study should be modified to more thoroughly and appropriately test the hypotheses of this study with statistical analyses. As mentioned before, the coding schema was not mutually exclusive and exhaustive. Several codes that defined different categories shared the same behaviors. For example, because coordinated joint attention was defined as the mother and the child looking at each other's face, coordinated joint attention also occurred in passive joint attention. That is, coordinated joint attention was confounded in passive joint attention. As a result, the confound

worked against separating out differences of occurrence between coordinated joint attention and passive joint attention.

It is also possible that differences in patterns of behavior between depressed mother-infant dyads and nondepressed mother-infant dyads in this study might have been detected by another statistical method. For instance, time series analysis (TSA) might yield different results than those reported in Chapter IV (wherein the data were analyzed based upon frequencies of behaviors). TSA is an analysis method that measures contingency and cyclicity in interactions between two persons (Sackett, 1979, 1987). It allows researchers to predict repetitive cycles of occurrence, concurrency, and orders of link of some interactive behaviors. In order to analyze behavioral interaction data by TSA, the data has to have the following characteristics: mutual exclusivity, exhaustiveness, and concurrency. In summary, in order to replicate and expand on this study's findings, it is suggested that coding schema for future studies on mother-infant interactions retain the same behavioral categories and one-second time interval, but in addition be mutually exclusive and exhaustive.

Finally, some implications for nursing intervention to promote mother-infant interactions and child cognitive development will be discussed based upon the literature review and the findings of this study.

Studies discussed in Chapter II showed that joint attention between a mother and infant is a beginning step or prerequisite to learning language. Even in the neonatal period a newborn has interactive behaviors (Condon, 1979) and the mother has an innate sensitivity to perceive the subtle cues the baby sends to her (Brazelton et al., 1974). These interactions evolve into joint attention behaviors. Bruner (1981) suggested that joint attention behaviors in

the infant begin with eye-to-eye contact with the mother and then emerge in communication skills used to obtain attention from others, such as giving signals by pointing out a toy to the mother. Later, joint attention behaviors of the child involve verbalization as well, such as asking "What is this?" while pointing at something. At this stage, the mother intentionally scaffolds the child's language acquisition by attempting to have joint attention with the child (Bakeman & Adamson, 1984), and by talking using motherese to the child (Bukatko & Daehler, 1992; Bettes, 1988). If the mother skillfully uses joint attention or scaffolding in interactions with her infant, the infant will have more advanced cognitive development (Rogoff, 1991). If the mother does not succeed in having joint attention with her infant, or the joint attention behaviors seem inappropriate, such as a mother who not only withdraws but also is directive or intrusive, the infant will have poorer language development (Rocissano & Yatchmink, 1983; Tomasello & Todd, 1983). In addition, one of this study's findings showed that, in the control group, the more the maternal vocal joint attention the higher the child's cognitive development.

Based upon the above findings, some suggestions can be presented for nursing interventions to help mother-infants dyads who have problems in their interactions and to promote cognitive development of the infants. There is one valuable and rare intervention study (Girolametto, Verbey, & Tannock, 1994) which focused on joint engagement to improve language development of children who had developmental delays and language impairment. The study offered a parent-centered intervention program to facilitate joint engagement between the children and their mothers, because the parents had special difficulty in having joint attention with their children with developmental delays. The researchers assumed that joint engagement can facilitate early

communicative and linguistic development. The results of the study revealed that this program effectively helped increase the duration and frequency of joint engagement in the parent-child interactions. The program adopted by the study was the Hanen Early Language Program (Manolson, 1992). A major strategy of the program is "**3a Way**: allow your child to lead, adapt to 'share the moment', add language and experience (pp. 1-54)." This program teaches the parents how they can obtain joint engagement with their children to improve language acquisition.

The current study found that in both the control and depression groups, joint attention occurred 90% of the entire time, maternal vocal joint attention occurred 26% of the time, and verbal-visual scaffolding occurred about 60% of the time, during their play sessions. Maternal vocal joint attention occurred during joint attention about 30% of the time, and verbal-visual scaffolding occurred during all joint attention about 70% of the time. These findings are applicable to all assessments of mother-infant interactions. In a play situation there should be a high amount of joint attention with more than a quarter of the time containing maternal vocalization and 60% of the time containing maternal scaffolding of the child activity. When little joint attention, verbal behaviors, or scaffolding occur, the dyad needs to be monitored for the quality of their interactions and the impact on the child's cognitive development, especially linguistic development. If the results of these assessments indicate problems, a program such as the Hanen Early Language Program may be implemented in intervention with the mother-infant dyad.

In this study, a significant positive correlation between maternal vocal joint attention and child cognitive development was found in the control group

with a nonsignificant trend in the same direction for the depression group. More studies will help clarify the possible relation between joint attention and depression. In a play situation the opportunity for joint attention is maximized and may not reflect the more normal pattern of behavior for the dyads. A different situation in which the opportunity for joint attention is challenged might also reveal differences. For instance, if the mother were instructed to do another task, such as complete a questionnaire during the episode, the occurrence of joint attention might be quite different.

Limitations and Conclusions of This Study

As mentioned before, the generalizability of this study is limited because it has a small sample size and a restricted range of SES and maternal education. The sample of this study consisted of highly educated and middle class mothers from intact families. Therefore, the results of this study cannot be applied to lower class mothers who do not have spouses or who do not have much education. Further, there has been no replication of this study which measured joint attention behaviors in interactions between depressed mothers and their infants to understand the effects of maternal depression on children's cognitive development. In order to enhance statistical power, a larger sample size is needed. In addition, replications of this study may modify the coding schema and adopt TSA as a statistical analysis method. Specifically, future studies should test the influence of mothers' verbal joint attention in interactions with their infants on the infants' cognitive development. This influence would be best investigated by a long-term longitudinal study.

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Appendix A: Tables of Descriptive Statistics

Table 4. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Depression (Related Cases, n = 24)

Variable	Control (n = 24)				Depression (n = 10)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	133.00	113.25	90.00	13.49	136.00	112.00	88.00	17.68
Co-joint Attention	83.00	17.67	2.00	18.04	32.00	14.60	2.00	9.89
Passive-joint Attention	336.00	295.17	215.00	31.80	336.00	308.30	252.00	25.91
All Joint Attention	367.00	312.83	226.00	32.95	349.00	322.90	276.00	22.30
Mother Vocalization	146.00	92.25	45.00	26.84	189.00	128.60	70.00	48.32
Child Vocalization	87.00	35.67	4.00	19.73	48.00	27.80	17.00	10.01
Mother Vocal All Joint	145.00	83.58	43.00	27.29	166.00	114.80	60.00	40.41
Child Vocal All Joint	83.00	32.75	4.00	19.12	47.00	24.70	15.00	9.78
Mother Vocal to Child With Engage	12.00	3.46	0.00	3.71	10.00	5.60	2.00	3.17
Mother Vocal to Other	34.00	11.54	0.00	8.55	55.00	14.00	1.00	16.58
Verbal Scaffolding	138.00	77.08	39.00	26.81	162.00	104.50	55.00	38.34
Visual Scaffolding	218.00	123.25	54.00	49.07	209.00	128.90	74.00	52.21
All Scaffolding	288.00	200.33	113.00	49.52	371.00	233.40	130.00	76.59

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 5. Maximum Scores, Means, Minimum Scores, and Standard Deviations for Observed Behaviors by Child's Age (Related Cases, n = 34)

Variable	13 months (n = 17)				18 months (n = 17)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	133.00	112.59	94.00	12.90	136.00	113.18	88.00	16.48
Co-joint Attention	47.00	15.88	2.00	12.58	83.00	17.65	2.00	19.16
Passive-joint Attention	336.00	293.41	215.00	32.33	336.00	304.65	243.00	28.20
All Joint Attention	338.00	309.29	228.00	31.25	367.00	322.29	254.00	28.62
Mother Vocalization	189.00	97.82	45.00	37.79	185.00	108.06	49.00	38.06
Child Vocalization	46.00	23.65	4.00	11.34	87.00	43.06	20.00	17.74
Mother Vocal All Joint	163.00	87.18	43.00	34.89	166.00	98.35	48.00	33.70
Child Vocal All Joint	41.00	21.00	4.00	10.42	83.00	39.76	19.00	17.67
Mother Vocal to Child With Engage	12.00	4.88	0.00	4.37	10.00	3.29	0.00	2.64
Mother Vocal to Other	34.00	11.18	0.00	9.46	55.00	13.35	1.00	13.06
Verbal Scaffolding	162.00	80.12	39.00	34.25	157.00	90.18	47.00	31.06
Visual Scaffolding	209.00	124.59	59.00	52.20	218.00	125.24	54.00	47.79
All Scaffolding	371.00	204.71	113.00	72.09	313.00	215.41	140.00	45.27

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 6. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Child's Sex (Related Cases, n = 34)

Variable	Male (n = 20)				Female (n = 14)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	136.00	111.30	88.00	16.98	128.00	115.14	97.00	10.42
Co-joint Attention	83.00	16.90	2.00	18.86	47.00	16.57	2.00	11.36
Passive-joint Attention	336.00	301.85	239.00	28.22	336.00	295.00	215.00	33.97
All Joint Attention	367.00	318.75	247.00	29.44	347.00	311.57	228.00	31.95
Mother Vocalization	178.00	99.85	45.00	33.47	189.00	107.36	49.00	44.00
Child Vocalization	87.00	35.55	9.00	19.60	66.00	30.21	4.00	14.57
Mother Vocal All Joint	166.00	91.05	43.00	32.51	163.00	95.21	48.00	37.71
Child Vocal All Joint	83.00	32.55	8.00	19.15	62.00	27.29	4.00	13.95
Mother Vocal to Child With Engage	12.00	4.80	0.00	4.03	8.00	3.07	0.00	2.84
Mother Vocal to Other	26.00	8.65	1.00	6.98	55.00	17.43	0.00	14.24
Verbal Scaffolding	162.00	83.90	39.00	31.58	143.00	86.93	44.00	35.12
Visual Scaffolding	209.00	119.70	55.00	48.21	218.00	132.36	54.00	51.63
All Scaffolding	371.00	203.60	113.00	69.18	288.00	219.29	153.00	42.93

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 7. Maximum Scores, Means, Minimum Scores, and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Age
(Related Cases, n = 34)

	Control (n = 24)							
	13 months (n = 12)				18 months (n = 12)			
Variable	max	mean	min	sd	max	mean	min	sd
Bayley MDI	133.00	113.17	95.00	13.35	128.00	113.33	90.00	14.23
Co-joint Attention	47.00	17.58	5.00	13.72	83.00	17.75	2.00	22.19
Passive-joint Attention	326.00	285.42	215.00	33.24	336.00	304.92	243.00	28.32
All Joint Attention	334.00	303.00	228.00	34.21	367.00	322.67	254.00	29.81
Mother Vocalization	129.00	85.58	45.00	23.50	146.00	98.92	49.00	29.29
Child Vocalization	46.00	23.92	4.00	12.89	87.00	47.42	25.00	18.62
Mother Vocal All Joint	124.00	75.25	43.00	22.07	145.00	91.92	48.00	30.31
Child Vocal All Joint	41.00	21.25	4.00	11.89	83.00	44.25	23.00	18.29
Mother Vocal to Child With Engage	12.00	3.75	0.00	4.47	10.00	3.17	0.00	2.92
Mother Vocal to Other	34.00	11.83	0.00	9.84	22.00	11.25	1.00	7.47
Verbal Scaffolding	121.00	68.42	39.00	22.54	138.00	85.75	47.00	28.82
Visual Scaffolding	204.00	118.42	59.00	48.03	218.00	128.08	54.00	51.73
All Scaffolding	288.00	186.83	113.00	55.94	269.00	213.83	140.00	40.00

	Depression (n = 10)							
	13 months (n = 5)				18 months (n = 5)			
Variable	max	mean	min	sd	max	mean	min	sd
Bayley MDI	128.00	111.20	94.00	13.14	136.00	112.80	88.00	23.00
Co-joint Attention	24.00	11.80	2.00	9.26	32.00	17.40	6.00	10.71
Passive-joint Attention	336.00	312.60	282.00	22.12	335.00	304.00	252.00	31.22
All Joint Attention	338.00	324.40	306.00	16.82	349.00	321.40	276.00	28.81
Mother Vocalization	189.00	127.20	75.00	51.63	185.00	130.00	70.00	50.83
Child Vocalization	35.00	23.00	17.00	7.48	48.00	32.60	20.00	10.57
Mother Vocal All Joint	163.00	115.80	60.00	45.60	166.00	113.80	67.00	39.90
Child Vocal All Joint	32.00	20.40	15.00	6.73	47.00	29.00	19.00	11.11
Mother Vocal to Child With Engage	10.00	7.60	3.00	2.88	7.00	3.60	2.00	2.07
Mother Vocal to Other	24.00	9.60	2.00	9.32	55.00	18.40	1.00	21.98
Verbal Scaffolding	162.00	108.20	55.00	43.55	157.00	100.80	65.00	37.10
Visual Scaffolding	209.00	139.40	75.00	64.54	165.00	118.40	74.00	41.14
All Scaffolding	371.00	247.60	130.00	94.46	313.00	219.20	149.00	61.40

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 8. Maximum Scores, Means, Minimum Scores, and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Sex
(Related Cases, n = 34)

Variable	Control (n = 24)							
	Male (n = 12)				Female (n = 12)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	133.00	111.58	90.00	16.22	128.00	114.92	97.00	10.56
Co-joint Attention	83.00	20.00	2.00	22.98	47.00	15.33	2.00	11.87
Passive-joint Attention	330.00	290.67	239.00	30.23	336.00	299.67	215.00	34.01
All Joint Attention	367.00	310.67	247.00	34.41	347.00	315.00	228.00	32.8
Mother Vocalization	136.00	90.42	45.00	23.61	146.00	94.08	49.00	30.69
Child Vocalization	87.00	41.83	9.00	22.00	66.00	29.50	4.00	15.72
Mother Vocal All Joint	126.00	81.42	43.00	23.93	145.00	85.75	48.00	31.22
Child Vocal All Joint	83.00	38.33	8.00	21.67	62.00	27.17	4.00	15.06
Mother Vocal to Child With Engage	12.00	4.17	0.00	4.43	8.00	2.75	0.00	2.83
Mother Vocal to Other	26.00	9.33	1.00	7.04	34.00	13.75	0.00	9.63
Verbal Scaffolding	122.00	74.25	39.00	20.94	138.00	79.92	44.00	32.35
Visual Scaffolding	181.00	108.08	55.00	41.84	218.00	138.42	54.00	52.75
All Scaffolding	259.00	182.33	113.00	49.85	288.00	218.33	153.00	43.99

Variable	Depression (n = 10)							
	Male (n = 8)				Female (n = 2)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	136.00	110.88	88.00	19.21	126.00	116.50	107.00	13.44
Co-joint Attention	32.00	12.25	2.00	9.71	24.00	24.00	24.00	0.00
Passive-joint Attention	336.00	318.63	299.00	13.76	282.00	267.00	252.00	21.21
All Joint Attention	349.00	330.88	306.00	14.54	306.00	291.00	276.00	21.21
Mother Vocalization	178.00	114.00	70.00	42.23	189.00	187.00	185.00	2.83
Child Vocalization	48.00	26.13	17.00	10.62	35.00	34.50	34.00	71.00
Mother Vocal All Joint	166.00	105.50	60.00	39.63	163.00	152.00	141.00	15.56
Child Vocal All Joint	47.00	23.88	15.00	10.70	32.00	28.00	24.00	5.66
Mother Vocal to Child With Engage	10.00	5.75	2.00	3.41	7.00	5.00	3.00	2.83
Mother Vocal to Other	20.00	7.63	1.00	7.25	55.00	39.50	24.00	21.92
Verbal Scaffolding	162.00	98.38	55.00	40.24	143.00	129.00	115.00	19.80
Visual Scaffolding	209.00	137.13	75.00	54.59	118.00	96.00	74.00	31.11
All Scaffolding	371.00	235.50	130.00	84.53	261.00	225.00	189.00	50.92

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 9. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Depression (Independent Cases, n = 41)

Variable	Control (n = 18)				Depression (n = 23)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	128.00	114.33	90.00	11.67	138.00	113.26	88.00	15.30
Co-joint Attention	83.00	18.44	2.00	19.67	32.00	14.04	2.00	7.88
Passive-joint Attention	336.00	297.56	243.00	28.00	335.00	304.70	252.00	21.72
All Joint Attention	367.00	316.00	254.00	30.10	349.00	318.74	276.00	20.75
Mother Vocalization	146.00	102.39	49.00	26.33	185.00	104.96	18.00	40.84
Child Vocalization	87.00	42.11	11.00	21.39	50.00	23.52	2.00	11.90
Mother Vocal All Joint	145.00	91.89	48.00	26.17	166.00	93.17	15.00	36.32
Child Vocal All Joint	83.00	37.61	7.00	21.28	48.00	20.57	2.00	11.72
Mother Vocal to Child With Engage	10.00	3.06	0.00	2.73	15.00	3.61	0.00	3.29
Mother Vocal to Other	38.00	13.72	1.00	8.90	55.00	14.43	1.00	12.10
Verbal Scaffolding	138.00	84.89	47.00	25.06	157.00	86.43	14.00	33.64
Visual Scaffolding	218.00	127.89	54.00	43.94	182.00	118.43	46.00	38.72
All Scaffolding	269.00	212.78	140.00	34.39	313.00	204.87	122.00	55.08

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 10. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Child's Age (Independent Cases, n = 41)

Variable	13 months (n = 21)				18 months (n = 20)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	138.00	114.86	95.00	12.10	136.00	112.55	88.00	15.38
Co-joint Attention	39.00	14.76	5.00	9.79	83.00	17.25	2.00	18.01
Passive-joint Attention	327.00	298.38	250.00	23.17	336.00	304.90	243.00	26.21
All Joint Attention	341.00	313.14	255.00	22.87	367.00	322.15	254.00	26.81
Mother Vocalization	152.00	102.90	18.00	33.62	185.00	104.80	49.00	36.92
Child Vocalization	77.00	23.62	2.00	16.68	87.00	40.15	20.00	17.80
Mother Vocal All Joint	148.00	89.81	15.00	31.54	166.00	95.55	48.00	32.80
Child Vocal All Joint	65.00	19.76	2.00	15.12	83.00	36.75	12.00	17.96
Mother Vocal to Child With Engage	15.00	3.52	0.00	3.56	10.00	3.20	0.00	2.44
Mother Vocal to Other	38.00	15.10	2.00	9.37	55.00	13.10	1.00	12.09
Verbal Scaffolding	135.00	83.71	14.00	30.23	157.00	87.90	47.00	30.03
Visual Scaffolding	182.00	126.43	72.00	33.37	218.00	118.55	46.00	48.01
All Scaffolding	308.00	210.14	122.00	47.15	313.00	206.45	139.00	47.51

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 11. Maximum Scores, Means, Minimum Scores and Standard Deviations for Observed Behaviors by Child's Sex (Independent Cases, n = 41)

Variable	Male (n = 25)				Female (n = 16)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	138.00	114.00	88.00	15.52	128.00	113.31	95.00	10.63
Co-joint Attention	83.00	18.84	2.00	16.98	24.00	11.50	2.00	6.82
Passive-joint Attention	335.00	296.24	243.00	24.71	336.00	309.38	252.00	23.05
All Joint Attention	367.00	315.40	254.00	27.21	347.00	320.88	276.00	21.44
Mother Vocalization	178.00	99.64	18.00	33.05	185.00	110.38	49.00	37.60
Child Vocalization	87.00	35.44	5.00	20.26	66.00	25.81	2.00	15.55
Mother Vocal All Joint	166.00	88.24	15.00	30.69	148.00	99.44	48.00	33.52
Child Vocal All Joint	83.00	31.36	5.00	19.91	62.00	22.88	2.00	15.14
Mother Vocal to Child With Engage	10.00	3.04	0.00	2.62	15.00	3.88	0.00	3.61
Mother Vocal to Other	38.00	12.08	1.00	9.52	55.00	17.31	2.00	11.91
Verbal Scaffolding	157.00	80.84	14.00	28.82	138.00	93.44	47.00	30.68
Visual Scaffolding	182.00	114.60	46.00	39.26	218.00	135.06	54.00	41.34
All Scaffolding	313.00	195.44	122.00	48.29	308.00	228.50	181.00	37.28

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 12. Maximum Scores, Means, Minimum Scores, and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Age (Independent Cases, n = 41)

Variable	Control (n = 18)							
	13 months (n = 6)				18 months (n = 12)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	122.00	116.33	113.00	3.20	128.00	113.33	90.00	14.23
Co-joint Attention	39.00	19.83	5.00	15.13	83.00	17.75	2.00	22.19
Passive-joint Attention	312.00	282.83	250.00	22.61	336.00	304.92	243.00	28.32
All Joint Attention	325.00	302.67	255.00	28.37	367.00	322.67	254.00	29.81
Mother Vocalization	126.00	109.33	82.00	19.58	146.00	98.92	49.00	29.29
Child Vocalization	77.00	31.50	11.00	24.30	87.00	47.42	25.00	18.62
Mother Vocal All Joint	114.00	91.83	71.00	17.52	145.00	91.92	48.00	30.31
Child Vocal All Joint	65.00	24.33	7.00	22.05	83.00	44.25	23.00	18.29
Mother Vocal to Child With Engage	6.00	2.83	0.00	2.56	10.00	3.17	0.00	2.92
Mother Vocal to Other	38.00	18.67	10.00	10.11	22.00	11.25	1.00	7.47
Verbal Scaffolding	106.00	83.17	60.00	17.38	138.00	85.75	47.00	28.82
Visual Scaffolding	160.00	127.50	87.00	26.03	218.00	128.08	54.00	51.73
All Scaffolding	229.00	210.67	174.00	22.22	269.00	213.83	140.00	40.00

Variable	Depression (n = 23)							
	13 months (n = 15)				18 months (n = 8)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	138.00	114.27	95.00	14.30	136.00	111.38	88.00	17.92
Co-joint Attention	25.00	12.73	5.00	6.31	32.00	16.50	2.00	10.25
Passive-joint Attention	327.00	304.60	271.00	20.97	335.00	304.88	252.00	24.58
All Joint Attention	341.00	317.33	283.00	19.85	349.00	321.38	276.00	23.52
Mother Vocalization	152.00	100.33	18.00	38.11	185.00	113.63	60.00	46.95
Child Vocalization	50.00	20.47	2.00	12.22	48.00	29.35	20.00	9.42
Mother Vocal All Joint	148.00	89.00	15.00	36.18	166.00	101.00	58.00	37.68
Child Vocal All Joint	48.00	17.93	2.00	11.85	47.00	25.50	12.00	10.41
Mother Vocal to Child With Engage	15.00	3.80	0.00	3.93	7.00	3.25	2.00	1.67
Mother Vocal to Other	33.00	13.67	2.00	9.01	55.00	15.88	1.00	17.15
Verbal Scaffolding	135.00	83.93	14.00	34.61	157.00	91.13	55.00	33.52
Visual Scaffolding	182.00	126.00	72.00	36.72	165.00	104.25	46.00	40.77
All Scaffolding	308.00	209.93	122.00	54.77	313.00	195.38	139.00	58.12

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

Table 13. Maximum Scores, Means, Minimum Scores, and Standard Deviations for Observed Behaviors by Mother's Depression and Child's Sex
(Independent Cases, n = 41)

Variable	Control (n = 18)							
	Male (n = 10)				Female (n = 8)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	126.00	112.40	90.00	13.51	128.00	116.75	107.00	9.16
Co-joint Attention	83.00	25.10	2.00	24.32	20.00	10.13	2.00	6.08
Passive-joint Attention	330.00	286.20	243.00	27.14	336.00	311.75	275.00	23.30
All Joint Attention	367.00	311.30	254.00	35.28	347.00	321.88	282.00	23.00
Mother Vocalization	136.00	106.40	82.00	19.25	146.00	97.38	49.00	33.99
Child Vocalization	87.00	49.10	22.00	22.65	66.00	33.38	11.00	17.16
Mother Vocal All Joint	126.00	94.30	71.00	20.22	145.00	88.88	48.00	33.45
Child Vocal All Joint	83.00	43.20	12.00	23.37	62.00	30.63	7.00	17.25
Mother Vocal to Child With Engage	10.00	3.40	0.00	3.20	5.00	2.63	0.00	2.13
Mother Vocal to Other	38.00	13.50	1.00	10.78	22.00	14.00	2.00	6.52
Verbal Scaffolding	122.00	84.70	60.00	18.59	138.00	85.13	47.00	32.87
Visual Scaffolding	181.00	119.80	55.00	41.99	218.00	138.00	54.00	47.04
All Scaffolding	259.00	204.50	140.00	40.64	269.00	223.13	192.00	23.00

Variable	Depression (n = 23)							
	Male (n = 15)				Female (n = 8)			
	max	mean	min	sd	max	mean	min	sd
Bayley MDI	138.00	115.07	88.00	17.10	128.00	109.88	95.00	11.46
Co-joint Attention	32.00	14.67	6.00	8.20	24.00	12.88	2.00	7.64
Passive-joint Attention	335.00	303.47	271.00	21.11	327.00	307.00	252.00	24.14
All Joint Attention	349.00	318.13	283.00	21.18	341.00	319.88	276.00	21.31
Mother Vocalization	178.00	95.13	18.00	39.75	185.00	123.38	73.00	38.56
Child Vocalization	50.00	26.33	5.00	12.31	34.00	18.25	2.00	9.65
Mother Vocal All Joint	166.00	84.20	15.00	36.16	148.00	110.00	70.00	32.16
Child Vocal All Joint	48.00	23.47	5.00	12.71	24.00	15.13	2.00	7.53
Mother Vocal to Child With Engage	8.00	2.80	0.00	2.24	15.00	5.13	1.00	4.45
Mother Vocal to Other	33.00	11.13	1.00	8.85	55.00	20.63	8.00	15.38
Verbal Scaffolding	157.00	78.27	14.00	34.41	135.00	101.75	68.00	27.9
Visual Scaffolding	182.00	111.13	46.00	38.42	173.00	132.13	74.00	37.81
All Scaffolding	313.00	189.40	122.00	53.28	308.00	233.88	181.00	48.82

Bayley MDI = Score of Bayley Mental Development Scale
Maximum frequency of a behavior = 360
All Joint Attention = Co-Joint Attention + Passive Joint Attention
All Scaffolding = Visual Scaffolding + Verbal Scaffolding

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PROFESSIONAL EXPERIENCE

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April 1984-March 1988	Staff nurse for the Infant Unit of Kitasato University Hospital, Kanagawa, Japan, providing direct intensive care for the infant.
April 1982-March 1984	Instructor: Department of School Nursing, National Hokkaido University of Education, Asahikawa, Hokkaido, Japan.
April 1978-March 1982	Staff Nurse of the General Pediatric Unit and the Infant Orphanage, Japanese Red Cross Medical Center, Tokyo, Japan, providing direct care for the child.
May 1974-March 1978	Staff Nurse of NICU of Nippon University Medical Center, Tokyo, Japan, providing direct intensive care for the newborn and premature baby.

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