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The Development and Testing of
the Müller Prenatal Attachment Inventory

by

Mary E. Müller

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Nursing

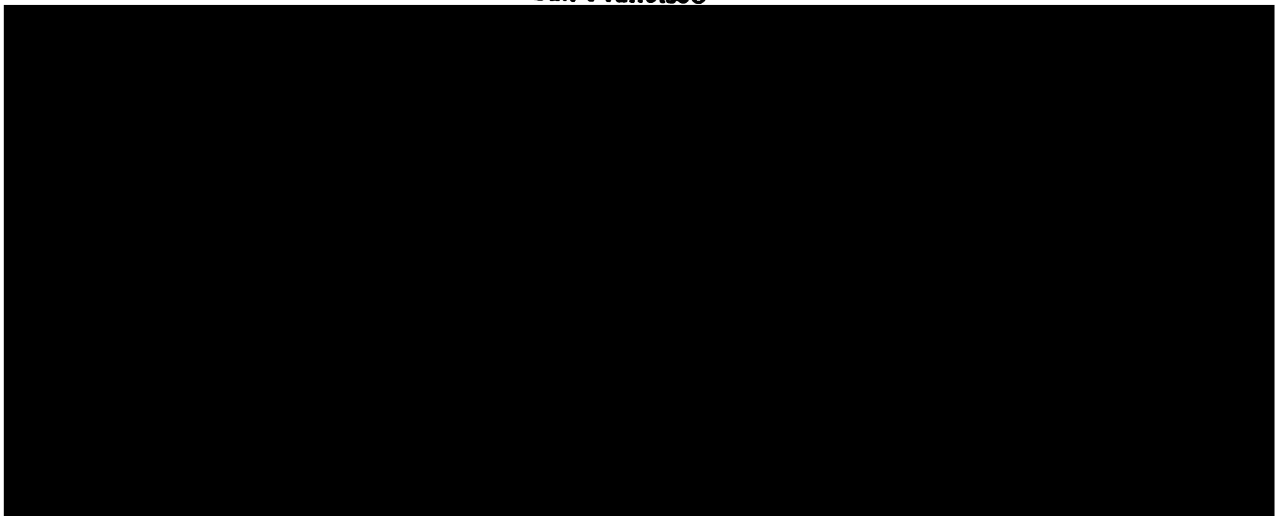
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Mary E. Muller

Dedication

To my husband Peter; my sons Eric, Joe, and David;
and my father, Louis R. Potvin

Acknowledgements

I am very grateful to the members of my committee, Sandra Ferketich, Jeanne DeJoseph, and Mary E. Duffy for their guidance and support. Steven M. Paul gave me much appreciated statistical advice.

I also wish to thank the nurses, physicians, midwives, and office staff members at my recruitment sites and the three hundred ten women who completed the research packets and made this dissertation possible.

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The Development and Testing of
The Müller Prenatal Attachment Inventory
Mary E. Müller

The purpose of this study was to develop the Muller Prenatal Attachment Inventory (MPAI), to measure fetal attachment and demonstrate evidence of reliability and construct and criterion validity for the PAI.

PAI items were deductively developed from theory. Construct validity was assessed by eleven experts who rated items on a four point scale from not relevant to relevant. Each of the final 29 items had a mean rating greater than three.

Three hundred thirty-six low risk, pregnant women were recruited for the study, and 310 (92%) completed the MPAI, a demographic questionnaire and four instruments chosen to provide evidence of concurrent validity: the Maternal Fetal Attachment Scale (MFAS), the Kansas Marital Satisfaction Scale (KMSS), the UCLA Loneliness Scale (UCLA), and the Maternal Adjustment and Maternal Attitudes Scale (MAMA), and its subscales: body image; somatic symptoms; marital relationship; attitudes to sex; and attitudes to pregnancy and the baby.

Thirty-two percent of the subjects were from minority groups (Asians=43, Blacks=19, Latinas=26, other=12). The women were older (mean=30 years), well educated (mean=15 years), employed outside the home (78%), and middle class (60% of family incomes exceeded \$30,000). Sixty-four percent were nulliparous.

The MPAI had a strong correlation with the MFAS ($r=.72$, $p<.01$). MPAI scores were also positively related to total MAMA scores ($r=.25$, $p<.01$) and two subscales, attitudes to sex ($r=.25$, $p<.01$) and body image ($r=.26$, $p<.01$). MPAI scores had a low, but significant negative correlation to loneliness ($r=-.13$, $p<.05$) but did not correlate in either direction with marital satisfaction or somatic symptoms. The internal consistency of the MPAI (Cronbach's alpha) was .81.

Factor analysis of MPAI scores did not support fetal attachment as multi-dimensional construct. Although the analysis produced five factors with eigenvalues greater than one, examination of item content suggests that the first factor, consisting of eleven items, represents attachment. Other factors appear to represent specific variance components and elements of instrument construction such as item wording.

Sandra Furubiel, Ph.D.

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Chapter 1

Introduction

During the past decade maternal/fetal health care professionals have witnessed many advances in research and technology. Conception outside the human body resulting in live birth has become a frequent event. The beating fetal heart can be observed via ultrasound examination, and the chromosomal configuration of the 10 to 12 week fetus can be determined as a result of chorionic villus sampling. This "high-tech" explosion has been accompanied by an intense interest in the emotional aspects of the maternal/fetal relationship. Naisbett (1982) points out that as technology intrudes on the natural experiences of life, the interest in the "high-touch" elements of life grows. Several researchers (Carter-Jessop, 1981; Cranley, 1981a, 1981b, 1984; Curry, in press; Davis & Akridge, 1987; Gaffney, 1986; Grace, 1984; Kemp & Page, 1987; Lumley, 1977, 1980, 1982; Mercer, Ferketich, May, DeJoseph, & Sollid, 1988; Phipps & Zinn, 1986; Reading, Cox, Sledmere, & Campbell, 1984; Stainton, 1985; and Weaver & Cranley, 1983) have examined the mother's relationship to the fetus and reported their results in scientific journals. Simultaneously, books and articles have been written, aimed specifically at the lay public, extolling the virtues and

importance of maternal attachment to the fetus not only for the mother but also to the future of the fetus (Bowen, 1984; Fallon, 1987; Verny, 1981).

Although the interest in fetal attachment has received significant attention of late, its roots can be found in theories developed over thirty years ago by John Bowlby. Borrowing from the field of ethology, his work focused originally on the development of children's ties to their mothers, and the importance of these ties to the psychological and physical development of children (1982). Bowlby postulated that this tie forms the basis of the internal representations children form for themselves, others and their attachment figures. Thus early attachments influence the ability to form such relationships in the future.

Different patterns of attachments in infants were noted (Ainsworth, 1978) indicating that the environment or the attachment object may be integral parts of the attachment process. The focus of research was extended to include the maternal side of the relationship (Robson & Moss, 1970). Since hospital practices which separated mothers and babies immediately after birth were found to influence maternal behavior, Klaus & Kennell (1976, 1982) focused their research on the elements of the period immediately after the birth that influenced a mother's interaction with her

infant. As part of this work, Klaus and Kennell (1982) discovered that experiences immediately following birth affected maternal and child behaviors for up to two years.

In the course of these investigations, Klaus and Kennell found that pregnancy experiences also influenced early maternal behavior. These findings reinforced the descriptions of maternal perceptions and experiences of the fetus found in the psychoanalytic and research literature describing pregnancy (Benedek, 1956; Bibring, 1959; Deutsch, 1944; Leifer, 1980; and Rubin, 1984). The pregnant woman's experiences with her mother and attachment to her partner had been found to influence her adaptation to pregnancy and feelings toward the fetus (Ballou, 1978; Chodorow, 1978; Rubin, 1984). Based on these observations, pregnancy was proposed as the first phase in the development of maternal infant attachment (Cranley, 1981a). Cranley first used the term fetal attachment, defined as "...the extent to which women engage in behaviors that represent affiliation and interaction with their unborn child" (p. 282). Recognizing the value of measurement to the development of a knowledge base for the new construct, Cranley (1981a) developed The Maternal Fetal Attachment Scale (MFAS) to measure fetal attachment.

Theorists and researchers have adopted assumptions from attachment theory and its parent, ethology, for use when considering fetal attachment. Whether stated explicitly or simply implied, these assumptions are: 1. as an inborn behavioral system, attachment to the fetus occurs in all pregnancies; 2. high levels of attachment lead to a more positive postpartum relationship (Carter-Jessop, 1980; Cranley, 1981a; Gaffney, 1986); 3. fetal attachment should be encouraged as early as possible (Reading, Cox, Sledmere, and Campbell, 1984, Fletcher & Evans, 1983), and 4. technological measures should be used to promote fetal attachment (Fletcher & Evans, 1983).

Based on these assumptions, nurses and parents have been encouraged to promote fetal attachment. Such promotions are expected to impact positively on the woman's relationship with the infant. The negative effects of the promotion of postnatal attachment have been discussed (Chess & Thomas, 1982), but consideration has not been given to the possible negative effects of the promotion of prenatal attachment. Some of the possibilities that should be explored are increased maternal anxiety and stress, maternal frustration, and mother blaming. It is also possible that promotion of fetal attachment, while an appealing idea, has no effect at all. Research findings to date do not provide adequate information about the actual outcomes of the promotion of fetal attachment.

Indeed, knowledge about this phenomenon is sparse in spite of the fact that several studies have been conducted (Carter-Jessop, 1981; Cranley, 1981a, 1981b, 1984; Curry, in press; Davis & Akridge, 1987; Gaffney, 1986; Grace, 1984; Kemp & Page, 1987; Lumley, 1977, 1980, 1982; Mercer, Ferketich, May, DeJoseph, & Sollid, 1988; Phipps & Zinn, 1986; Reading, Cox, Sledmere, & Campbell, 1984; Stainton, 1985; and Weaver & Cranley, 1983). The findings from these studies were often inconclusive or in conflict with each other. If the results from those studies using the MFAS are examined, they are also found to be contradictory in spite of the use of a common measurement tool (Cranley, 1981a, 1981b, 1984; Curry, in press; Davis & Akridge, 1987; Gaffney, 1986; Kemp & Page, 1987; Mercer, Ferketich, May, DeJoseph & Sollid, 1988; Phipps & Zinn, 1986; and Weaver & Cranley, 1983). In addition, the MFAS did not perform well when subjected to psychometric and qualitative testing (Müller & Ferketich, 1987, 1988).

The Problem

Theoretical links have been identified between : 1. the attachments in infancy and the ability to form attachments as an adult; 2. adult attachments and maternal adaptation to pregnancy; 3. maternal adaptation and fetal attachment; and 4. fetal attachment and maternal infant attachment.

All of these links are depicted in the Predictive Attachment Model (Figure 1). Empirical evidence is needed to support all links of this model, but the contradictory findings of fetal attachment research do not provide this support. The instrument most frequently used to measure fetal attachment and obtain the empirical data, the MFAS, has been found wanting when subjected to scientific testing. The contradictory results obtained when using the MFAS leads to questions about its validity, and the testing produced questions about its division into subscales as well as the validity of some of its items.

The unsatisfactory progress in fetal attachment research may be the result of three problems: 1. flaws in the theoretical framework of the research, 2. poor research design, or 3. inadequate measurement of fetal attachment. The problems can be attacked independently. However, when the problem of poor measurement is attacked, theory and design are also addressed.

Theory is tested by examining the relationships of operationalized constructs predicted by that theory. Abstract constructs such as fetal attachment are operationalized by instruments that seek to indirectly measure that which does not lend itself to the scale or yardstick. An instrument with evidence of reliability and validity and identified criteria for use contributes to

research design. Data gathered using a specific instrument leads to sampling and intervention choices in later research. An accurate instrument contributes to the testing of theory, research design and ultimately the conclusions which are drawn as a result of these endeavors.

The Purpose

The purpose of this study was to develop and test the Müller Prenatal Attachment Inventory (MPAI) to measure fetal attachment. This instrument was tested for reliability and construct, content, and criterion validity. The development of the MPAI will contribute to the study of fetal attachment theory.

Significance

Fetal attachment is an appealing construct because of the intuitive idea that many of the problems of mothers and children could be solved if approached at the earliest point in the relationship. Practitioners are urging changes in prenatal care to promote fetal attachment (Fletcher & Evans, 1983). Books and articles have been published encouraging women to speak and interact with their unborn children (Bowen, 1984; Fallon, 1987; and VERNY, 1981). Expectations for levels of attachment to the fetus have already become part of the pregnancy experience

(Verny, 1981) for some women. These notions may influence the lives of many pregnant women and the practice of their care providers over the next decade.

Changes in prenatal care, clinical practice and expectations of subsequent maternal behavior should be based on evidence about fetal attachment that is consistent, repeatable and has a substantive impact sufficiently large to warrant the changes and expectations. However, such evidence is best obtained when fetal attachment is operationalized by an instrument or instruments that are strong measures of the construct. Thus the development of such an instrument will make a significant contribution to fetal attachment research.

Assumptions

This study assumes that fetal attachment exists and can be measured. It is assumed that the feelings of fetal attachment are expressed in women's thoughts, behaviors, and interactions with the fetus, but that not all women will have the same thoughts, behaviors and interactions. It is also assumed that men attach to their children before they are born. However, the process by which this occurs is not assumed to be identical to that of women due to the obvious differences in the physical experiences of pregnancy. Because there is much left to be learned about

the process of attachment to the fetus in men, this study focused exclusively on women.

Operational Definitions

Attachment has had many different definitions as attachment theory has developed and the term has become part of everyday language. Bowlby originally used the word to refer to the child's tie to the mother. "Bonding" was introduced by Klaus and Kennell (1976) to refer to the parents' tie to their child. However, the distinction between these two words and their meanings has been lost, and attachment is used by many to refer to all parent and child relationships. For the purpose of this study, attachment is defined as a strong affectional relationship with another that persists over time and provides the person who is attached with feelings of security and comfort. This relationship is often but not necessarily accompanied by feelings of love.

Fetal attachment was first defined by Cranley (1981a) as "...the extent to which women engage in behaviors that represent affiliation and interaction with their unborn child" (p. 282). The definition of behavior includes the word action, specifically in response to stimulation. This author finds the limitation implicit in the word behaviors too restrictive, not considering thoughts or fantasy. At

the same time, a distinction of the relationship from the physical experience seems warranted. Therefore, for the purposes of this study, fetal attachment is defined as the unique relationship that develops between a mother and her unborn fetus. These feelings are not dependent on the feelings the woman has about herself as a pregnant person or her perception of herself as a mother.

Theoretical Framework

The process of instrument development is guided by the substantive as well as measurement theory. In order for an instrument to accurately measure a construct, it must reflect the knowledge about that construct. Testing the instrument requires evaluation of the results in terms of the theoretical framework upon which the construct was built. The theoretical framework from which fetal attachment has developed is presented next. Consideration of measurement theory will be found in Chapter 3, where the specific development and testing methods are discussed.

Attachment theory was developed by Bowlby (1969, 1982) after World War II. His initial intent was to explain why children suffered physically and psychologically when separated from their mothers, even though their physical needs were met. Bowlby identified similarities between the behaviors of separated human infants and those of separated

young animals. He suggested that these parallels (1969, 1982) indicated that inborn responses in human infants mediate interaction with their caretakers. Using the ethological paradigm, Bowlby proposed that the infant's inborn responses are translated into a repertoire of attachment behaviors (such as crying, calling, reaching, and clinging) with the set-goal of bringing an adult into proximity with the infant. Adults in turn respond to these behaviors because of an inborn bias to react to certain features and behaviors of infants. The proximity to the adult provides the infant with feelings of security as well as meeting physical needs. The loss or change of primary caretaker would lead first to increased attachment behaviors in an attempt to form a new attachment. If a new attachment figure is absent or nonresponsive, physical and psychological suffering would occur.

Attachment behaviors are at first indiscriminate because infants do not have the sensory or cognitive abilities to recognize specific individuals. However, as they mature, and their abilities increase, infants begin to direct behaviors toward a specific individual or individuals. Bowlby proposed that the attachment behaviors are directed by a behavioral system that once activated performs in a predictable manner to reach the set-goal of proximity to the attachment figure.

Because it is the mother who usually responds, her child is most likely to recognize her and form a primary attachment to her. Maternal responses to the infant (smiling, vocalizing, carrying, playing) reinforce attachment formation. Characteristics of the infant who has formed an attachment are: 1. appearance of greater security in the presence of the attachment figure; 2. demonstration of more frequent attachment behaviors (crying, calling, reaching, clinging) if fearful or ill; and 3. protestation when separated from the attachment figure.

Ainsworth, Blehar, Waters, and Wall (1978) found two main categories of attachment dependent on adult responses to infant attachment behaviors. Securely attached children had mothers who responded in a consistent, positive manner. Inconsistent or negative responses were characteristic of the mothers of anxiously attached children.

Attachment is not only an experience of infants and young children. Marris (1982) points out that "...while attachment behavior itself...arises from an innate predisposition, the way in which the experience of attachment comes to be interpreted and developed in a child's evolving structure of meaning is learned" (p. 198). The smiling, talking, playing and caring behaviors

of the mother and other frequent caretakers teach the child to expect a category of attachment relationships in their lives. This category includes those relationships that are unique, nurturing, have high priority, provide security, and are to be enjoyed. Adolescents and adults ascribe meaning to attachment relationships as a result of this learning process and "...gain a sense of security and place...Without them [they] feel lonely and restless" (Henderson, 1982, p. 213). Bowlby (1982), Bretherton (1985), and Main, Kaplan, and Cassidy (1985) refer to this process as the development of internal representations. The person develops models of self, others, and relationships based on the early attachment experiences. These internal representations are pertinent to the functioning of the behavioral system that directs attachment not only in the infant but for the remainder of the individual's life (Thompson & Lamb, 1986).

As the importance of the maternal infant attachment to the attachment pattern of the adult was identified, scientists attempted to account for the mother's part of the relationship, since from a purely practical standpoint, babies are more of a liability than an asset. Following their work with mothers in Cleveland and Guatemala, Klaus and Kennell (1976, 1982) drew upon studies that examined the physiological bases for maternal behavior in animals to

theorize that hormonal and physical conditions existing immediately after birth create a sensitive period of peak maternal responsiveness to the new baby. The sensitive period is most intense during the first two hours after birth but extends up to three days. While noting that factors prior to birth could influence maternal behavior, they contended that the mother's experience with her baby during this sensitive period is a critical factor in her attachment to the infant.

Klaus and Kennell implied that the strength of maternal attachment could be determined by observing specific maternal behaviors. These behaviors included the orderly progression of touching behavior after birth (which had been first reported by Rubin, 1977), eye to eye contact (the "en face" position), and the use of a high pitched voice when speaking to the infant along with kissing and cuddling of the infant. The implication was made by some practitioners that the mother who evidenced these behaviors was attached to her infant, while the mother who was not demonstrative might be a cause for practitioner concern.

In response to the Klaus and Kennell research findings, which were widely reported in the popular press, changes were made in hospital policies to encourage more mother baby interaction. Parental expectations were raised with resultant distress if they were unable to "bond" with their

infants because of maternal and infant separation due to maternal or infant complications (Krotz, 1988).

Bonding theory critics (Chess & Thomas, 1982) consider the formation of the maternal infant attachment as taking place over a period of days or weeks. They point to findings that mothers express neutral or negative feelings for their newborns soon after birth (Robson & Kumar, 1980) and that many women do not report feelings of love for their infants until weeks or months after the birth (Moss & Robson, 1970). Characteristics of the infant were also found to influence maternal behavior (Moss, 1967).

Sluckin, Herbert, and Sluckin (1983) proposed that maternal attachment results from exposure learning and conditioning. They point out that liking another is a direct function of familiarity. Repeated exposure to the infant acts as a reward to the mother. As the mother cares for the child, she becomes more effective in her activities and "feelings of satisfaction become more and more closely associated with her child and this helps to strengthen her relationship with the child, her attachment to it" (p. 80). This satisfaction reinforces the mother's previous learning that attachments provide security and comfort.

Rubin (1984) defined maternal attachment as "the unconditional love a mother has for her child [which] originates in the binding-in process of pregnancy"

(p. 128). With the growing abdomen and the perception of fetal movement, most women acknowledge that there is another person living inside their bodies.

During pregnancy women focus on themselves and their relationship with the fetus. They often rework conflicts and problems from previous attachments. They recognize their need for support and worry about their partner's health and safety (Colman & Colman, 1974). As a women contemplates the process of becoming a mother herself, she begins to shift the focus of her security and comfort from her own mother to her partner. She views her mother as a peer and reevaluates her past relationship with her mother. As a result "...the loosened bonds between mother and daughter during adolescence are realigned and tightened..." (Rubin, 1984, p.41).

The quality of a woman's adaptation to pregnancy has been related to the support she received from her adult attachment figures. Grossman, Eichler, and Winicoff (1980) found that a woman's adaptation to pregnancy was positively correlated with her marital satisfaction and the support she received from her husband. The reverse of this situation was found by Richardson (1983, 1987) who reported physical problems such as preterm delivery among a group of women having poor relationships during pregnancy. This supports the observation of DeLozier (1982) that children and adults "...are more likely to develop mastery and

adjust to new situations when feeling securely attached" (p. 113). This close relationship between adjustment to pregnancy and attachment to others may be expected to influence the woman's attachment to her fetus.

At the completion of a longitudinal study of 19 women during and after pregnancy, Leifer (1980) discovered that she could identify three levels of psychological functioning during early pregnancy in her subjects as measured by their scores on several psychological instruments. Among the predictors of having high, moderate or low psychological functioning were motivation for pregnancy, body satisfaction, self-esteem, and mood tone. These levels of functioning predicted the course of the maternal fetal and maternal neonatal relationships developed by her subjects.

Women with high psychological functioning, "used pregnancy as a time to identify and initiate a relationship with the fetus" (p. 183) and easily formed a relationship with the neonate. However, these women experienced stress in adjusting to the requirements of the maternal role.

Women with moderate psychological functioning did not show much interest in preparing for childbirth. These women had a less emotionally intense relationship with their two month old infants and found motherhood a difficult stage of life.

Women identified as of low psychological functioning exhibited "...more ambivalence and negative feelings were expressed toward the fetus" (p. 186). These women were passive and remained uninformed about childbirth. "...the emotional attachment shown by these women to their infants was markedly less ..." (p. 186) than that of the other women in the study.

A positive relationship with the fetus and neonate did not predict the amount of stress experienced in the maternal role by Leifer's subjects indicating that acceptance of the maternal role is a separate phenomenon from the development of attachment.

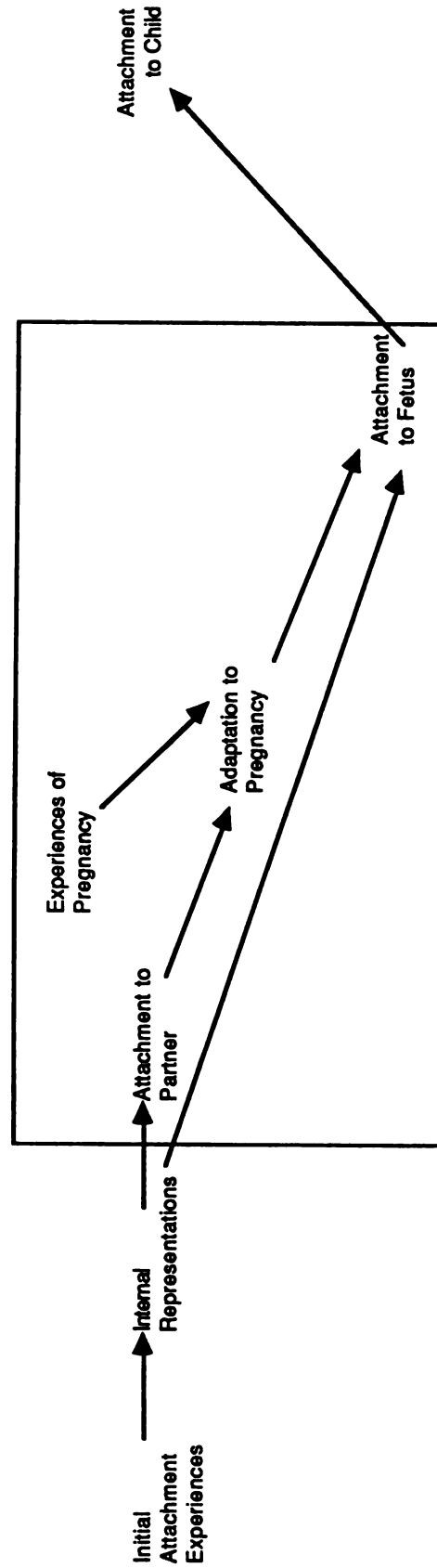
The theories and theoretical links described in the above section are depicted visually in Figure 1. below. Attachment theory, the implicit assumptions of ethology, and the proposition that internal representations have a long lasting influence on life attachments play major roles in this model. This model also incorporates the simple reality that fetal attachment is confined to pregnancy and thus pregnancy adaptation theory influences the model.

In this model, "initial attachment experiences" directly predict the development of "internal representations". "Internal representations" directly predict both "attachment to the partner" and "attachment to the fetus". At the next stage, "attachment to the partner" directly predicts "adaptation to pregnancy", directly

predicts "attachment to the fetus", and has an indirect effect on "attachment to the fetus" via "adaptation to pregnancy". The "experiences of pregnancy" are predictive of "adaptation to pregnancy" and via this variable, "attachment to the fetus". Finally, "attachment to the fetus" is identified in this model as predicting "attachment to the child".

Any study testing a new instrument must be conducted within a framework that provides a guide for that testing. Figure 1., the Predictive Attachment Model, serves as the guide for testing the MPAI. The study tested only those relationships within the lines (section A). A review of the empirical evidence about the nature of fetal attachment and the existence of the links depicted in section A of the Predictive Attachment Model is found in Chapter 2.

Figure 1. The Predictive Attachment Model



Note: Area in box is Section A

Chapter 2

Review of the Literature

This report is a description of the development and testing of a new instrument. To ensure validity of the items, they must reflect the state of knowledge about the construct being measured. However, as discussed previously, there is an intimate link between theory and instrument, and therefore, testing the instrument is also linked to testing the theory. This chapter reviews those studies which have examined fetal attachment with special emphasis on those which have incorporated the constructs found in the Predictive Attachment Model.

A systematic approach to knowledge development and theory testing results in a logical, chronological review of the literature. Unfortunately, research may not be conducted in a chronological or logical sequence that is easily categorized. In this chapter the studies are grouped according to four questions that can be asked about the construct of fetal attachment. Some of the studies may have been designed to answer more than one question. In those cases, the study is relegated to the category whose question appears to be the primary focus of the study.

How do Pregnant Women Experience Fetal Attachment? Lumley (1977, 1980, 1982) was one of the first researchers to study the development of maternal attitudes toward the

fetus. She used semi-structured interviews and pictures drawn by the subjects to identify the change in maternal attitudes toward the fetus over the course of pregnancy. Pictures were drawn during the first trimester, and interviews were conducted over the course of pregnancy.

The sample consisted of 30 well educated, middle class Australian women. They were all married primigravidae in their middle twenties who entered the study during the first trimester of pregnancy.

In the first trimester, 30% of these women described the fetus as a person, reported that it could affect their feelings, and stated that they would be saddened by its loss. Lumley equated these responses with fetal attachment and labeled these women "early attachers". Early attachers had these other characteristics: a large family of origin; few symptoms of morning sickness; and a nurturing occupation (sic) such as teaching or nursing. Early attachers were more likely to stroke their abdomens, talk to the fetus and avoid activities they identified as harmful to the fetus.

Quickening had a significant impact on the attitudes of the other subjects. After quickening, all but two of the participants identified the fetus as a real person who could affect their feelings.

Leifer (1980) also documented women's relationships with their fetuses during her study of the psychology of

pregnancy. She interviewed 19 women five times, once during each trimester, on the third day after delivery, and six to eight weeks after delivery. The subjects were recruited prior to the 16th week of pregnancy. They were all married, middle-class, and from 20 to 35 years old.

In addition to the interviews, the subjects completed: the Symptom Checklist to report common physical symptoms; The Life-Stage Instrument; The Self-Concept Instrument; a shortened version of the Jourard Body-Cathexis Scale to detect changes in body image; The Child-Trait Index to determine which traits the woman wished to see in her child; and The Perception of Motherhood Scale. Leifer did not report evidence of validity or reliability for these instruments.

Descriptive categories were developed from the amount of change in instrument scores and detected in the interviews. The final analysis, done by two independent raters, rated women according to the level of each variable they demonstrated. Leifer synthesized the results to develop a typology that correlated the depth of the maternal fetal relationship and the mother's interest in preparing for the birth of her infant with the level of psychological functioning during early pregnancy. Analysis of interview data revealed that "...the emotional bond with the fetus develops surprisingly soon after conception and for most women deepens considerably during

pregnancy..."(p. 76). Although seven of the 19 women formed an early bond with the fetus, at quickening the fetus became more of a person to all the mothers, and many reported engaging in conversations with their unborn babies.

Women with high psychological functioning, "used pregnancy as a time to identify and initiate a relationship with the fetus" (p. 183) and easily formed a relationship with the neonate. However, these women experienced stress adjusting to the maternal role. Women with moderated psychological functioning showed little interest in preparing for childbirth. They had a less emotionally intense relationship with their two month old infants and found motherhood a difficult stage of life. Women with low psychological functioning had "...more ambivalence and negative feelings....toward the fetus" (p. 186). These women remained uninformed about childbirth and were less emotionally attached to their newborn infants.

Stainton (1985) studied the attitudes of both mothers and fathers toward the fetus. She interviewed 25 expectant couples who were attending childbirth preparation classes and experiencing low risk pregnancies. No mention was made of socioeconomic status. Twenty-two couples were white and three were racially mixed. Three women had amniocenteses and knew fetal gender.

Stainton found that both fathers and mothers formed a

perception of individual fetal characteristics and that there was surprising agreement between the parents about these characteristics. Mothers were more likely to report interaction with the fetus, but both parents communicated with the fetus and believed it responded. Fathers reported playing with the fetus.

Can Fetal Attachment be Measured? Cranley (1981a) was the first researcher to propose that fetal attachment could be measured independent of the other aspects of pregnancy. After reviewing maternal identity theory (Rubin, 1975) and psychoanalytic theory, Cranley identified fetal attachment as having six dimensions: 1. differentiation of self from the fetus, 2. interaction with the fetus, 3. attributing characteristics and intentions to the fetus, 4. giving of self, 5. roletaking, and 6. nesting. Statements thought to be indicative of these dimensions were elicited from clinicians and childbirth educators. These statements were administered to 71 women between 35 and 40 weeks gestation. Demographic data were obtained from only 30 subjects. These women were from 20 to 33 years of age and represented the full range of socioeconomic groups. White subjects accounted for 93% of the sample, while 93% were married and 27% were nulliparas.

After statistical analysis, items were eliminated including the entire nesting subscale. The remaining 24 item scale had an internal consistency (Cronbach's alpha)

of .85. Subscale to subscale correlations ranged from $r=.29$ to $r=.60$. Correlations of subscales to the total scale ranged from $r=.61$ to $r=.83$.

To establish predictive validity, Cranley (1981a, 1981b) compared scores of the Maternal Fetal Attachment Scale (MFAS) with Broussard Neonatal Perception Inventory (NPI) scores obtained three days after delivery. The correlation was not statistically significant. However, Cranley found a significant correlation between three NPI items related to baby output (crying, vomiting, stooling), which she labeled Average Baby Output, and MFAS scores.

Cranley (1981b) also gathered data to provide evidence of criterion validity for the MFAS. Thirty women answered demographic questions, completed a series of open-ended questions to measure social support and their perceptions of stress during pregnancy, and completed the State-Trait Anxiety Inventory (STAI) and Rosenberg Self-Esteem Scale. The social support and stress questionnaires were developed by Cranley for the study. Cranley (1984) reported a Cronbach's alpha coefficient for the social support instrument of .64. She did not report evidence of reliability for the stress questionnaire.

No relationships were found between MFAS scores and demographic variables. Neither self-esteem ($r=.01$) nor anxiety ($r=.01$) was associated with MFAS scores. Social support was positively associated with MFAS scores ($r=.51$,

$p=.002$) while stress was negatively associated ($r=-.41$, $p=.01$).

Weaver and Cranley (1983) modified the MFAS for use with expectant fathers. They assumed that the father's process of fetal attachment was the same as the mother's and changed item wording to reflect the father's gender. The modified scale was administered to 100 men attending childbirth education classes with their partners during the third trimester of pregnancy. The men were well educated, (mean of 15.3 years), and 90% were expecting their first child. Cronbach's alpha for the men's version of the MFAS was .80.

The men responded positively to the items, indicating their engagement in attachment behaviors. The men's scores were higher for the "differentiation of self", "role-taking", and "giving of self" subscales. The men's scores on the entire instrument were lower than women's, however, mean scores were not reported.

The men also completed a marital relation measure and an instrument designed to measure their health and physical history. Marital relations scores were positively related to attachment scores. There was also a weak (statistically discernible) positive relationship between the fathers' report of physical symptoms resembling pregnancy and attachment scores.

A group of researchers in Great Britain have also

developed a fetal attachment instrument. Reading, Cox, Sledmere and Campbell (1984) sought to determine the relationship between physical experiences of pregnancy and a woman's attitudes toward the fetus. The attitudes measured included attachment as well as positive and negative feelings. The authors also determined the degree to which the attitudes toward the fetus impacted their subjects' later relationship with the infants. The sample consisted of 129 women attending a prenatal clinic in Great Britain. All of the women were white, married or in a stable relationship, and having their first baby (18 women had previous elective abortions). The women ranged in age from 18 to 32 years (mean = 24.9 years) and represented all social classes (median = middle class). The women were recruited between 10 and 14 weeks of pregnancy, and all had ultrasound examinations at 16 and 32 weeks.

Attitudes were measured at recruitment, after the ultrasound examinations, within 24 hours after delivery and three months postpartum. For the first three measurements, a 15 item, seven-point "likert-like" adjective rating scale was used. Six of the adjectives referred to women's attitudes about their pregnancy while nine items referred to attitudes about the fetus. After principal components analysis, three adjectives loaded on the attachment factor: attached, loving and maternal and accounted for 44% of the variance in maternal scores. The entire 15 adjective scale

had a Cronbach's alpha coefficient of .93.

Following delivery, maternal attitudes were measured using the nine fetal attitudes adjectives plus the words, "disappointed" and "detached". Again following principal components analysis, the same three adjectives (attached, loving, maternal) comprised the attachment factor and accounted for 38% of the variance. The Cronbach's alpha coefficient for the 11 adjective scale was .90.

Additional data gathered included the maternal report of quickening and obstetric information from the chart. Within 24 hours of delivery, the subjects were asked their immediate reaction to their neonates. Their responses were rated as positive or negative/detached. Also following delivery, the subjects rated their mood on an 11 point ladder scale and completed the Eysenck Personality Questionnaire.

Analysis of the data revealed "a significant linear increase in attachment over the course of pregnancy.." (p. 216). Those women reporting fetal movement before 16 weeks (n=41) had higher attachment scores.

Multiple regression analysis was used to determine which variables best predicted postnatal attachment. Drug requirements during labor predicted 17% of the variance in neonatal attachment, and attachment scores at 32 weeks predicted 13% of the variance. Attachment scores at 16 weeks, apgar score, and method of delivery predicted an

additional 17% of the variance.

Only 11% of the variance in attachment scores at three months postpartum could be explained, 7% by attachment scores at delivery and 4% by postpartum mood. Attachment to the fetus and initial response to the infant did not enter the regression equation.

The Cranley and Reading et. al. instruments were developed from different perspectives by different processes, but both support the notion of the personal relationship with the fetus. While both instruments have identified variables that are correlated with fetal attachment, neither Cranley nor Reading et. al. have reported that scores on their instruments correlate with postnatal attachment.

The psychometric properties of the MFAS have been assessed in subsequent studies. A content analysis of interviews of 40 low risk (defined as no hospitalization for pregnancy complications) pregnant women and their mates (Müller & Ferketich, 1987) was performed to examine the relationship of inductively generated categories with those of the Cranley instrument. Men were included to test the Weaver and Cranley (1983) assumption that a man's process of attachment is similar to a woman's. Six categories emerged from the content analysis: 1. Imagining Self as Parent, 2. General Anticipation and Curiosity, 3. Affectionate Statements, 4. Concerns and Fears,

5. Negative Statements, and 6. Recognizing Baby as a Person. The Müller and Ferketich category, "Recognizing the Baby as a Person" appeared similar to Cranley's (1981) subscales "Attributing Characteristics and Intentions to the Fetus" and "Differentiation of Self from Fetus". The Müller and Ferketich category, "Imagining Self as Parent" corresponded to the Cranley subscale, "Roletaking".

No categories were found corresponding to the subscales "Giving of Self" and "Interaction with the Fetus". Müller and Ferketich identified four unique categories: "General Anticipation and Curiosity", "Concerns and Fears", "Negative Statements", and "Affectionate Statements".

Cranley eliminated negative items from the MFAS assuming that women were unwilling to admit negative feelings about the fetus. In the Müller and Ferketich content analysis, six percent of the statements were negative. A Chi square analysis was performed to determine if the inclusion of negative statements was dependent on gender. Only the category "Affectionate Statements" ($\chi^2=5.33$, $p<.05$) demonstrated a difference. Women were more likely to make affectionate statements.

The differences noted between MFAS subscales and Müller and Ferketich categories led to a follow-up study to analyze the MFAS subscales. This study employed 593 MFAS scores obtained as part of a larger study (Mercer, May, Ferketich, & DeJoseph, 1986). The subjects included 153

high-risk women, 75 mates of high-risk women, 218 low-risk women, and 147 mates of low-risk women. Seventy percent were white-non Hispanic, 11% Hispanic, 11% Asians, 4% blacks and 4% others. All subjects were married or in stable relationships. All socioeconomic levels were represented, and 30% were expecting their first child.

Factor analysis was used to confirm the presence of stable dimensions of fetal attachment. MFAS scores were analyzed with seven factor extractions (principal components analysis, principal axis factoring, alpha analysis, image analysis, generalized least squares, unweighted least squares, and maximum-likelihood analysis). All items were factored by gender. A modification of Thurstone's (1947) criteria was used to determine item strength. Those criteria included a loading of .50 or greater on the primary factor and a difference of .20 between an item's loadings on any other factors. Twelve items for women and 15 items for men met the selection criteria and were again factored by gender. Finally, reliability coefficients were computed for the instruments consisting of selected items for men and women. Reliability coefficients were also determined for the factors of the restructured instruments and compared with MFAS subscale coefficients.

The initial solutions revealed a general consistency, but factor composition and explained variance varied by

approach. Six factors emerged for women but seven emerged for men. Factor compositions were compared to the MFAS subscales. Neither the solutions for men or women fully coincided with the published MFAS subscales.

Four factors emerged from the analysis of the 15 selected items for men and the 12 selected items for women. The gender specific solutions for selected items were also compared to the MFAS subscales. As before, the factors did not correspond with the published MFAS subscales.

The Cronbach's alpha reliability coefficients for the instruments composed only of selected items were not improved over those obtained in the original studies (Cranley, 1981a; Weaver & Cranley, 1983), but were improved when compared to the alphas obtained in the original Mercer et. al. (1986) antepartum stress study.

The results of this factor analysis did not support the independent use of the MFAS subscales as structured. The evidence also indicated that the instrument performs differently for men and women. The appearance of different items in the selected item groups for men and women indicate that there may be gender dependent processes at work during a parent's growing attachment to the fetus. The results of the factor analysis may explain why studies that have used the MFAS have not produced consistent results.

What Factors have Relationships with or Effects on the Development of Fetal Attachment? The positive relationship between marital adjustment and fetal attachment in fathers noted in the 1983 Weaver and Cranley study was tested in couples (Cranley, 1984). The MFAS and Spanier Dyadic Adjustment Scale (Cronbach's alpha coefficient was .81) were administered to 326 Wisconsin couples. The subjects were predominantly middle class, at 8 to 42 weeks gestation (mean=29 weeks), and expecting their first child (56%). No data on race or age were reported. The positive relationship between marital adjustment and MFAS scores was found for men ($r=.30$, $p=.0001$) and women ($r=.32$, $p=.0001$).

Gaffney (1986) examined the relationship between anxiety, self-concept, and maternal fetal attachment. One hundred subjects completed the Tennessee Self Concept Scale (TSCS), The State-Trait Anxiety Inventory (STAI), and the MFAS. The subjects were from all socioeconomic levels (median = middle class) with a mean age of 26 years and a mean educational level of 14 years. Sixty-seven percent were primigravidae, 98% were married, and all were attending childbirth education classes.

Analysis of the data revealed a nonsignificant relationship between self-concept and general MFAS scores. A significant correlation was found between "Giving of Self" subscale and self-concept. However, as discussed above, there is reason to doubt the construct validity of

the MFAS subscales. Gaffney also found a low, but discernible, inverse relationship between state anxiety scores and MFAS scores. Trait anxiety and MFAS scores showed a trend toward an inverse relationship.

Curry (in press) explored the influence of high risk pregnancy status on fetal attachment in hospitalized pregnant women. A convenience sample of 124 women was interviewed within the first few days of their hospital stay and asked to participate in the study. Two days later, 76 women completed a second interview, 75 women completed the MFAS, and 63 women completed the Tennessee Self-Concept Scale (TSCS). The Cronbach's alpha coefficient for the MFAS for this sample was .82. There was no control for the various diagnostic and treatment procedures that occurred between recruitment and completion of the interviews and instruments.

The subjects had a mean age of 25.5 years, 12.4 years of education and a \$17,000 family income. Only 14.7% of the women were nulliparous. There was a high incidence of previous negative outcome, with 10.7% having previous fetal death, and 21.3% having had a previous premature delivery. Mean gestational age was 29.7 weeks.

The MFAS scores of the high risk women did not differ significantly from those reported for low risk women in other studies. Self-concept scores were positively related to MFAS scores ($r=.25$, $p=.02$).

Kemp and Page (1987) also studied fetal attachment in women with low and high risk pregnancies. Their 85 subjects were recruited during the third trimester from either Lamaze classes or the high risk clinic of a teaching hospital. The low-risk group was larger (n=53), slightly older (29 years versus 27 years), predominantly white (83% versus 59%), and with a higher incidence of planned pregnancies (70% versus 47%). All subjects were from 28 to 39 weeks.

Immediately after recruitment, the subjects completed a descriptive data form and the MFAS. The means of the two groups were examined by two-tailed, pooled t-tests, and no differences were found. There were no significant correlations between MFAS scores and any of the demographic data such as educational level, age, race, or whether or not the pregnancy was planned. In contrast to other studies (Kohn, Belson, & Weiner, 1980; Milne & Rich, 1981) no correlation was found between MFAS scores and having an ultrasound examination. However, the majority of the subjects had ultrasound examinations (n=73). Since so few women did not have ultrasound examinations, there may have been an inadequate number of subjects for a valid comparison. Also the subjects were tested toward the end of pregnancy, and the previous studies of the effects of ultrasound examination were conducted earlier in pregnancy.

Another project comparing attachment scores in relation

to the risk status of high and low risk women was reported by Mercer, Ferketich, May, DeJoseph, and Sollid (1988) who studied four groups of high and low risk expectant parents. Their 593 subjects included 153 high-risk women, 75 mates of high-risk women, 218 low-risk women, and 147 mates of low-risk women. Seventy percent were white-non Hispanic, 11% Hispanic, 11% Asians, 4% blacks and 4% others. All of the subjects were married or in stable relationships. All socioeconomic levels were represented, and 30% were expecting their first child.

Attachment to the fetus was measured by men's and women's versions of the MFAS. Other variables measured included demographic characteristics, risk status, social support, self-esteem, sense of mastery, health status, mate relationships, family functioning, stress, anxiety, depression, perceptions of early attachment relationships, and readiness for pregnancy.

No differences in MFAS scores were found between low and high risk women, but both groups of women had higher scores than the men. The correlations of study variables with fetal attachment were low, only a few reached statistical significance. Among high risk women, age ($r=-.17$, $p<.05$), socioeconomic status ($r=-.25$, $p<.01$), and education ($r=.23$, $p<.01$) correlated with MFAS scores.

For high risk men, only health perception ($r=.26$, $p<.05$) and family function ($r=.27$, $p<.05$) correlated with

fetal attachment. Among low risk women several variables were correlated with fetal attachment: current relationship with her own father ($r=-.19$, $p<.01$), health perception ($r=.17$, $p<.05$), sense of mastery ($r=.13$, $p<.05$), mate relationship ($r=.17$, $p<.05$), received social support ($r=.23$, $p<.01$), network size ($r=.16$, $p<.05$), depression ($r=-.17$, $p<.01$), being anglo-white ($r=.16$, $p<.05$), and number of children ($r=.26$, $p<.001$).

Low risk men's MFAS scores were correlated with their relationships with their fathers as teenagers ($r=-.17$, $p<.05$), mate relationships ($r=-.20$, $p<.05$), anxiety ($r=-.17$, $p<.05$), age ($r=-.18$, $p<.05$), and number of children ($r=.20$, $p<.05$).

Using both versions of the MFAS, these authors found that being male or female, having a low or high risk status, appear to divide their subjects into four distinct groups. Although several variables were found to be correlated with fetal attachment, no variable was pertinent for all four groups.

LoBiondo-Wood (1985) hypothesized that physical symptoms of pregnancy would have a negative impact on maternal-fetal attachment. One hundred low risk women aged 19 to 39 years (mean=27.8 years), expecting their first child were recruited during the first trimester of pregnancy. The subjects completed the MFAS and Symptom Checklist (20 items reflecting the usual complaints of

pregnancy) at three times: before the 11th week of pregnancy, between the 12th and 16th week, and between the 21st and 26th week.

No statistically significant correlation between MFAS scores and symptoms occurred at any test period ($r = -.01, .20, -.02$). The greatest increase in MFAS scores occurred between times 2 and 3. Since the women experienced quickening during this interval, this was accepted as evidence of the positive influence of quickening on attachment.

Vito (1986) examined the effect of maternal age, maternal education, gestational age, intendedness of the pregnancy, parity, quickening, and ultrasound examinations on the MFAS (as adapted by Vito) subscale scores of 325 women. Vito proposed that fetal attachment is a developmental construct and that the six dimensions of fetal attachment originally identified by Cranley represent the phases of this development. She anticipated that the scores for specific subscales would rise at different rates over the course of pregnancy.

Her subjects were mostly married (89%) white-anglo (96.3%) women. Many of them had at least attended some college (52.7%). At the time of testing, most of the women had experienced quickening (86.2%) and the majority had at least one ultrasound examination (52.6%). Vito found that quickening and length of gestation had a positive influence

on all MFAS subscales. The use of canonical correlation allowed Vito to determine that maternal age, parity, and intendedness were related to higher scores on the "Roletaking", "Giving of Self", and "Nesting" subscales of the adapted MFAS. Ultrasound examination was only related to the "Giving of Self" subscale. Post hoc examination of the data revealed that maternal age and education were multicollinear.

Müller and Ferketich (1987, 1988) have questioned the validity of the subscales. Vito adapted the MFAS, and did a factor analysis of the 325 scores at the completion of her study. The items were forced into a six factor solution, and the solution did not coincide completely with the subscales as originally devised by Cranley (1981) or as revised by Vito. Therefore, with no support for subscale validity, correlations with individual subscales must be considered with great caution.

A study reported by Koniak-Griffin (1988) considered the relationships between social support, self-esteem and maternal fetal attachment in adolescents. Ninety primiparous adolescents between 14 and 19 years of age were recruited from two residential maternity homes. Gestational age ranged from 15-41 weeks, and the group was racially mixed (White=33, Black=24, Hispanic=26, Asian=5, Others=2).

In addition to the MFAS, Koniak-Griffin used the

Coopersmith Self-Esteem Inventory, and Norbeck's Social Support Questionnaire. Overall MFAS scores had a nonsignificant relationship with self-esteem ($r=.03$) and total social support scores ($r=.03$). The "Giving of Self" subscale of the MFAS approached significance with self-esteem ($r=.15$, $p=.07$).

A regression analysis to predict MFAS scores was done. Total functional support, total network, whether the pregnancy was planned, and intent to keep the baby were the only variables which had coefficients significantly different from zero ($R^2=.32$, $p<.001$).

Will Interventions Influence Attachment to the Fetus? Two types of interventions have been studied. Several studies implemented specific maternal activities that resulted in greater personal knowledge of and interaction with the fetus. These studies will be discussed first. The second group of studies examined medical procedures that provided the mother with more information about the fetus such as gender. These studies are discussed at the end of this section.

Carter-Jessop (1981) manipulated postnatal attachment through nursing intervention during the last ten weeks of pregnancy. Ten primigravid women, married, from 21 to 34 years of age and attending childbirth education classes, were randomly assigned to experimental and control groups. The experimental subjects were taught to feel for fetal

parts, determine fetal position, and be aware of fetal activity patterns. Attachment intervention methods were used with the experimental mothers at weekly intervals for two to three times. The control group received the usual prenatal care.

On the second to fourth day after delivery, the subjects were observed in the hospital interacting with their newborns by an observer, blind to mother's group. A guide, derived from the work of Klaus and Kennell (1976), was used to rate attachment behaviors. The observation guide was not tested for reliability nor was evidence provided to support the observation guide behaviors as indicative of later maternal infant attachment or support the notion that more frequent behaviors are indicative of greater maternal feeling. The experimental group exhibited twice as many attachment behaviors as the control group ($t=2.85$, $p=.025$).

Carson and Virden (1984) replicated the Carter-Jessop study using two experimental groups. The attachment promoting interventions were taught to one experimental group. The second group was taught passive and active relaxation techniques to control for the effect of an educational experience.

The 69 subjects, ranging in age from 16 to 35 years (mean=24) were all clients of a public health prenatal clinic. The group was racially mixed (whites=29,

blacks=30, others=10), and 35 were primiparous.

Observations were conducted in the subjects' home, at the clinic, or in the hospital, 2 to 16 days after delivery (mean = 5.5 days). The same person made all observations and was blind to the subjects' group membership.

Observation revealed no differences among the three groups in the absolute numbers of attachment behaviors. This is not surprising, considering the differences in the samples and the difference in the timing of the observation. The time that elapsed between delivery and the observation may have lead to maturation of the subjects. Maternal behavior changes significantly after delivery as the mother becomes familiar with her infant.

Davis and Akridge (1987) also modeled a study after the work of Carter-Jessop. They altered the project in two ways. Subjects were pretested for fetal attachment with the MFAS. Postnatal attachment behaviors were assessed using a scale developed by Avant rather than by the Carter-Jessop scale.

A convenience sample of 21 low risk women were randomly assigned to experimental and control groups. The subjects were from 17 to 32 years of age and between 32 and 37 weeks gestation. The majority were white (n=17). Seven women had planned their pregnancies, and ten women planned to attend childbirth preparation classes.

The MFAS was administered to all subjects at

recruitment. Those women in the experimental group received the first attachment promoting intervention at recruitment and during their next two clinic visits, the second and third interventions were administered. The first intervention consisted of teaching the women to detect fetal position through abdominal palpation. During the second intervention, the women were asked to identify behaviors that altered fetal activity. For the third intervention, the women were taught to massage their abdomens above the fetus and note fetal responses.

On the second to fourth day after delivery, a second investigator, blind to subject group membership, observed the women feeding their infants. No differences in the number or types of postpartum maternal behaviors were found between the groups.

Kohn, Belson, and Weiner (1980) explored the effects of ultrasound examination. Rather than observe for changes in postnatal attachment, the authors examined maternal feelings in the period immediately before and after the examination. Interview and questionnaire data was obtained from 100 women aged 18 to 40 years. The group was racially mixed (Black=47%, White=47%, and Hispanic=6%). Most women were multiparous (53%), and 47% were in the first trimester of pregnancy. The reasons for the ultrasound examination ranged from dating the pregnancy (n=52) to more serious conditions such as genetic studies (n=7) and vaginal

bleeding (n=6).

Prior to her examination, each woman completed questionnaires about her concepts of her fetus. During the examination, the image of the fetus on the screen was visible to the woman, and fetal parts were pointed out to her by the examiner. All questions were answered during the examination, and an ultrasound photograph of the fetus was provided on request.

After the ultrasound examination, the women more accurately described the fetus and were willing to attribute gender to it as compared to their descriptions from before the examination. While the effects of the experience were described as "usually profound" (p.79) some women expressed the fear that they would feel more distress in case of a negative outcome. No significant correlations were found among specific maternal variables and subjects' responses.

Milne and Rich (1981) also studied the influence of ultrasound examination. The 20 subjects (14 white and 6 black) were from 20 to 35 weeks of gestation (median of 20.5 weeks), and the primary reason for the subjects' examinations was to determine gestational age. Subjects were from 17 to 38 years of age, and 60% were married.

Interviews were conducted just prior to the examination and repeated immediately afterward. Sixteen women were interviewed a third time within eight days. Samples of the

women's behaviors before, during, and after the examination were also recorded with photographs and in writing.

The interview and behavioral data were pooled and subjected to content analysis. Two categories of data emerged: cognitive and affective. The time periods before, during and after the examinations were reviewed to determine if there were changes in the cognitive and/or affective behaviors from one period to the next.

After reviewing the data, the authors proposed that a "process of pattern recognition" (p.35) occurred as women learned to identify fetal parts on the sonography screen and synthesized this recognition into an "enhanced awareness of baby" (p. 35). The examination evoked excited responses in all women. Their fears regarding the fetus were resolved immediately after the examination but reappeared in some women during the follow-up interview. Many women expressed "an increased sense of knowing their babies" (p.32), and a few women felt more possessive of their babies.

Grace (1984) studied the effect of amniocentesis and knowledge of fetal gender on postpartal attachment. Of the 67 women sampled, 33 had prenatal genetic diagnostic procedures, and 25 of these were aware of fetal gender. A contrast group of 34 women was matched for age, parity, and socioeconomic group. Of this group, 3 had undergone an ultrasound examination and also knew fetal gender. The

subjects were observed interacting with their infants after delivery. Seventeen behaviors "thought to represent affectionate bonding" (p. 43) guided the observations. Knowledge of fetal gender did not affect postpartum attachment scores. The subjects were older women undergoing amniocenteses to rule out chromosomal abnormalities. The impact of the knowledge of fetal gender may be minimal in such a select group.

Phipps and Zinn (1986) gathered data from 40 women undergoing diagnostic amniocentesis due to advanced maternal age. Comparison data were gathered from 32 low risk subjects. Both groups were predominantly white, middle class, and well educated. However, the experimental subjects were older (mean of 35.6 years versus 29.9 years).

Data were gathered from the experimental subjects at three times to detect the effect of amniocentesis on the mood state and adaptation to pregnancy: 1. after genetic counseling (12-14 weeks gestation), 2. after the amniocentesis (16-18 weeks gestation), and 3. one week after receipt of the results (20-22 weeks). The MFAS was administered at time 1 and time 3. In addition to the MFAS, the subjects completed the Profile of Mood States (at all three times) and the Maternal Attitude to Pregnancy Instrument (at times 1 and 3). Data were gathered from the control group at corresponding points in pregnancy.

Depression and anxiety scores did not decrease until

after the women in the experimental group received the results of the amniocentesis (all of the subjects received "good news"). MFAS scores increased from time 1 to time 3. for the control and experimental subjects. The increase for the women experiencing amniocentesis was greater than that of the control group.

Threats to the Validity of this Research

Construct Validity. The qualitative descriptions generated by Leifer (1980), Lumley (1977, 1980, 1982), and Stainton (1985) provided specific descriptions of maternal perceptions of the fetus that could have served as the focus for defining fetal attachment. However, there is little evidence that the other authors built on these data to define or operationalize fetal attachment in their studies.

Cranley (1981a) used suggestions from clinical experts rather than an exhaustive review of the literature, as suggested by Lynn (1986), as a basis for the MFAS items. Reading et. al. (1984) did not identify the source of the adjectives for their rating scale. Neither instrument appears to have been subjected to a rigorous validity "judgment quantification" process (Lynn, 1986, p. 383). As a result, these instruments may confound fetal attachment with other constructs pertinent to pregnancy. Construct validity was also threatened by inadequate

operationalization of the effect. Maternal attachment has been used as an outcome variable in some studies and operationalized by a specific sequence of postpartum behaviors identified from the bonding literature (Carson and Virden, 1984; Carter-Jessop 1981; and Grace, 1984). Tulman (1985) compared the behaviors of new mothers and student nurses when first handling infants. She found that the student nurses were actually more likely to follow the touching sequence identified as typical of the new mother attaching to her infant.

Statistical Conclusion Validity. The normal range of maternal attachment behaviors has not been established. This leads to the threat of inadequate statistical power. If there is a wide variation in behaviors, a much larger number of subjects may have been necessary to enable researchers such as Carson and Virden (n=69), Davis and Akridge (n=21), and Grace (n=67) to find differences between groups.

The intervention studies took advantage of diagnostic tests such as ultrasound and amniocentesis which were administered in the course of prenatal care. However, the lack of control over the testing allowed for unreliable delivery of the test and threatened statistical conclusion validity.

The repeated use of the MFAS has meant that much of the evidence for fetal attachment's development has been based

on this particular instrument. Evidence regarding characteristics of the MFAS indicate that the items do not factor into the subscales as published by Cranley (Müller & Ferketich, 1988). The items also perform differently for men and women. Thus the results from studies that correlated variables with specific subscales or compared the scores of men and women are suspect.

Internal Validity. In many studies, there were weeks or months between the intervention and measurement of the effect. This is appropriate when searching for long term effects of an intervention. However, it involves significant risk. During the intervening time, the usual or unusual events of pregnancy may contribute to the threat of history.

Random assignment of subjects to groups was used infrequently in this body of research with only Davis and Akridge (1987) pretesting both groups for fetal attachment prior to the intervention. Kohn, Belson and Weiner (1980) and Milne and Rich (1981) also pretested subjects for level of fetal attachment prior to ultrasound examinations. However, all of their subjects received the intervention. Matching women on certain demographic characteristics does not eliminate the selection threats of lack of random assignment and/or no pretesting.

Implementation of the diagnostic tests may have led to the threat of maturation. For example, Grace (1984)

compared the outcomes of women who had amniocenteses to rule out fetal anomalies with women who had no such risk. Women at risk for delivering an abnormal child may attach to the fetus at a different rate from low risk women, particularly after they discover that the fetus has no detectable anomaly.

External Validity. This literature is characterized by the lack of large, randomly selected samples of representative subjects. However, the small sample sizes and relative homogeneity of the subjects has also been a strength. In the early stages of construct development, homogeneity eliminated extraneous variables such as culture which would have masked consistencies of the construct.

Summary of Research Findings

The findings from these studies are not easily summarized because of the inconsistencies and the variety of research designs represented. However, there are some specific answers that can be identified for each question. The findings that are reported below are represented in Table 1.

Table 1

Variables Appearing in More Than One Study

Variables	+Correlation	-Correlation	0 Correlation
Social Support	Cranley 1981, 1984 Mercer et al 1988		Koniak-Griffin 1988
Stress		Cranley 1981, 1984	
Self-Esteem	Curry(in press) Leifer 1980 *		Cranley 1981, 1984 Gaffney 1986 Koniak-Griffin 1988
Marital Adjustment	Cranley 1984 Weaver & Cranley 1983 Mercer et al 1988****		
Anxiety	Mercer 1988	Gaffney 1986	Cranley 1981, 1984
Demographics**	Mercer et al 1988		Cranley 1981 1984 Kemp & Page 1987 Curry(in press) Kemp & Page 1987 Mercer et al 1988
Risk Status			
Quickening	Lumley 1977, 1980, 1982 Leifer 1980 LoBiondo-Wood 1985 Reading et al 1984 Vito 1986		
Gestational Age	LoBiondo-Wood 1985 Reading et al 1984 Vito 1986		
Symptoms of Pregnancy	Weaver & Cranley 1983 Lumley 1977, 1980, 1982		LoBiondo-Wood 1985
Ultrasound Exam			Kemp & Page 1987
Planning Pregnancy	Leifer 1980*		Kemp & Page 1987
Self-Esteem***	Gaffney 1986 Koniak-Griffin 1988		
Demographic Variables***	Vito 1986		
Ultrasound***			Vito 1986
Planning Pregnancy***	Vito 1986		

* as part of psychological functioning

**age, socioeconomic status, education & race

***correlations found with individual subscales only

****low risk

How do Pregnant Women Experience Fetal Attachment? The studies revealed that mothers and fathers are able to provide clear descriptions of a developing relationship with their unborn children (Stainton, 1985). Mothers reported interaction and conversation with the unborn child (Leifer, 1980; Stainton, 1985). They were willing to ascribe individual characteristics to the fetus, and freely expressed feelings of love for it (Lumley, 1977, 1980, 1982). In addition, fathers recounted episodes of play with the fetus (Stainton, 1985).

Attachment was reported by Lumley's subjects as early as eight weeks of gestation, but quickening seemed to play a vital role in the growth of maternal feelings. These findings were gathered from a small number of men and women from Australia (30), Canada (25 couples), and the U.S. (19), and they are similar to findings from the descriptive literature of pregnancy (Deutsch, 1943; Rubin, 1984). The agreement between the studies provides impetus for exploring other cultures in the hopes of finding similarities. However, the subjects shared a common language and cultural heritage, therefore, it is premature to describe a universal experience of fetal attachment.

Can Fetal Attachment be Measured? Two instruments, the MFAS (Cranley, 1981a) and the Reading et. al. adjective scale (1984) were developed and used to measure fetal attachment. Both instruments have reported evidence of

reliability. The MFAS has been used in several studies with inconsistent, and in some cases, conflicting results. Hypotheses regarding correlations (Gaffney, 1986) or causal models (Mercer et. al., 1988) could not be supported. Psychometric testing of the MFAS has questioned the validity of its revision for men and of the subscales as currently structured. Unfortunately, several studies have based their data analysis and conclusions on these subscales.

Women and men have responded positively to the items of these instruments which were developed from accepted theory and submitted to expert review. Thus it appears that fetal attachment can be measured, but that there is a need for improvement in the existing measures or the development of an improved measure.

What Factors have Relationships with or Effects on Fetal Attachment? Many variables have been associated with increases in fetal attachment both by reports in the descriptive studies and by statistical correlation and regression analysis. Only two variables have been consistently found to have a positive correlation with fetal attachment in all studies in which they have been addressed: quickening and gestational age. In those studies examining risk status, there were no differences between the scores of high and low risk women. Mercer et. al. (1988) found that high and low risk subjects were

distinct groups requiring the development of group specific causal models to predict fetal attachment.

In most studies, demographic variables did not influence fetal attachment. Mercer et. al. (1988) found that age, socioeconomic status, education, race, and number of children did predict fetal attachment, but only for particular subgroups of their sample. Vito (1986) also found that age, education, and parity were correlated with three subscales of her adapted MFAS. The correlation of variables with subscales rather than the entire instrument confounds this finding because as has been discussed previously, there is reason to doubt the validity of the individual MFAS subscales.

The results for social support and anxiety were mixed. While Cranley (1981a) found a strong correlation between fetal attachment and social support ($r=.51$), Mercer et. al. (1988) only found a modest correlation between received social support and fetal attachment, ($r=.23$) and then only for the low risk women. On the other hand, Koniak-Griffin (1988) found no correlation between social support and fetal attachment in adolescents. Cranley (1981a) found no correlation of MFAS scores with anxiety ($r=.01$) but Gaffney (1986) did find a low negative correlation between state anxiety and MFAS scores.

In summary, it does appear that some personal and situational variables may influence the development of

fetal attachment. The conflicting results suggest that fetal attachment may develop differently based on group characteristics in different populations such as high risk women and adolescents. Another possibility that must be considered is that the instrument used to obtain these results, in most cases the MFAS, is performing inconsistently, or has idiosyncratic items which limit its usefulness.

Will Interventions Influence Fetal Attachment? The reported results indicate that ultrasound visualization of the fetus may increase expressions of concern and feelings for the fetus. But these increased feelings do not appear to extend beyond the first few days after the examination. Ultrasound examinations did not correlate with total MFAS scores (Kemp & Page, 1987) although Vito found that ultrasound examination was related to the "Giving of Self" subscale of her version of the MFAS.

Amniocentesis and providing women with knowledge of fetal gender had no impact on postnatal attachment. The results were different when amniocentesis resulted in reassurance that the fetus was chromosomally normal. In these cases, MFAS scores rose more dramatically than for women who had not had concerns for fetal abnormality.

Teaching pregnant women palpation of the abdomen to detect fetal position, attention to fetal activity, and abdominal massage for interaction with the fetus probably

does not effect postnatal attachment. Although the original study by Carter-Jessop had positive results, two subsequent studies have been unable to repeat these results (Carson & Virden, 1984; Davis & Akridge, 1987).

There is evidence that at least one intervention, amniocentesis with reassurance of fetal health may influence fetal attachment. Further studies are needed before more definitive statements can be made about the impact of interventions.

Does Fetal Attachment Predict Neonatal Attachment? No study specifically asked this question. Yet ethology and attachment theory postulate that once the attachment process has begun, internal representations are developed and influence the ongoing relationship. Cranley (1981a) and Reading et. al. (1984) attempted to provide predictive validity for their instruments by measuring postnatal attachment. Cranley was unable to correlate fetal attachment with Neonatal Perception Inventory scores. Reading et. al. found that attachment at 32 weeks predicted 13% of postnatal attachment within 24 hours of delivery. This relationship was no longer detected three months after birth.

Leifer (1980) on the other hand, did find that psychological functioning in early pregnancy not only predicted attachment to the fetus but also to the infant. There is indirect evidence for this relationship from other

literature. Robson and Moss, (1970); Klaus and Kennell, (1982); and Peterson and Mehl, (1978) reported that the prenatal feelings of the mother influenced the mother's behaviors and attachment to her infant after its birth.

Fetal Attachment and the Study Variables

This body of research can also be summarized in terms of the variables which were used to test the validity of the MPAT, marital satisfaction and adaptation to pregnancy. Loneliness has not been addressed in previous fetal attachment studies and will be reviewed at the end of this section.

The Effect of Marital Satisfaction on Attachment to the Fetus. Cranley (1984) and Weaver and Cranley (1983) studied the correlation of marital satisfaction with fetal attachment. They found positive correlations between these two variables for both men ($r=.30$) and women ($r=.32$). Mercer et. al. (1988) found that mate relations were predictive of fetal attachment for low risk men and women, but not for their high risk subjects.

The marital relationship/partner relationship has been found by others to influence the course of pregnancy. Richardson (1987) studied 45 women, 30 experiencing preterm labor and 15 not in preterm labor but at similar points of pregnancy. These subjects were interviewed extensively about the important relationships in their lives.

Richardson reported that worrisome relationships with husbands were a major source of concern for the women in premature labor. The premature labor subjects also described their previous and current parental relationships as troubled, neglectful, or abusive.

Another indirect support for this link is the consistent finding that pre and postpartum depression is strongly correlated with a poor marital relationship (Ballinger et. al., 1979; Kumar & Robson, 1978; O'Hara et. al., 1983; Payket et. al., 1980). For example Kumar and Robson (1978) found that marital tension was reported more frequently by their depressed subjects ($p < .01$) during, as well as after, pregnancy.

The Impact of Adaptation to Pregnancy. Attitudes toward pregnancy, also referred to as pregnancy adjustment and maternal adaptation, is recognized by theorists and researchers as being composed of several components. Rubin's (1984) description of maternal adaptation and the maternal experience resulted from her analysis of the experiences of over six thousand women. These women had been observed by Rubin or her students. Content analysis of the resulting process recordings enabled Rubin to identify body image, binding-in to the child, and self-concept as aspects of attitudes to pregnancy. Kumar, Robson, and Smith (1984), after an extensive literature review, identified body image, somatic symptoms, marital

relations, attitudes to sex, and attitudes to the idea of pregnancy and the baby as being aspects of maternal adjustment.

None of the fetal attachment researchers have examined attitudes to pregnancy in either the manner of Rubin or Kumar et. al. However, there is evidence linking fetal attachment to attitudes towards pregnancy when individual aspects of this construct are considered.

Leifer (1980) categorized women based on their responses to instruments measuring mood tone, body image, self-esteem, and motivation for pregnancy. These elements contributed to Leifer's categorization of her subjects as having high, moderate or low psychological functioning. She went on to associate the level of psychological functioning directly with the maternal relationship with the fetus.

Self-concept, one aspect of attitudes to pregnancy, was examined by Cranley (1981a), Curry (in press), Gaffney (1986), and Koniak-Griffin (1988). The results for this one element have been mixed, however, as noted above, only Curry found a correlation with fetal attachment.

Loneliness: Filling the Attachment Gap? The evidence that loneliness is the emotion that occurs in the absence of an attachment figure was originally found in adult attachment theory. Weiss (1984) pointed out that there are two types of loneliness. One form is experienced by the adult in

response to the absence of attachment figures. The other type, feelings of exclusion, occurs when one does not have a place in an accepting community. Even this type of loneliness seems to be linked to the presence or absence of attachment figures. Weiss' propositions have been supported by a factor analysis (Rubenstein & Shaver, 1982) and instrument testing by Russell, Peplau and Cutrona (1980).

Russell et. al. recruited 164 men and women who had recently begun their first year as UCLA students to test the UCLA loneliness scale. Among the study's pertinent results was the finding that loneliness decreased as the subject's social commitment increased (from not dating to romantically involved). Affiliative motivation (affiliative tendency and introversion-extroversion) was found to be a predictor of loneliness. Even when the effect of mood and personality variables were considered in a regression analysis, a significant relationship existed between dating or marital status and loneliness.

Final Comments

Fetal attachment research findings indicate that there is still much to learn about this construct and raise questions about the ability of the MFAS to validly and reliably measure fetal attachment. The conflicting results from the studies using the MFAS lead to questions about its

validity. It is possible that some MFAS items are pertinent to other aspects of the pregnancy experience and thus confound the results.

Specific testing of the MFAS also raised serious doubts about MFAS subscale validity and its applicability to men. Together these findings indicate the need to develop another instrument that will demonstrate evidence of validity and reliability. The MPAI was developed and tested for this purpose.

Chapter 3

Methods and Plan for Data Analysis

The purpose of this study was to develop and test the Müller Prenatal Attachment Inventory (MPAI). Measurement is defined by Nunnally (1978) as "...consist[ing] of rules for assigning numbers to objects in such a way as to represent quantities of attributes" (p. 3). The MPAI items produce a score which seeks to quantify the attribute of fetal attachment.

In the behavioral sciences, however, the assignment of quantities to attributes is based on expectations about the attributes. These expectations grow out of the theory in which the attribute is embedded. Knowledge gained from observing the quantities that arise in research settings contributes to the expectations of the attributes and thus may contribute to the alteration or clarification of the theory. Recognizing this integration of measurement and theory, Zeller and Carmines (1980) define measurement "...broadly to include all aspects of the process by which abstract concepts are linked to empirical referents" (p. 17). The abstract concepts of this project were described in Chapter 1. Previous efforts to link these concepts to empirical referents were described in Chapter 2. In the first section of Chapter 3 the author describes the process

used to identify empirical referents for the MPAl. This process is intimately related to the concept of validity. The other sections describe the procedures used to gather the data and the methods for data analysis.

Item Development

In most textbooks, the reliability of instruments is discussed before validity. Thus the reader first considers if an instrument is "...repeatable and consistent" (Zeller & Carmines, 1980, p. 48) before assessing "...the extent to which empirical indicants measure what they are intended to measure" (Zeller & Carmines, 1980, p. 17). However, the validity of the empirical indicants or items, is the first concern in the instrument development process. Content validity is most pertinent to item development. Content validity reflects "...the adequacy with which a specific domain of content is sampled" (Nunnally, 1978, p. 91).

Because the MPAl measures an attitude, fetal attachment, content validity was achieved and evaluated by the method proposed by Lynn (1986). Rather than attempting to deductively identify the full content domain as would be done for a cognitive test, the developer of an instrument to measure an attitude identifies the dimensions of the domain by a thorough review of the literature. Items are then generated to reflect the descriptive literature.

For the MPAI, an extensive review of the literature describing a woman's relationship with the fetus during pregnancy (Deutsch, 1944; Lederman, 1984; Leifer, 1980; Lumley, 1977, 1980, 1982; Rubin, 1984; and Stainton, 1985) was conducted to determine those experiences, ideas, feelings and behaviors identified as contributing to the maternal fetal relationship. Statements were worded to reflect those experiences, ideas, feelings and behaviors.

A significant change in a woman's perception of the fetus occurs when she first experiences fetal movement (quickening). Fetal movement continues for the remainder of the pregnancy and appears to be an important aspect of the woman's developing relationship. Therefore, items reflecting the perception of fetal movement were included in the MPAI. This will mean that there may be a significant difference between the scores of those women who have and have not experienced quickening.

Lennon (1973) has reminded the instrument developer that "...appraisal of content validity must take into account not only the content of the questions but also the process presumably employed by the subject in arriving at his response" (p. 122). Efforts were made to state the items in such a way that only one idea is described by each statement, there is little room for speculative responses, and the vocabulary is recognized by all the subjects.

Also, the content of the items was limited to what is considered general knowledge of pregnant women so that responses are not influenced by a woman's exposure to special education. Statements applicable only to one culture or social class were deleted.

A judgment-quantification review of the items (Lynn, 1986) was conducted to assess item validity. A panel of eleven experts consisting of theoreticians (not limited to the nursing discipline), nurses who have cared for women during pregnancy, and pregnant women rated the items as to their relevance to fetal attachment. Following the advice of Crocker and Algina (1986), a broad based panel was chosen. Theoreticians provided an understanding of the concept of fetal attachment. Practitioners provided their experience of observing pregnant women. Pregnant women offered the unique perspective of those currently attaching to a fetus. Finally, the panel included two black experts and one Latina.

The panel rated each item by the following scheme:

1. item not relevant;
2. item needs much revision, hard to assess relevance;
3. item needs minor revision;
4. item is relevant.

Numerical rating allowed for a rigorous determination of content validity (Lynn, 1986) and formed the basis for decision rules regarding the inclusion of items. Those items with a mean score less than three were

excluded from the MPAI or rewritten to reflect the experts comments. Forty-seven items were submitted to the expert panel. Twenty-nine items remained at the end of the judgement-quantification process.

The MPAI has a four point response scale for the frequency of experiences, ideas, feelings and behaviors toward the fetus (almost always, often, sometimes, almost never). Matell and Jacoby (1971) found that the internal consistency and stability of measures was maintained regardless of the number of scale points. Four points were chosen because of the clear meaning of the words used to describe frequency. A larger number of choices require the use of words with subtle shades of meaning and require subjects to make difficult decisions of little substance.

Subjects

To provide an adequate number of subjects for psychometric tests of validity and reliability ten subjects were obtained for each item on the instrument (Nunnally, 1978). Since the MPAI contains 29 items, three hundred subjects were recruited. Pregnant women who have not been hospitalized for a high risk pregnancy and were able to read and write English were asked to participate. Women were recruited from a clinic setting in the San Francisco Bay Area, two midwifery practices, a private obstetric

practice, and two childbirth preparation classes.

Women meeting study criteria in the clinic and at the private practices were approached by the investigator, the study was explained to them, and questions were encouraged (five women declined to participate). Women willing to participate read and signed the consent form. They were given the study materials and an envelope for returning the materials to the researcher. The women at the childbirth preparation classes were approached as a group just prior to the beginning of the class. The rest of the recruitment process was the same as that for women recruited individually.

The materials were combined in a study packet. The demographic sheet was first. The order of the prenatal attachment instruments was rotated randomly to detect response patterns resulting from the influence of one instrument on the other. Women were asked to provide a phone number to the investigator so that a follow-up phone call could be made if the envelope was not returned within ten days. A page was provided at the end of the packet for comments.

Evidence for Criterion Validity

Criterion related validation of an instrument involves "...the correlation between a measure and some criterion

variable of interest" (Zeller & Carmines, 1980, p. 79).

The criterion may be a prediction of some event to occur in the future that can be related to a score on the instrument. An example of predictive validity is the estimation of success in college based on scores from admission testing. Ethology proposes that once a sequence of behavior is initiated, it progresses to its ultimate goal. Based on ethology, attachment theory has implied that once the attachment process begins, it progresses unless interrupted by dramatic events. As a result, levels of fetal attachment have been predicted to effect postnatal maternal attachment behaviors. However the empirical data supporting this link are weak. As mentioned in Chapter 2, no correlations have as yet been found between the available measures of fetal attachment and postnatal attachment (Cranley, 1981a; Reading et. al., 1984). Thus with no reasonable variable to predict, this type of validity was not addressed.

Several criteria have been chosen to provide evidence of concurrent validity for the MPAI. "Concurrent validity is assessed by correlating a measure and the criterion at the same point in time" (Zeller & Carmines, 1980, p. 80). Concurrent or criterion validity is closely related to construct validity. Construct validity is also concerned with the correlation of a measure with other measures, but

it differs by focusing on the extent to which this correlation is "consistent with theoretically derived hypotheses concerning the concepts or constructs that are being measured" (Zeller & Carmines, 1980, p. 81). The choice of the criteria for the validation study is thus guided by the theory and empirical data surrounding the construct being measured.

The criteria for correlation with the MPAI have been chosen because of their empirical or theoretical associations with fetal attachment. As discussed in Chapter 2, length of gestation, attitude toward pregnancy, and marital satisfaction have been associated with fetal attachment in previous research. Other pieces of information were gathered so the sample could be described: age, parity, level of education, occupation, marital status, and race. Women were also asked to respond to a forced response question "How do you feel about being pregnant now?" Finally, they were asked if they knew fetal gender.

Four instruments were used to develop a convergent/divergent matrix to provide evidence for the construct validity of the MPAI (Campbell & Fiske, 1967). Attitudes toward pregnancy was identified in Figure 1. as predicting fetal attachment. Marital satisfaction was measured as an indicator of attachment to the partner.

Loneliness has been identified as an attribute that varies inversely with attachment. A parallel measure of fetal attachment, the MFAS, was also administered.

Instruments

Developed by Kumar, Robson, and Smith (1984), The Maternal Adjustment and Maternal Attitude Scale (MAMA) is "specifically concerned with a woman's orientation towards her pregnant condition....(p.43). The 60 item instrument consists of five subscales: 1. body image; 2. somatic symptoms; 3. marital relationship; 4. attitudes to sex; and 5. attitudes to pregnancy and the baby. The MAMA was tested using 119 women attending a prenatal clinic in London. Test-retest and split half reliabilities were published for the individual scales of the MAMA but not for the entire instrument. The range for the test-retest coefficients (n=38) were .95 (attitudes to sex) to .81 (marital relationship). The split-half coefficients ranged from .82 (attitudes to sex) to .58 (somatic symptoms). Evidence for validity was obtained by correlating scores on the MAMA subscales with findings from other independent measures of the constructs such as previously reported pregnancy symptoms and interview ratings of marital satisfaction.

The Kansas Marital Satisfaction Scale (KMSS) is a 3

item instrument that assesses general marital satisfaction (Schumm, Paff-Bergen, Hatch, Obiorah, Copeland, Meens, & Bugaighis, 1986). The subject is asked to respond on a seven point scale (extremely dissatisfied to extremely satisfied) to three items concerning specific satisfaction with the marriage, the spouse, and the relationship with the spouse. In previous studies, Cronbach's alpha for the KMSS has been .92 and .93 (Schumm et. al., 1986; Grover, Paff-Bergen, Russell, & Schumm, 1984).

Fincham and Bradbury (1987) have evaluated the assessment of marital satisfaction and concluded that in the larger instruments, the items used to assess marital quality often overlap with items used to assess specific personal resources or variables which may in fact influence marital quality. They therefore recommend the use of a smaller, more specific instrument such as the KMSS when seeking to assess general marital quality or satisfaction. The KMSS has been found to correlate with other, longer marital satisfaction instruments (Schumm et. al. 1986).

The UCLA Loneliness Scale is a 20 item instrument composed of an equal number of positive and negative items to assess the subjects feelings of loneliness. The instrument was tested on a population of students during their first year in college. Criterion validity was supported by correlating the loneliness scores with

depression and anxiety scores. The internal consistency of the UCLA scale as used in three separate studies has been high with coefficient alpha ranging from .89 to .94 (Russell, et. al., 1980; Russell, Altmaier & Van Velzen, 1987; and Solano, 1980).

When compared to the Belcher loneliness scale (Solano, 1980), the UCLA was found to identify estrangement and lack of communication in subjects rather than "more pathological forms of loneliness such as depression and anxiety" (p.28).

Expected Outcomes of Validity Testing

The scores from the MPAI, the MAMA and its subscales, the KMSS, the UCLA Loneliness scale, and the demographic questionnaire were used to construct a convergent/divergent correlation matrix as one means of providing evidence for construct validity. Figure 2 is a depiction of the expected correlations in the matrix. Table 2 outlines the instruments and their abbreviations to assist in interpretation of Table 3.

The correlations predicted in the matrix were derived from previous research findings or based on the relationships depicted in the Predictive Attachment Model. Scores from the MAMA, the MFAS, and the KMSS were anticipated to positively correlate with prenatal attachment scores. As the converse of attachment it had

been anticipated that loneliness scores would correlate negatively with prenatal attachment as measured by the PAI and the MFAS. The results of previous studies reviewed in Chapter 2 indicated that prenatal attachment would also have a positive relationship to the length of gestation.

Table 2 **Study Variables and Their Abbreviations**

Weeks of Gestation	Gest
Maternal Age	Age
Number of Previous Children	Children
Years of Maternal Education	School
Maternal Feeling About Pregnancy	Happy
Muller Prenatal Attachment Inventory	MPAI
Maternal Fetal Attachment	MFAS
Kansas Marital Satisfaction Scale	KMSS
UCLA Loneliness Scale	UCLA
Maternal Adjustment and Maternal Attitude Scale	MAMA
Body Image Subscale	MAMAS1
Somantic Symptoms Subscale	MAMAS2
Marital Relationship Subscale	MAMAS3
Attitudes to Sex Subscale	MAMAS4
Attitudes to Pregnancy and Baby Subscale	MAMAS5

Table 3	Predicted Correlations												
	2	3	4	5	6	7	8	9	10	11	12	13	
MPAI	hi	mod	neg	mod	mod	neg	mod	low	mod	low	low	mod	
MFAS		mod	neg	mod	mod	neg	mod	low	mod	low	low	mod	
KMSS			neg	mod	low	0	hi	mod	mod	low	low	mod	
UCLA				low	mod	0	mod	low	low	0	low	low	
MAMA					hi	hi	hi	hi	hi	mod	low	hi	
MAMAS1						mod	mod	mod	mod	mod	mod	mod	
MAMAS2							0	neg	neg	neg	0	neg	
MAMAS3								mod	mod	low	low	mod	
MAMAS4									0	neg	0	low	
MAMAS5										low	low	mod	
GEST											0	low	
CHILD												low	
HAPPY													

low = .2 to .3, mod = .31 to .50, hi = .50 or greater

neg = negative correlation

0 = no correlation

Factor Analysis

Seminal work in fetal attachment proposed that it is a multi-dimensional construct. To test this proposition, a factor analysis of MPAI scores was conducted. Factor analysis is a term that encompasses "a broad category of approaches to conceptualizing groupings (or clustering) of variables and an even broader collection of mathematical procedures for determining which variables belong in which groups" (Nunnally, 1978, p. 327). Factor analysis seeks to identify an underlying factor or factors that may explain the common variance among a group of variables, in this case items. Factors may be described as underlying categories that allow a number of items to be arranged according to an underlying similarity.

Principal axis factoring, a method of common factors analysis, uses a reliability estimator from the data being analyzed on the main diagonal of the correlation matrix of the variables. From this correlation matrix the factors are derived. The common factors model was chosen for this study because it recognizes unique and measurement error in the data which may not be relevant to the factor solution. (Nunnally, 1978).

After the initial factors are extracted from the data, the results are rotated to produce a simple structure (Thurstone, 1947). The extraction process has attempted to

identify groups of variables (in this study, items) that explain the variance of the items. The groups are called factors and the members of each group should share certain recognizable characteristics. Rotation rearranges the items in such a way that the factors are more reasonably interpretable. The amount of variance being explained is unchanged, the variance is just allocated in such a way that the factors are easier to identify. Thurstone's (1947) ideal simple structure would have each item loading on only one factor. This is a very rare occurrence.

If an investigator assumes that the factors are independent, an orthogonal rotation method is used. Oblique rotations may be appropriate when the factors are theorized to be correlated. The choice of whether to use orthogonal or oblique rotations is often based on the investigator's conceptualization of the construct. However, Nunnally (1978) points out that the solutions are usually similar and that there are certain mathematical properties of oblique rotations that occasionally result in misleading results. This study compared an orthogonal (Varimax) and oblique (Oblimin) rotation.

In addition to providing evidence for dimensions of fetal attachment, factor analysis provides information regarding the strength of the correlation between an item and the factor on which it loads most highly. A factor

loading explains how much of the variance of an item is explained by a factor. If the loadings of an item are large on one factor and fairly small on other factors, the item can be more clearly identified with a single factor and the underlying phenomenon of the factor. When a factor is composed of items all with substantial loadings, the factor is more clearly distinguishable from other factors (Zeller & Carmines, 1980). Thurstone (1947) identified criteria for determining if items are contributing clearly to the solution. These criteria were used in this study to identify items clearly related to the factors that emerge from the MPAI. These criteria include a loading of at least .50 on one factor with a difference of at least .20 between any one item's loading on any two factors.

Reliability Testing

Reliability refers to the consistency or the repeatability of an instrument. A more reliable instrument will provide a similar score when administered to the same persons on repeated occasions if it measures a stable attribute. Thorndike (1982) notes that classical test theory identifies the source of unreliability as the random error that appears in the observed score along with the hypothetical true score. Because random error is random, the scores fluctuate as respondents choose different

answers on different occasions. A systematic error in the instrument would lead to a systematic response on the instrument. This would threaten the validity of the responses but not the reliability.

Reliability can be tested in two ways: 1. evaluating stability and/or 2. evaluating equivalence. The classic test of stability is the test-retest method. The scores of the same subjects, taking the same test on two separate occasions are correlated to produce the coefficient of stability. Memory, practice, maturation of the subjects, and historical events (Crocker & Algina, 1986) can all threaten the accuracy of the coefficient. This test of reliability is inappropriate if the attribute being tested is expected to change over time. The test-retest method was not used because of the expectation that fetal attachment scores change over time.

An equivalence test for reliability can be conducted in several ways. If an equivalent form of the instrument is available, it can be administered to the same subjects during the same testing period. The correlation between the scores of the alternate forms is the coefficient of equivalence.

If the halves of an instrument can be considered equivalent, the split half test is applicable. Items can be divided randomly or according to a numbering scheme

(odd, even for example). The correlation of the scores between the halves again results in a coefficient of equivalence. In this study, MPAI scores were correlated with MFAS scores. The previously mentioned weakness of the MFAS prevent this test for equivalence being used as the only or even as a major test of reliability for the MPAI. A correlation of approximately .70 was expected.

Several formulas exist for determining the internal consistency or rational equivalence as a measure of reliability. These formulas require that the composite score variance and the covariance among the items be known (Crocker & Algina, 1986). The KR-21 (Richardson & Kuder, 1973) formula is one of the earliest developed to measure internal consistency. It is relatively easy to compute but provides the lowest limit of the reliability estimate.

Cronbach's alpha measurement of internal consistency is perhaps the most frequently used test for reliability. Alpha is an indication of the correlation between all possible split halves of the instrument. The correlation of the items with the instrument itself indicates which items are so redundant that they may be eliminated as well as identifying those items that are not related to the others and thus may not be appropriate to the instrument. Nunnally (1978) suggests that an alpha level of .70 should be considered adequate for an instrument in the early

stages of development. An alpha coefficient of .90 would be required before clinical decisions regarding individual women could be based on any instrument (Nunnally, 1978). An alpha coefficient was determined for the MPAI. A coefficient greater than .70 (in this case .81) indicates that a satisfactory first step was taken, but that further refinement of the MPAI is possible.

Cronbach's alpha assumes that all the items are tau-equivalent, or basically measure a single construct (Zeller & Carmines, 1980). However, it has been suggested that fetal attachment has more than one dimension. When multiple dimensions or constructs exist, the alpha is a maximum likelihood estimate of the reliability and will therefore be a minimized reliability coefficient. Coefficient theta, which is based on the results of a principal components analysis of the items, provides a maximized coefficient and was computed as part of the testing of the MPAI.

Summary

A sample of pregnant women completed a packet containing the MPAI, demographic questionnaire and four other instruments. Analysis of these scores provided evidence for validity and reliability of the MPAI. The results of this analysis are reported in Chapter 4.

Chapter 4

Results

The purpose of this study was to develop and test the Müller Prenatal Attachment Inventory (see Appendix A), an instrument to measure fetal attachment in pregnant women. Eleven experts contributed to the determination of validity during the development phase. Three hundred ten women completed the Müller Prenatal Attachment Inventory (MPAI) and five other questionnaires during the testing phase of the study. The additional instruments included: a demographic questionnaire (see Appendix B), the Maternal Fetal Attachment Scale (MFAS), The UCLA Loneliness Scale (UCLA), the Kansas Marital Satisfaction Scale (KMSS), and the Maternal Adjustment and Maternal Attitudes Scale (MAMA). The findings are described below.

Description of the Sample

A total of 336 women were recruited into the study and took packets from the investigator. Three hundred and ten women returned the packets for a return rate of 92%. Sixty-eight percent (n=210) of the women were patients of midwifery practices. The remainder were patients of physicians and were recruited from a clinic, private obstetric practice and two childbirth preparation classes.

The subjects were mainly white with only 32.3% identifying themselves as members of ethnic minorities. Reflecting the ethnic composition of the Bay Area, the largest ethnic group represented was Asians (n=43). The subjects' age ranged from 18 to 44 years (mean=30 years). The women were well educated (mean=15 years). Subject family income reflected the high income levels of the Bay Area. Sixty percent reported family income as exceeding \$30,000. The majority of the sample was employed outside the home. Occupations ranged from general office clerk to physician.

Eighty-five percent of the women were married and 8% reported living with a partner. At the time of completing the packet, gestational age ranged from 14 to 41 weeks (mean = 31.4 weeks). Sixty-three percent of the women had no other children. Twenty-one percent of the women knew the gender of the fetus due to testing during the early part of pregnancy. Forty-one were expecting sons and 24 were expecting daughters. A detailed description of sample characteristics is found in Table 4.

Table 4

Sample Characteristics

Recruitment Site	N	%
Midwifery Clinic	109	35.2
Private Midwifery Practice	101	32.6
Childbirth Class II	54	17.4
Physician Clinic	30	9.7
Private Obstetric Practice	11	3.6
Childbirth Class I	5	1.6
 Ethnic Identification	 N	 %
White	210	67.7
Asian	43	13.9
Latina	26	8.4
Black	19	6.1
Other	9	2.9
Native American	3	.9
 Age	 N	 %
18-20 years old	15	4.8
21-25 years old	48	15.5
26-30 years old	109	35.0
31-35 years old	97	31.3
36-40 years old	39	12.6
41-44 years old	2	.6
 Education	 N	 %
8-11 years	8	1.3
12-15 years	146	47.1
16-19 years	141	45.5
20+ years	15	4.8
 Income	 N	 %
Less than \$10,000	19	6.5
\$10,000-20,000	40	13.6
\$20,000-30,000	57	19.4
\$30,000-50,000	88	29.9
\$50,000 or more	90	30.6

Table 4(Continued)

Sample Characteristics

Occupation	N	%
Homemaker	66	21.6
Clerical	58	18.7
Other Profesional	33	10.6
Technical	32	10.3
Health Professional	27	8.7
Sales	24	7.7
Managerial	16	5.2
Teachers	15	4.8
Others	14	4.5
Scientists	13	4.2
Service	12	3.9
Marital Status	N	%
Married	262	84.5
Living with partner	26	8.4
Single	18	5.8
Divorced	4	1.3
Gestational Age	N	%
14-19 weeks	8	2.6
20-24 weeks	42	13.5
25-29 weeks	58	18.7
30-34 weeks	78	24.5
35-39 weeks	112	36.1
40+ weeks	12	3.9
Number of Previous Children	N	%
0 children	196	63.2
1 children	85	27.4
2 children	19	6.1
3-5 children	10	3.2
Knowledge of Baby Gender	N	%
No Knowledge	244	79
Male Fetus	41	13.3
Female Fetus	24	7.7

Instrument Analysis

Forty-seven items were submitted to the eleven experts for review. Calculation of mean item scores resulted in the elimination of 18 items, therefore, 29 items remained in the MPAI at the end of the development phase. The items which were retained had received consistent scores from all three groups of experts. The items which were deleted were most likely to have received low scores from pregnant women and psychologists. An example of an eliminated item is "I share my favorite foods with my baby."

The maximum, minimum, and mean scores for each of the instruments and the MAMA subscales used in the study were calculated. These scores can be found in Table 5.

Table 5

Study Instrument Scores

Instrument	Mean	S.D.	Minimum	Maximum
MPAI	83.31	10.17	58.00	110.63
MFAS	87.84	10.63	47.00	115.00
UCLA	36.35	8.76	20.00	62.00
KMSS	17.44	4.32	3.00	21.00
MAMA	152.25	19.46	97.90	202.74
MAMAS1	27.72	5.29	13.00	41.00
MAMAS2	25.75	4.56	15.27	41.46
MAMAS3	24.18	4.03	16.00	38.00
MAMAS4	24.19	5.60	12.00	42.00
MAMAS5	25.68	4.65	13.00	40.00

The MPAI and the other instruments, except for the demographic questionnaire, were tested for evidence of reliability using Cronbach's alpha coefficient of internal consistency. The reliabilities were also determined for the subset of subjects who identified themselves as members of ethnic minorities and the subset of white subjects. Table 6. illustrates the alpha coefficients for the five instruments tested for all subjects, for the ethnic minorities, and for the white subjects. Cronbach's alpha is calculated from each individual subject's responses to an item or set of items. The calculation of reliabilities for the group of non-white subjects does not indicate that this group was assumed to be homogeneous. A review of Table 8 indicates that the mean scores of the various groups varied. Indeed, larger numbers of subjects in the groups may have resulted in statistically significant differences among all the groups. The reliability coefficients were determined for the separate groups only to determine if the instruments were performing consistently for all groups. Generally this consistency was found, and therefore instruments scores were considered as a unit in the rest of this analysis. It is of interest to note that there were differences of .10 or greater in the alpha coefficients between the white and ethnic groups for the MFAS, and the body image, negative symptoms of

pregnancy, and attitudes to sex subscales of the MAMA. These differences may indicate that these instruments contain items which make them more idiosyncratic for individual groups of subjects.

Cronbach's alpha coefficient for the MPAI was .81. Because the MPAI is in the initial stage of development, another estimate of reliability, coefficient theta, was determined from the results of the principal components analysis of the MPAI. Coefficient theta for the MPAI was .89.

Table 6 **Cronbach's Alpha Coefficients**

Instrument	All Subjects (n=310)	Minority Subjects (n=100)	White Subjects (n=210)
MPAI	.8083	.8163	.7992
MFAS	.8085	.8676	.7634
UCLA	.8918	.9040	.8852
KMSS	.9693	.9762	.9645
MAMA	.8853	.8797	.8869
MAMAS1	.7558	.5740	.8104
MAMAS2	.6586	.7283	.6212
MAMAS3	.8722	.8796	.8286
MAMAS4	.8397	.7580	.8607
MAMAS5	.6776	.6554	.6906

The item-scale correlation results from the MPAI reliability analysis were examined. The correlation fell between .3 and .7 for the majority of MPAI items. Nine items have correlations less than .3 indicating that they are poorly related to the other items and the total scale and should be considered for deletion or rewording. The item-scale correlations for these nine items are listed in Table 7. When the nine items with low item-scale correlations were deleted from the analysis of internal consistency, Cronbach's alpha rose to .85. However, theoretical considerations play a primary role in the deletion or rewording of items. Statistics such as alpha and item-scale correlations only serve as a guide for these considerations.

Table 7 **Low Item Scale Correlations for MP AI**

Items	Average Inter-item Correlation
MP AI 4	.187
MP AI 5	.000
MP AI 6	.245
MP AI 12	.087
MP AI 16	-.042
MP AI 19	-.008
MP AI 20	.155
MP AI 23	-.021
MP AI 29	.112

Factor analysis of the MPAAI scores also provided information about the functioning of individual scale items. Ten items were found which did not meet the criteria described in Chapter 3. However, the factor solutions do not firmly support the validity of separate subscales or multi-dimensionality of the construct. Therefore, the pertinence of "simple structure" criteria to the MPAAI items is questionable. The results of the factor analyses will be discussed further in the section on factor analysis at the end of this chapter.

Impact of Demographic Variables

Analysis of variance (see appendix C for all ANOVA tables) was used to determine if MPAAI scores varied by site of recruitment, specific ethnic identity, family income, marital status, or knowledge of fetal gender. MPAAI scores were found to vary by ethnic identity ($F=4.56$, $p<.01$) and site ($F=2.79$, $p<.05$). Post hoc testing of the means of the groups, using the Scheffe' method, found one statistically significant difference between ethnic groups. The mean of the 18 Black women was higher than that of the 209 white women. The absolute difference of the group means was 8.2 points. The mean MPAAI score for the various ethnic groups can be found in Table 8. Post hoc testing of group means by site found no significant pairwise differences.

Table 8 **Mean MPAI Scores by Ethnic Group**

Ethnic Group	Mean Score	n
Native American	98.33	3
Black	90.38	18
Latina	86.42	26
Asian	83.75	43
White	82.16	209
Other*	79.75	9
Grand Mean	83.31	308

***This group consists of Middle Eastern and East Indian Women**

Convergent/Divergent Matrix Results

A correlation matrix was constructed consisting of the Pearson Product Moment correlation results of the scores of the research instruments and key demographic variables predicted to provide evidence of MPAI validity. The relationships which were depicted in the Predictive Attachment Model and predicted prior to the study were compared with the outcomes of the data analysis.

MPAI scores correlated strongly with MFAS scores ($r=.72$, $p<.001$). As MPAI scores increased, indicating increased attachment to the fetus, MAMA scores decreased, indicating a more positive overall maternal adjustment to of pregnancy ($r=-.25$, $p<.001$). MPAI scores shared this relationship with three subscales of the MAMA, Body Image ($r=-.26$, $p<.001$), Attitudes to Sex ($r=-.25$, $p<.001$), and Attitudes to the Pregnancy and Baby ($r=-.39$, $p<.001$). The MPAI scores also increased as gestational age increased ($r=.14$, $p<.01$) and as the mother reported a higher degree of happiness about being pregnant ($r=.28$, $p<.001$).

MPAI scores were negatively correlated to the level of loneliness as measured by the UCLA ($r=-.13$, $p<.05$). The prenatal attachment/loneliness relationship is less than that expected, however. MPAI scores declined with maternal age ($r=-.13$, $p<.05$) and years of education ($r=-.14$, $p<.001$). MPAI scores had no correlation with marital

satisfaction whether measured by the KMSS ($r=.05$, $p=ns$) or the MAMA marital relations subscale ($r=-.10$, $p=ns$). The number of previous children in the family ($r=.03$, $p=ns$) and the number of negative symptoms of pregnancy ($r=-.02$, $p=ns$) also had no correlation with MPAI scores. The complete correlation matrix can be found in Table 9.

Table 9

	Correlation Matrix														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MPAI	1.00														
MFAS	.72**	1.00													
UCLA	-.13*	-.05	1.00												
KMSS	.05	.05	-.36**	1.00											
MAMA	-.25**	-.13*	.40**	-.30**	1.00										
MAMAS1	-.26**	-.13*	.23**	-.06	.70**	1.00									
MAMAS2	-.02	.00	.28**	-.08	.77**	.40**	1.00								
MAMAS3	-.10	.02	.36**	-.55**	.54**	.14	.33**	1.00							
MAMAS4	-.25**	-.18**	.30**	-.29**	.71**	.44**	.31**	.33**	1.00						
MAMAS5	-.39**	-.21**	.29**	-.20**	.64**	.46**	.27**	.27**	.37**	1.00					
GEST	.14*	.28**	.02	-.02	.09	.00	.04	.08	.06	.12*	1.00				
AGE	-.13*	-.15*	-.19**	.12*	-.22**	-.15*	-.26**	-.13*	-.02	-.11	-.11	1.00			
CHILDREN	-.03	-.02	-.02	-.05	.08	.05	.08	.17**	.07	-.11	.02	.19**	1.00		
SCHOOL	-.14*	-.13*	-.08	.08	-.13*	.10	-.14*	-.16**	.00	.02	-.13*	.45**	-.12	1.00	
HAPPY	-.28**	-.16**	.27**	-.25**	.42**	.27**	.19**	.31**	.24**	.52**	.14*	-.08	.11	-.15*	1.00

All correlations have 286 degrees of freedom. The P-values shown are 2 tailed values.
 High MPAI and MFAS scores equal more attachment.

High KMSS scores equal increased marital satisfaction.

High UCLA scores equal increased loneliness.

Low MAMA and MAMA subscale scores equal more positive maternal attitudes and adjustment.

* = p < .05

** = p < .01

The correlations of the MFAS with these same instruments and variables show a similar pattern to that of the MP AI, but the relationships are not as strong in most cases. MFAS scores increased as MAMA scores decreased indicating greater pregnancy adjustment ($r = -.13$, $p < .05$), Body Image ($r = .13$, $p < .05$), Attitudes to Sex ($r = .18$, $p < .01$), and Attitudes to Pregnancy and the Baby ($r = -.21$, $p < .001$). The MFAS was more strongly correlated with gestational age ($r = .28$, $p < .001$) but not as strongly related to the maternal report of happiness with the pregnancy ($r = .16$, $p < .001$). In contrast to the MP AI, the MFAS had no relation to loneliness ($r = -.05$, $p = \text{ns}$).

As expected, marital satisfaction as measured by the KMSS and MAMAS3 was correlated with both loneliness ($r = -.36$, $p < .001$; $r = .36$, $p < .001$) and adjustment to pregnancy as reflected by the total MAMA score ($r = .30$, $p < .001$; $r = .54$, $p < .001$). Of course being a component of the MAMA ensures that the marital relations subscale will be correlated with the entire scale to some extent.

Factor Analysis Results

The MP AI was submitted to three separate factor analyses. The Principal Components analysis produced seven factors in the varimax rotation. The oblimin rotation failed to converge after 25 iterations. The first factor

had an eigenvalue of 7.36 with subsequent eigenvalues all being less than 3. Only three of the factors had five or more items per factor. The factors produced by this analysis accounted for 62% of the item variance.

Principal Axis Factoring (PAF) produced six factors in the varimax rotation. Again, the oblimin rotation failed to converge. The eigenvalue of the first factor was 6.92. The remaining factors had eigenvalues of 2.42 or less. However, the eigenvalue of the last factor was less than one (.90). Only three of the factors contained five or more items. Eleven items comprised the first factor. The PAF solution explained 50.0% of the item variance.

Alpha factoring also produced seven factors. However, the eigenvalues of the last two factors were less than one. The eigenvalue of the first factor was 6.86 with all of the remaining factors having values of 2.16 or less. The alpha solution explains 51% of the item variance.

Item groupings were nearly identical in all three solutions. The only deviation was found in items 7 and 25. They were in the seventh factor of the PC and Alpha solutions. The three factor solutions can be found in Tables 10 to 12.

Table 10 Principal Components Analysis with Varimax Rotation

Items	1	2	3	4	5	6	7
MPAI2	.79						
MPAI10	.69						
MPAI3	.68						
MPAI18	.68						
MPAI17	.67						
MPAI13	.67						
MPAI1	.62						
MPAI9	.52						
MPAI21	.51					-.43	
MPAI20		.79					
MPAI12		.75					
MPAI22		.70				-.32	
MPAI26		.61				-.41	
MPAI4		.59					
MPAI27			.80				
MPAI28			.76				
MPAI29			.61	.32			
MPAI14	.39		.58				
MPAI15	.32		.56	.30			
MPAI8				.87			
MPAI11				.84			
MPAI23					.89		
MPAI24					.71		
MPAI19				.49	.70		
MPAI6				.52	.61		
MPAI16						.76	
MPAI15	.35					.60	
MPAI25							.78
MPAI7	.31					.39	.47
Eigenvalue	7.36	2.78	2.36	1.84	1.55	1.21	1.03
% Var	25.4	9.6	8.1	6.3	5.3	4.2	3.5
Cum %	25.4	35.0	43.1	49.5	54.8	59.0	62.5

Only loadings > .30 reported

Table 11 Principal Axis Factoring with Varimax Rotation

Items	1	2	3	4	5	6
MPAI2	.77					
MPAI18	.65					.37
MPAI13	.63					
MPAI10	.63					
MPAI17	.62					
MPAI3	.62					
MPAI1	.54					
MPAI19	.48					
MPAI21	.43					.32
MPAI7	.32					
MPAI25						
MPAI27		.75				
MPAI28		.66				
MPAI14	.38	.56				
MPAI29		.49				
MPAI15	.30	.48				
MPAI23			.82			
MPAI19			.73	.43		
MPAI24			.60			
MPAI6			.58	.46		
MPAI11				.85		
MPAI8				.80		
MPAI20					.71	.48
MPAI22					.69	
MPAI12					.60	.44
MPAI26					.58	
MPAI4					.40	.35
MPAI16						.63
MPAI15	.31					.52
Eigenvalue	6.92	2.42	1.90	1.35	1.02	.90
% Var	23.9	8.3	6.5	4.7	3.5	3.1
Cum %	23.9	32.2	28.8	43.4	46.9	50.0

Only loadings >.30 reported

Table 12

Alpha Factoring with Varimax Rotation

Items	1	2	3	4	5	6	7
MPAI2	.78						
MPAI18	.66					.32	
MPAI10	.65						
MPAI17	.63						
MPAI13	.62						
MPAI3	.61						
MPAI1	.53						
MPAI9	.49						
MPAI21	.42					-.32	
MPAI7	.31					.30	
MPAI20		.77				.35	
MPAI22		.66					
MPAI12		.64				.32	
MPAI26		.53					
MPAI4		.47					
MPAI11			.81				
MPAI8			.78				
MPAI23				.83			
MPAI19			.47	.70			
MPAI24				.59			
MPAI6				.57			
MPAI27					.72		
MPAI28					.66		
MPAI14	.40				.55		
MPAI29					.50		
MPAI15	.31				.48		
MPAI16						.67	
MPAI15	.34					.49	
MPAI25							.40
Eigenvalue	6.86	2.16	2.08	1.41	1.02	.78	.49
% VAR	23.7	7.4	7.2	4.9	3.5	2.7	1.7
Cum %	23.7	31.1	38.3	43.1	46.7	49.3	51.0

Only loadings > .30 reported

The sharp drop from the first to the second factor (7.36 to 2.78; 6.92 to 2.42; 6.86 to 2.16 respectively) eigenvalue in all of the factor solutions suggests that there is actually only one dimension to fetal attachment. The other factors may represent a more specific variance component rather than dimensions of fetal attachment. A review of the item groupings by factor tends to support this conclusion. The first factor appears to encompass several feelings, activities, and ideas about the fetus that could be described as attachment to the fetus. It is a general factor. While factor III is specific to fetal movement, movement items also appear in other factors. Factor IV contains the only two items that refer to the partner. Their grouping may indicate that reference to the partner is not as pertinent to the fetal maternal relationship as it is to the partner maternal relationship.

Limitations of the Study

Two thirds of the women in this study were clients of midwives. This particular characteristic may influence their responses. The choice of a midwife is a choice away from the usual health care provider for pregnancy. The women were all volunteers, however, only five women refused to accept the packet when first approached, and only 8% of the women taking the packets did not return them.

There are several other constructs, explored in previous fetal attachment research, which were not considered in this study. Their inclusion may have contributed further evidence for MPAI validity. The subjects' relationships with their mothers and remembrances of attachments as children may have been particularly pertinent.

Summary

Analysis of the scores of 310 pregnant women who completed the Müller Prenatal Attachment Inventory and five other instruments provides support for the validity and reliability of the MPAI. MPAI and MFAS scores were found to be strongly correlated. Fetal attachment had a small negative relationship with loneliness and a positive relationship with adjustment to pregnancy. There was no support for the predicted relationship between marital satisfaction and fetal attachment whether it was measured by the MPAI or the MFAS.

Chapter 5

Summary and Conclusions

This study involved the development and testing of the Müller Prenatal Attachment Inventory, an instrument to measure fetal attachment that can be used confidently by researchers developing the fetal attachment knowledge base. The MPAI was created from the rich descriptive pregnancy literature to ensure that the items are true to women's stated experience of the fetus during pregnancy.

A predictive model of attachment and its effect on adaptation to pregnancy and fetal attachment served as the theoretical framework for this study. Loneliness was identified as the emotion that occurs in the absence of an attachment figure. Instruments that operationalized selected constructs from the Predictive Attachment Model were chosen to provide evidence of validity for the MPAI. Another instrument developed to measure fetal attachment, The Maternal Fetal Attachment Scale (MFAS) was included in this study for comparison with the MPAI. In addition, demographic data about the subjects were gathered.

Research packets containing these instruments were distributed to 336 pregnant women who were recruited from prenatal clinics, private midwifery and obstetric practices, and childbirth preparation classes. Three

hundred and ten women returned their packets for a return rate of 92%. The subjects were mainly white, married, well educated, employed and from families with an income over \$30,000. Only a minority of the subjects knew the gender of their fetuses as a result of prenatal testing, and over half were expecting their first baby.

The initial evidence for the validity of the MPAI resulted from the reviews of an eleven member expert panel. These theoreticians, nurses and pregnant women agreed that 29 of the items submitted to them were relevant to maternal fetal attachment. Agreement by experts with these different perspectives support the validity of the final items. The validity of the MPAI was further supported by the correlation of the MPAI with the MFAS ($r=.72$) which was also developed to measure fetal attachment and has been used by many researchers.

The results of correlation analysis revealed that fetal attachment as operationalized by the MPAI and MFAS was positively correlated to general adjustment to and attitudes toward pregnancy as operationalized by the Maternal Adjustment and Maternal Attitudes Scale (MAMA) and specific dimensions of this scale, body image, attitudes toward sex, and attitudes toward pregnancy and the baby. Prenatal attachment was also correlated with gestational age and the subjects' declaration of happiness with the

pregnancy. A low but significant negative correlation was found between MPAI scores and scores of the UCLA loneliness scale, indicating that as feelings of loneliness decrease, feelings of attachment to the fetus increase. Maternal age also demonstrated a small but significant negative correlation with prenatal attachment. No correlation was found between prenatal attachment and marital satisfaction as measured by the Kansas Marital Satisfaction Scale (KMSS) or the attitudes to the marital relation scale of the MAMA. Somatic symptoms and number of previous children also had no correlation with prenatal attachment.

Two indicators of reliability were computed. The Cronbach's alpha for the entire MPAI was .81. After items with low item-scale correlations were removed from the instrument, the Cronbach's alpha rose to .85. Coefficient theta, derived from the outcome of a principal components analysis, was .89.

Factor analysis did not support the idea that maternal fetal attachment is a multi-dimensional construct. While the common factors solution did result in six factors, there was a sharp drop from the first factor eigenvalue of 6.92 to the next eigenvalue of 2.42. The remaining eigenvalues gradually decreased. This same pattern was noted in the principal components and alpha solutions. Careful examination of the loadings of the items on the

factors revealed ten items that did not load cleanly on the factors. Four of these items had been identified as poor through the examination of the item-scale correlations performed in the calculation of Cronbach's alpha. These four items were deleted from the instrument when the revised alpha of .85 was calculated. However, because of the weak evidence for the significance of the factors, the other items were not removed during the revised calculations of internal consistency.

The alpha coefficients of the MPAI for all subjects (.8083), the subset of minority subjects (.8163), and the subset of white-anglo subjects (.7993) were very consistent. This is contrasted to the results for the MFAS which appeared to be more sample dependent. Alpha on the MFAS for the minority subjects was .8676 while for the white-anglo subjects, it was .7634.

Conclusions

The following conclusions can be reached as a result of this study: 1. there is evidence that the MPAI can validly and reliably measure prenatal attachment, 2. there is evidence that the predicted relationships between fetal attachment and adjustment to pregnancy and loneliness do exist, 3. there is evidence that the predicted relationships between marital satisfaction and adjustment

to pregnancy and loneliness exist, 4. there is evidence that the marital relationship influences a woman's attachment to her fetus only as it impacts adjustment to pregnancy, 5. there is no substantial evidence that fetal attachment is a multi-dimensional construct.

Discussion

The purpose of this study was to develop and test an instrument and not specifically to test the propositions of fetal attachment theory. The results of any study must however be considered in the context of the theoretical framework of the study. In addition to providing information about the performance of the MPAI, the results of this study also support links of the Predictive Attachment Model and support findings from previous fetal attachment research.

The finding that MPAI scores increase as loneliness decreases ($r=.13$, $p<.05$) was predicted in the model. The small size of the relationship is not surprising in view of Marris' (1982) contention that attachment for the adult provides feelings of comfort and security. The fetus may be able to meet the mother's comfort needs, but security needs are more likely to be met by another adult. The strong correlation between loneliness and marital satisfaction as measured by the KMSS ($r=.36$, $p<.001$) and

the attitudes toward the marital relation scale of the MAMA ($r=.36$, $p<.001$) support the importance of another adult in providing the attachment needs of the subjects.

The Predictive Attachment Model indicated that marital satisfaction, as measured by the KMSS and the attitudes toward the marital relation scale of the MAMA, would be moderately correlated with fetal attachment as measured by the MPAI and MFAS. This relationship was not found to exist. Weaver and Cranley (1983) found a positive correlation between marital satisfaction and fetal attachment in a group of 100 men. Men experience the fetus through their partner and are therefore more dependent on a positive relationship with their partner in order to learn about their unborn children. Since each woman experiences the fetus "first hand", she is able to form an attachment independent of the other relationships in her life.

However, Cranley (1984) also found positive correlations between MFAS scores and marital satisfaction (as measured by the Spanier Dyadic Adjustment Scale) for both partners of 326 Wisconsin couples. This contradiction to the results of this study may be due to the use of a different marital satisfaction instrument by Cranley. Contradictions such as this one consistently plague fetal attachment research and indicate the need for repeated testing of the relationship between marital satisfaction and attachment to the fetus.

The positive relationships between fetal attachment and adjustment to pregnancy, body image, attitudes toward pregnancy and the baby and stated maternal feelings of happiness about the pregnancy were predicted by the attachment model and pregnancy theory. Rubin (1984) explained that in order to have a positive regard for the fetus, the woman must first see herself in a positive light. Body image is just one aspect of this image of self.

As in many previous studies (Lobiondo-Wood, 1985; Phipps & Zinn, 1986; Reading, Cox, Sledmere, & Campbell, 1984; Vito, 1986), fetal attachment scores increased as gestation progressed. The correlation in this sample was small ($r=.14$, $p<.05$) which may reflect the fact that all but eight of the subjects were greater than 20 weeks at the time they completed the MPAI and had already experienced the "turning point" of quickening. The MFAS scores had an even greater relationship with gestational age ($r=.28$, $p<.01$). This suggests that the MFAS contains more items which reflect specific activities associated with the latter part of pregnancy. Given the MFAS response choices of definitely no to definitely yes, the women in the first part of pregnancy may have few items on the MFAS that are appropriate for yes answers.

No relationship was found between the number of previous children and either MPAI or MFAS scores. This finding supports attachment as a feeling about an individual which can and should be separated at least to some extent from the woman's perception of herself as a mother. One would expect that if attachment was dependent on feelings of competence as a mother or even the desire to be a mother, there would be stronger feelings of attachment in those women who had previous experience as mothers.

Lumley (1977, 1980, 1982) described women who attached early to their fetus as having few negative symptoms of pregnancy. There was no correlation between MPAI scores and symptoms in this sample. These women were all over 14 weeks gestation, the point at which the most severe symptoms of nausea start to resolve, and this may account for the difference. However, LoBiondo-Wood (1985) tested women on three occasions prior to 26 weeks gestation and also found no correlation between attachment and symptoms. This supports the idea that a woman can separate her perception of the fetus from the negative physical symptoms associated with its presence.

The negative relationship between maternal age and both MPAI and MFAS scores was not anticipated. Kemp and Page (1987) found no relationship between age and fetal attachment. Maternal age did not enter into the regression

equation Reading et. al. (1984) found to best predict attachment. The results may be specific to this sample which included a large percentage of older women. These women were more educated and were likely to work outside the home. This involvement in work may limit the amount of time the women have to think about or interact with their fetuses. It may be that as one gets older, one is less likely to form attachments to others as quickly. Further exploration of this finding is necessary before explanation can proceed beyond the merely speculative notions presented here.

Analysis of variance found no difference in MPAI scores based on maternal knowledge of fetal gender. This finding supports similar data from Grace (1984). That this particular piece of knowledge is not pertinent to the development of attachment indicates that the women in the study were not particularly influenced by fetal gender. The results may have been very different in a sample composed only of women from a culture placing a high value on children of a particular gender.

The results of MPAI reliability testing have been very promising. The correlation between the MPAI and the MFAS ($r=.72$, $p<.001$) suggests that there is equivalence. There is reason to criticize the independent use of MFAS subscales and question its applicability to men. The MFAS

development process provided evidence for item validity, and women have responded positively to them. The area of nonconcurrence between MPAI and MFAS scores may indicate that the more rigorous MFAS development process produced a more valid measure of fetal attachment. The consistency of alpha coefficients for the MPAI across the subsets of the sample compared to the variations for the MFAS indicates that the MPAI is also less sample dependent.

A Cronbach's alpha coefficient of .81 prior to any adjustment of the MPAI is acceptable for a new instrument (Nunnally, 1978). The item-scale correlations were reviewed to determine which items had correlations of less than .30, indicating these items may not be as strongly related to the construct being measured by the rest of the items. The deletion of nine items with low correlations increased the alpha to .85. However, if the adjusted MPAI is administered to another sample of pregnant women, the alpha may not reach .85. The responses to the 20 "stronger" items were influenced by the nine items which had poor item-scale correlations. Their deletion would affect the responses to the other 20 items. Only further testing of the instrument can reveal the true effect of instrument adjustment.

As discussed in Chapter 4, adjustment of the instrument must also be based on theoretical as well as empirical considerations. Thus only three items (4, 12, and 29) will be deleted before the MPAI is administered again (see appendix D for the adjusted MPAI). Because there was no correlation between marital satisfaction and fetal attachment, the two items referring to the partner will be reworded to refer simply to others. This rewording also increases the applicability of the MPAI in a society where an increasing number of pregnant women are without partners.

Item 19 will be rewritten to clarify the meaning of "get hurt" by using the words "feel physical pain." Finally, item 6 "I enjoy feeling the baby move" had a poor item-scale correlation. However, clinical experience suggests that enjoyment is pertinent for some women while reassurance may be pertinent to others. To clarify this issue, another item, "I am reassured when I feel the baby move" will be added to the MPAI.

The coefficient theta of .89 was based on the outcome of the Principal Components analysis. This coefficient does not assume that the items are all Tau equivalent and may indicate the upper level of the reliability of the MPAI.

Implications for Nursing Practice

Whenever a research study is conducted that may impact patient care, there is a temptation to make suggestions to the practicing nurse for changes in nursing care. One example is the recent review of the fetal attachment research (Gaffney, 1988) which suggests that nursing care be altered to provide additional social support to pregnant women. In fact, as described in Chapter 1, even before substantive results from research about the effects of fetal attachment have been published, popular books and newspaper articles are prescribing activities for pregnant women to improve their attachment to the fetus (Verny, 1981; Bowen, 1984).

While the results of the current study support some of the findings of previous research, it is still too early to promote particular activities for pregnant women. It is even too early to identify which scores on fetal attachment instruments indicate the need for intervention. So far researchers have been unable to positively link prenatal attachment scores with postnatal maternal behaviors or feelings of attachment. The results of this study are also in conflict with data from previous studies and were not supportive of all aspects of the Predictive Attachment Model. Further research is necessary before it can be determined what the exact nature of maternal fetal

attachment is and what, if any, impact fetal attachment has on the mother's continuing relationship with her child.

The impact of advice about fetal attachment on the well being of the pregnant women may have negative as well as positive results. Books such as Verny's (1981) and Bowen's (1984) prescribe thoughts, feelings and activities for the pregnant woman. The authors suggest that an exemplary relationship with the fetus and child will result. An added benefit is also promised, a psychologically healthy child. These same authors point to the negative consequences that result from maternal ambivalence, anger, or fear as depicted by this passage from Verny (1981): "Whether his mind evolves into something essentially hard, angular and dangerous or soft, flowing and open depends largely on whether [the mother's] thoughts and emotions are positive and reinforcing or negative and etched with ambivalence" (p.29). This sentence contains the seeds for maternal stress, disappointment and self-blame. It appears in a book aimed specifically at pregnant women and sold in retail bookstores. Unfortunately, nothing has been published for the lay public to help the reader put Verny's statement in perspective.

It behooves the serious researcher in fetal attachment to identify the exact nature of the mother's attachment and its impact on her child's psychological development.

Research findings should be communicated not only to research peers, but also to the population most concerned with this issue, pregnant women.

In the meantime, the potential dangers to women must be recognized by health practitioners. Until more is known, women should be reassured that their individual style and level of attachment is appropriate.

Future Research

Three items will be deleted from the MPAI prior to its next use. These are: 4. "I just want the baby to be healthy"; 12. "I wish I could stop carrying the baby around for a little while"; and 29. "I feel silly talking to the baby". Three items will be rewritten to improve their performance and remove confounding meanings. These are: 8. "I put my partner's hand on my abdomen to feel the baby move", which will be rewritten as "I allow other people to put their hands on my abdomen to feel the baby move"; 11. "I tell my partner what the baby does inside me" which will be rewritten as "I tell others what the baby does inside me"; and 19. "I get hurt when the baby kicks me", which will be rewritten as "I feel physical pain when the baby kicks me". One item will be added to the MPAI, "I am reassured when I feel the baby move."

The revised MPAI should be administered again in that form. Future samples should include younger women as well as those from the first half of pregnancy in order to determine the range of scores for women in these categories. Including women at all gestational ages will provide data to confirm the development of fetal attachment over the course of pregnancy and the current findings regarding somatic symptoms.

Longitudinal studies in which MPAI scores are obtained at various points in pregnancy would confirm the findings of Vito (1986) and provide evidence for the natural progression of attachment to the fetus over the course of pregnancy. The natural progression of this line of research includes measurement of postnatal attachment as the final data collection point. A postnatal attachment inventory developed in a manner similar to the MPAI would allow for a clear comparison and correlation of pre and postnatal attachment scores.

The group means for the specific ethnic subsets also indicate that larger numbers of women from these subsets should be included in later studies to determine the range of their scores. Results from these different populations can contribute further to an understanding of the nature of maternal fetal attachment. If further studies confirm significant score differences, descriptive studies of the

maternal experience of the fetus in other cultures will be appropriate.

The Predictive Attachment Model may be tested again using different measures of marital satisfaction. Another test of the model would be measurement of attachment to parents and friends. This information could help to explain the exact relationship between marital satisfaction and maternal fetal attachment. It could also help to classify fetal attachment as similar to or different from the attachments formed with adults.

Additional variables should be included in future studies. As social support has been tested frequently in relation to fetal attachment with contradictory results, it should certainly be examined in further studies using the MPAT. In all cases, consistent use of the same instruments provides a base for comparison.

Final Comments

There is much interest in the phenomenon of fetal attachment among lay persons as well as clinical nurses and nurse researchers. The potential for improving a woman's relationship with her child exists as does the potential for raising maternal stress levels, blaming women for their children's negative traits, and misusing health care technology. Research findings are needed and should be

carefully communicated to all concerned parties. Valid and reliable measures can contribute to the generation of these research findings, and this study has demonstrated the evidence for the validity and the reliability of the Müller Prenatal Attachment Inventory.

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Appendix A

The Müller Prenatal Attachment Inventory

The following sentences describe thoughts, feelings, and situations women may experience during pregnancy. We are interested in your experiences with these thoughts, feelings, and situations during the past month. Please put a circle around the letter under the word that applies to you.

	almost always	often	sometimes	almost never
1. I dream about the baby	a	b	c	d
2. I wonder what the baby looks like now	a	b	c	d
3. I imagine calling the baby by name	a	b	c	d
4. I just want the baby to be healthy	a	b	c	d
5. I worry that I might do something to hurt the baby	a	b	c	d
6. I enjoy feeling the baby move	a	b	c	d
7. I think that my baby already has a personality	a	b	c	d
8. I put my partner's hand on my abdomen to feel the baby move	a	b	c	d
9. I believe that things I do make a difference to the baby	a	b	c	d
10. I plan the things I will do with my baby	a	b	c	d
11. I tell my partner what the baby does inside me	a	b	c	d
12. I wish I could stop carrying the baby around for a little while ..	a	b	c	d
13. I imagine what part of the baby I'm touching	a	b	c	d
14. I know when the baby is asleep	a	b	c	d
15. I can make my baby move	a	b	c	d
16. I think I have given up a lot for the baby	a	b	c	d
17. I buy/make things for the baby	a	b	c	d
18. I feel love for the baby	a	b	c	d
19. I get hurt when the baby kicks me	a	b	c	d
20. I'm tired of having the baby in me	a	b	c	d
21. I try to imagine what the baby is doing in there	a	b	c	d
22. I like to sit with my arms around my abdomen	a	b	c	d
23. I think the baby moves too much	a	b	c	d
24. I know why the baby is moving	a	b	c	d
25. I stroke the baby through my abdomen	a	b	c	d
26. I share secrets with the baby	a	b	c	d
27. I know the baby hears me	a	b	c	d
28. I get very excited when I think about the baby	a	b	c	d
29. I feel silly talking to the baby	a	b	c	d

Appendix B
Demographic Questionnaire

Directions: Please fill in the blanks or circle the letter that applies to you. You can decline to answer any of these questions.

Today's date is_____

What is your due date?_____

How old are you?_____

How many children do you have at home?_____

Do you work outside the home? Yes_____ No_____ If the answer is yes, what is your occupation?_____

What is your family's yearly income?

- a. less than \$10,000
- b. \$10,001 to 20,000
- c. \$20,001 to 30,000
- d. \$30,001 to 50,000
- e. over \$50,000

What is your ethnic identification?

- a. asian
- b. black
- c. hispanic
- d. native american
- e. white
- f. other

What is your marital status?

- a. single
- b. living with a partner
- c. married
- d. divorced
- e. widowed

How many years of school have you completed?_____

<u>1 2 3 4 5 6 7 8</u>	<u>9 10 11 12</u>	<u>13 14 15 16</u>	<u>17 18 19 20</u>
grade school	high school	college	graduate school

How do you feel about being pregnant now?

- a. very happy
- b. happy
- c. not happy or unhappy
- d. unhappy
- e. very unhappy

Some women have tests during pregnancy (amniocenteses or chorionic villus sampling) and learn the sex of their baby. Do you know the sex of your baby? Yes_____ No_____

If you know the sex of your baby, is it a boy_____ or a girl_____?

Appendix C
ANOVA Tables
Dependent Variable is MPAT Score

Analysis of Variance With Summary Data
Factor = Ethnicity

Factors	N	Mean	S.D.
All Subjects	308*	83.31	10.17
Asians	43	83.75	10.44
Blacks	18	90.38	10.03
Latinas	26	86.42	10.33
Native Americans	3	98.33	10.12
Whites	209	82.16	9.61
Others	9	79.75	12.01

* Missing = 2

Source	df	SS	MSS	F	P
Between Subjects	307	31738.08			
Between Groups	5	2227.08	445.42	4.56	0.0005
Within Groups	302	29511.00	97.72		

Post Hoc Tests for Ethnicity

Comparison	Scheffe'
1 < 2	
1 < 3	
1 < 4	
1 > 5	
1 > 6	
2 > 3	
2 < 4	
2 > 5	0.0452
2 > 6	
3 < 4	
3 > 5	
3 > 6	
4 > 5	
4 > 6	
5 > 6	

Analysis of Variance With Summary Data
Factor = Income

Factors	N	Mean	S.D.
All Subjects	292*	83.22	10.03
< \$10,000	19	84.95	10.97
\$10,000-\$20,000	40	85.55	8.41
\$20,000-\$30,000	57	82.33	9.21
\$30,000-\$50,000	88	83.88	10.91
> \$50,000	88	81.70	9.98

* Missing = 18

Source	df	SS	MSS	F	P
Between Subjects	291	29250.30			
Between Groups	4	559.94	139.98	1.40	0.2322
Within Groups	287	28690.36	99.97		

Analysis of Variance With Summary Data
Factor = Site

Factors	N	Mean	S.D.
All Subjects	308*	83.31	10.17
Prenatal Clinic	30	85.96	8.26
Midwifery Practice	107	83.51	9.94
Midwifery Clinic	101	80.78	10.00
Childbirth Class I	5	82.60	9.04
Childbirth Class II	54	85.04	11.00
Obstetric Practice	11	89.17	10.73

* Missing = 2

Source	df	SS	MSS	F	P
Between Subjects	307	31738.08			
Between Groups	5	1402.34	280.47	2.79	0.0174
Within Groups	302	30335.73	100.45		

Post Hoc Tests for Site

Comparison	Scheffe'
1 > 2	
1 > 3	
1 > 4	
1 > 5	
1 < 6	
2 > 3	
2 > 4	
2 < 5	
2 < 6	
3 < 4	
3 < 5	
3 < 6	
4 < 5	
4 < 6	
5 < 6	

Analysis of Variance With Summary Data
Factor = Knowledge of Baby Gender

Factors	N	Mean	S.D.
All Subjects	307*	83.32	10.18
No Knowledge	244	84.05	10.22
Having Male	39	84.04	8.29
Having Female	24	84.85	12.57

* Missing = 3

Source	df	SS	MSS	F	P
Between Subjects	306	31735.85			
Between Groups	2	94.39	47.19	0.45	0.6385
Within Groups	304	31641.47	104.08		

Analysis of Variance With Summary Data
Factor = Marital Status

Factors	N	Mean	S.D.
All Subjects	308*	83.31	10.17
Single	18	84.59	7.85
Living with Partner	26	85.57	10.46
Married	260	83.08	10.27
Divorced	4	77.75	10.78

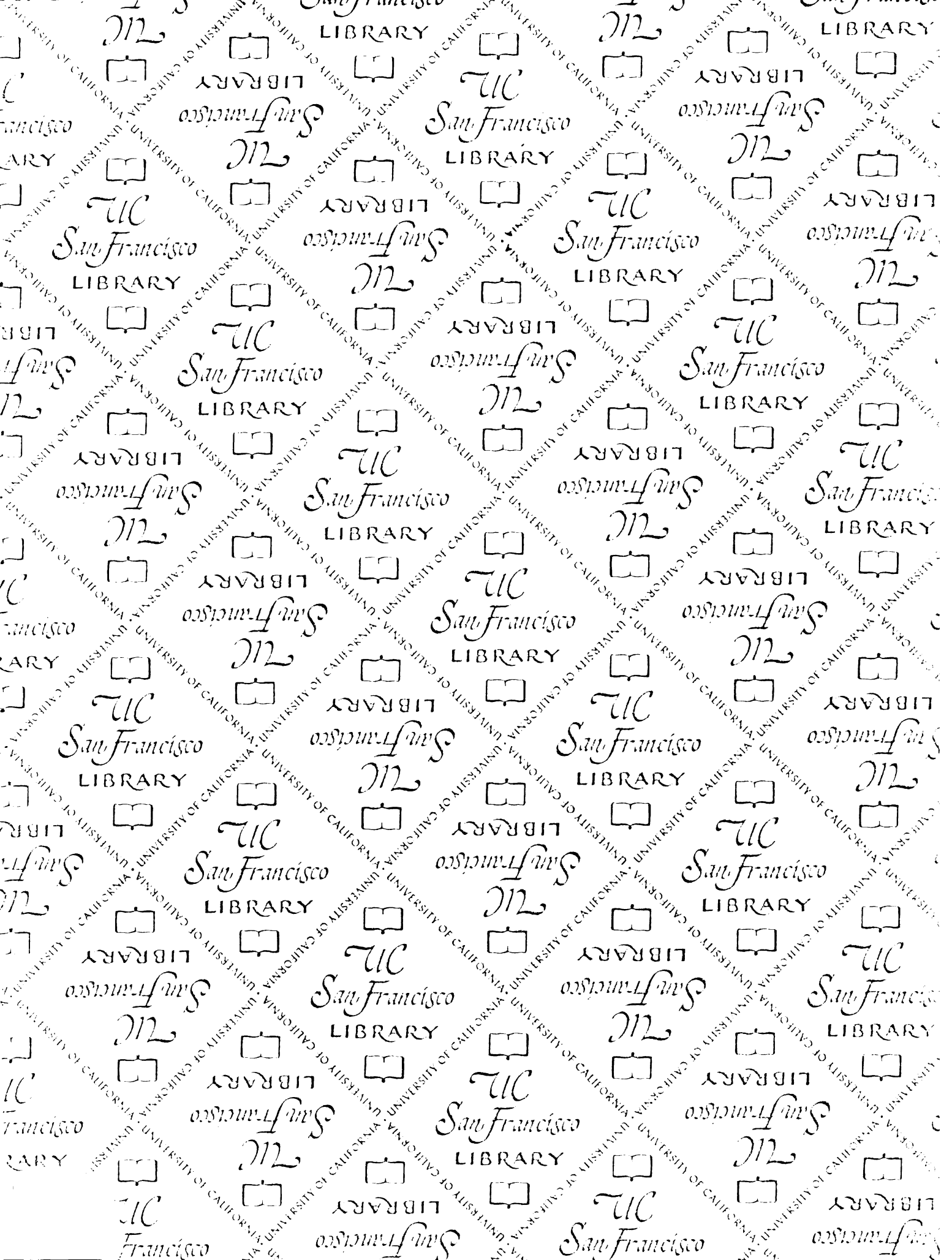
* Missing = 2

Source	df	SS	MSS	F	P
Between Subjects	307	31738.08			
Between Groups	3	299.81	99.94	0.97	0.4140
Within Groups	304	31438.27	103.42		

Appendix D
Revised Müller Prenatal Attachment Inventory

The following sentences describe thoughts, feelings, and situations women may experience during pregnancy. We are interested in your experiences with these thoughts, feelings, and situations during the past month. Please put a circle around the letter under the word that applies to you.

	almost always	often	sometimes	almost never
1. I dream about the baby	a	b	c	d
2. I wonder what the baby looks like now	a	b	c	d
3. I imagine calling the baby by name	a	b	c	d
4. I worry that I might do something to hurt the baby	a	b	c	d
5. I enjoy feeling the baby move	a	b	c	d
6. I think that my baby already has a personality	a	b	c	d
7. I allow other people to put their hands on my abdomen to feel the baby move	a	b	c	d
8. I believe that things I do make a difference to the baby	a	b	c	d
9. I plan the things I will do with my baby	a	b	c	d
10. I tell others what the baby does inside me	a	b	c	d
11. I imagine what part of the baby I'm touching	a	b	c	d
12. I know when the baby is asleep	a	b	c	d
13. I can make my baby move	a	b	c	d
14. I think I have given up a lot for the baby	a	b	c	d
15. I buy/make things for the baby	a	b	c	d
16. I feel love for the baby	a	b	c	d
17. I feel physical pain when the baby kicks me	a	b	c	d
18. I'm tired of having the baby in me	a	b	c	d
19. I try to imagine what the baby is doing in there	a	b	c	d
20. I like to sit with my arms around my abdomen	a	b	c	d
21. I think the baby moves too much	a	b	c	d
22. I know why the baby is moving	a	b	c	d
23. I stroke the baby through my abdomen	a	b	c	d
24. I share secrets with the baby	a	b	c	d
25. I know the baby hears me	a	b	c	d
26. I get very excited when I think about the baby	a	b	c	d
27. I feel reassured when I feel the baby move	a	b	c	d





FOR REFERENCE

NOT TO BE TAKEN FROM THE ROOM



CAT. NO. 23 012

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