A Questionnaire to Measure Mother-to-Infant Attachment

Mary E. Müller, PhD, RN

The Maternal Attachment Inventory (MAI) was developed and tested to provide a practical measure of maternal affectionate attachment. MAI items were identified from the literature, and their construct validity was assessed by experts who numerically rated them for relevance. The MAI, two other indicators of maternal attachment, and a measure of maternal adjustment were completed by 196 women approximately 1 month after the birth of their infants. Two subgroups of women completed the research instruments when their infants were 4 (Group A) or 8 (Group B) months old. The MAI demonstrated evidence of validity through significant correlations with other indicators of maternal attachment (the How I Feel About the Baby Now Scale and the Maternal Separation Anxiety Scale) at all time points and a correlation with maternal adjustment as measured by the Maternal Attitudes and Maternal Adjustment Scale. The MAI also demonstrated evidence of acceptable internal consistency reliability at all three time points.

A mother's affectionate attachment to her infant is recognized as a major contributor to the child's healthy growth and development (Koniak-Griffin, 1993). Disturbed attachments have been implicated in the development of dysfunctional parent-child relationships (Bates & Bayles, 1988). In addition, the child's initial attachment experiences lay the foundation for the development of all subsequent attachments (Bowlby, 1988; Bretherton, 1985). Thus, authors of clinical texts and journal articles encourage maternal-child nurses to observe and promote the development of maternal-infant attachment, and clinical researchers explore the development and correlates of mother-to-infant affectionate attachment.

In most studies, maternal attachment has been operationalized as observed maternal behaviors (Carson & Virden, 1984; Carter-Jessop, 1981; Davis & Akridge, 1987; Schroeder-Zwelling & Hock, 1986; Tulman, 1985, 1986) or as mother-infant interaction scores (Fuller, 1990). Less frequently, attachment has been measured by questionnaires regarding maternal perceptions of or feelings about her infant (Mercer, 1985; Mercer & Ferketich, 1990).

From the Riverside Methodist Hospitals (M. E. Müller).

In spite of these measurement options, including maternal affectionate attachment as a research variable of interest can be difficult. Obtaining a representative sample of observed behaviors or interactions is time-consuming, requires trained assistants, is logistically complicated, and is expensive. In addition, there are questions about the validity of behaviors or interactions as indicators of maternal affectionate attachment (Beal, 1991; Brazelton & Cramer, 1990; Gross, Conrad, Fogg, Willis, & Garvey, 1993). Thus the development and testing of a questionnaire designed to measure maternal affectionate attachment would render the inclusion of this variable more feasible, particularly in the clinical setting. This article reports on the development of such an instrument, the Maternal Attachment Inventory (MAI), and its testing over the first 8 months following birth.

CONCEPTUAL BASIS OF THE MAI: ATTACHMENT THEORY

Maternal affectionate attachment was defined for this study as the unique, affectionate relationship that develops between a woman and her infant and persists over time. A corollary to this definition is the notion that affectionate attachment is just one element of maternal role adaptation.

Attachment theory postulates that certain inborn behaviors (such as crying, reaching, and smiling) in human neonates are exhibited in order to bring a protective, nurturing attachment figure into close proximity (Bowlby, 1982). This closeness provides the infant with security and gratification, and serves as the blueprint or internal representation for all later attachment relationships. The human adult also exhibits behaviors in response to the infant's attachment behaviors. These reciprocal behaviors contribute to the complex interactions between the adult and infant that ultimately result in the development of the long-standing, complex relationship referred to as an attachment.

Attachment relationships are built over the life span according to the internal representations developed during infancy (Bretherton, 1985; Henderson, 1982). People wish to be close to their attachment figures, particularly at times of stress or illness. The other side of the attachment coin is separation anxiety. Throughout life, people experience some level of distress, or separation anxiety, when fearing or experiencing separation from their attachment figure (Henderson, 1982).

Women first develop an attachment to their children during pregnancy (Cranley, 1981; Rubin, 1984), and the quality and intensity of the attachment increase with the progression of pregnancy. The development of an affectionate attachment to the infant is a key element of a woman's attainment of the maternal role (Mercer, 1985), sometimes referred to as maternal adaptation. This maternal adaptation process begins during pregnancy simultaneously with the development of attachment to the fetus (Kumar, Robson, & Smith, 1984). Thus the developing prenatal attachment may contribute to the development of other elements of adaptation such as childcare skills and taking pleasure in being a mother.

After birth, a mother interacts with her real child and compares the real child with her experience of the fetus and her fantasies (Rubin, 1984). Mothers have been

noted to exhibit characteristic, maternal attachment behaviors during the early postpartum period (Klaus & Kennell, 1982; Rubin, 1984). As proposed by attachment theory, mothers also exhibited separation anxiety at the thought of leaving their infants (Hock, McBride, & Gnezda, 1989).

MEASUREMENT OF MATERNAL ATTACHMENT

Maternal affectionate attachment has been most frequently measured by observing the rate or pattern of maternal "attachment" behaviors. These behaviors were identified from the literature as being exhibited by mothers during the first daysfollowing delivery (Carson & Virden, 1984; Carter-Jessop, 1981). There are threats to the validity of this approach.

Behavior assessment is usually conducted during the mother's hospitalization, a period of convalescence away from her usual environment. Most women are experiencing some pain, lack of sleep, and concern about the home situation. In addition, behavioral measures make no provision for maternal behavioral style, previous experience with children, or cultural/regional behavior variations. Thus although the measure interprets these behaviors in terms of attachment, they may only be indicators of fatigue, pain, or cultural differences.

Brazelton and Cramer (1990) warned that behaviors and single interactions between mother and child may not be indicative of the maternal feelings or mental interpretation of her actions, unless the behavior is repeated over time and constitutes a pattern. Persons not related to the newborn infant were also noted to follow patterns of behavior previously labeled as "maternal attachment" when first holding infants (Tulman, 1985). Finally, recent research has indicated that one of the most frequently used interaction scales for measuring maternal attachment (the NCAST [Nursing Child Assessment Teaching Scale]) "is more sensitive to cognitive rather than affective qualities underlying the mother-child relationship" (Gross et al., 1993, p. 264). Thus, attitude questionnaires that directly measure maternal attitudes and feelings may provide more valid information about those attitudes and feelings.

An attitude questionnaire, 10 items about parental feelings about the baby (How I Feel About the Baby Now, or HIFBN), was developed by Leifer (1977) and has been used in pregnancy and maternal adaptation research. Evidence for the validity of the HIFBN was supported in this research, but the reliability coefficients for the HIFBN have ranged from fair to poor (Mercer, 1986) to good (Mercer & Ferketich, 1990). The variability of reliability scores has limited the usefulness of the HIFBN.

DEVELOPMENT OF THE MAI

Items for the MAI were obtained from a thorough review of the attachment and maternal adaptation literatures. Examples of statements found in the literature are: "I look forward to being with my baby" and "I want my baby to trust me." Fifty-

one items were identified and submitted to a group of 12 experts to quantify construct validity (Lynn, 1986). The expert panel consisted of theoreticians, postpartum and neonatal nurses, and women who had young infants. This large, broad-based panel was chosen for the variety of perspectives that would be brought to the validity quantification process (Crocker & Algina, 1986). Theoreticians were chosen for their understanding of the concept *mother-infant attachment*. Health care practitioners were chosen because of their experiences of caring for mothers and infants. New mothers were included because they offered the unique perspective of those forming an attachment to a new baby. The variety of experts also served as a check against including jargon or unfamiliar words in the items.

Each member of the expert panel scored each item according to its relevance to maternal affectionate attachment: 1 = not relevant; 2 = much revision needed, hard to assess relevance; 3 = needs minor revision; 4 = relevant (Lynn, 1986). Because more than two experts evaluated the validity of proposed items, a content validity index (Waltz, Strickland, & Lenz, 1991) was not computed. Rather, a mean of the 12 ratings was calculated and served as the basis for the inclusion decision rule. Those items with a mean score less than 3.5 were excluded. The resulting instrument contained 31 items. Examples of MAI items include: "I look forward to being with my baby," "I want my baby near me," and "My thoughts are full of my baby."

Administration and Scoring

The MAI was designed to be self-administered, so the vocabulary required a fourth-grade reading level, and instructions were provided at the top of the questionnaire. A 4-point scale (a = almost always, b = often, c = sometimes, d = almost never) comprised the response set for the MAI. Three items in the MAI as tested were reverse scored. For score calculations, at data entry the letters were converted to numbers (a = 4, b = 3, c = 2, d = 1), and all items summed for a total score. The higher the total, the higher the maternal affectionate attachment to the infant. The possible range of scores was 31 to 124.

TESTING THE MAI, PHASE I

Instruments

The MAI was administered to new mothers in conjunction with other instruments to provide concurrent, convergent evidence that the MAI "...is coherently related to other measures of the same construct as well as to other variables that it should relate to on theoretical grounds" (Messick, 1980, p. 1016). The first, the HIFBN, was mentioned earlier. This 10-item instrument produced evidence for its validity as a measure of maternal attachment during its development and in previous research but has also produced unstable reliability indicators. In spite of this problem, the HIFBN was included because of its repeated appearance in the literature and previous acceptable reliability coefficients in the early postpartum

(Mercer & Ferketich, 1990). The MAI was predicted to have only a moderate (> .30) correlation with the HIFBN because the HIFBN is shorter than the MAI by over 20 items, is concerned only with feelings (each item begins, "I feel"), and 50% of the items were worded negatively.

Another instrument administered with the MAI was the first subscale of the Maternal Separation Anxiety Scale (MSAS). As noted earlier, separation anxiety is a construct closely associated with attachment in both children and adults. The entire MSAS consists of three independent subscales; the first is specifically aimed at measuring generalized maternal anxiety at the prospect of leaving the infant. This 21-item subscale was used independently by its authors (Hock et al., 1989) and demonstrated evidence of its validity (correlation with interview data) and reliability (Cronbach's alpha of .90 and .91). It was anticipated that if the MAI measured postnatal attachment, MAI scores would have a moderate (.30-.50), positive correlation with MSAS scores. Again, only a moderate correlation was predicted because the two instruments measure two separate but related concepts, maternal affectionate attachment and maternal separation anxiety.

Finally, because maternal affectionate attachment has been identified as an element of maternal adaptation, the MAI was administered in conjunction with the Maternal Attitudes and Maternal Adjustment Scale, or MAMA (Kumar et al., 1984). This 60-item questionnaire consists of five subscales representing five elements of maternal adjustment: Body Image, Physical Symptoms, Marital Relations, Attitudes to Sex, and Attitudes to Pregnancy and the Baby. There is also a postnatal version (PPMAMA) of the MAMA. Both versions were tested by Kumar and colleagues (1984) for evidence of validity during the instrument development process. Evidence for MAMA reliability was obtained during its development and in prior studies (Müller, 1993). In previous research (Müller, 1993), prenatal attachment scores had a modest, but significant, correlation (r=.25,p < .01) with prenatal MAMA scores. A similar correlation (> .25) was expected between MAI and PPMAMA scores in this study. Such a correlation would not only provide evidence that the MAI measures maternal affectionate attachment but would also support the hypothesized relationship between attachment and maternal adaptation.

Participants and Procedure

As part of a larger correlational study, 228 women were recruited from childbirth education classes in a large midwestern city. After informed consent was obtained from the participants, the time 1 packet was distributed during the childbirth class and returned to the investigator by mail. The time 1 packet contained the prenatal version of the MAMA and a measure of prenatal attachment, the Prenatal Attachment Inventory (Müller, 1993). The participants provided the researcher with phone numbers and due dates to be used for reminder calls and to arrange for subsequent data collection. At the completion of the entire study, participant-identifying information was destroyed to protect confidentiality. Packets were returned by 207 women.

The time 2 packet, containing the MAI, HIFBN, MSAS (first subscale), PPMAMA, and a brief demographic questionnaire, was mailed to the women when their babies were approximately 4 weeks old. Timing of this data collection point was based on Mercer's (1986) Theory of Maternal Adaptation. The end of Phase 1 (the physical recovery phase) occurs approximately 1 month after the birth of the infant. The physical recovery of the mother has limited her social and psychological adaptation to motherhood during this early phase. Her activities during this time have been dominated by self-care and the care of the infant.

One hundred ninety-six women returned time 2 packets. Most of these women were white (91%), reflecting the racial/ethnic makeup of the county in which participants were recruited. The women were generally young (M = 27.9 years), educated beyond high school (M = 15 years), and planning to return to outside employment after delivery (79%); 74% had family incomes over \$30,000. The majority of infants were boys (54%), were delivered vaginally (79%), and were breast-fed (55%) at time 2. The mean age of babies at packet completion was 29 days, and most (90%) time 2 packets were completed within 40 days of delivery.

Findings

The mean MAI score was 116.4 with a range of 93 to 124. Cronbach's alpha coefficient for the MAI was .85. The other instruments also evidenced reliability. Mean scores and alpha coefficients for all Phase 1 instruments may be found in Table 1. Item statistics from the MAI alpha procedure can be found in Appendix A.

MAI scores correlated with both HIFBN (r = .45, p < .001) and MSAS scores (r = .46, p < .001) as predicted. PPMAMA scores also correlated with MAI scores (r = .30, p < .01) greater than predicted.

TESTING THE MAI, PHASE 2

Participants and Procedure

The purpose of this second phase was to determine if the MAI would be useful to clinical researchers beyond the early postnatal period. A second set of MAI,

TABLE 1. Phase I Instrument Scores and Reliability
Coefficients (n = 196)

Instrument	Mean Score	SD	High	Low	Coefficient Alpha
MAI	116.4	5.7	124	93	.85
HIFBN	35.1	3.2	40	12	.80
MSAS	71	13.2	104	25	.94
PPMAMA	179.6	17.1	226	141	.89

Note. HIFBN = How I Feel About the Baby Now; MAI = Maternal Attachment Inventory; MSAS = Maternal Separation Anxiety Scale; PPMAMA = postnatal version of the Maternal Attitudes and Maternal Adjustment Scale.

HIFBN, and MSAS scores was obtained from two subgroups of the original 196 women who completed the MAI in Phase 1. Group A (n=62) participated when their babies were 4 months old. Group B (n=86) participated when their babies were 8 months old. As in Phase 1, these two data collection points were chosen based on Mercer's (1986) phases of maternal role adaptation. The second phase (the achievement phase) ends 4 to 5 months after birth. The third phase (the disruption phase) ends about 8 months after birth.

When data collection for Phase 2 began, 26 women either could not be reached or had babies older than 9 months and thus were not eligible to participate. The remaining 170 women were contacted by phone and asked to complete one more research packet. All of the women agreed, and the packets were mailed so as to arrive at the women's homes the day the baby was either 4 or 8 months of age. One hundred forty-eight women returned their packets. These women were very similar to the group participating in Phase 1: generally young (M = 28 years), white (91%), having some education beyond high school (M = 15 years), and married (91%). Most women had returned or planned to return to employment outside the home (78%). There were no significant differences between the Group A and Group B women for any of these variables.

There were differences between the groups of babies. Group A contained 60% boys, whereas Group B was evenly divided between boys and girls. Group B had more babies delivered by cesarean section (27% vs. 15%). Twenty-nine percent of the Group A babies were breast-fed at 4 months, and 26% of the Group B babies were breast-fed at 8 months. A review of the original demographic information identified an equal dropout rate for both groups with 84% of the eligible women participating. Review of the demographic characteristics at Phase 1 did not reveal significant differences in the women who dropped out of the study. Results of analysis of variance calculations found no differences in the scores of any instrument based on baby's gender or mode of delivery; therefore, baby group differences had no significant influence on the results.

Findings

Group A mean MAI score was 117.2, a statistically insignificant rise above the Phase 1 score. Group B mean MAI score was 117.4. Scores of Phase 2 instruments and alpha coefficients can be found in Tables 2 and 3.

TABLE 2. Phase 2 Instrument Scores and Reliability Coefficients, Group A (n = 62)

Instrument	Mean Score	SD	High	Low	Coefficient Alpha
MAI	117.2	4.3	124	106	.76
HIFBN	35.1	1.7	40	12	.33
MSAS	69.1	12.8	103	40	.93
PPMAMA	179.5	15.9	214	141	.89

Note. Abbreviations defined in Table 1.

Coefficients, Group 2 (n or)					
Instrument	Mean Score	SD	High	Low	Coefficient Alpha
MAI	117.4	5.6	124	97	.85
HIFBN	35.2	2.2	40	24	.51
MSAS	71	14	104	25	.92
PPMAMA	186.3	19.6	221	144.4	.92

TABLE 3. Phase 2 Instrument Scores and Reliability Coefficients, Group B (n = 84)

Note. Abbreviations defined in Table 1.

At 4 months (Group A), the correlation between Phase 1 and Phase 2 MAI scores was .65, p < .01. At 8 months (Group B) this correlation had dropped slightly to .61, p < .01. For comparison, Group A Phase 1 MSAS scores had a strong correlation (r = .73, p < .01) with Phase 2 MSAS scores. The Group B (8 months) correlation was .54, p < .01. Phase 1 PPMAMA scores correlated with Group A PPMAMA scores (r = .64, p < .01) and Group B scores (r = .69, p < .01).

At 4 months, Group A MAI correlation with the HIFBN was .42 (p < .01), with the MSAS was .38 (p < .01), and with the PPMAMA was nonsignificant. Group B MAI correlation with the HIFBN was .43 (p < .01), with the MSAS was .31 (p < .05), and with the PPMAMA was .23 (p < .05). Unfortunately, as depicted in Tables 2 and 3, not all instruments exhibited adequate reliability coefficients for both groups in Phase 2. The HIFBN in particular performed poorly, rendering all Phase 2 correlations with the HIFBN very questionable.

DISCUSSION

The correlations between the MAI and the other indicator of maternal feelings about the baby (HIFBN) and separation anxiety (MSAS) support the new instrument as a measure of postnatal maternal affectionate attachment. The absolute value of these correlations decreases over time, but the trends continue. As would be expected, the scores of the MAI from Phase 1 and Phase 2 also correlate strongly. The strength of the correlations was an indicator of the validity of the instrument. The correlations were not strong enough to indicate test-retest reliability. However, test-retest reliability is difficult to obtain when scores are expected to change with time. Maternal attachment is not a static characteristic but a process like any other attachment. Attachment is effected by interaction with the child, feedback from the child, the child's changing behavior and independence, the mother's own early attachment experiences, and other characteristics of the environment such as the quality of the mother's relationship to her child's father (Belsky & Isabella, 1988).

Item-total correlations for five MAI items were consistently below .30, and elimination of these items is expected to improve MAI internal consistency. (See Appendix B for the revised version of the MAI.) In addition, minor word changes were made to three items as a result of written comments on the returned packets.

The greater evidence for internal consistency reliability of the MAI, particularly when compared to the poor internal consistency reliability of the HIFBN in Phase

2, indicates its use is preferable to the HIFBN in studies extending beyond the early postpartum period.

Limitations of this study include the limited range of the MAI scores and the homogeneity of the sample. These two problems may be interrelated, because the homogeneity of the women may have contributed to the limited range of scores. This notion can be confirmed or disputed by testing the MAI in more heterogeneous samples of women in different regions of the country. The majority of the study participants were well-educated, middle-class women, more likely to read parenting texts and strive to develop strong relationships with their babies. Cranley (1992) may have explained these high postnatal attachment scores when she described women with high prenatal attachment scores: "They are self-confident, high achievers with sufficient material security to be able to afford to worry about bonding" (p. 25).

The limited range of scores was also indicative of the presence of some items in the tested and revised versions of the MAI that had little variance. Again, because of the homogeneity of the participants, eliminating items with little variance would be premature. These items may provide significant information when the MAI is used with more diverse groups. As with any instrument, the MAI may be revised as additional information is gathered about the instrument itself or the concept it measures.

A final limitation in this study was the inability to follow the entire group of women at both 4 and 8 months. Although there were no obvious differences between the two groups of women, following the entire group would have resulted in more power for the *t* tests and may have influenced the pattern of scores.

In contrast to Mercer's (1985) findings, maternal attachment as indicated by both MAI and HIFBN scores did not peak at 4 months and decline at 8 months. HIFBN group mean scores (the instrument used by Mercer) were identical at 1 and 4 months (35.1) and rose only 0.1 at 8 months. However, internal consistency was poor for the HIFBN at 4 and 8 months.

The absolute change in mean scores for the MAI was greater (0.8 at 4 months and 1.0 at 8 months), but paired t tests indicated these differences were not significant. This lack of significance may have been due to the relatively small number in each group. The comparison between 1-month mean score and 8-month mean score approached significance (t = 1.7, p = .09).

Possible explanations for the inconsistency with Mercer's results include: (a) Participants in the studies lived in different regions of the country and regional differences may influence the pattern of maternal feelings; (b) all of Mercer's participants completed the HIFBN at 4 and 8 months; in this study, subsets of the participants completed the MAI and HIFBN at either 4 or 8 months; (c) the reliability coefficients of the HIFBN decreased dramatically at 4 and 8 months. Time- and sample-based unreliability threatens the validity of resulting comparisons even though the same instrument (HIFBN) was used.

As a result of this study, there is evidence that the MAI can be used to measure the affectionate maternal component of the maternal-child relationship. It is available for use in research in a reasonable, user-friendly format for both re-

searcher and participant. The availability of a questionnaire with evidence of reliability and validity provides the clinical researcher with a feasible means of including mother-to-infant affectionate attachment in studies of the first year of maternal adaptation. Using an attitude measure of maternal feelings may help to identify the antecedents of maternal behavior.

The most productive means for measuring maternal affectionate attachment remains controversial, particularly for the clinical researcher. Beal (1991) emphasized the interactive aspects of the mother-infant relationship in her definition of attachment. From that perspective, she asserts that the "direct observation of the parent-infant dyad...is most desirable" (p. 14). In contrast, in her state of the science review, Koniak-Griffin (1993) noted that maternal feelings are not necessarily related to maternal behavior: "...A mother's attitude toward her infant may influence her overall pattern of response to the infant, yet need not predict any specific mothering behaviors" (p. 261).

Until these conflicting views can be resolved through repeated empirical research, measures of both maternal attitudes and maternal behaviors are necessary. Indeed, it may be only through the integrated use of both types of measures that a consistent knowledge base explicating the facets of the maternal-child relationship can be developed.

REFERENCES

- Bates, J. E., & Bayles, K. (1988). Attachment and the development of behavior problems. In J. Belsky & T. Nezworski (Eds.), *Clinical implications of attachment* (pp. 253-299). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Beal, J. A. (1991). Methodological issues in conducting research on parent-infant attachment. *Journal of Pediatric Nursing*, 6, 11-15.
- Belsky, J., & Isabella, R. (1988). Maternal, infant, and social-contextual determinants of attachment security. In J. Belsky & T. Nezworsky (Eds.), *Clinical implications of attachment* (pp. 41-94). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bowlby, J. (1982), Attachment (2nd ed.). New York: Basic Books.
- Bowlby, J. (1988). A secure base. New York: Basic Books.
- Brazelton, T., & Cramer, B.G. (1990). *The earliest relationship*. Reading, MA: Addison-Wesley.
- Bretherton, I. (1985). Attachment theory: Retrospect and prospect. In I. Bretherton & E. Waters (Eds.), *Growing points of attachment: Theory and research* (pp. 3-35). Chicago: University of Chicago Press.
- Carson, K., & Virden, S. (1984). Can prenatal teaching promote maternal attachment? Practicing nurses test Carter-Jessop's prenatal attachment intervention. *Health Care for Women International*, 5, 355-369.
- Carter-Jessop, L. (1981). Promoting maternal attachment through prenatal intervention. American Journal of Maternal Child Nursing, 6, 107-112.
- Cranley, M. S. (1981). Development of a tool for the measurement of maternal attachment during pregnancy. *Nursing Research*, 30, 281-284.

- Cranley, M. S. (1992). Response to "A critical review of prenatal attachment research." Scholarly Inquiry for Nursing Practice: An International Journal, 6, 23-26.
- Crocker, L., & Algina, J. (1986). *Introduction to classical & modern test theory*. New York: Holt, Rinehart and Winston.
- Davis, M. S., & Akridge, K. M. (1987). The effect of promoting intrauterine attachment in primiparas on postdelivery attachment. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 16, 430-437.
- Fuller, J. R. (1990). Early patterns of maternal attachment. *Health Care for Women International*, 11, 433-446.
- Gross, D., Conrad, B., Fogg, L., Willis, L., & Garvey, C. (1993). What does the NCATS measure? *Nursing Research*, 42, 260-265.
- Henderson, S. (1982). The significance of social relationships and the etiology of neurosis. In C. M. Parkes & J. Stevenson-Hinde (Eds.), *The place of attachment in human behavior* (pp. 165-185). New York: Basic Books.
- Hock, E., McBride, S., & Gnezda, M. T. (1989). Maternal separation anxiety: Mother-infant separation from the maternal perspective. *Child Development*, 60, 793-802.
- Klaus, M. R., & Kennell, J. H. (1982). Parent-infant bonding (2nd ed.). St. Louis: Mosby.
- Koniak-Griffin, D. (1993). Maternal role attainment. *Image: Journal of Nursing Scholarship*, 25, 257-262.
- Kumar, R., Robson, K. M., & Smith, A. M. R. (1984). Development of a self-administered questionnaire to measure maternal adjustment and maternal attitudes during pregnancy and after delivery. *Journal of Psychosomatic Research*, 28, 43-51.
- Leifer, M. (1977). Psychological changes accompanying pregnancy and motherhood. Genetic Psychology Monographs, 95, 55-96.
- Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research*, 35, 382-385.
- Mercer, R. T. (1985). The process of maternal role attainment over the first year. *Nursing Research*, 34, 198-204.
- Mercer, R. T. (1986). First-time motherhood: Experiences from teens to forties. New York: Springer Publishing Company.
- Mercer, R. T., & Ferketich, S. (1990). Predictors of parental attachment during early-parenthood. *Journal of Advanced Nursing*, 15, 268-280.
- Messick, S. (1980). Test validity and the ethics of assessment. *American Psychologist*, 35, 1012-1027.
- Müller, M. E. (1993). The development of the prenatal attachment inventory. Western Journal of Nursing Research, 15, 199-215.
- Rubin, R. (1984). *Maternal identity and the maternal experience*. New York: Springer Publishing Company.
- Schroeder-Zwelling, E., & Hock, E. (1986). Maternal anxiety and sensitive mothering behavior in diabetic and nondiabetic women. *Research in Nursing and Health*, 9, 249-255.
- Tulman, L. J. (1985). Mothers' and unrelated persons' initial handling of newborn infants. *Nursing Research*, 34, 205-210.
- Tulman, L. J. (1986). Initial handling of newborn infants by vaginally and cesarean-delivered mothers. *Nursing Research*, 35, 296-300.
- Waltz, C. F., Strickland, O. L., & Lenz, E. R. (1991). *Measurement in nursing research* (2nd ed.). Philadelphia: F. A. Davis.

Acknowledgment. This research was supported by a Grant-in-aid from the College of Nursing, The Ohio State University.

Offprints. Requests for offprints should be directed to Mary E. Müller, PhD, RN, Riverside Methodist Hospitals, 3535 Olentangy River Road, Columbus, OH 43214.

APPENDIX A

Maternal Attachment Inventory Items as Tested

	Item-Scale Correlation	Alpha if Item Deleted
1. My baby has an important place in my life	.14	.845
2. I feel love for my baby	.33	.843
3. I feel warm and happy with my baby	.47	.838
4. I want to spend special time with my baby	.62	.833
5. I look forward to being with my baby	.64	.847
6. Just seeing my baby makes me feel good	.61	.835
7. I know my baby needs me	.47	.837
8. I think my baby is cute	.37	.843
9. I'm glad this baby is mine	.47	.841
10. I feel special when my baby smiles	.39	.841
11. I like to look into my baby's eyes	.39	.841
12. I enjoy holding my baby	.64	.834
13. I forget that I have a baby	.06	.847
14. I watch my baby sleep	.42	.84
15. I want my baby near me	.56	.833
16. I tell others about my baby	.39	.84
17. I don't want this baby	.04	.847
18. I wish my baby were different	21	.856
19. It's fun being with my baby	.64	.829
20. I don't like to hear my baby cry	10	.874
21. I enjoy having my baby cuddle with me	.57	.836
22. I'm proud of my baby	.44	.841
23. I like to see my baby do new things	.38	.843
24. Loving my baby is easy	.50	.838
25. My thoughts are full of my baby	.51	.835
26. I recognize my baby's personality	.46	.838
27. I want my baby to trust me	.47	.841
28. I know I am important to my baby	.50	.836

29. I can understand my baby's signals	.45	.838
30. I give my baby special attention	.56	.835
31. I soothe my baby when he/she is crying	.32	.842

APPENDIX B Maternal Attachment Inventory (Revised)

The following sentences describe thoughts, feelings, and situations new mothers may experience. Circle the letter under the word that applies to you.

	Almost Always	Often	Some- times	Almost Never
1. I feel love for my baby	a.	b.	c.	d.
2. I feel warm and happy with my baby	a.	b.	c.	d.
3. I want to spend special time with my baby	/ a.	b.	c.	d.
4. I look forward to being with my baby	a.	b.	c.	d.
5. Just seeing my baby makes me feel good	a.	b.	c.	d.
6. I know my baby needs me	a.	b.	c.	d.
7. I think my baby is cute	a.	b.	c.	d.
8. I'm glad this baby is mine	a.	b.	c.	d.
9. I feel special when my baby smiles	a.	b.	c.	d.
10. I like to look into my baby's eyes	a.	b.	c.	d.
11. I enjoy holding my baby	a.	b.	c.	d.
12. I watch my baby sleep	a.	b.	c.	d.
13. I want my baby near me	a.	b.	c.	d.
14. I tell others about my baby	a.	b.	c.	d.
15. It's fun being with my baby	a.	b.	c.	d.
16. I enjoy having my baby cuddle with me	a.	b.	c.	d.
17. I'm proud of my baby	a.	b.	c.	d.
18. I like to see my baby do new things	a.	b.	c.	d.
19. My thoughts are full of my baby	a.	b.	C.	d.
20. I know my baby's personality	a.	b.	c.	d.
21. I want my baby to trust me	a.	b.	c.	đ.
22. I know I am important to my baby	a.	b.	c.	d.
23. I understand my baby's signals	a.	b.	c.	d.
24. I give my baby special attention	a.	b.	c.	d.
25. I comfort my baby when he/she is crying	g a.	b.	c.	đ.
26. Loving my baby is easy	a.	b.	c.	d.

Scoring: A = 4, B = 3, C = 2, D = 1. All items are summed for a single score.

Copyright M. E. Müller, Reprinted with Permission