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ABSTRACT

Behavioral outcomes in mother-infant interaction in the first month of life after contact in the recovery room are described. In the first postpartum hour, personnel presented 62 infants to their mothers. Personnel crossed two modes (skin-to-skin versus cradling) and two durations (15 versus 60 minutes) of contact. Instances of maternal and infant behaviors in observation sessions during and between feedings at 2 days and 28 days postpartum were scored. This report presents descriptive data on maternal-infant behaviors, along with: (1) significant behavioral findings from multivariate analyses of covariance employing the early contact design; (2) findings of significant covariate effects on maternal-infant demographic factors; and (3) findings of significant residual effects controlling design manipulations. Findings are discussed in terms of their value as normative, descriptive data of maternal-infant behavior in the first month of life, and in terms of their implication for maternal attachment following the unique bonding experience that occurs in the recovery room. (Author/RH)

Maternal-Infant Behavior at 2-Days and at 28-Days Post-Partum

Following Maternal-Infant Contact in the Recovery-Room

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Abstract

This report describes the behavioral outcomes in mother-infant interaction in the first month of life following contact in the recovery-room. Infants (N = 62) were presented to their mothers crossing two modes (skin-to-skin vs. cradling) and two durations (15 vs. 60-min.) of contact in the first post-partum hour. The instances of maternal and infant behaviors in observation sessions during and between feedings, at 2, and at 28 days post-partum were scored. Descriptive data on maternal-infant behaviors are presented along with significant behavioral findings from multivariate analyses of covariance (MANCOVAs) employing the early contact design, significant covariate effects on maternal-infant demographic factors, and significant residual effects controlling design manipulations. Findings are discussed in terms of their value as normative,descriptive data of maternal-infant behavior in the first month of life; and, in terms of their implication for maternal attachment following a unique "bonding" experience in the recovery-room.

Introduction

Substantial attention has been directed toward the behavioral determinants of maternal-infant bonding. Over the last 20 years, work by Klaus, Kennell, and their associates (e.g., Klaus, Jerauld, Kreger, McAlpine, Steffa, & Kennell, 1972; Hales, Lozoff, Sosa, & Kennell, 1977; Kennell & Klaus, 1984), and of deChateau (1976) has examined the importance of early postpartum contact between mother and neonate. This examination includes the simple exposure of neonate to mother in the first post-partum hours and days. The seminal study (Klaus, et al., 1972) in this series of research studies compared mothers who received early and extended contact with their neonates to mothers who received neither early nor extended contact with their babies. Twenty-eight low-income women were selected at random from a lower class black population and half of them given 1 hr. of skin-to-skin contact with their newborns during the first 2 hrs. of life. Also, they were given up to 5 additional hours to spend with their infants in the next 3 days. The second half of the sample received no contact in the first 2 hrs. of the infant's life and saw their infants only at routine feeding times. When the infants were 1 month of age, a number of behavioral dimensions were assessed. Differences between the extended contact group and the no contact group were observed. The extended contact mothers reported being much more attached to their infants than no contact mothers; and the extended contact mothers fondled their infants more and engaged in more "en face" or face-to-face gazing than no contact mothers. Based upon these results and subsequent follow-up studies through 2 years of age, Klaus and Kennell suggested that early initial contact between mother and infant has a major effect on maternal caretaking behavior that continues to influence mother-child relations. The extensive reporting of these results has influenced the modification of hospital policies to allow early contact experiences to occur.

Reviews evaluating the consequences of early infant-mother contact upon maternal attachment,bonding are more equivocal. For example, Vietze and O'Connor (1980) conclude that with the exception of one study on a medically indigent population, the evidence supporting beneficial effects of early or extended contact between mothers and newborns is meager. Campos, et al. (1986), in their chapter in the Mussen Handbook reach essentially the same conclusion. Thus, these mixed results combined with some methodological questions about the results of additional key studies, called for a further examination of this central topic of human development. The present work was undertaken to remedy these deficiencies. From the early reports it was difficult to know how generalizable the results were due to the oversampling of minority and indigent populations. An attempt was made to remedy this by sampling a white, middle-class population. Secondly, it was unclear what aspect of the early contact experience contributed to the maternal behavior differences. Across studies, the mode via which infants were presented to mothers and the duration mothers were allowed contact with their infants varied. An attempt was made to remedy this by systematically varying presentation mode and duration. Thirdly, in many reports, multiple variables were examined, but only a few were reported as significant. To remedy this, appropriate statistical controls were implemented on important confounds. such as drugs used at labor and delivery. Also, appropriate multivariate techniques were employed to minimize capitalization on chance that most certainly flawed prior studies.

The present study was designed to consider varying modes and durations of the presentation of the neonate to its mother. One hope was that information could be

gathered about the relative importance of these variables on maternal attachment in subsequent interaction contexts. Moreover, data could be concurrently provided about the effects of presentation mode and presentation duration on infant behaviors, both in interaction with mothers and on a comprehensive neonatal performance test.

This report describes the behavioral outcomes in mother-infant interaction. The design entailed two modes of contact (skin-to-skin vs. cradling) and two durations (15 vs. 60 min.) of neonate presentation to its mother in the recovery-room in the first post-partum hour. These factors represent the range of presentation modes reported in the literature. Because of the prior work by Klaus and Kennell, doctors in the hospitals used were reluctant to allow a "no contact" group. Thus, it was not possible to establish the comparison control condition in which the infant was unavailable to its mother in the first post-partum hour.

Method

Subjects

Subjects were 62 middle-class, Caucasian, married mothers and their neonates. Neonates included 34 male and 28 female, with slightly less than half first borns (34 later borns vs. 28 first borns). All were normal, full-term with Apgar scores greater than nine at 5-min. Deliveries occurred without complication for neonate or mother. Fifty-two of the deliveries were under epidural anesthesia, and ten were under natural childbirth conditions, in two suburban Washington, D.C., general hospitals. Informed consent was obtained from both parents during labor.

Procedure

Before each of the mother-neonate pairs were brought into the recovery-room from the delivery room, one of four conditions was assigned on a predetermined random basis. The neonate was presented to the mother in the recovery-room either ventral-ventral and naked on her naked abdomen, "skin-to-skin" (with a blanket covering both) or swaddled in a blanket and "cradled" in the crook of the mother's arm (with the mother in hospital bedclothes, covered by a blanket). The presentation mode was either for 15-min. or 60-min. in duration. The experimental design is schematized in Table 1. Mother and neonate

Insert Table 1 about here.

behaviors in interaction were observed in the recovery-room during the particular treatment to which they were exposed, and also during two 15-min. periods at both 2 days and 28 days post-partum. With the exception of the recovery-room observer, data collectors at other time points were unaware of experimental-group membership of mother-neonate pairs. No observations or other data were collected in the delivery room, where mother and neonate could remain for up to 20-min. prior to their removal to the recovery-room.

The data-collection points are summarized in Table 2.

Insert Table 2 about here.

A reliable observation procedure was used to score the instances of maternal or neonate behaviors that occurred during 10-sec. time blocks in each 15-min.-long observation. On days when an infant was scheduled to be observed, he/she was brought to mother as early as was feasible for the observation. The context for the observation was that the baby should be (a) not crying; (b) diapers checked or diapered; (c) not within 1 hr. of having given blood sample or 5 hrs. post circumcision; (d) at least 30 min. following, or 60 min. before, feeding; (e) alert, with eyes open and some motor activity. Infant could be brought to alert state by being uncovered, or picked up, or by tactile stimulation (palming, stroking, or reflex grasp and pull to sit maneuver). In this double-blind design, 11 maternal and 11 infant behaviors (see Appendix A) were time-sampled during two 15-min. observation periods of infant and mother together, one during and one between feedings at 2 and at 28 days post-partum.

Eleven maternal behaviors directed toward the infant were scored, including *show/tell*, *caregiving*, *grimace*, *kiss*, *smile*, *look at face or body part*, *talk to*, *vocalize*, *touch with fingers*, *touch with palms*, and *rock*. The 11 infant behaviors included *grimace*, *smile*, *resist*, prolonged ("en face") *looking at mother's face*, *eyes open*, *nonvocal sound*, *vocalize*, *fuss/cry*, *mouthing*, *motor acts*, and *feed* The instances of behaviors that occurred during 10-sec. time blocks in each 15-min. observation were scored. Maternal or infant behavior was observed for a 10-sec. "on" period, then recorded during a 10-sec. "off" period. Two 10-sec. intervals of maternal-behavior scoring alternated with one 10-sec. interval of infant-behavior scoring. A behavior was scored either as

occurring or nonoccurring during a 10-sec. time block. A subject's score was the number of 10-sec. blocks in which a given behavior occurred at least once. (The maximum possible score during a 15-min. session was 30 for the mother and 15 for the infant.) Agreement by independent observers on maternal and infant behavior categories was satisfactory (*M* proportion agreement = .74; range = .62 to .84).

Two days post-partum, the Brazelton (1973) Neurobehavior Assessment Scale (NBAS), which measures the neurological and behavioral functioning of the infant, was administered. Infants were scored on dimensions of alertness, irritability, responsivity to outside intervention, and reactions to visual, auditory, and tactile stimulation. These areas measure the social and physical capabilities of the neonate, which may play an important role in early parent-infant relations. The NBAS assessment was made during the infant's hospital stay by a trained examiner who was unaware of the infant's treatment group. The mean age at testing was 44 hrs. post-partum. The examination was begun at a time midway between feedings and was delayed if stressful procedures, such as circumcision or PKU testing, had recently occurred. To minimize distractions, testing took place in a quiet corner of the nursery or in an adjacent examining room. Each infant was tested by one of two examiners who had previously established interrater agreement of .96. At 2 and at 28 days, mothers completed a questionnaire containing NBAS equivalent items on their infants' behavior (Field, Hallock, & Schuman, 1978).

At the end of home visits at 28 days, independent observers rated 11 items descriptive of parent behavior and 8 items descriptive of infant behavior and their environment using variants of scales devised by Yarrow, Rubenstein, and Pedersen (1975), as revised by Vietze (1977)(see Appendix B). The Parent Scales were: physical involvement and closeness; intensity of positive emotional expression; intensity of negative emotional expression; sensitivity and responsiveness to nondistress and prosocial behavior; latency of response to infant behaviors connoting distress; contingent responding to infant nondistress behavior; parent's satisfaction with baby's personality; parent's report of observer influence; observer report of observer influence on parent; appropriateness of parent behavior to feeding; appropriateness of parent behavior to baby's needs and rhythms. Interrater agreement, calculated on 20 percent of all maternal ratings by two independent raters, was low but satisfactory for parental ratings (*Kappa* = .31, $p < .001$). Thirty-nine percent of all ratings were in agreement after correcting for chance agreements. Because rater agreement for infant ratings was unsatisfactory, those results are not reported. Finally, mothers kept a full-day diary of their activities with their infants between the second and fourth week post-partum.

Analysis Plan

The overall experimental design crossed two presentation modes (skin-to-skin vs. cradled) with two mother-infant contact durations (15-min. vs. 60-min.) in the first post-partum hour; behavioral outcomes in maternal-infant interaction and in infant test performance were examined at 2 days and at 28 days post partum during feed and nonfeed observations. In these analyses, presentation mode and contact duration are between subject factors, while day of measurement and feeding status are within-subject factors. Data subsets included the observational-variable frequencies separately for mother and infant in the recovery-room; the 2-day observational-variables separately for mother and infant; the 28-day maternal and child observations; Parent Rating Scales, Field's questionnaire, and home diaries; and two subsets of NBAS item scores. Each data subset was independently subjected to the multivariate analysis of variance (Bock, 1975). For purposes of explication, the design and analyses are considered as having four separate components: between-subject effects, within-subject effects, covariate effects, and residual effects. Covariate effects provide the bases for analysis of the relation between demographic factors (e.g., drug doses) as co-variables and the maternal and infant behaviors.

In this third aspect of the analysis, covariance controls were implemented for drug variables and for the following demographic variables: infant gender, maternal parity, drugs at delivery (natural vs. epidural), mother's years of schooling, mother's highest school degree, and mother's original (at 2 days) and final (at 28 days) mode of feeding (bottle vs. breast). For the drug component of the covariance analysis three separate drug variables were constructed: (a) for drugs taken within 6-hr. pre-partum, (b) for anesthesia at labor and delivery, and (c) for drugs taken up to 4 days post partum. An extensive report of drug-related findings has been

published (Hollenbeck, Gewirtz, Sebris, and Scanlon, 1984). Each covariate was examined independently to determine if it contributed significantly to any data subset, either between or within groups. Only covariates that approached statistical significance at conventional levels ($p < .05$) were retained in the appropriate section of the analysis. (In most instances, one to three covariates were retained to correct a given data subset.) These covariates were allowed to enter the *MANOVA* equation in an order determined by their independent strength of association with the dependent variable subset.

The covariance-control analyses were incidental to the primary experiment. Specifically, the residual variances and covariances were examined using a *MANCOVA* (multivariate analysis of variance and covariance) design. Where overall *MANCOVA* effects were found for covariates, individual correlations between that covariate and the maternal and infant behavior items in the error correlation matrix were examined to obtain estimates of the relations between variables unbiased by experimental and control factors. Finally, the error correlation matrix was examined for residual relations that might offer insight for future research.

Results

The presentation of results is organized around (a) descriptive data from maternal and infant observations during feed and nonfeed settings at 2 and at 28 days post-partum, (b) maternal and infant observations in the recovery-room, (c) maternal observation results employing the *MANCOVA* design described earlier, and (d) infant observation results employing the *MANCOVA* design. Positive findings were *not* obtained for the following data subsets and they will not be discussed: the NBAS at 2 days post-partum, the Field's questionnaire at 2 and at 28 days post-partum, the Parental Ratings at 28 days, and the maternal diaries recorded from the second to the fourth week post-partum.

Descriptive Data

Means, standard deviations, and mean percentage of intervals scored are presented for the 11 maternal behaviors (see Table 3) and the 11 infant behaviors (see Table 4) scored during feed and nonfeed observations at 2 and at 28 days post-partum. Examination of Table 3 indicates the stability of maternal behaviors across observation

Insert Tables 3 and 4 about here.

settings (feed vs. nonfeed) and across days post-partum (2 vs. 28). In only four instances did maternal behavior differ by more than 10 percent: (a) mothers' *talking* increased during the 28 day nonfeed observations relative to the other three observation sessions, (b) mothers' *vocalizations* to their infants also increased during the 28 day nonfeed observations relative to the other three observation sessions, (c) the difference between maternal *fingering* during feed and nonfeed observations increased at 28 days over the difference at 2 days, and (d) maternal *palming* was substantially greater during nonfeed observations than feed observations at both 2 and 28 days post-partum. (Nevertheless, subsequent analyses indicated that maternal *looking at* and *palming* of their infant was influenced by the early contact conditions.)

In contrast to maternal observations, infant observations, as presented in Table 4, were less stable as indicated by a greater range in standard deviations and larger relative shifts in behavior from day 2 to day 28. Nevertheless, the shifts in infant behavior, in general, appear to represent normal developmental changes with age. For example, infants displayed more *eyes open* and more *en face looking* at 28 days than at 2 days. Similarly, infants did more *fuss,crying* at 2 days than at 28 days. Thus, while more variability is present in infant behavior relative to more stable maternal behavior across observation settings and the first month of infant life, this behavioral lability appears to make sense in a developmental framework. (The subsequent analyses indicated that infant *resistance* differences appeared to be artifact accounted for by a single anomalous group.) The sections that follow present the formal analyses of these complex data subsets for mothers and infants.

Recovery-room Observations

To examine the potency of the experimental manipulations, the observations made in the recovery-room during initial maternal-neonate contact were subjected to analysis using the *MANCOVA* design. Table 5 presents results of that analysis for the maternal observations. Nine of 11 maternal behaviors observed showed higher mean frequencies in

Insert Tables 5 and 6 about here.

the 60-min. group than in the 15 min. group. The remaining two behaviors were marginally significant and

their means were in the same direction as the other behaviors. Thus, as would be expected, the longer duration of contact (60-min. vs. 15-min.) was a potent manipulation of these maternal behaviors overpowering mode of presentation effects.

Seven of the 11 neonate behaviors observed showed higher mean frequencies in the 60-min. group than in the 15-min. group as presented in Table 6. Again, the longer duration of contact was a potent manipulation of infant behaviors as well.

Maternal Observations

Employing the MANCOVA screening procedure described earlier, four findings emerged: two covariate effects, a repeated measures main effect, and a between-subject by within-subject interaction were significant. The *Feed vs. Nonfeed* contrast main effect was significant [Fmanova (11,46) = 2.21, $p < .03$]. Examination of the univariate results yielded three significant maternal behaviors: mothers provided more *caregiving* during feeding ($M = 5.3$) than nonfeed ($M = 4.0$) observations [F (1,56) = 8.14, $p < .01$]. In contrast, mothers provided more *palming* during nonfeeding ($M = 9.0$) than feeding ($M = 4.8$) observations [F (1,56) = 4.44, $p < .04$], and more *rocking* during nonfeeding ($M = 6.2$) than during feeding ($M = 5.0$) observations [F (1,56) = 12.18, $p < .01$]. These findings must be considered in terms of the significant interaction involving feed vs. nonfeed.

The *Duration of Contact* by *Feed vs. Nonfeed* interaction was significant [Fmanova (11,46) = 1.99, $p < .06$]. Examination of the univariate results yielded two significant maternal behaviors: *looks at infant* [F (1,56) = 9.58, $p < .01$] and *palming* [F (1,56) = 4.33, $p < .04$]. Mean differences were examined for both dependent variables using Scheffe's test ($p < .05$). Mothers in the 15-min. Nonfeed group (M 16.8) *looked* at their infants more than mothers in the 15-min. Feed group ($M = 15.4$). Mothers in the 15-min. Nonfeed group ($M = 9.3$) *palmed* their infants more than mothers in the 15-min. ($M = 4.0$) or the 60-min. ($M = 5.7$) Feed groups. Similarly, the 60-min. Nonfeed group ($M = 8.7$) mothers *palmed* their infants more than mothers in the 60-min. Feed group ($M = 5.7$).

Covariate effects. A MANOVA covariate effects was detected for the mothers' *Original Feed Mode* (bottle vs. breast feeding) [Fmanova (11,47) = 2.55, $p < .02$]. Examination of the error correlation matrix under the Grand Mean indicated that more *caregiving* was given under breast feeding than under bottle feeding ($r = -.49$, $p < .05$). Similarly, a covariate effects was detected for *Delivery Anesthesia* [Fmanova (11,47) = 2.09, $p < .05$]. Examination of the error correlation matrix under the *Feed vs. Nonfeed* contrast indicated that mothers receiving more anesthesia at delivery did less *fingering* during nonfeed than feed observations ($r = -.31$, $p < .05$).

Residual effects. The error correlation matrix offers the opportunity to explore relations among independent variables while controlling for the experimental design manipulations. An examination of these "residual" effects is presented without further interpretation as relations deserving of further study. Table 7 presents the relations found under the four design elements for the independent co-variables in the study with observed maternal behaviors.

Insert Table 7 about here.

Infant Observations

The MANCOVA screening procedure yielded six significant findings: main effects for the two repeated measures, three interactive effects related to the repeated measures, and a covariate effect.

The *Day 2 vs. Day 28* contrast main effect was significant [Fmanova (1,47) = 3.38, $p < .01$]. Examination of the univariate results yielded three significant infant behaviors. Infants at Day 28 ($M = 5.2$) *vocalized* [F (1,57) = 5.32, $p < .01$] more than at Day 2 ($M = 0.3$). Also, infants at Day 28 ($M = 5.7$) did more *feeding* [F (1,57) = 14.44, $p < .01$] than at Day 2 ($M = 4.2$). In contrast, infants at Day 2 ($M = 5.2$) displayed more *mouth open* [F (1,57) = 7.60, $p < .01$] behavior than at Day 28 ($M = 4.7$).

The *Feed vs. Nonfeed* contrast main effect was significant [Fmanova (11,47) = 4.55, $p < .01$]. Examination of the univariate results yielded four significant infant behaviors. Infants in the Feed observation did more *nonvocal sounds* (M 7.6) [F (1,57) = 9.08, $p < .01$], more *motor acts* ($M = 7.2$) [F (1,57) = 17.30, $p < .01$], and more *feeding* ($M = 9.1$) [F (1,57) = 20.87, $p < .01$] than during Nonfeed observations ($M = 5.2$, $M = 4.7$, $M = 0.8$, respectively). In contrast, infants during the Nonfeed observations did more *mouth open* [F (1,57) = 3.87, $p < .05$] behaviors ($M = 6.5$) than during the Feed observations ($M = 3.4$).

The *Day 2 vs. Day 28* by *Feed vs. Nonfeed* interaction was significant [Fmanova (11,47) = 2.84, $p < .01$].

Table 8 presents the means for *motor acts* and *feeding* by the four repeated observations. A subsequent Scheffe's analysis ($p < .05$) yielded multiple differences:

Insert Table 8 about here.

for *motor acts* [F (1,57) = 5.81, $p < .02$], Day 2-Nonfeed was greater than Day 28-Feed; Day 28-Nonfeed was less than Day 2-Feed, Day 2-Nonfeed, and Day 28-Feed which did not differ among themselves. For *feeding* [F (1,57) = 8.95, $p < .01$], Day 2-Feed was greater than Day 2- and Day 28-Nonfeeds, which did not differ; Day 28-Feed was greater than Day 2- and Day 28-Nonfeeds, which did not differ; and Day 28-Feed was greater than Day 2-Feed.

The *Day 2 vs. Day 28* by *Feed vs. Nonfeed* by *Duration of Contact* (15-min. vs. 60-min.) triple interaction was significant [Fmanova (11,47) = 1.92, $p < .06$]. A Scheffe's analysis ($p < .05$) was employed to compare mean pairs. The Day 28-Nonfeed group showed few *motor acts* [F (1,57) = 5.71, $p < .05$] regardless of their amount of contact in the recovery-room. The other groups did not differ. Thus, the pattern of mean differences under this interaction collapses to that under the *Day 2 vs. Day 28* by *Feed vs. Nonfeed* interaction presented earlier.

The *Feed vs. Nonfeed* by *Duration of Contact* by *Presentation Mode* (skin-to-skin vs. cradled) triple interaction was significant [Fmanova (11,47) = 2.17, $p < .05$]. A Scheffe's analysis ($p < .05$) was employed to compare mean pairs. The 15-min. Cradled-Feed group ($M = 0.6$) showed more *resistance* [F (1,57) = 10.64, $p < .01$] than all other groups, and the 60-min. Skin-to-Skin-Feed group ($M = 0.3$) showed more *resistance* than all groups but the 15-min. Cradled-Feed group. All remaining groups did not differ significantly.

Covariate effects. A covariate effect for the *Original Mode of Feeding* (bottle vs. breast) was found in the MANCOVA analysis [Fmanova (1,47) = 2.98, $p < .01$] under the Grand Mean, and under the *Day 2 vs. Day 28* contrast and the *Day 2 vs. Day 28* by *Feed vs. Nonfeed* interaction. Examination of the error correlation matrix under the Grand Mean indicated more *mouth open* behaviors occurred during observations when *Original Mode of Feeding* was "bottle" ($r = -.43$, p .05), while more *feeding* behaviors occurred when the *Original Mode of Feeding* was "breast" ($r = .46$, $p < .05$). Examination of the error correlation matrix under the *Feed vs. Nonfeed* contrast indicated More *motor acts* occurred when the Original Feed Mode was "bottle" ($r = -.30$, $p < .05$), while more *feed* behaviors occurred when the Original Feed Mode was "breast" ($r = .29$, $p < .05$). Examination of the error correlation matrix under the *Day 2 vs. Day 28* by *Feed vs. Nonfeed* contrast yielded more infant *smiling* during observations if "breast" feeding was the Original Feed Mode ($r = .29$, $p < .05$).

Residual effects. Again, an examination of the error correlation matrix offers the opportunity to explore potential relations. These "residual" effects are presented without interpretation as suggestive areas for future research. Table 9 presents the relations found under the four design elements for the independent co-variables in the study with the observed infant behaviors.

Insert Table 9 about here.

Discussion

Descriptive Data

With the exception of two maternal behaviors (*looking at* and *palming*) and one infant behavior (*resistance*) which appear to be influenced by the early contact treatment conditions (and will be discussed later), the remaining nine maternal behaviors and ten infant behaviors provide a set of normative,descriptive data on what mothers and infants do in the first month of life when observed in standardized feed and nonfeed settings. Few data exist that provide a comprehensive examination of maternal-infant behavior in a white middle-class sample where neither experimental manipulations nor systematic interventions are occurring during the time sampling frame. The pattern of results presented suggests that the maternal behavior, for the most part, was stable across observation settings (feed and nonfeed) and across observation times (day 2 and day 28). Four of 11 behaviors did increase by more than 10 percent in different sessions. Thus, while variability of maternal behavior is low across observation sessions there does appear to be subtle behavioral shifts from session to session. These results are consistent with other reports that mothers, responding to a variable stimulus (their baby), modify behavior based on that stimulus, and in response to these behavior modifications have specific behaviors which come under operant control (e.g., Hollenbeck & Gewirtz, 1989). These

results could also help explain the type of finding reported by Zeanah and his colleagues (e.g., Zeanah, Keener, & Vielra-Baker, 1987; Zeanah & Anders, 1987) who observed that adolescent mothers' perceptions of several infant temperament characteristics were stable prenatally and at 4 months postnatally. Given the pattern of subtle maternal behavior change reported here a number of alternatives could explain the stability in maternal perception of infants: (a) perception of the infant may lag the mother's own change in behavior, (b) perception of the infant influencing the mother may escape maternal awareness altogether, and,or (c) maternal stability of infant perception may contribute to maternal behavior change by the mother changing her behavior to maintain a consistent perception of expectations about her infant.

In contrast to maternal behavior in the first month of life, the infants' lability of state in most behaviors observed was greater across observation sessions. As presented earlier, this instability in behavior is indicated by the larger range in standard deviations and the larger relative shifts in behaviors from session-to-session. Nevertheless, infant behavior appears to change in a predictable fashion. For example, more visual behavior occurs at the older age while fuss,crying decreases These types of changes make common-sense and are not novel when placed in a developmental context of change and growth. This lack of infant behavioral stability early in life has been reported by others employing different behavioral outcome measures (e.g., Asch, Gleser, & Stelchen, 1986).

Early Contact Issues

At first glance these data appeared disappointing. No differences for mother or infant were detected for the between subjects factors of mode and duration of presentation. This means that the factors associated with early contact alone did not significantly alter maternal and infant behaviors. Differences were found for these factors in interaction with repeated measures, particularly the feed vs. nonfeed observations for both mother and infant. This means that context of observation interacted with the factors associated with early contact to produce behavior change. Thus, what appears to be happening here is not necessarily best understood at the level of individual behavioral differences. The level at at which these data may best be understood is the contextual level which constitutes the early life environment. What is most striking is the relative importance of the strength of the feeding situation. It appears that the modification of mother,infant behaviors due to the natural manipulation of context (feed vs. nonfeed) is more powerful (in an experimental sense) than the manipulation of either mode or duration of presentation of neonate to mother in the first hour of life. If true, then parents and professionals should be more concerned with the behavioral factors that ensure a higher quality of parental-infant interactive life instead of concern about unique contact opportunities following birth. Simply, the natural caretaking environment already affords rich opportunities for establishing parent,infant relations.

What the present study does not provide is an unambiguous statement of the precise behaviors that hallmark the qualitative nature of parent-infant interaction behaviors. To that end, the authors have begun exploring the impact on adult,infant interactive behavior of common attributions, such as love, comfort (Hollenbeck & Gewirtz, 1989), and gender labels (Hollenbeck, Gewirtz, & Scanlon, 1989), that constitute affectional components of attachment behaviors by developing a behavioral taxonomy of how adults operationalize these affective elements that are attributed to attachment bonds. The working assumption is that the attributions present in the first few days of life will have impact on adult behaviors in predictable ways.

The available literature on maternal-infant bonding has provided few hard data as to the viability of this concept. The work presented here does provide some partial replication of the original observations presented by Klaus and Kennell. Mothers, with different amounts of early contact looked at and palmed their infants differently during feed and nonfeed observations over the first month of life. Whether these behavioral alterations constitute bonding is another question. Moreover, it has been demonstrated that the natural context provided by the feeding situation can alter the same domain of behaviors with equal or greater impact. For the future, attempts are being made to specify those contexts and those behaviors which influence early life relations. Only through a behavioral analysis of the context of early life experiences will the meaning of concepts such as "maternal-infant bonding" be elucidated.

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Appendix A

Adult Behavior Definitions

show/tell: calls another person's attention to infant.

caregiving: diapers — dresses or swaddles, adjusts blanket and other caretaking activities such as bathing, wiping mouth or other body part, giving pacifier, burping, patting in feeding, and measurements card.

grimace: any nonvocal movement of face directed to the infant, excluding smiles and imitations.

kiss: any face to body contact.

smile: a deepening of the naso-labial folds, with a movement of the cheeks upward and outward.

look at face or body part: fixates infant's face, whether or not faces are lined up; fixation of any part of infant's body apart from the face.

talk to: verbal responses directed to infant.

vocalize: nonverbal responses directed to infant, excluding imitation.

touch with fingers: includes such movements as patting

or stroking, but excludes pats to bump. If palm also in contact, score as palming.

touch with palms: includes such movements as patting or stroking with palms or fingers and palms. If fingering also involves palm in contact, score as palming.

rock: holding and rocking, in or out of rocking chair; includes jiggling.

The following behaviors were scored, but not analyzed due to low frequencies of occurrence and/or low observer reliability:

hold: any support of infant's body — partial or complete, by either one or two arms. Context of observation precludes holds that are preparatory to, or in association with, feeding, diapering, bathing, or some other caregiving activity, e.g., checking diapers. Special contact to extremities (e.g., fingers on infant's foot or head, moving or not, while infant is held, is also scored in contact category.

encompassing: holds infant cradled in arm(s) and in contact with adult's body.

repositions: repositions infant in space. Arising or sitting down are not automatic position changes.

visual stimulation: presenting visual stimuli (e.g., fingers, pacifier) for infant to attend visually. Score even if visual stimulation is involved in imitation.

speaks to third person: talks to third person, but not directly about infant; not show/tell.

Infant Behavior Definitions

grimace: any facial movement or involvement without vocalization, including frowns, drooping of mouth, and apparent prefuss behaviors.

smile: deepening of naso-labial folds, upward and outward movement of cheeks.

resist: infant resists mother's caregiving, e.g., pulls away — does not behave in a reciprocal manner to allow successful maternal response, e.g., mother tries to cradle in arm, infant arches back or mother places nipple to infant's mouth, infant expels nipple — turns head.

looking at mother's face: fixates caregiver's face for a duration of 3 seconds (estimated as "1,000, 2,000, 3000").

eyes open: includes fixating, looking around, but not at mother's face.

nonvocal sound: biologically induced sounds; includes hiccups, wheezes, sighs, burps, smacking of lips, swallowing.

vocalize: any voiced sounds that are not accompanied by fussing or facial grimaces. If sound is obscure because it is short or muffled, downgrade to nonvocal sound.

fuss/cry: vocal sounds associated with facial grimaces of drooping mouth and/or of frowning.

mouthing: any movement of mouth, including yawning, mouthing, non-nutritive sucking.

motor acts: motor acts and movement of extremities — fingers, toes, head, arms or legs; excluding "looking around" that involves movement of head.

feed: nutritive sucking of bottle, breast, or nipple

Appendix B

Parental Rating Scales

Scale 1: Physical involvement and closeness. The quality of physical contact, evaluated in terms of the degree of close physical contact with the infant.

1. Very low physical involvement. Aloofness and distance characterize the physical relationship to the infant. Infant is usually held at a distance from the caretaker's body, e.g., baby fed on lap away from caretaker's body, baby usually carried without direct contact with parent's body.

2. Low physical involvement. Parent usually keeps a distance between self and the infant. Generally avoids physical contact.

3. Moderate physical involvement. Moderate closeness. Mother seems comfortable with closeness. No physical aloofness or marked avoidance of physical contact but does not go out of her way to initiate close contact.

4 High physical involvement. Parent usually tends to hold baby close. Initiates close contact when not required by ongoing activity.

5. Very high physical involvement. Extremely close physical contact. Parent often carries baby, even when engaged in household activities.

Scale 2: Intensity of positive emotional expression. A measure of the intensity of positive emotional expression to which the infant is exposed. Emotions expressed verbally, through facial expression and through body activity, i.e., smiles, eye contact, hugs, etc.

1. Very low. Even mild expressions of positive feelings are *rare* There may be occasional mild expressions of positive feeling. Strong expression of feeling is completely absent.

2. Low. Moderate expression of positive feeling toward child. Intense positive expression is rare or absent

3. Moderate. Frequent, moderately strong expressions of positive feeling, with some intense expression.

4 High. Very frequent, moderately strong expression of positive feeling, with much intense expression.

5. Very high. Parent is characterized by frequent and exuberant expression of positive feelings. Motions, facial expression, and sounds indicating pleasure and delight are frequent.

Scale 3: Intensity of negative emotional expression. A measure of the intensity of negative emotional expression to which the infant is exposed. Emotions may be expressed verbally, through facial expression and gesture (e.g., frowning, sharp commands, threat of force, yelling disapproval, of yelling) or physically, through body acts (e.g., rough handling of, striking, or shoving, baby). Watch for concrete examples of negative behavior.

1. Very low. There is no expression of negative feelings.

2. Low. Expression of negative feeling is rare.

3. Moderate. There is some mild expression of negative feeling with sharper, more intense expression only rarely.

4. High. there are frequent, moderate expressions of negative feeling with occasional strong expression.

5. Very high. There are frequent, strong expressions of negative feeling.

Scale 4: Sensitivity and responsiveness to nondistress and presocial behavior. The degree to which the parent responds to such infant behaviors as vocalizations, visual attentiveness, and smiles, or increase or decrease in activity *to stimuli* from the parent or another person. The low point of the scale would involve ignoring such behavior. The high point would represent extreme sensitivity to such behavior and treating such behavior as potentially meaningful signals. The parent's response to the infant's behavior may run the range from acknowledgment to ecstatic pleasure, accompanied by all manner of social behaviors, including pats, hugs, smiles, verbal praise, expressive behaviors denoting positive affect, and the like.

1. Very low responsiveness to infant's presocial and nondistress behavior. The parent is unresponsive to obvious infant visual attention, vocalizations, smiles, or motor acts. Her behavior with the infant is not guided by such infant responses.

2. Low responsiveness. Occasional response to obvious infant responses.

3. Moderate responsiveness. The parent frequently responds to the more obvious infant behaviors.

4. High responsiveness. The parent consistently responds to infant's responses, obvious and subtle.

5. Very high responsiveness. The parent consistently responds to the infant's every nuance of behavior. She responds to both obvious and subtle responses to the infant.

Scale 5: Latency of parental response to infant behaviors connoting distress. How quickly the parent responds appropriately to the infant's distress signals. Rating takes into consideration the amount of time before the parent gives a direct response, and the intensity of the infant's signal.

1. Very long latency. Parent ignores baby's intense distress signal or may wait several minutes before making some attempt to respond to it. May verbally acknowledge baby's distress at a distance.

2. Long latency. Parent usually does not respond to baby's intense distress signal for one or two minutes. or if baby is fussing may wait several minutes

3. Moderate latency. Parent usually responds quickly to an intense cry and within a couple of minutes to fussing or whining. At times involvement in other activities may prevent immediate response to infant's distress signal.

4. Short latency. Parent usually responds quickly to crying and to fussing or whining.

5. Very short latency. Parent consistently responds quickly to crying and fussing,whining and also to such prefuss behaviors (denoting the beginnings of distress) as increased motor activity, finger sucking, vocalizations, and the like.

Scale 6: Contingent parental responding to infant nondistress behavior. How appropriately and rapidly the parent responds to infant nondistress behavior. The infant's response may be achievement, communicative, expressive, or simply instrumental.

1. Noncontingently. Parent may ignore infant's response entirely, or respond so inappropriately or slowly that the response is effectively noncontingent.

2. Seldom contingent.

3. Occasionally contingent.

4. Frequently contingent.

5. Invariably contingent. Parent's response to infant's is routinely appropriate, dicriminable, and rapid.

Scale 7: Parent's satisfaction with baby's personality. The extent to which parent is satisfied with baby's habits of sleeping, feeding, excreting, socializing, smiling, fussing, playing, and general responsiveness.

1. Very low satisfaction. Parent is very dissatisfied with baby's feeding, crying, fussing, smiling, sleep habits, or behavior when held.

2. Low satisfaction.

3. Moderate satisfaction.

4. High satisfaction.

5. Very high satisfaction. Parent is very enthusiastic about baby's personality and behavior.

Scale 8: Parent's report of observer influence. The extent to which parent's report their behavior was influenced or was altered (i.e., was atypical) by the presence of the observer. Both the degree of influence and the range of activities mentioned by the parent as affected by the observer will be considered in the rating — e.g., feeding, burping, bathing, changing diapers, grooming,dressing, playing, offering toys, talking to baby, holding, cuddling, etc. Also included, mention of more general effects such as increased tension, self-consciousness, discomfort on the part of the parent.

1. Very low observer influence. No mention of activities affected or parental feelings of strain.

2. Low observer influence. One activity minimally affected, or low level of tension awareness of observer (e.g., "I think feeding went a little slower." "I was probably a little tense because you were here.").

3. Moderate observer influence. One activity affected to some degree or two activities to a minor degree; may be some strain or tension attributed to observer's presence (e.g., "The baby seemed to have more trouble than usual during bath or feeding, maybe because I felt somewhat tense because you were here." "I usually talk more to her but I felt silly." "I was shy, really." "The bath was not exactly like it is usually — maybe she ate slower.").

4. High observer influence. Two activities affected to more than minimal degree, or two areas mentioned to a minor degree; significant increase in parental general tension, discomfort, etc. (e.g., "Well, I usually was not as smooth as usual," or "Well the bath seemed harder than on other days. I am not very comfortable doing that even if no one is here and baby hates it! Maybe that is also why he fussed during the feeding." "I usually talk and play a little more and I guess kiss him a little more too!").

5. Very high observer influence. Three or more activities more than minimally affected; high level of self-consciousness reported (e.g., "I didn't think I'd be so nervous but it was a hard day for me. He seemed to feel it too, cried more, spit up more and he didn't do any of his tricks." "I guess I still am awkward — can't tell what he wants. It felt worse for me today and he acted up" — after probe: "Oh, ate less, fussed more.").

Scale 9: Observer report of observer influence on parent The extent to which the parent's behavior was influenced or altered (i.e., was atypical) by the presence of the observer, as shown by eye contact with the observer during the observation, comments to observer or to infant about the observer made during observation

1 Very low observer influence. Almost no eye contact, no comments to observer or infant.

2. Low observer influence. Little eye contact, none sustained. No more than one comment.

3. Moderate observer influence. Some eye contact, rarely sustained. One or two comments.

4 High observer influence. Some eye contact, occasionally sustained. Up to four comments.

5. Very high observer influence. Frequent eye contact, often sustained. More than five comments to observer or infant.

Scale 10: Appropriateness of parent's behavior regarding feeding. The extent to which parent's management of feeding situation is sensitive to and adapted to the infant's needs and rhythms. Considerations include: a) adult's initiation of feeding in relation to baby's sleep cycle and arousal level (e.g., waking to feed baby, feeding when baby is insufficiently aroused to feed satisfactorily, feed baby when convenient for parent rather than infant); b) attentiveness and sensitivity to infant regarding the pacing of the feeding (e.g., parent is focused on focused on feeding and does not engage in distracting activities such as talking on the phone, intensive or intrusive play, parent adjusts nipple for satisfactory rate of flow, allows rest periods or required digression for burping or swallowing without excessive interruptions, parent burps effectively, does not overstimulate sucking by jiggling nipple or touching the mouth); c) parent terminates feeding when baby seems satisfied (e.g., does not persist in feeding when child signals satiation; does not terminate while child still hungry or sucking); d) parent allows opportunity for infant to feed self at appropriate age.

1. Extremely inappropriate. Three or more instances of intrusiveness, over-stimulation, faulty pacing or misreading of baby cues regarding initiation, pacing or termination of feeding. Three or more instances of inappropriate behavior continue despite obvious signals from infant.

2. Somewhat inappropriate. One, two, or more instances of above, any one of which is persisted in over time.

3. Appropriate for new parent. By and large the behaviors is appropriate to baby's needs and rhythms but some trial and error is noted. When inappropriate behavior occurs adult notices infant's adverse reactions and modifies behavior accordingly.

4. Very appropriate. A few isolated instances of inappropriate handling, quickly remedied or modified.

5. Exceptionally appropriate. Parent is unusually sensitive and competent in tuning in to baby's needs and adjusting to them.

Scale 11: Appropriateness of parent's behavior to baby needs and rhythms. The extent to which the parent's handling and managing is adapted to baby's rhythms and sensitivities. Examples of highly appropriate behavior include:

a) providing stimulation at a time and in a manner that the baby is receptive. Allow baby "to be" without intensively imposing adult's own interest on him. b) providing for sleep or rest when baby is tired rather than over-stimulating him; arranging rest times to suit infant's needs rather than to non-baby considerations. c) handling baby in manner appropriate to his motor maturity — neither excessively vigorously nor overprotectively. d) managing activities which may be necessary but not enjoyed by baby (e.g., changing diapers, bathing) in an efficient manner without excessive prolongation. e) utilizing a repetoire of soothing techniques, allowing time for baby to soothe, not persisting in ineffective or distracting behaviors. f) exercising effective control of baby's behavior when necessary, resolving difficulties easily.

1. Extremely inappropriate behavior. Actions often totally contrary to infant's needs and rhythms, may be abusive.

2. Inappropriate behavior. Two, three, or more instances of understimulation or overstimulation, intensiveness, excessively vigorous handling, faulty pacing in providing for the stimulation-sleep cycle, or allowing persistent inappropriate behavior by baby. Misreading or ignoring of cues, (e.g., soothing when infant needs more stimulation). Inappropriate behavior is continues in spite of obvious signs from baby.

3. Appropriate for new parent. By and large the behavior is appropriate to baby's needs and rhythms, but some trial and error behavior is noticed. When inappropriate behavior occurs, mother is quick to see that infant is reacting adversely and she modifies her behavior accordingly.

4 Very appropriate. A few isolated instances of inappropriate handling and they are quickly remedied.

5. Exceptionally appropriate. This parent is a virtuoso in baby handling. Parent is exceptionally attuned to baby's needs and rhythms and high capable in adapting her behavior to those needs.

[Note: *Infant Rating Scales* are not presented as they were not reliably scored]

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Inquires and requests for reprints may be sent to Dr. Albert R. Hollenbeck, AARP Andrus Foundation, 1909 K Street, N.W., Washington, D.C. 20049. The views expressed in this paper are those of the authors. They do not necessarily represent the views or policies of the association and educational institutions listed herein. The names of these organizations are listed for identification purposes only.

Table 1: *First Hour Treatment Conditions in the Recovery-Room*

	Contact Minutes	
	15-Minutes	*60-Minutes*
Mode		
Skin-to-Skin	N = 16	N = 15
of		
Cradled	N = 17	N = 14
Presentation		
		Total N = 62

Table 2: *Data Collection Points for Mothers and Infants*

Data Type	*in Recovery-Room*	*at 2 Days*	*at 28 Days*
Observations:			
Feed		X	X
Nonfeed		X	X
NBAS	X		
Field's Questionnaire		X	X
Parental Ratings			X
[Maternal Diary (completed 2nd through 4th week of life)]			

Table 3: *Maternal Feed and Nonfeed Observation Means (M), Standard Deviations (SD), and Mean Percentage of Intervals Scored (%), at 2 and at 28 Days Post-Partum*

	Day 2						*Day 28*					
	Feed			*Nonfeed*			*Feed*			*Nonfeed*		
Behavior	M	SD	%	M	SD	%	M	SD	%	M	SD	%
show,tell	3.7	3.3	12.2	4.4	4.1	14.7	4.6	3.5	15.2	4.1	3.6	13.5
caregive	5.6	4.0	18.6	4.4	3.5	14.5	4.9	2.9	16.5	3.7	3.4	12.3
grimace	.3	.7	1.1	.5	1.2	1.7	.1	.4	.3	.3	.9	1.0
kiss	.7	1.2	2.2	1.1	2.0	3.6	.6	.9	2.0	1.3	1.9	4.2
smile	5.7	5.4	18.9	5.7	5.6	19.9	3.7	2.9	12.2	6.4	4.7	21.3
look	16.8	2.5	55.9	16.3	4.1	54.4	15.3	2.6	51.1	16.7	2.5	55.7
talk	11.4	6.5	38.0	9.5	7.1	31.8	9.7	4.8	32.4	17.6	5.4	58.7
vocal	2.6	2.3	8.8	2.8	3.4	9.3	2.5	2.0	8.3	6.4	4.5	21.3
finger	5.4	4.7	18.0	7.0	6.4	23.3	3.0	3.1	10.1	6.3	5.5	20.8
palm	5.7	4.8	19.1	9.7	6.4	32.2	3.9	3.4	13.1	8.3	5.3	27.6
rock	4.5	5.4	15.1	6.0	7.4	20.1	5.5	7.6	18.3	6.4	6.5	21.3

Table 4: *Infant Feed and Nonfeed Observation Means (M), Standard Deviations (SD), and Mean Percentage of Intervals Scored (%) at 2 and at 28 Days Post-Partum*

	Day 2						*Day 28*					
	Feed			Nonfeed			Feed			Nonfeed		
Behavior	M	SD	%	M	SD	%	M	SD	%	M	SD	%
grimace	.9	1.3	6.0	1.8	1.7	11.7	.3	.6	1.8	1.5	1.6	10.1
smile	0.0	0.0	0.0	.1	.2	.2	0.0	0.0	0.0	.2	.6	1.3
resist	.4	.9	2.9	.1	.1	0.0	.1	.3	.3	.1	.1	.1
en face	.1	.4	.4	.2	.5	1.0	1.4	2.2	9.4	2.0	2.2	13.4
eyes open	4.6	4.1	30.4	3.9	4.7	25.9	9.0	3.8	59.9	10.2	3.3	67.7
nonvocal	5.9	3.3	39.1	3.7	3.1	24.9	9.4	3.3	62.6	6.7	3.1	44.4
vocal	.3	.6	1.9	.3	.7	2.2	.1	.4	.7	.3	.7	1.9
mouthing	4.3	2.3	28.5	6.0	3.7	40.1	2.5	2.3	16.4	7.0	2.3	46.4
fuss,cry	.2	.7	1.5	.4	.9	2.6	.5	.7	3.2	1.8	2.0	11.7
motor acts	7.5	4.1	49.9	8.4	4.2	56.2	6.9	3.1	46.0	1.0	1.8	6.3
feed	7.8	3.8	52.1	.7	1.6	4.5	10.5	2.3	69.7	.9	1.8	6.3

Table 5: *Maternal Observations in the Recovery-Room*

MANOVA Analysis

Source	*df*	*F*	*p<*
Post Del. Medication	11,46	1.90	.06
Duration of Contact (15-min. vs. 60-min.)	11,46	24.00	.01

Univariate Analyses				*Adjusted Means*	
Source	*df*	*F*	*p<*	*15-min*	*60-min*
show,tell	1,56	12.49	.01	02.8	09.3
caregive	1,56	18.34	.01	01.3	05.0
grimace	1,56	04.29	.05	00.1	00.7
kiss	1,56	03.63	.06	00.1	00.4
smile	1,56	18.02	.01	15.9	40.2
look	1,56	76.63	.01	18.4	47.6
talk	1,56	12.05	.01	21.3	44.5
vocal	1,56	08.14	.01	01.5	04.9
finger	1,56	10.67	.01	13.6	29.8
palm	1,56	06.60	.01	07.7	19.4
rock	1,56	03.00	.09	06.2	12.8

Note. Parity, Pre-medication, Anesthesia, Post-medication, and Years of Schooling are scaled low to high (0,1,2,3,...,N); Gender is scaled (female = 2, male = 1); and feed mode is scaled (bottle = 1, breast = 2).

Table 6: *Infant Observations in the Recovery-Room*

MANOVA Analysis

Source	*df*	*F*	*p<*
Original Feed Mode	11,46	1.69	n s.
Delivery Anesthesia	11,46	1.31	n.s
Duration of Contact (15-min. vs. 60-min.)	11,45	6 94	01

Univariate Analyses

				Adjusted Means	
Source	*df*	*F*	*p<*	*15-min.*	*60-min.*
grimace	1,55	11.60	.01	01.0	03.0
eyes open	1,55	27.95	01	12.2	36.3
nonvocal sound	1,55	21.35	.01	04.3	13.6
mouthing	1,55	27.56	.01	10.8	25.9
fuss,cry	1,55	10.63	.01	02.0	06.1
motor acts	1,55	46.00	.01	15.1	37.9
feed	1,55	08.67	.01	00.9	06.3

Table 7: *Residual Correlations Between Independent Co-Variables and Observed Maternal Behaviors Controlling for Experimental Design Elements (df = 61, p < .05)*

Grand Mean	
Original Feed Mode with Final Feed Mode	r = .65
Parity with *talk*	r = -.28
Gender with *kiss*	r = 33
Anesthesia with *rock*	r = -.28
Anesthesia with Final Feed Mode	r = -.35
Day 2 vs. Day 28 Contrast	
Pre-medication with *caregive*	r = -.25
Gender with *vocal, nonsound*	r = -.26
Anesthesia with *palm*	r = .35
Final Feed Mode with *palm*	r = -.32
Feed vs. Nonfeed Contrast	
Original Feed Mode with *rock*	r = .25
Anesthesia with *smile*	r = .25
Post-medication with *palm*	r = .31
Final Feed Mode with *look*	r = -.27
Day 2 vs. Day 28 by Feed vs. Nonfeed Contrast	
Original Feed Mode with *kiss*	r = -.32
Anesthesia with *talk*	r = -.28
Post-medication with *rock*	r = .31

Note. Parity, Pre-medication, Anesthesia, Post medication, and Years of Schooling are scaled low to high (0,1,2,3,...,N); Gender is scaled (female = 2, male = 1); and feed mode is scaled (bottle = 1, breast = 2).

Table 8: *Day 2 vs. Day 28 by Feed vs. Nonfeed Contrast Means (M) for Observed Infant motor acts and feed Behaviors*

	Day 2		Day 28	
Behavior	Feed	Nonfeed	Feed	Nonfeed
motor acts	7.5	8.4	6.9	0.9
feed	7.8	0.7	10.5	0.9

Table 9: *Residual Correlations Between Independent Co-Variables and Observed Infant Behaviors Controlling for Experimental Design Elements (df = 61, p < .05)*

Grand Mean	
Gender with *nonvocal sound*	r = .31
Anesthesia with *grimace*	r = .27
Anesthesia with *mouth open*	r = .27
Final Feed Mode with *eyes open*	r = -.27
Final Feed Mode with *mouth open*	r = -.42
Final Feed Mode with *feed*	r = .26
Day 2 vs. Day 28 Contrast	
Original Feed Mode with *smile*	r = -.29
Original Feed Mode with *vocal*	r = -.26
Original Feed Mode with *feed*	r = .30
Pre-medication with *eyes open*	r = -.33
Final Feed Mode with *smile*	r = -.27
Feed vs. Nonfeed Contrast	
Final Feed Mode with *grimace*	r = -.28
Final Feed Mode with *vocal*	r = -.32
Day 2 vs. Day 28 by Feed vs. Nonfeed Contrast	
Gender with *grimace*	r = -.28
Gender with *nonvocal sound*	r = .27
Pre-medication with *fuss,cry*	r = .27
Post-medication with *mouth open*	r = .26
Post-medication with *feed*	r = -.25
Final Feed Mode with *smile*	r = .27
Final Feed Mode with *eyes open*	r = .29

Note. Parity, Pre-medication, Anesthesia, Post-medication, and Years of Schooling are scaled low to high (0,1,2,3,...,N); Gender is scaled (female = 2, male = 1); and feed mode is scaled (bottle = 1, breast = 2).