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The influence of infant irritability on maternal sensitivity in a sample of very premature infants

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ABSTRACT

The relationship between maternal sensitivity and infant irritability was investigated in a short-term longitudinal study of 29 very preterm infants. Infant irritability was assessed at term with the Brazelton NBAS, the Mother and Baby Scales (MABS) and the Crying Pattern Questionnaire (CPQ). Maternal sensitivity was assessed by nurses' ratings in the neonatal care unit and at three months during mother-infant interaction observation. Cross-lagged panel analysis indicated that neonatal irritability did not influence sensitivity at 3 months nor did maternal sensitivity in the newborn period lead to reduced irritability at 3 months. Both irritability and maternal sensitivity showed moderate stability over time ($r=.55$ and $r=.60$, respectively). It is concluded that in early infancy maternal sensitivity shows little influence on infant irritability in very preterm infants.

Keywords:

Irritability, Crying, Maternal sensitivity, Very premature infants, VLBW

INTRODUCTION

There is an unresolved debate in the literature concerning whether infant crying influences maternal sensitivity or vice versa. Temperament researchers have argued that difficult infant behaviour can negatively influence maternal sensitivity and the evolving mother-infant relationship (van den Boom, 1994). In contrast, others suggest that non-optimal maternal sensitivity increases the likelihood of the development of difficult child characteristics and high irritability (Bell & Ainsworth, 1972). In samples with fullterm infants, and depending on the design and measures of sensitivity/responsiveness and irritability, studies found either a) a gradual decrease of sensitive responses of mothers with highly irritable infants over time (van den Boom, 1994; Balleyguier, 1991), b) an increase of crying if the mother was less responsive (Bell & Ainsworth, 1972, see also critical comments by Gewirtz & Boyd, 1977), c) independence between maternal responsiveness and the level of infant irritability (Crockenberg, 1986; Crockenberg & Smith, 1982) or d) mutual negative influence of crying and responsiveness/sensitivity over time with unclear direction of influence (Hubbard & van Ijzendoorn, 1991; Fish, Stifter & Belsky, 1991; Fish & Crockenberg, 1981). Most studies with fullterm infants have found a negative correlation between irritability and maternal sensitivity/responsiveness. However, the direction of influence is not clear as yet, due to methodological shortcomings in previous studies. These include start of measurement only after the first three months of the infant's life (e.g. Bell & Ainsworth, 1972) and variable definitions of sensitivity and responsiveness.

Maternal sensitivity and irritability in the very preterm infant

The relationship of infant irritability and sensitivity over time has not, to our knowledge, been investigated in very preterm babies. Several researchers found higher levels of irritability in high-risk very preterm infants, compared to low-risk preterm and fullterm infants (Oberklaid, Prior & Sanson, 1986; Wolke, Meyer, Ohrt and Riegel, 1994; Washington, Minde & Goldberg, 1986). Maternal sensitivity in dyads with very preterm infants has often been reported to be less optimal than in dyads with fullterm infants (eg Beckwith & Cohen, 1989; Crnic, Ragozin, Greenberg, Robinson, & Basham, 1983). It has not yet been determined whether these differences in maternal interaction patterns are related to potentially higher levels of infant irritability. The present study investigated the relationship of infant irritability and maternal sensitivity at term and three months post term and across time in very preterm infants.

METHOD

Sample

Parents of 38 infants born very prematurely (<1500g or <32 weeks of gestation) between January and August 1998 were approached. Parents of nine infants did not agree to take part in the study. However, infants for whom no consent was obtained did not differ from the study sample regarding birth weight and gestation. Thus the final sample for this study consisted of 29 very preterm infants. The characteristics of the participants are shown in Table 1.

(Table 1 about here)

Procedure

This study was designed to include two assessment points: The Term Assessment (t1) was scheduled at 40 weeks gestation (+/- 1 week), the second assessment (t2) took place at 3 months corrected for prematurity (+/- 2 weeks). The instruments used at both assessment points are listed in Table 2.

(Table 2 about here)

Instruments

The Neonatal Behavioral Assessment Scale (NBAS, Brazelton & Nugent, 1995, 3rd edition) is a standardized measure of the newborn infant's behavioural competence suitable for use for infants of 36 to 44 weeks gestational age. The study used Kaye's irritability cluster (Kaye, 1978) adding the supplementary item "General Irritability" of the 3rd edition of the NBAS. These supplementary items were developed especially for the use with fragile and premature infants at term age.

The Mother and Baby Scale (MABS, neonatal version, St. James-Roberts & Wolke, 1988, Wolke, 1995) is a mother-report measure of her perceptions of the baby's behaviour. Each item is rated on a 6-point scale ranging from "not at all" to "very much/very often". The 15-item "unsettled-irregular" subscale, previously reported to show high internal consistency ($\alpha = .93$; Wolke, 1995), was administered during the first assessment.

The Crying Pattern Questionnaire (CPQ, St. James-Roberts & Halil, 1991) is a short mother-questionnaire for the assessment of the crying and fussing duration during morning, afternoon, evening and night. From

this, the total cry duration per day was computed (fussing and crying were combined). The CPQ was administered at t1 and t2.

The Boston City Hospital Assessment of Parental Sensitivity (BCHAPS, Zahr & Cole, 1991) is a tool developed to evaluate sensitivity of mother-preterm infant interactions in hospital. It is a 13-item questionnaire given to the nurses to assess how well the mother cares for, interacts with, and enjoys her premature infant while s/he is still in hospital. The items are rated on 5-point scales from “poor” to “very competent”. The questionnaire was completed by a nurse in the last days prior to discharge. The BCHAPS was missing for one mother.

Mother-Infant Interaction Observation: A 6-minute semi-structured face-to-face play interaction was videotaped during the second assessment (2.5 min toy play, 2.5 min free play, 1 min getting baby to watch mothers face). For two mother-infant dyads there was no videotaped interaction due to technical failure.

The employed sensitivity scale was adapted from the sensitivity subscale in the Emotional Availability Scales (Biringen, 1990, 1993). The main emphasis lay on absence of intrusive behaviour; the use of baby's feedback for appropriate and prompt responses; positive and authentic affect towards the baby; and enjoyment of the interaction. After a training period, 38% of the videotapes were coded independently by two raters, one of whom was blind to all infant and mother data. Interrater agreement was $\kappa=.86$.

Data Analysis

Cross-lagged panel analysis was used to determine the relative influence of term sensitivity (BCHAPS) and irritability (Irritability Scale t1: NBAS, MABS, CPQ, see below) on both observed maternal sensitivity and infant cry duration (CPQ) at 3 months (corrected age). Cross-effects as well as stability of both constructs were obtained.

RESULTS

Construction of an Irritability Scale for t1

Low stability of irritability measures in early infancy (i.e. $r = 0.10$ to $r = 0.40$) has been reported previously (eg Wolke & St. James-Roberts, 1987; Seifer, Schiller, Sameroff, Resnick, & Riordan, 1996). Considering the variability of newborn behaviour according to current state and across situations, aggregated scores using

multiple data-sources and situations may provide a more reliable composite measure of newborn irritability (Crockenberg, 1986). This study used such an aggregated score to improve reliability. The mothers' rating of the average duration of their infants' crying per day (CPQ) was significantly correlated with both the examiner measure NBAS ($r=.40$; $p<.05$, $n=29$) and the Mother and Baby Scale irritability subscale ($r=.50$; $p<.005$, $n=29$). NBAS and MABS were also significantly associated ($r=.38$; $p<.05$, $n=29$). A common factor analysis of the three irritability measures was carried out to determine whether a composite score could be computed. One factor, explaining 43% of the total variance, was extracted, and the assumption of a uni-dimensional construct was accepted (all loadings $>.50$). All three t1 measures were used to compute a factor scale, the "irritability composite score". This irritability composite score was unrelated to birth weight and gestational age.

Stability of Cry Duration over Time (t1 to t2)

A scatter plot of cry duration at term and three months showed two outlying cases (more than two standard deviations from group mean) that were removed from further analysis because outliers are especially biasing in analysis of small samples. All subsequent analysis was carried out with 27 mother-infant pairs unless otherwise indicated. The neonatal irritability composite score correlated significantly with 3-month Fuss/Cry Duration $r=.55$ ($p<.005$, $n=27$). Irritability was moderately stable over the first three months of the infant's life.

Stability of Maternal Sensitivity between Assessment 1 and Assessment 2

The bivariate correlation between nurse rated maternal sensitivity at term and observed sensitivity at three months was $r=.60$ ($p=.001$). Sensitivity appears to be a stable maternal characteristic despite using different raters and observation situations. Those mothers with initially lower scores remained insensitive, whereas mothers with initially high scores showed greater variability at the second assessment point. It has to be noted that the average sensitivity score lay above scale mid-point for both instruments.

Cross-Lagged Panel Analysis

The longitudinal design allows the application of cross-lagged panel analysis, which takes the direction of the influence into account. Cross-lagged panel analysis yields not only information about the stability of maternal sensitivity and infant irritability when controlled for the influence of the other domain (lagged effects), but also permits conclusions about the cross-domain influence when controlled for the stability of the two constructs (cross effects, see Figure 1). The lagged effect for maternal sensitivity was obtained by partialing out the effect of early infant crying. The stability of irritability was obtained by partialing out the influence of early maternal sensitivity. The cross effects were obtained by regressing maternal sensitivity and irritability (t1) on maternal sensitivity and cry duration (t2). Cross-lagged panel analysis is subject to some important methodological assumptions, namely synchronicity and stationarity. Synchronicity refers to the measurement of all variables at the same time. It was attempted to measure maternal sensitivity and irritability/crying as synchronous as possible whilst assessing them independently. The nurses completed the BCHAPS just before discharge. All irritability measures were completed on the same day but in general several days later than the BCHAPS, as most children had left hospital when they reached term. Stationarity refers to the assumption that the assessed constructs do not change over time. This assumption is difficult to meet when the data covers periods of rapid growth and development, which is a characteristic feature of the first 3 months after birth. However, an additional factor analysis of irritability measures from t1 and t2 indicates only one common factor with communalities of .45 and above. This and the high stability of both sensitivity and irritability suggest that the data is suitable for cross-lagged panel analysis.

(Figure 1 about here)

Figure 1 shows moderate to strong stability (the first-order partial correlations are partial $r = .66$ for sensitivity, partial $r = .57$ for irritability). The small negative partial correlations ($r = -.15$ and $r = -.23$) indicate that the cross effects linking the two constructs were small and insignificant. Similarly, the cross-effect zero-order coefficients were weak and insignificant ($r = .24$ and $r = .10$, respectively). The change of sign between zero- and first order coefficients and the slightly higher stability of first-order lagged effects suggest that the cross effect partial r 's were mainly due to suppression effects.

DISCUSSION

This study set out to explore whether or not infant crying and maternal sensitivity influence each other over time in a sample of very preterm infants. Results from this small-sample study indicate that infant irritability did not influence later maternal sensitivity nor did early maternal sensitivity lead to changes in irritability at 3 months. We found that maternal sensitivity levels for most mothers were high at both assessment points, which suggests that excessive irritability and crying in very preterm infants often occur despite optimal maternal involvement with the infant, a conclusion also drawn for fullterm infants by St. James-Roberts et al. (1998). To test the robustness of findings, replication in a larger sample is necessary and currently under way.

The present study was designed to permit the employment of cross-lagged panel analysis to describe the influence of term maternal sensitivity and irritability on 3-month maternal sensitivity and irritability. Apart from studying a very preterm sample rather than fullterm infants, this study used a broader construct of sensitivity than those studies that defined responsiveness or sensitivity as the time to respond to crying (eg Hubbard & van Ijzendoorn, 1991). In this study, sensitivity was defined as the maternal ability to recognize, interpret and respond appropriately to all her baby's communications and needs (see de Wolff & van Ijzendoorn, 1997). There are advantages in using a broader definition. Firstly, it is this wider concept of sensitivity that has been consistently found to relate to later attachment development and parenting problems. Secondly, it yields data about maternal caretaking that can vary independent of crying. Thus, a test of the hypothesis of the influence of maternal sensitivity on infant irritability without confounding sensitivity and crying duration was possible (Gewirtz & Boyd, 1977).

In conclusion, within the first months of life infant crying is not influenced by maternal sensitivity and irritability may occur despite often highly sensitive caretaking, both in fullterm (St. James-Roberts et al., 1998) and very preterm infants as shown here.

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Table 1: Sample Characteristics

Infant characteristics	<u>n</u>=29
Distribution by sex (%)	
male	19 (65.5%)
female	10 (34.5%)
Multiple births	
Twin	6 (21%)
Singleton	23 (79%)
Birth weight (gms)	1412 (262)
Gestation (weeks)*	30.01 (1.25)
Length of hospitalisation/mechanical ventilation (days)	46.4/9.5 (18.9/12.5)
Small for gestation**	9 (31%)
Breastfed at term (%)	11 (38%)
Maternal characteristics	<u>n</u>=23 (six sets of twins)
Osborn Index of Social Class	52.31 (9.19)
Maternal age (years)	29.83 (5.34)
Maternal age leaving school (years)	16.25 (0.80)
Living with partner (%)	
single	5 (21.7 %)
living with partner	18 (78.3 %)

Note. Values are Means (SD) unless otherwise stated.

* determined from date of last recorded menstrual period

** weight below 10th percentile (Lucas, Cole & Gandy)

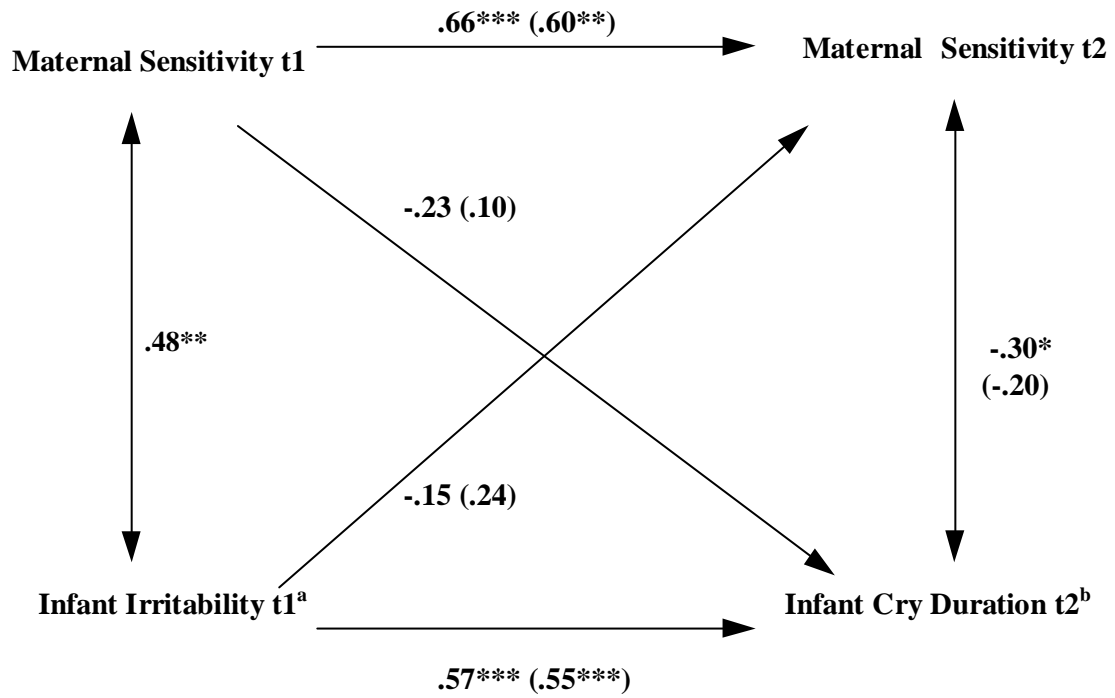
Table 2: Summary Table of Measures

<u>Assessment</u>	<u>Construct</u>	<u>Data Source</u>	<u>Instruments</u>	<u>Mean (SD) for this sample</u>
t1	Maternal Sensitivity	Nurse	Boston City Hospital Assessment of Parental Sensitivity (Zahr & Cole, 1991)	4.28 (.88)
t2	Maternal Sensitivity	Examiner	Maternal Sensitivity Rating Scale (adapted from the Emotional Availability Scales, Biringen, 1990)	3.51 (.90)
t1	Infant Irritability*	Mother	Duration of Fussing/Crying in minutes per day (CPQ, St. James-Roberts & Halil, 1991; Wolke et al., 1994)	155.6 (149.9)
t1	Infant Irritability*	Mother	Mother and Baby Scales (MABS, St. James-Roberts & Wolke, 1988; Wolke, 1995): Unsettled-Irregular Subscale	39.74 (12.90)
t1	Infant Irritability*	Examiner	Brazelton Neonatal Behavioral Assessment Scale (NBAS, Brazelton & Nugent, 1995): Irritability Cluster	4.07 (1.94)
t2	Infant Irritability	Mother	Duration of Fussing/Crying (CPQ, see above)	117.7 (96.9)

Note. t1: at term or before; t2: 3 months

* combined into Irritability Composite Score (Neonatal)

Figure 1: Cross-lagged model: Partial correlations between sensitivity and irritability from t1 to t2 (zero-order correlations in brackets)



^a Irritability Composite Score

^b CPQ Cry Duration

*** $p < .001$, ** $P < .005$, * $p < .05$