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Twin birth: An additional risk factor for poorer quality maternal interactions with very preterm infants?

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ABSTRACT

Background: Twin birth can be considered an additional risk factor for poor interactions between mothers and their very preterm (VP; <32 weeks' gestation) infants.
Aims: To explore if mothers of (VP) twins experience higher levels of stress than mothers of singletons and if mother–twin infant dyads experience poorer quality interactions.
Method: Mothers of VP twin infants (N = 17) were closely matched to mothers of VP singleton infants (N = 17). Mother–infant interaction was assessed before discharge from hospital and during a home visit at three months corrected age using the Nursing Child Assessment Teaching Scale (NCATS). Mothers' responsiveness to their infants was assessed using the Responsivity subscale of the Home Observation for Measurement of the Environment (HOME) and mothers completed the Parenting Stress Index short form (PSI-SF).
Results: Mothers of twins had significantly lower HOME responsiveness scores (median 9 vs. 10) at three months corrected age and were more likely to have total PSI-SF scores in the clinical range (>90th percentile) compared to mothers of singletons (Fishers exact probability = 0.05). Twin infants had lower mean Total Child Domain NCATS scores than singletons both at discharge (9.07 vs. 11.33) and at three months corrected age (13.18 vs. 15.71) indicating they were less responsive communicators.
Conclusions: VP twins present a greater challenge than singletons as their mothers experience high levels of parenting stress. Although mothers appear to compensate for twin infants' poorer clarity of cues in a structured, one to one task, mothers of twins were less responsive than mothers of singletons in an unstructured setting.

1. Introduction

Maternal interactions with preterm infants have been shown to be of poorer quality than interactions with infants born at term [1,2]. Although preterm infants are less attentive and less facially expressive during interactions compared to infants born at term [3], maternal psychological and cognitive factors also influence the quality of the exchange. For example, a preterm birth is associated with significant emotional disturbance for parents [4], and symptoms of stress and depression [5,6]. Such stress has been shown to reduce sensitivity to infant cues [7,8]. Negative stereotypes of preterm infants as less cognitively competent, may further impair maternal interactions [9]. This is of concern, since the quality of maternal interactions predicts developmental outcomes [10,11], particularly for more vulnerable infants such as those born preterm or low birth weight [12–15].

Mothers of twins experience higher levels of parenting stress than mothers of singletons [16–18], and competing demands from a twin sibling may result in a more impoverished verbal environment [19]. The most recent figures for the USA show that twin births have increased to a new record high of 33.2 per 1000 births in 2009 [20] and, a recent review of twins reports that 12% will be born VP [21]. In view of this there has been surprisingly little research exploring the extent that twin status impacts on mother–infant interaction following preterm birth. One study that did, compared the interactions of 22 mothers with their preterm (32.3 ± 2.1 weeks) singleton babies, to four mothers with their eight preterm (32.0 ± 2.6 weeks) twins, matched for demographic and medical status, at one and eight months corrected age [22]. Maternal interactions with twins were of reduced frequency and quality. Moreover, these measures were significantly correlated with poorer cognitive development at 18 months. The extremely small sample size with only 4 mother–twin dyads, means it is imperative to see if the findings can be replicated with a larger sample. A further limitation of the study was that all observations of mother–infant interactions were carried out in

Abbreviations: PSI-SF, Parenting Stress Index short form; VP, very preterm; NCATS, Nursing Child Assessment Teaching Scale; HOME, Home Observation for Measurement of the Environment.

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naturalistic settings, with no opportunity to observe the mother interacting in a one to one situation.

A larger more recent study explored correlates of mother–infant interactions between 108 infants born <35 weeks gestation and their mothers [23]. The authors reported that mothers of multiples displayed less positive involvement and, developmental stimulation when interacting with their infants, compared to mothers of singletons. Although these findings suggest multiples are at risk for poorer quality interactions the study did not use a validated assessment of interaction and, interactions were evaluated during free play. Moreover, interaction was assessed in terms of groups or dimensions of behaviour and so it was not possible to determine if this was due, as the authors suggest, to the time constraints of caring for more than one infant or the nature and quality of the interaction. In addition more mature preterm infants with those born at gestations up to 34 weeks were included in the study. The present study was designed to overcome the shortcomings of the previous studies and so uses data from a large study of 233 very preterm infants born <32 weeks gestation [24]. The quality of mother–infant interaction will be compared between mothers of twins and closely matched mothers of singletons during a structured one to one task, and in a naturalistic setting, using validated measures. We hypothesised that mothers of twins would experience higher levels of stress than mothers of singletons and, mother–twin infant dyads would experience poorer quality interactions than mother–singleton dyads.

2. Methods

2.1. Design & participants

Participants were mothers of preterm infants born <32 weeks gestation who had been recruited to a parenting intervention study [24]. Of the 340 infants who fulfilled the study inclusion criteria, 33 died and of the remaining 307, 233 (76%) were consented into the study, including 23 pairs of twins. No significant differences were found between those who consented to take part in the original study and those who did not in terms of birth weight, gestational age, gender or multiple pregnancy [24]. Following recruitment, 2 pairs of twins were withdrawn from the study and in 4 pairs one or both infants died. This resulted in 17 pairs of twins participating in the original study. One infant from each pair of twins was selected at random to participate in the present study. Each mother of a twin was matched to a singleton mother for parity, age at birth of baby and highest educational qualification (see Table 1).

2.2. Measures

2.2.1. Index of Multiple Deprivation 2004 (IMD) [25]

An IMD score for each infant was calculated based on their postcode and derived from data on deprivation across seven domains: income, employment, health and disability, education skills and training, barriers to housing and services, living environment and crime. Scores in England range from 0.59 (least deprived) to 86.36 (most deprived) with a median of 17.02.

Table 1
Maternal demographic characteristics.

	Twins (n = 17)	Singletons (n = 17)
Mean age (SD)	32.47 (5.48)	31.82 (5.02)
White European	17 (100%)	17 (100%)
Married/ cohabiting	16 (94%)	16 (94%)
First baby	10 (59%)	10 (59%)
Highest level of education NVQ, GCSE	5 (29%)	5 (29%)
Degree/postgraduate	7 (41%)	7 (41%)

2.2.2. Nursing Child Assessment Teaching Scale (NCATS) [26]

This widely-used standardised and reliable assessment has been validated for the assessment of caregiver–child interactions for children up to three years old. Caregivers are shown a list of sensorimotor skills in ascending order of difficulty and asked to select the first skill the child has not yet acquired. A trained observer rates 73 binary items related to child and caregiver behaviour while the caregiver attempts to teach this skill. Sub-scale scores can be calculated to examine both the child and caregiver contribution. There are 2 child subscales: Child's Clarity of Cues and Responsiveness to caregiver, and these are summed to give a Total Child Domain Score. Four subscales describe the caregiver's behaviour: Sensitivity to Cues, Response to Child's Distress, Social Emotional Growth Fostering and Cognitive Growth Fostering. These are summed to provide a Total Caregiver Domain Score. For all scales higher scores indicate more optimum interactions.

2.2.3. Home Observation for Measurement of the Environment (HOME) — Responsivity subscale [27]

The Responsivity subscale consists of 11 binary items that are completed by observation in the child's home. The items explore the extent that the parent responds to the child's behaviour, offers verbal, tactile and emotional reinforcement for desired behaviour and communicates through words and actions. Scores range from 0 to 11 with higher scores reflecting greater maternal emotional and verbal responsiveness. The Responsivity subscale has been found to correlate with naturalistic observations of mother–child interactions [28].

2.2.4. Parenting Stress Index-Short Form (PSI-SF) [29]

The PSI-SF comprises three subscales. The Parental Distress scale measures the distress a parent experiences in their role as a parent. The Parent–child Dysfunctional Interaction focuses on the perception by the parent that the child does not meet their expectations and interactions with the child are not reinforcing for them. The Difficult Child subscale focuses on characteristics of the child that makes them easy or difficult to manage. Higher scores on these subscales and the total score (a composite score of the three subscales) reflect higher levels of stress. Parents who obtain a Total Stress score at or above the 90th percentile are classified as experiencing clinically significant levels of stress. The author reports excellent correlations ($r = 0.94$) with the well validated long-form.

2.3. Data collection and procedure

The study was approved by the South-West Multicentre REC and the local REC in each centre. Informed parental consent to participate in the study was obtained shortly after birth by a research nurse. Demographic and clinical information was collected by the research nurse from mothers' and infants' clinical notes and from maternal interviews. NCATS assessments were carried out in the week prior to discharge (videotaped by a research nurse) and at a home visit when the infant reached three months corrected age (videotaped by a psychologist). The same rater: (CB) who was blind to study group allocation but not to twin status rated all the videotaped interactions. This rater had been trained to >90% reliability and any uncertainties over ratings were resolved by discussion with a second blind rater (CG) also trained to >90% reliability. Ten percent of NCATS assessments balanced for time and phase of study were re-rated at least 6 months later. Test re-test reliability was excellent with ICC of 0.93 for the caregiver total score and 0.92 for the child total score. HOME Responsivity subscale assessments were carried out by one of three psychologists during the home visit at three months corrected age. The raters were all blind to study group allocation but not to twin status. Inter-rater reliability was good with 92.9% item agreement. Completed PSI-SF questionnaires, which had been posted to participants a week before, were collected at this visit.