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Early Dyadic Patterns of Mother–Infant Interactions and Outcomes of Prematurity at 18 Months

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ABSTRACT

OBJECTIVE. With the increased survival of very preterm infants, there is a growing concern for their developmental and socioemotional outcomes. The quality of the early mother–infant relationship has been noted as 1 of the factors that may exacerbate or soften the potentially adverse impact of preterm birth, particularly concerning the infant's later competencies and development. The first purpose of the study was to identify at 6 months of corrected age whether there were specific dyadic mother–infant patterns of interaction in preterm as compared with term mother–infant dyads. The second purpose was to examine the potential impact of these dyadic patterns on the infant's behavioral and developmental outcomes at 18 months of corrected age.

METHODS. During a 12-month period (January–December 1998), all preterm infants who were <34 weeks of gestational age and hospitalized at the NICU of the Lausanne University Hospital were considered for inclusion in this longitudinal prospective follow-up study. Control healthy term infants were recruited during the same period from the maternity ward of our hospital. Mother–infant dyads with preterm infants ($n = 47$) and term infants ($n = 25$) were assessed at 6 months of corrected age during a mother–infant play interaction and coded according to the Care Index. This instrument evaluates the mother's interactional behavior according to 3 scales (sensitivity, control, and unresponsiveness) and the child's interactional behavior according to 4 scales (cooperation, compliance, difficult, and passivity). At 18 months, behavioral outcomes of the children were assessed on the basis of a semistructured interview of the mother, the Symptom Check List. The Symptom Check List explores 4 groups of behavioral symptoms: sleeping problems, eating problems, psychosomatic symptoms, and behavioral and emotional disorders. At the same age, developmental outcomes were evaluated using the Griffiths Developmental Scales. Five areas were evaluated: locomotor, personal-social, hearing and speech, eye–hand coordination, and performance.

RESULTS. Among the possible dyadic patterns of interaction, 2 patterns emerge recurrently in mother–infant preterm dyads: a "cooperative pattern" with a sen-

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Key Words
premature infant, mother–infant interactions, infant outcomes

Abbreviations
SCL—Symptom Check List
DQ—Developmental Quotient
PERI—Perinatal Risk Inventory
SES—socioeconomic status
S-C—sensitive mother with cooperative infant
C-CC—controlling mother with compulsive-compliant infant

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sitive mother and a cooperative-responsive infant (28%) and a "controlling pattern" with a controlling mother and a compulsive-compliant infant (28%). The remaining 44% form a heterogeneous group that gathers all of the other preterm dyads and is composed of 1 sensitive mother–passive infant; 10 controlling mothers with a cooperative, difficult, or passive infant; and 10 unresponsive mothers with a cooperative, difficult, or passive infant. Among the term control subjects, 68% of the dyads are categorized as cooperative pattern dyads, 12% as controlling pattern dyads, and the 20% remaining as heterogeneous dyads. At 18 months, preterm infants of cooperative pattern dyads have similar outcomes as the term control infants. Preterm infants of controlling pattern dyads have significantly fewer positive outcomes as compared with preterm infants of cooperative pattern dyads, as well as compared with term control infants. They display significantly more behavioral symptoms than term infants, including more eating problems than term infants as well as infants from cooperative preterm dyads. Infants of the controlling preterm dyads do not differ significantly for the total development quotient but have worse personal-social development than term infants and worse hearing-speech development than infants from cooperative preterm dyads. The preterm infants of the heterogeneous group have outcomes that can be considered as intermediate with no significant differences compared with preterm infants from the cooperative pattern or the controlling pattern dyads.

CONCLUSION. Among mother–preterm infant dyads, we identified 2 specific patterns of interaction that could play either a protective (cooperative pattern) or a risk-precipitating (controlling pattern) role on developmental and behavioral outcome, independent of perinatal risk factors and of the family's socioeconomic background. The controlling pattern is much more prevalent among preterm than term dyads and is related to a less favorable infant outcome. However, the cooperative pattern still represents almost 30% of the preterm dyads, with infants' outcome comparable to the ones of term infants. These results point out the impact of the quality of mother–infant relationship on the infant's outcome. The most important clinical implication should be to support a healthy parent–infant relationship already in the NICU but also in the first months of the infant's life. Early individualized family-based interventions during neonatal hospitalization and transition to home have been shown to reduce maternal stress and depression and increase maternal self-esteem and to improve positive early parent–preterm infant interactions.

WITH THE INCREASED survival of very preterm infants, there is a growing concern for their developmental outcome and quality of life; these have become an important focus of research. It generally is found that prematurely born children have more cognitive, behavioral, socioemotional, and school problems when compared with control children, even in the absence of major neurosensory or motor impairments.[1–5] Some studies have analyzed these outcomes, in the light of the degree of prematurity or of potential central nervous system insults (biological factors). In several studies, the quality of socioenvironmental factors also has been considered. A number of investigations have documented differences between premature infants and term infants in the communicative styles with their mothers during infancy.[1,3,6–9]

It is suggested that the parent's ability to adjust to the situation of a premature birth and the quality of the early parent–infant relationship represent critical aspects concerning the infant's later competencies and development.[7] The early mother–infant relationship has been pointed out as 1 of the factors that may exacerbate or ameliorate the impact of the preterm birth.[4] The quality of the early relationship has been described as having an important effect on parental emotions, perceptions, and attitudes toward the infant's needs and the future. Child and environment reciprocally affect one another over time in a transactional way involving complex feedback systems.[4,9,10]

Crittenden[11] underlined that maternal and infant interactional behaviors tended to match in a predictable way: sensitive mothers matching with cooperative children and controlling or unresponsive mothers matching with compliant, difficult, or passive children. Crittenden assessed mother–infant interaction in the specific case of abusive mothers. These mothers were found to be more controlling and their children more compliant than control subjects.

In a previous study, we found mothers of preterm infants to be less sensitive and more controlling than mothers of term control infants and the children to be more compliant. This was especially manifest when mothers had experienced high stress in the perinatal period.[6] As far as premature birth is concerned, it remains unclear whether such interactional patterns are adaptive, representing a compensatory response to specific difficulties that are presented by the preterm infant's immaturity[10,12,13] or representing a problematic maternal behavior that is detrimental to the preterm infant's outcomes.[14,15]

The first purpose of the present study was to identify at 6 months of corrected age the possibly specific dyadic patterns of interaction in preterm mother–infant dyads as compared with term dyads. The second purpose was to examine the potential impact of these dyadic patterns on the infant's behavioral and developmental outcomes at 18 months of corrected age.

METHODS

Procedure and Instruments

Perinatal and sociodemographic data were collected during the hospitalization period. Follow-up visits took place when the infants were 6 and 18 months of corrected age. At 6 months (mean: 6 months and 1 week; SD: 1 week), mothers with their infant were observed in a mother–infant standardized object-play interactional situation. At 18 months (mean: 18 months and 2 weeks; SD: 2 weeks), a semistructured interview was proposed to the mothers to explore the infant's behavioral symptoms.[16] The mental and psychomotor development was assessed during a pediatric examination (including a neurologic and somatic examination) using the Griffiths developmental scales.[17]

The mother–infant play interaction, which lasted 10 minutes, was videotaped. The mother was asked to play freely with her child and choose among a predetermined number of toys. It later was coded according to the third revision of the Care Index[11] by 2 blinded independent coders, 1 of them certified by Crittenden. We computed an intraclass coefficient (model α) on 16 dyads: 0.873 for maternal characteristics and 0.865 for infant characteristics. The coding procedure is suitable from birth to 30 months of infant age, is not specific to prematurity, and has been used with various populations.[18] This instrument assesses the mother's interactional behavior according to 3 scales (sensitivity, control, and unresponsiveness) and the child's interactional behavior according to 4 scales (cooperation, compliance, difficult, and passivity). Each qualification ranges from 0 to 7.* To determine dyadic interactional patterns, we computed the median scores for each scale on the whole population and compared infants' and mothers' scores above/under median with one another to determine whether recurrent patterns emerged.

The Symptom Check List (SCL) is a 30-minute semistructured interview with the mother that aims to explore her perception of her infant's behavioral problems.[16,18] The SCL explores 4 groups of behavioral symptoms: (1) sleeping problems (trouble going to sleep, night waking, time needed to go back to sleep, and evaluation of the overall consequences of these problems on the parent–child relationship), (2) eating problems (refusal to eat, appreciation of the meal as a negative experience, vomiting, and evaluation of the overall consequence of these problems on parent–child relationship), (3) psychosomatic symptoms (digestion, asthma, allergies, and eczema), and (4) behavioral and emotional disorders (opposition, rituals, withdrawal, aggressiveness, fears, and separation anxiety). The items were coded by the interviewer on a 1- to 5-point scale (1: absence of symptom; 5: severe disorder), and means were calculated for each group of symptoms, as well as for the total SCL.

The Griffiths developmental scales (0–2 years)[17] assess the infant's mental and psychomotor development. Five areas are evaluated, providing 5 subscores: locomotor, personal-social, hearing and speech, eye–hand coordination, and performance. Each score is standardized for an expected value of 100 with an SD of 15. A global developmental score (DQ) represents the mean score of the 5 subscale scores.

The Perinatal Risk Inventory (PERI)[19] is an 18-item inventory that is used to describe the severity of the infant's perinatal problems on the basis of several perinatal factors (eg, the Apgar score, gestational age, birth weight, head growth, electroencephalogram, computed tomography scan or ultrasound, and ventilation). The PERI was used as a covariate in the analysis to control for the potential effect of the perinatal risk factors.

The socioeconomic status (SES) was coded using a score that was derived from the Hollingshead Index, combining training and work position for both parents.[20] As for the PERI, the SES was used as a covariate in the outcome analyses.

The results were analyzed with the SPSS version 12 for Windows (SPSS, Inc, Chicago, IL). Student's t tests were used to compare groups on demographic variables, gestational age, PERI score, and SES. χ^2 was used for comparison of frequencies. One-way analyses of variance and multivariate analyses of variance were performed for comparisons of means between groups. Posthoc tests (Tukey) were used for 2×2 comparisons. Statistical significance was considered at $P < .05$.

Participants

During a 12-month period (January–December 1998), all preterm infants who were <34 weeks of gestational age and hospitalized at the NICU of the Lausanne University Hospital were considered for inclusion in this longitudinal, prospective, follow-up study. The design of this prospective study was approved by the Ethics Committee for clinical research of the Lausanne University Medical School. Written informed consent was obtained from 1 of the parents.

Entry exclusion criteria were congenital malformations, chromosomal anomalies, evident parental psychiatric illness, drug abuse, and language barriers. The eligible patients represented 105 infants. Twenty refused to participate, and 12 died. Later exclusion criteria were severe developmental problems at 6 months and visual impairment ($n = 3$; 2 children with cerebral palsy and 1 child with severe visual impairment and developmental delay). In addition, 23 patients who were not included in

*Maternal sensitivity identifies behaviors such as mother is accommodating to her infant. Maternal control identifies that mother is overtly or covertly hostile. Maternal unresponsiveness identifies facial, vocal, or physical withdrawal. Infant cooperation identifies behavior that is associated with the expression of pleasure and facilitation of turn taking. Infant compliance identifies wary and inhibited behavior. Infant difficult identifies overt forms of resistance to maternal behavior. Infant passivity identifies behavior that functions to reduce contact with the mother.

our previous study for incomplete data[6] were equally excluded from this cohort. The remaining preterm group therefore was composed of 47 infants and their mothers. Control healthy term infants (gestational age ≥37 weeks) were recruited in 1998 at the maternity ward of the same hospital. Exclusion criteria were difficulties during pregnancy or delivery, somatic abnormalities, parental psychiatric problems, and language barriers. No term infants had developmental delay, and the control group was composed of 25 healthy term infants and their mothers.

RESULTS

Neonatal and Sociodemographic Data

Table 1 presents neonatal and sociodemographic data for the control term and the preterm infants. The 2 groups did not differ significantly in gender, maternal age, percentage of first-born, or nationality. The preterm group obviously had a lower gestational age and higher PERI score than the term control group. The SES of preterm infants was significantly lower than that of term control infants.

Ten (21%) preterm infants and no term infants were born after a multiple pregnancy ($P < .01$). Eight preterm twins were dizygotic, and the zygocity was unknown for 2. Because multiple pregnancy is a widely known risk factor for preterm birth, these dyads were not excluded to preserve the representativeness of the preterm group.

Specific Dyadic Patterns

When comparing infants' and mothers' interactional behavior scores (above/under median), 2 significant dyadic patterns of interaction emerged among the preterm dyads:a "cooperative pattern" with a sensitive mother and a cooperative-responsive infant (S-C; 28%) and a "controlling pattern" with a controlling mother and a compulsive-compliant infant (C-CC; 28%). The remaining 44% form a heterogeneous group that gathers all of the other preterm dyads and is composed of 1 sensitive mother–passive infant; 10 controlling mothers with a cooperative, difficult, or passive infant; and 10 unresponsive mothers with a cooperative, difficult, or passive infant. Because a large majority of term dyads were sensitive-cooperative dyads, in an additional analysis, the 3 groups of preterm infants were compared, with the term control infants considered as a whole (Table 2).

The PERI score of the 3 preterm groups, distinguished by dyadic patterns, did not differ significantly (S-C: 5.5; C-CC: 5.4; heterogeneous: 6.1). The SES of the 3 preterm groups did not differ significantly either (S-C: 2.2; C-CC: 2.2; heterogeneous: 2.6). Among the 10 preterm twins, 3 mother–infant dyads are characterized as S-C dyads, 4 as C-CC, and 3 as heterogeneous dyads. It is interesting to note that, when we compared mother–infant dyads inside a family (twins), they did not present the same interactional pattern in 60% of the cases.

Preterm Versus Term Infants' Outcomes at 18 Months

Table 3 presents behavioral symptoms (SCL) and developmental quotients (Griffiths) for the term and preterm infants. There is a tendency for preterm infants to present more behavioral symptoms than terms infants; nevertheless, none of the differences is significant. Regarding the developmental scores, preterm infants present a significantly lower score than the term control infants on the personal-social subscale only, with an equal global DQ value and a higher score on the performance subscale.

Interactive Scales and Dyadic Patterns of Mother–infant Interaction

Table 4 presents mothers' and infants' interactional characteristics, separately for each dyadic group: S-C, C-CC, heterogeneous, and term. We noted that term dyads do not differ significantly from S-C dyads on any maternal or infant variable. C-CC dyads differ from term and S-C dyads with a lower maternal sensitivity and a higher control, as well as a lower infant cooperation and higher compliance. Heterogeneous dyads differ significantly from term dyads with a lower maternal sensitivity and a higher control and differ from S-C dyads with a higher maternal control and higher infant difficult behavior. Heterogeneous dyads show nevertheless a significantly lower maternal control and lower infant compli-

TABLE 1 **Neonatal and Sociodemographic Data**

	Term Infants ($n = 25$)	Preterm Infants ($n = 47$)	*P*
Male	10 (40%)	22 (42%)	NS
Gestational age, wk	40 (1)	31 (2)	.001
Range	38–41	26–33	
PERI	0.2 (0.5)	5.8 (3.6)	.001
Range	0–2	1–15	
Maternal age, y	32 (4)	31 (5)	NS
Range	25–42	21–42	
First born	11 (44%)	30 (64%)	NS
Singleton	25 (100%)	37 (79%)	.01
Socioeconomic level	2.8 (0.6)	2.4 (0.6)	.01
Range	1.3–4	1–3.5	
Nationality (Switzerland + EU; %)	24 (96%)	44 (94%)	NS

Values represent actual numbers (gender, first born, nationality), means for other variables (SD in parentheses). Statistics: χ^2 and analysis of variance (ANOVA). NS indicates not significant.

TABLE 2 **Specific Dyadic Patterns**

	Term Infants ($n = 25$)	Preterm Infants ($n = 47$)
S-C	17 (68)	13 (28)
C-CC	3 (12)	13 (28)
Heterogeneous	5 (20)	21 (44)

Each maternal and infant characteristics is considered above median. Values represent actual numbers, % in parentheses. χ^2 (df: 3) = 94, $P < .001$.

TABLE 3 **Behavioral Symptoms (SCL) and DQs (Griffiths) for the Term and Preterm Infants**

	Term Infants ($n = 25$)	Preterm Infants ($n = 27$)	F	*P*
Total SCL score	1.47 (0.05)	1.60 (0.44)	3.64	.06
Sleeping problems	1.36 (0.11)	1.59 (0.11)	1.72	NS
Eating problems	1.12 (0.05)	1.22 (0.06)	1.30	NS
Psychosomatic symptoms	1.21 (0.04)	1.22 (0.05)	0.05	NS
Behavioral and emotional disorders	1.97 (0.12)	2.23 (0.10)	2.74	NS
DQ score	118 (1)	119 (1)	0.02	NS
Locomotor score	125 (2)	124 (1)	0.09	NS
Personal-social score	119 (1)	115 (1)	4.26	.04
Hearing-speech score	114 (1)	113 (2)	0.12	NS
Eye–hand coordination score	115 (1)	117 (1)	1.02	NS
Performance score	120 (2)	124 (1)	4.24	.04

Values represent means, with SEs in parentheses. Statistics: ANOVA with F and *P* values.

TABLE 4 **Mothers' and Infants' Interactional Characteristics and Dyadic Patterns of Mother–Infant Interaction at 6 Months**

	Term Dyads ($n = 25$)	S-C Preterm Dyads ($n = 13$)	C-CC Preterm Dyads ($n = 13$)	Heterogeneous Dyads ($n = 21$)	F	*P*
Maternal sensitivity	6.12 (0.25)[a,c]	7.00 (0.01)[b,d]	4.23 (0.40)[a,b]	5.10 (0.28)[c,d]	14.80	.001
Maternal control	1.56 (0.25)[a]	1.00 (0.28)[b,d]	4.00 (0.25)[a,b,c]	2.43 (0.43)[c,d]	11.89	.001
Maternal unresponsiveness	2.16 (0.35)	1.92 (0.47)	2.00 (0.38)	2.48 (0.35)	0.39	NS
Infant cooperation	6.76 (0.13)[a]	7.00 (0.01)[b]	5.92 (0.37)[a,b]	6.29 (0.29)	4.65	.01
Infant compliance	0.36 (0.23)[a]	0.08 (0.08)[b]	1.46 (0.22)[a,b,c]	0.19 (0.09)[c]	17.92	.001
Infant difficult	1.08 (0.22)	0.38 (0.18)[a]	0.85 (0.32)	1.62 (0.28)[a]	3.95	.01
Infant passivity	1.36 (0.28)	1.69 (0.38)	2.15 (0.42)	2.24 (0.40)	1.45	NS

Values represent means, with SEs in parentheses. Statistics: multivariate ANOVA (MANOVA) with F and *P* values. Multivariate test: Wilks' Lambda: 4.50; $P < .01$.

[a] $P < .05$ for post hoc test (C-CC preterm dyads versus term dyads).

[b] $P < .05$ for post hoc test (C-CC preterm dyads versus S-C preterm dyads).

[c] $P < .05$ for post hoc test (heterogeneous dyads versus term dyads).

[d] $P < .05$ for post hoc test (heterogeneous dyads versus S-C preterm dyads).

ance than C-CC dyads. When the indices of perinatal severity (PERI) and of SES are introduced in the model as covariate, differences among the 4 groups remain identical.

Infants' Behavioral Symptoms at 18 Months According to Patterns of Mother–Infant Interaction

Table 5 presents the total SCL mean score, as well as the mean SCL's subscales, for the 4 groups (S-C, C-CC, heterogeneous, and term). Premature infants of C-CC dyads present significantly more SCL symptoms (total) and eating problems than term control infants. They also present significantly more eating problems than infants of S-C dyads. Infants of S-C dyads do not differ significantly from term control infants on any variable. When the PERI and/or SES is controlled as a covariate, the same differences remain significant for the SCL symptoms.

Infants' Development Scores at 18 Months According to Patterns of Mother–infant Interaction

Table 6 presents the results concerning the Griffiths developmental scales for the various groups. The total DQ does not differ significantly among the 4 groups. However, infants from C-CC dyads present a significantly lower score for the personal-social subscale, as compared with term infants. Infants of C-CC dyads also present significantly lower scores for the hearing-speech sub-

TABLE 5 **Infants' Behavioral Symptoms (SCL) at 18 Months According to Patterns of Mother–Infant Interaction**

	Term Dyads ($n = 25$)	S-C Preterm Dyads ($n = 13$)	C-CC Preterm Dyads ($n = 13$)	Heterogeneous Dyads ($n = 21$)	F	*P*
Total SCL score	1.47 (0.05)[a]	1.52 (0.08)	1.72 (0.09)[a]	1.57 (0.06)	2.51	.07
Sleeping problems	1.36 (0.11)	1.36 (0.18)	1.63 (0.22)	1.70 (0.18)	0.24	NS
Eating problems	1.12 (0.05)[a]	1.02 (0.02)[b]	1.45 (0.15)[a,b]	1.20 (0.09)	3.66	.02
Psychosomatic symptoms	1.21 (0.04)	1.12 (0.05)	1.27 (0.12)	1.25 (0.07)	0.76	NS
Behavioral and emotional disorders	1.97 (0.12)	2.27 (0.21)	2.44 (0.16)	2.08 (0.14)	1.80	NS

Values represent means, with SEs in parentheses. Statistics: MANOVA with F and *P* values. Multivariate test: Wilks' Lambda: 1.94; $P < .05$.

[a] $P < .05$ for post hoc test (C-CC preterm dyads versus term dyads).

[b] $P < .05$ for post hoc test (C-CC preterm dyads versus S-C preterm dyads).

TABLE 6 **Infants' Development Scores (Griffiths) at 18 Months According to Patterns of Mother–Infant Interaction**

	Term Dyads ($n = 25$)	S-C Preterm Dyads ($n = 13$)	C-CC Preterm Dyads ($n = 15$)	Heterogeneous Dyads ($n = 21$)	F	*P*
DQ score	118 (1)	120 (2)	116 (2)	120 (1)	1.24	NS
Locomotor score	125 (2)	124 (2)	126 (1)	123 (2)	0.28	NS
Personal-social score	119 (1)[a]	118 (2)	110 (4)[a]	117 (1)	3.43	.02
Hearing-speech score	114 (1)	119 (3)[a]	105 (3)[a]	114 (2)	4.41	.01
Eye–hand coordination score	115 (1)	116 (2)	116 (2)	118 (2)	0.45	NS
Performance score	120 (2)[a]	124 (3)	121 (3)	127 (2)[a]	2.63	.06

Values represent means, with SEs in parentheses. Statistics: MANOVA with F and *P* values. Multivariate test: Wilks' Lambda: 2.62; $P < .01$.
[a] $P < .05$ for post hoc tests.

scale, as compared with infants of S-C dyads. Infants of heterogeneous dyads show a significantly higher score than the term infants for the performance subscale.

When the PERI index is controlled as a covariate, the difference between infants from C-CC dyads and term control infants, on the personal-social subscale, becomes less significant (expressing only a statistical tendency, $P < .1$), whereas the hearing-speech scale remains significant. When the SES is controlled, the differences remain significant for personal-social and hearing-speech scores. When both PERI and SES are introduced as covariates, the differences between the dyadic groups still express a statistical tendency for the personal-social subscale ($P = .08$) and remain significant for the hearing-speech ($P < .01$) subscale.

DISCUSSION

The first purpose of the study was to identify specific mother–preterm infant dyadic patterns of interaction at 6 months of corrected age. Two mother–infant interactional patterns emerge recurrently, each representing 28% of the preterm population, a "cooperative pattern" (S-C,) and a "controlling pattern" (C-CC). In the term group, the cooperative pattern represents the largest part of the group (68%), whereas the controlling pattern represents the smallest part of the group (12%).

The second purpose of the study was to evaluate the possible impact of the mother–infant dyadic pattern of interaction at 6 months on the infant's behavioral and developmental outcomes at 18 months. We found no differences between the preterm infants of cooperative pattern dyads and term dyads. In contrast, the outcomes of infants from controlling pattern dyads differed from those of term infants, as well as from those of cooperative pattern preterm dyads, with more global behavioral symptoms, in particular more eating problems, as well as lower personal social and/or hearing-speech abilities. The preterm infants of the heterogeneous group have outcomes that can be considered as intermediate with no significant differences compared with preterm infants from the cooperative pattern or the controlling pattern dyads.

A number of investigations have documented differences in the early communicative styles between mothers and their premature infants, as compared with mothers and term infants. Mothers of preterm infants have been described as more active, stimulating, and intrusive and at the same time more distant during the dyadic interaction,[3,8,9,12,21–23] whereas premature infants have been described as less alert, attentive, active, and responsive than term infants. Our results are consistent with these findings, pointing out how the interactional characteristics significantly combine in specific patterns of interactions among preterm dyads. Nevertheless, 44% of the preterm dyads could not be characterized in 1 of these 2 relevant patterns. In fact, this heterogeneous group is composed of various interactional dyadic styles.

Preterm infants of controlling dyads present globally more behavioral symptoms and particularly eating symptoms. In a previous article, we reported that sleeping and eating problems at 18 months (corrected age) were related to the mother's posttraumatic stress in the perinatal period.[24] It is possible that mother–infant interactional characteristics play a mediating role between the mother's anxiety and the infant's behavioral outcomes.

Several studies have shown a high rate of feeding difficulties in preterm infants, specifically refusal behavior.[25,26] Such difficulties make the parent feel frustrated and anxious regarding the infant's growth and health, which then may induce the parents to become overactive in the feeding process.[26] Our results suggest that infants from specific interactional dyads are more at risk for presenting feeding difficulties.

Concerning the developmental outcome at 18 months, we found only a few differences between preterm and term infants. Differences were found for the personal-social subscale between preterm infants and term infants, in particular when specific dyadic patterns are taken into account between controlling pattern infants and term infants. Considering the differences among the preterm groups, infants of controlling pattern dyads present lower scores on the hearing-speech subscale of the Griffiths as compared with infants of the cooperative pattern. Both scales relate to social communication and the interest or abilities of the child to communicate with his or her environment.

The quality of early social interactional experiences

between the infant and primary caregivers is recognized as the foundation for the infant's socioemotional skills. In the case of prematurity, studies have shown that maternal sensitivity and responsiveness represent potent antecedents to toddler engagement and cooperativeness in the mother–child relationship and to later language and social competencies.[1,3,4,27]

The studies that aimed to explore school-age cognitive outcomes showed a higher incidence of difficulties in preterm as compared with term infants. Most of these studies reported that cognitive delays or deficits are specific to very preterm infants. A relatively high rate of neurodevelopmental problems has been described, especially in extremely preterm infants.[2,28,29] In the present study, preterm infants with major neurologic impairments were excluded, and this could explain the relatively small differences noted between preterm and term infants regarding the developmental outcome in our population.

The findings in our study that preterm infants of controlling pattern seem to have a more problematic outcome at 18 months than the term infants and the cooperative pattern preterm infants can be discussed in light of the debate concerning the assumption that maternal control could be an adaptive interactional characteristic.[6,10,12,13] In our results, the controlling pattern is associated with a less favorable infant outcome when the infant responds with a compulsive-compliant behavior.

These results have to be considered cautiously. Comparison between studies related to mother–child interaction and infant outcomes in the case of prematurity is difficult. Differences in instruments used, timing of observations, and scoring systems may lead to incongruity in interpretation. Concerning the infant's developmental outcome, Griffiths scales represent an objective evaluation of the child's competencies by an experienced pediatrician. However, the behavioral symptoms of the SCL (sleeping, eating, psychosomatic, and behavioral and emotional disorders) were collected from a semi-structured interview with the mother. We cannot exclude the possibility that the mother's affective state may have interfered somewhat with the ratings. There are reports in the literature that maternal anxiety in the neonatal period represents a strong predictor of the parental perception of the child's vulnerability, even long after the child has fully recovered.[30] In this sense, it would have been interesting to take into account maternal perinatal anxiety. Mothers with evident psychiatric illness were excluded. Despite that of 1 of the 2 outcome measures suggests maternal subjectivity, it is interesting to note that both point out the same preterm dyads as being at risk. It would be interesting to have a later follow-up outcome of children concerning these different aspects. Another limitation is the small size of the various dyadic pattern groups.

The most important clinical implication of these findings is that supporting healthy mother–infant interactions may improve not only behavioral but also developmental outcomes in premature infants. It is not easy to distinguish, already in the NICU, specific at-risk mother–infant patterns of interaction because the infant still is very immature, but after discharge, the pediatrician could be attentive to it as it becomes more apparent during the infant's first months of life.

Early individualized family-based interventions during neonatal hospitalization and transition to home have been shown to reduce maternal stress and depression and increase maternal self-esteem and to improve positive early parent–preterm infant interactions.[31,32] These interventions should address parental perceptions of the infant in a preventive and guiding way. It then is essential to promote a positive parent–infant interactional style in giving opportunities to the parents to handle, care for, and observe their preterm infant, which increase parental feelings of self-confidence and competence in reading the infant's cues and responding appropriately to the infant's behavior.[33,34] It allows them to nurture their child while experiencing an affective and multisensorial experience and in this way reinforces the parent–infant bond.

CONCLUSION

We identified specific mother–infant dyadic patterns of interaction that could play either a protective (cooperative pattern) or a risk-precipitating (controlling pattern) role on developmental and behavioral outcome, independent of perinatal risk factors and of the family's socioeconomic background. These findings should lead to an increased awareness among the NICU staff regarding the quality of parent–infant interactions.

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