



## Brief Report

# Early interactive behaviours in preterm infants and their mothers: Influences of maternal depressive symptomatology and neonatal birth weight



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## ABSTRACT

The study evaluated the quality of preterm infant–mother interactions, considering severity of birth weight (ELBW and VLBW) and maternal depression, compared to full term babies. 69 preterm infants (29 ELBW and 40 VLBW) and 80 full-term (FT) infants and their mothers were recruited. At 3 months of corrected age, the quality of mother–infant interaction was evaluated through Global Rating Scales; moreover, infant level of development and maternal depression were assessed through Griffith Development Mental Scales and Edinburgh Postnatal Depression Scale. Results showed adequate sensitivity in preterm infants' mothers and higher involvement with their infants, compared to full term mothers, but ELBW ones exhibited an intrusive interactive pattern and a higher prevalence of depressive symptoms. The study underlined the relevance of paying special attention to both ELBW infants and their mothers, in order to support the parenting role and the co-construction of early interactions.

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## 1. Introduction

### 1.1. Mother–infant interaction in preterm infants

The quality of parent–infant interaction, co-constructed since the first weeks after birth, has been widely recognized as a strong mediating factor for the development of skills in the areas of self-regulation, socialization, cognitive and emotional functioning and as a strong predictor of child's developmental pathways (Ainsworth, Blehar, Waters, & Wall, 1978; Feldman, 2007; Murray, Fiori-Cowley, Hooper, & Cooper, 1996; van Ijzendoorn, Schuengel, & Bakermans-Kranenburg, 1999).

Among the elements which can interfere with the building of a synchronous and positive dyadic interaction, the premature birth plays a significant role. Indeed, in the last years, an increasing number of studies have investigated the impact of preterm birth on the early mother–infant interactions, finding more interactive difficulties compared to those with infants born at term (Holditch-Davis, Schwartz, Black, & Scher, 2007; Korja, Latva, & Lehtonen, 2012).

Specifically – as to infant interactive behaviour – preterm infants have been described as more passive, compliant and fretful during the interaction with their mothers (Forcada-Guex, Borghini, Pierrehumbert, Ansermet, & Muller-Nix, 2011;

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Goldberg & Di Vitto, 2002). Due to their biological immaturity, in fact, preterm babies appear less attentive and alert than full-term ones and show more difficulties in providing clear cues to their caregiver (Feldman & Eidelman, 2007; Olafsen et al., 2012).

On the other hand, the results of maternal interactive behaviours are, somehow, inconsistent (Korja et al., 2012): while most researchers have described less sensitive, more intrusive and controlling behaviours in preterm infants' mothers than in those of full-term babies (Feldman, 2007; Forcada-Guex et al., 2011), other studies have found less maternal responsiveness, fewer smiles and lower attention to preterm infants' cues (Feldman & Eidelman, 2007; Schmücker et al., 2005). This poorly investigated inconsistency could be partly due to the diversity of the instruments used to evaluate interactions and to the heterogeneity of sample characteristics; indeed, preterm groups can include infants with significant differences with relation to birth weight, gestational age and level of development reached (Korja et al., 2012).

### 1.2. Medical factors affecting parenting and parent–child relationships in preterm infants: the comparison between ELBW and VLBW infants

Nowadays the relevant improvements in technology allow the babies who present very severe preterm birth condition, which urgently call for the necessity of a prolonged hospitalization in NICU and different interventions, to survive: in the early 2000s, the survival rates stabilized at approximately 85% for VLBW infants (*very low birth weight*: babies weighing less than 1500 g) and 70% for ELBW ones (*extremely low birth weight*: weight less than 1000 g) (Fanaroff et al., 2007). However, these groups are of major concern because they can present different levels of difficulties in mental and motor development in the long term and higher rates of inattention and hyperactivity at school age (VLBW children: 23–27%; ELBW: 33–37%) (Bhutta, Cleves, Casey, Cradock, & Anand, 2002).

### 1.3. Parent's psychological distress in VLBW and ELBW infants

A very severe premature birth can impact parents' affective state and their ability to cope with the traumatic situation (Feldman, 2007). With regard to this, the literature has underlined that preterm babies' parents experience high levels of distress, anxiety and depression (Forcada-Guex et al., 2011; Miles, Holditch-Davis, Schwartz, & Scher, 2007; Schmücker et al., 2005); moreover, a higher risk of depression has been detected in preterm infants' mothers compared to full-term infants', especially during the first 12 weeks postpartum (Vigod, Villegas, Dennis, & Ross, 2010).

Depending on the severity of prematurity, an increased amount of stress and emotional burden is expected in those parents who face a more severe condition of preterm birth, associated to higher medical comorbidity, length of hospitalization, etc.; indeed, increased levels of depressive symptoms throughout the first postnatal year (Vigod et al., 2010) have been found in VLBW infants' mothers, compared to low birth weight infants' ones (birth weight < 2500 g). In any way, it is interesting to point out that the presence of depressive symptoms in a severe prematurity condition such as ELBW has been poorly investigated (Miles et al., 2007; Vigod et al., 2010), although it is well known that maternal postnatal depression represents a risk factor for the mother's sensitivity and ability to pick up her infant's signals, with possible negative consequences on the child's attachment and development (Field, 2010; Tronick & Weinberg, 1997).

### 1.4. The current study

To the writers' knowledge, no study has sufficiently evaluated the relationship among the severity of prematurity (based on the distinction between VLBW and ELBW babies), the presence of depressive symptoms and the quality of early dyadic interactive patterns, including a comparison with a control group. Therefore, this study was aimed at: (1) exploring if depressive symptoms were related to more severe preterm conditions – specifically, a higher presence of symptoms in ELBW infants' mothers were expected, compared to VLBW and control infants' mothers; (2) exploring if dyadic interactive behaviours were influenced by the category of birth weight – the quality of maternal (e.g. sensitivity, intrusiveness) and infants' behaviours (e.g. fretfulness, active communication) were expected to be more compromised in the ELBW group; (3) investigating any influence of the interaction between maternal depression and the severity of birth weight on the quality of interactive patterns.

## 2. Methods

This is part of a longitudinal research project which followed preterm infant–mother dyads from 3 to 18 months of corrected age. The study protocol was approved by the Ethic Committee of the Hospital and the Department of Psychology (University of Bologna).

During the period between April 2010 and December 2012, all mothers of preterm infants with birth weight under 1500 g and a gestational age < 32 weeks, who had been hospitalized at the NICU in the Bufalini Hospital (Cesena, Italy), were asked to take part at the study. Only 3 mothers refused to participate. A total of 69 infant–mother dyads were recruited: according to their birth weight, 29 infants were ELBW (under 1000 g) and 40 were VLBW (birth weight between 1000 and 1500 g). The exclusion criteria were: infant chromosomal abnormalities, cerebral palsy, malformations and fetopathy, previous or present parents' psychiatric illness and lack of fluency in Italian.

**Table 1**  
Dimensions of GRS.

<i>Maternal dimensions</i>	
Sensitivity	The mother's ability to detect and understand her infant's signals and to appropriately respond, with adequate levels of acceptance, affection and warmth
Intrusiveness	The mother's behaviour and/or speech which result in overbearing, over stimulating and can interrupt infant's activity, possibly causing negative affective states and reactions
Remoteness	The mother's degree of withdrawal from the interaction with her infant
Signs of depression	Captures the typical signs of depression, such as low energy, poor engagement with the infant, self-absorption
<i>Infant dimensions</i>	
Communicative	Any positive communicative signals and actions directed towards the mother, including appropriate visual contact and positive vocalizations
Inert	Measures the tendency to self-absorption and to a low level of activity/motionless
Distressed	Negative affective state, going from fretfulness to high degree of distress

During the period January 2011–November 2011, a psychologist met potential subjects for the control group in 24 antenatal classes held in Cesena. Each antenatal class was attended by 10–12 pregnant women at third trimester of pregnancy; approximately 30% in each group voluntarily accepted to participate in the study, so a total of 80 women were recruited. Here, the exclusion criteria included: severe pregnancy complications, mother's psychiatric illness and lack of fluency in Italian. All 80 women did not have severe complications at delivery and gave birth to a healthy baby, so the control group resulted composed of 80 mothers and their full-term infants (FT group).

All mothers completed a written consent form and a socio-demographic questionnaire at first assessment. Perinatal data were collected for all the dyads at second assessment; for preterm babies, medical data on length of hospitalization and the presence of intraventricular haemorrhage (IVHs, III or IV degree) were also collected.

At 3 months after birth (corrected age for preterm infants), which represents an important step for the co-construction of dyadic interactive patterns (Feldman, 2007), mothers and infants were met by a psychologist at our Laboratory (School of Psychology, University of Bologna). A general quotient (GQ) of infant development was assessed by means of the Griffiths Mental Development Scales-Revised version (GMDS-R for 0–2 years), a well-recognized measure for infants' mental and psychomotor development (Griffiths, 1996). The quotient represents the mean score of 5 areas of development (locomotor, personal-social, hearing and language, eye and hand co-ordination, performance). The score is standardized for an expected value of 100 with SD of 12.

To detect depressive symptoms in the postnatal period the Edinburgh Postnatal Depression Scale was used (EPDS) (Cox, Holden, & Sagovsky, 1987). This self-report questionnaire investigates the presence and the severity of depressive symptoms during the previous 7 days through 10 items, each scoring from 0 to 3, with higher total scores indicating increasing distress. The Italian version (Benvenuti, Ferrara, Niccolai, Valoriani, & Cox, 1999), which showed good internal consistency (0.78), was used in the present study both as continuous and categorical variable (depressed vs non-depressed, using a cut-off value of 12/13 to screen for major depressive symptomatology).

Infant and maternal interactive behaviours were coded by means of the Global Rating Scales (GRS) (Murray, Fiori-Cowley, et al., 1996; Murray, Stanley, Hooper, King, & Fiori-Cowley, 1996). GRS are a video-based assessment of the quality of mother–infant engagement in the 2–4 month postnatal period and have originally been developed to distinguish depressed and non-depressed mother–infant interactions for research purposes, similarly to other rating systems (e.g. Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Field, Healy, Goldstein, & Guthertz, 1990). They have often been used to discriminate a wide range of infant and maternal populations (e.g. clinical groups with schizophrenia, social adversity), showing good reliability (Costa & Figueiredo, 2011; Grant, McMahon, Reilly, & Austin, 2010; Gunning et al., 2004; Montirosso et al., 2012; Riordan, Appleby, & Faragher, 1999) and validity to predict the later child's performance (Murray, Fiori-Cowley, et al., 1996; Murray, Stanley, et al., 1996b). As to the procedure, the mother was asked to sit opposite her baby, and to interact in a five-minute free play, possibly without toys, as she usually would do at home. Video recordings of the episode were rated by a trained and expert rater (blind to maternal mood) on 4 maternal behavioural dimensions (sensitivity, intrusiveness, remoteness, signs of depression) and on 3 infant's (communicative, inert, distressed) (see description in Table 1). All the dimensions are scored on a five-point scale, where 1 always corresponds to “poor” interactive maternal or infant behaviour and 5 to most “optimal” behaviour. A second rater coded ten videos randomly selected: the intra-class correlations showed acceptable reliability, mean = 0.75, range 0.68–0.88.

### 3. Results

The 3 groups were homogeneous with relation to most of the variables, except for gestational age, birth weight and type of delivery (Table 2); since these variables are strictly linked to preterm birth, these results were expected. Considering the medical data on preterm babies' clinical conditions (Table 2), ELBW babies showed a significant higher length of hospitalization than VLBW ones ( $F(1,68) = 35.08$ ;  $p < 0.0005$ ); no statistical comparisons between the 2 preterm groups were possible regarding the presence of IVHs (III or IV degree), as the observed values were very low (Table 2). Anyway, when analysed with relation to EPDS and GRS scores, these medical variables did not show any significant influence.

**Table 2**  
Maternal and infant characteristics.

	ELBW (n=29)	VLBW (n=40)	FT (n=80)	p Value
<i>Infant characteristics</i>				
Gestational age, weeks (mean ± SD)	27.42 ± 2.16	29.64 ± 1.24	39.86 ± 1.13	<0.0005
Birth weight, grams (mean ± SD)	820.24 ± 98.32	1261.18 ± 156.67	3410.24 ± 462.76	<0.0005
Gender				0.10
Male (%)	55.2	72.5	52.5	
Female (%)	44.8	27.5	47.5	
GMDS general quotient (GQ)	103.76 ± 12.97	111.10 ± 8.31	112.56 ± 7.94	0.003
Length of hospitalization	61.59 ± 16.82	37.69 ± 16.17	–	<0.0005
Intraventricular haemorrhage (grades III–IV)	3	0	–	na
<i>Maternal characteristics</i>				
Maternal age, years (mean ± SD)	33.55 ± 4.77	34.42 ± 5.60	32.98 ± 4.98	0.34
Type of delivery				<0.0005
Spontaneous (%)	28.6	19.4	76.3	
Caesarean section (%)	71.4	80.6	23.7	
Education				0.07
Primary and secondary school (%)	28.6	50.0	21.4	
High school (%)	12.8	69.2	17.9	
University (%)	10.1	57.0	32.9	
Parity				0.08
Nulliparous (%)	69.0	70.0	85.0	
Multiparous (%)	31.0	30.0	15.0	
Marital status				0.93
Married	59.3	56.4	55.0	
Cohabiting	40.7	43.6	45.0	

na, not applicable.

The level of infant development, as measured by the general quotient of GMDS-R, was significantly different among the 3 groups [ $F(2,149) = 5.97$ ,  $p = 0.003$ ] (Table 2): Bonferroni's post hoc analyses showed that ELBW infants had significantly lower scores than both VLBW and FT groups ( $p = 0.004$  and  $p < 0.0005$ , respectively). In order to control the influence of this variable on EPDS and GRS scores, GQ was always included as covariate in consecutive analyses.

### 3.1. Maternal depression and categories of birth weight

The mean scores of EPDS resulted significantly different among the 3 categories of birth weight [ $F(2;148) = 8.67$ ;  $p < 0.0005$ ], including GQ as a covariate. Indeed, ELBW infants' mothers showed higher scores compared to VLBW and FT infants' ones (9.92, 6.48, 5.74, respectively) (Bonferroni test  $p = 0.007$  and  $p < 0.0005$ , respectively).

Considering the categorical score of EPDS (depressed vs non-depressed), 12.1% ( $n = 18$ ) women of the total sample resulted in the "depressed group". A Pearson chi square analysis showed a significantly higher prevalence of depressed women in the ELBW group compared to VLBW and FT mothers (31%, 15%, 3.8%, respectively;  $\chi^2(2) = 15.36$ ,  $p < 0.0005$ ).

### 3.2. Mother–infant interaction and categories of birth weight

Table 3 shows mothers' and infants' GRS mean scores. The ANOVA Univariate was run for each GRS scale in order to analyse the main effects of birth weight and maternal depression variables on interactive behaviours, also considering their possible interaction; general quotient score was always included as a covariate.

With relation to the birth weight variable, no differences emerged among the 3 groups on maternal sensitivity mean scores, while the intrusiveness dimension scores were significantly different [ $F(2, 149) = 4.29$ ;  $p = 0.016$ ]: Bonferroni's post hoc test showed that ELBW infants' mothers were significantly more intrusive than those of the control group ( $p = 0.006$ ). The remoteness dimension scores also significantly differed among the 3 groups [ $F(2, 149) = 4.78$ ;  $p = 0.01$ ], as ELBW and VLBW infants' mothers were significantly less remote than FT infants' ones (Bonferroni test  $p = 0.003$  and  $p = 0.0026$ , respectively).

Regarding the infants' interactive behaviours, no differences emerged among the 3 groups on any of the dimensions considered (communicative, inert, distressed).

### 3.3. Mother–infant interaction and maternal depression

Depressed and non-depressed mothers showed similar mean scores on sensitivity and intrusiveness dimensions (Table 3), while the 2 groups significantly differed on remoteness dimension mean scores [ $F(1, 149) = 7.53$ ;  $p = 0.007$ ]; in fact, depressed mothers were more remote than non-depressed ones. Besides, depressed mothers showed a lower mean score on the signs of

**Table 3**  
Mother–infant interactive behaviours (GRS): differences among groups.

GRS dimensions	Birth weight			Depressive symptoms		F		
	ELBW (n = 29)	VLBW (n = 40)	FT (n = 80)	Depressed (n = 18)	Non-depressed (n = 131)	Birth weight	Depressive symptoms	Birth weight × depressive symptoms
<i>Mother</i>								
Sensitivity	3.34 ± 0.11	3.64 ± 0.12	3.43 ± 0.16	3.45 ± 0.14	3.49 ± 0.06	1.65	0.06	0.38
Intrusiveness	3.45 ± 0.16 <sup>a</sup>	3.88 ± 0.16	4.21 ± 0.22 <sup>a</sup>	3.88 ± 0.19	3.81 ± 0.08	4.29 <sup>*</sup>	0.13	0.18
Remoteness	4.37 ± 0.19 <sup>b</sup>	4.11 ± 0.20 <sup>b</sup>	3.38 ± 0.26 <sup>b</sup>	3.62 ± 0.23	4.29 ± 0.09	4.78 <sup>*</sup>	7.53 <sup>*</sup>	3.91 <sup>**</sup>
Signs of depression	3.93 ± 0.10	3.99 ± 0.11	3.72 ± 0.14	3.70 ± 0.13	3.98 ± 0.05	2.34	4.32 <sup>*</sup>	2.49
<i>Infant</i>								
Communicative	2.84 ± 0.16	3.00 ± 0.17	2.74 ± 0.23	2.84 ± 0.20	2.81 ± 0.08	0.82	0.04	0.20
Inert	3.11 ± 0.14	3.19 ± 0.15	3.04 ± 0.20	3.03 ± 0.18	3.18 ± 0.70	0.19	0.66	0.33
Distressed	3.46 ± 0.12	3.68 ± 0.13	3.57 ± 0.17	3.45 ± 0.15	3.69 ± 0.60	0.74	2.34	0.16

Scores are rated on 5-point scale (1 = poor, 5 = optimal).

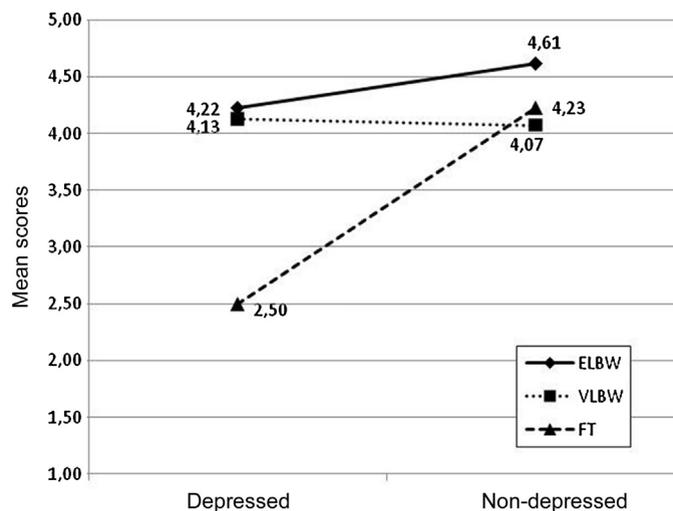
Values represent means ± standard deviation.

<sup>a</sup>  $p < 0.05$  for post hoc test (ELBW preterm dyads vs FT dyads).

<sup>b</sup>  $p < 0.05$  for post hoc test (ELBW and VLBW preterm dyads vs FT dyads).

<sup>\*</sup>  $p < 0.05$ .

<sup>\*\*</sup>  $p < 0.005$ .



**Fig. 1.** Remoteness mean scores in relation to birth weight × depressive symptoms interaction.

depression dimension [ $F(2, 149) = 4.32$ ;  $p = 0.04$ ] (Table 3), meaning that their interactive behaviour was significantly affected by their negative affective state in terms of low energy, sad facial expressions and tendency to self-absorption.

No differences emerged between depressed and non-depressed groups on any of the infants' dimensions considered (communicative, inert, distressed).

### 3.4. Mother–infant interaction, maternal depression and categories of birth weight

Birth weight and depressive symptoms variables showed a significant interaction regarding remoteness dimension mean scores [ $F(1, 48) = 3.91$ ,  $p = 0.002$ ] (Table 3): simple effect analyses showed that, only in FT mothers, a higher degree of remoteness was strongly associated to the presence of depressive symptoms, while for ELBW and VLBW mothers the level of remoteness was low, independently from the exhibition of depressive symptomatology (Fig. 1).

## 4. Discussion

The development of early mother–infant interaction in case of preterm birth has been deeply analysed in the literature (Korja et al., 2012); however, the role of the severity of preterm babies' birth weight on the characteristics of interactive patterns has been understudied. This study aimed at exploring this relevance, taking into consideration the severity of prematurity both with reference to maternal depression and to the quality of early interactive patterns in dyads with ELBW and VLBW infants, compared to those with full-term babies.

Regarding the depressive symptomatology, this study pointed out that a more severe preterm birth condition (ELBW) was associated with a higher prevalence of symptoms; this result was also confirmed by higher EPDS continuous scores in ELBW mothers, compared to VLBT and FT ones. The review by [Vigod et al. \(2010\)](#) has already evidenced how a severe preterm birth may be associated, during the first postnatal year, with higher levels of depressive symptoms, but the reported studies were referring only to LBW and VLBW infants cases, not ELBW. So, our results tend to fill a lack in the literature and emphasize the need for future research to distinguish among different preterm conditions, as this element could help deepen the existing literature and identify the parents who, after a preterm birth, are facing stress with less adaptive coping skills. However, it is to note that the rate of maternal depressive symptoms, in full-term mothers, was slightly lower compared to the prevalence reported in other studies (3.8% vs 10%) ([Gavin et al., 2005](#); [Murray, Fiori-Cowley, et al., 1996](#)); the method of recruitment and the sample characteristics could partly explain this result; therefore it is suggested to further confirm these data on wider samples.

Regarding interactive behaviours, preterm infants' mothers of both groups showed levels of sensitivity similar to FT babies' mothers, confirming other studies which considered cohorts of healthy preterm infants ([Korja et al., 2012](#)). It is interesting to note that the maternal interactive behaviour in the VLBW and ELBW groups was characterized by a low level of remoteness during the interaction: compared to the control group, in fact, ELBW and VLBW mothers showed a higher degree of engagement with their infants, with fewer or no signs of withdrawal at all. This pattern was evident also in preterm infants' mothers who were experiencing depressive symptoms: independently from neonatal birth weight, they exhibited a strong tendency to remain in close proximity to their infant during the interaction, whereas, in case of full-term birth, depressive symptoms significantly affected maternal behaviours in terms of higher remoteness and withdrawal. While the latter is already known from the literature on postnatal depression ([Field et al., 1990](#); [Murray, Fiori-Cowley, et al., 1996](#); [Tronick & Weinberg, 1997](#)), the former is clinically relevant, suggesting that the mothers in the index group are able to remain focused and attentive to their infant's needs and to attempt to engage his/her attention, even though they are affected by a predominant negative affective state.

According to the objectives of this study, the birth weight appeared an influencing factor on mothers' level of intrusiveness, as ELBW infants' mothers showed more overbearing and over-stimulating behaviours, compared to VLBW and full-term ones. This result may add some information to the previous literature ([Forcada-Guex et al., 2011](#); [Schmücker et al., 2005](#)), about the role of birth weight as a possible moderator between preterm birth and maternal level of intrusiveness, thus widening the areas of future investigations.

Different elements could explain these results. First of all, it has already been suggested how ELBW infants may really need more stimulation and activity from their parents, in order to keep their alertness, attention and engagement on ([De Schuymer, De Groote, Striano, Stahl, & Roeyers, 2011](#); [Goldberg & Di Vitto, 2002](#)). So, the intrusiveness dimension measured by GRS could actually express, in part, this kind of "intrusiveness", intended as a behavioural pattern characterized by very high active stimulation. Second, it has been observed how high-risk preterm infants' mothers are more likely to have negative and incoherent representations of their infant, compared to full-term mothers ([Meijssen et al., 2011](#)). To this end, [Stern, Karraker, McIntosh, Moritzen, & Olexa \(2006\)](#) talk about "prematurity stereotyping", referring to a biased perception of a sick, vulnerable and weak baby in the mother. These kinds of representation could lead ELBW preterm infants' mothers not only to major closeness but also to overstimulation; indeed, [Forcada-Guex et al. \(2011\)](#) have recently found out how mothers with controlling interactive behaviours presented a prevalence of distorted representations of their preterm infant.

Contrary to some studies ([Forcada-Guex et al., 2011](#); [Korja et al., 2012](#)), no significant differences among the 3 groups emerged as to infant interactive communicative behaviours, their degree of inertness and of distress, even if in this study the ELBW infants showed a lower GQ compared to the other two groups. It is important to consider that recognizing preterm infants' communicative signals, often very subtle at this early stage of life, can be complex and challenging; for this reason, the instrument we used to assess the quality of interaction could not represent the most appropriate choice, even if already adopted for different infant populations ([Gunning et al., 2004](#)). Future studies are required, in order to further detect, with other observative scales, possible peculiarities in ELBW and VLBW infant's early interactive behaviours.

Anyway, it is also important to note that all preterm infants' dyads were recruited in a NICU where special attention is paid to guarantee the infant's and parents' quality of life. In particular, the rules of the NICU allow an uninterrupted free access to the unit to parents and a continuous presence of specialized figures (e.g. physiotherapists, clinical psychologists), who help mothers feel involved in their infant's care, also learning techniques such as kangaroo care and infant massage. These interventions can support mothers to represent themselves as able to care for their fragile babies and to reduce the level of psychological distress in the NICU and after discharge ([Melnyk et al., 2006](#); [Trombini, Surcinelli, Piccioni, Alessandrini, & Faldella, 2008](#)), with positive effects on the quality of the dyadic interaction. These elements could explain the similarity of the levels of maternal sensitivity and the infant interactive patterns found among groups. In fact, when a NICU functions as supportive environment, it can promote positive mother–infant interactions during hospitalization, inducing mechanistic changes in brain structure and function, maximizing positive neurodevelopmental outcomes and reducing neurologic deficits, according to Schore's regulation theory ([Weber, Harrison, & Steward, 2012](#)).

Nevertheless, some limits of the study must be acknowledged. Firstly, the results need to be confirmed on wider samples. Secondly, as recent literature supports a high prevalence of anxiety and stress symptoms in preterm infants' mothers, it would be useful to investigate their specific effect, if any, on interactive patterns, other than depression. Besides, the inclusion of infants' fathers is missing, but future studies should recommend this, as we know from the literature on postnatal depression that the father plays a relevant role in moderating the effects of maternal depression on dyadic interactions and can represent

a strong source of support for his partner (Fletcher, 2009; Robertson, Grace, Wallington, & Stewart, 2004); we also know that triadic interactions represent a research and clinical perspective of growing interest (Fivaz-Depeursinge & Corboz-Warnery, 1999). Finally, the assessments of the maternal perception and representation of the infant were not included.

On the whole, the mothers of both preterm groups' showed strong closeness and involvement with their babies and adequacy to understand their infants' signals but, at the same time, the higher risk preterm group was characterized by a more "intrusive and controlling" mothering. The results, therefore, seem to suggest that, within preterm populations, ELBW infants represent a sample with peculiar characteristics, specific needs and difficulties, linked, at least, to developmental level and parental affective state. For these reasons, special attention should be paid by hospital staff during ELBW babies' hospitalization, in order to promote specific programmes and focused interventions, aimed at preventing the onset of depressive symptomatology and at supporting the parents in the first steps of interactive co-construction. The evaluation of how these mother–infant interactive patterns will evolve in the following steps of this longitudinal study will help to give a more comprehensive description of the influence of birth weight and depressive symptoms.

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