

# Child-Rearing History and Emotional Bonding in Parents of Preterm and Full-Term Infants

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**Abstract** Some parents fail to develop strong emotional bonds with their newborn infants. As the quality of the parent–infant relationship contributes to the infant’s development, it is of great importance to identify protective and risk factors that facilitate or impede the development of the parent–infant bond. The present study examined both infant-related and parent-related factors. We investigated whether or not the infant’s gestational age at birth influenced the quality of the mother–infant and father–infant bond. In addition, we examined whether or not parents’ own child-rearing history predicts bonding with their newborn infant. Mothers and fathers of full-term infants (born >37 weeks of gestational age,  $n = 72$ ), moderate preterm infants (born between 32 and 37 weeks of gestational age,  $n = 69$ ) and very preterm infants (born <32 weeks of gestational age,  $n = 70$ ) completed the Parental Bonding Instrument—assessing their own child-rearing history—and the

Postpartum Bonding Questionnaire at two points in time—which examines the quality of the bond with their infant. Results reveal that mothers of preterm infants report higher feelings of bonding than mothers of full-term infants. For fathers, no differences were found between the gestational age groups. These findings are discussed in light of compensatory care theory and the supporting role of hospital staff. Furthermore, bonding with the infant was strongly influenced by parents’ perceptions of their own child-rearing history in both mothers and fathers of full-term and preterm infants. Clinicians working with parents of newborn infants should pay attention to parental recollections of their own upbringing during early screening in parents of full-term and preterm infants.

**Keywords** Mothers · Fathers · Emotional bonding · Preterm childbirth · Child-rearing history

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## Introduction

The quality of the relationship between a parent and his or her infant contributes significantly to the development of the infant (Thompson 2008). Generally, this relationship has been examined from the infant's perspective, by examining the quality of infant-to-parent attachment. From the parent's perspective, 'bonding' has been described as the quality of the emotional tie from the parent to the infant. Some early studies concluded that parent–infant contact immediately after birth was a critical factor in the development of an enduring optimum parent–infant relationship (Klaus et al. 1972; Klaus and Kennell 1976), but ample research (see Myers 1984, for example) has disproven the crucial nature of this period. Nevertheless, parental bonding remains an important psychological process after birth, with the quality of the bond that parents develop with their infant now being regarded as one expression of the care-giving behavioral system. In this view, the quality of the parental bond complements the attachment relationship that the infant develops with its mother and father in the course of the first year (Solomon and George 1996).

The process of parental bonding often starts during pregnancy, and usually develops further after birth. With some parents, however, affectionate feelings toward their infant fail to develop. Instead, these parents may feel very anxious, irritable, or experience feelings of antipathy towards their infant (Brockington et al. 2001). Studies have reported rates of between 4 and 12.2 % of women in the general population with poor bonding scores in the postpartum period (Bienfait et al. 2011; Figueiredo et al. 2007; Reck et al. 2006; Taylor et al. 2005). Bonding problems can persist beyond the first weeks or months postpartum. A recent study demonstrated that mothers with poor bonding in the first month postpartum were almost 16 times more likely to be experiencing bonding problems 1 year postpartum (O'Higgins et al. 2013). Therefore, it is important to identify the factors that play a role in the development of a parent–infant bond.

One factor that may influence the quality of parental bonding is the infant's gestational age at birth. A disturbed bonding process has been reported in parents of preterm infants (Feldman et al. 1999). Several factors that accompany a preterm birth can influence parental bonding. First, a preterm birth has been described as an extremely stressful and demanding occurrence (Kersting et al. 2004). It can lead to feelings of depression, anxiety and posttraumatic stress symptoms, which are associated with a lower quality of the parent–infant bond (Forcada-Guex et al. 2011; Levy-Shiff et al. 1989; Minde et al. 1983; Moehler et al. 2006). Second, the distance between a parent and infant—due to physical separation and the uncertainty about the infant's

outcome—could lead to withdrawal and a delay in parental psychological investment in forming a relationship (DeMier et al. 2000). Furthermore, the appearance and inconsistent and limited responsiveness of preterm infants could also hamper emotional bonding (Goldberg and DiVitto 2002; Langlois et al. 1995). In contrast, other studies provided evidence for parents' ability to provide compensatory care for their vulnerable newborn. These studies revealed that, despite the difficulties that accompany preterm birth, parents of preterm infants are quite capable of forming an affectionate bond with their infant (see Holditch-Davis et al. 2003, for example). A recent review demonstrated that, in some studies, the quality of the parent–infant relationship in the postnatal period was found to be equal or even higher for parents of preterm infants, compared to parents of full-term born infants (Korja et al. 2012). It is important to conduct more in-depth research and elucidate the quality of the parent–infant bond among preterm samples, because—although the quality of parenting is important to the development of all infants—the quality of the bond might be even more important to the development of preterm infants. To a certain extent, the quality of the parent–infant relationship can diminish the impact of intrinsic medical risks that preterm infants may face (e.g., cognitive or social–emotional problems, Hille et al. 2001) (Beckwith and Rodning 1996; Forcada-Guex et al. 2006; Greenberg and Crnic 1998; McCarton et al. 1997). A lower quality of parent–infant relationship has been associated with lower levels of weight gain (DeWitt et al. 1997) and slower development of social abilities in preterm infants (Landry et al. 1997).

Besides infant-related factors, parent-related factors influence parental bonding as well. Parents' recollections of their own child-rearing history may also influence the bonding process with their newborn infant. Several researchers have found links between parents' recollections of the early parenting they received and the quality of parenting they provide to their own infant (Kitamura et al. 2009). Adults who have recollections of being raised in an affectionate way are thought to be more capable of providing optimal care themselves. On the other hand, having recollections of dysfunctional parenting during one's own childhood, such as abusive or neglectful parenting, is considered to be a risk factor for possible engagement in a similar style of parenting (Main et al. 1985; Page et al. 2007; Van IJzendoorn 1995). Despite the fact that parental bonding is an important psychological process in the postpartum period, very few studies on the effect of child-rearing history on the parent–infant relationship have focused specifically on the concept of bonding. Most research has focused rather—and often solely—on overt parenting behavior such as parent–infant interaction. Bonding and parent–infant interaction are interrelated: the

extent to which a parent feels connected with the infant influences the parents' observable care-giving behavior (Brockington et al. 2001). This suggests that poor bonding in parents affects the quality of parent–infant interaction in a negative way. The results of two recent studies by Muzik et al. (2012) and Choi et al. (2010), which focused on child-rearing history, bonding and subsequent parent–infant interaction, did indeed support this idea. Both studies demonstrated that mothers who reported a lack of maternal care during their own childhood were at risk of experiencing bonding problems with their own infants. These bonding problems, in turn, were significantly related to a lower quality of parent–infant interaction (Muzik et al. 2012) or even to abusive behavior in mothers (Choi et al. 2010).

Among parents of preterm infants, only a small number of studies have examined the association between parents' recollections of their own child-rearing history and their current bonding or parenting. Moreover, the few studies that have included parents of preterm infants have primarily focused on overt parenting behavior, and have yielded inconsistent and complex results. One study demonstrated that maternal recollections of child-rearing history—and not prematurity of the infant—predicted the quality of maternal care-giving (Assel et al. 2002). Other studies reported that the effect of the child-rearing history on parenting depended on the prematurity of the infant (preterm vs full-term). For instance, Hammond et al. (2000) found that mothers who reported that they had received emotional warmth from their care-givers themselves showed more warmth and flexibility during interaction with their infant, regardless of the infant's prematurity. The responses of mothers with negative child-rearing histories, however, depended on the degree of prematurity of the infant: mothers with recollections of negative child-rearing histories showed *better* parenting towards high-risk preterm infants compared to low-risk or full-term infants. In contrast, another study found that mothers who reported that they had not experienced emotional warmth in their childhood were less sensitive to their premature infant, whereas mothers who reported that they had experienced emotional warmth from their parents were capable of sensitive care-giving regardless of the infant's prematurity (Coppola et al. 2007). In contrast, a recent study indicated that perceived child-rearing history had no effect on current parenting in a group of parents with clinical infants (ten premature infants and ten infants affected by atopic dermatitis), whereas the perceived child-rearing history in the control group (with healthy infants) did appear to predict the quality of mother–infant interaction (Cassibba et al. 2012).

Up to the present, many studies have reported exclusively on mothers, whereas the father–infant relationship and the quality of a father's emotional bond with the

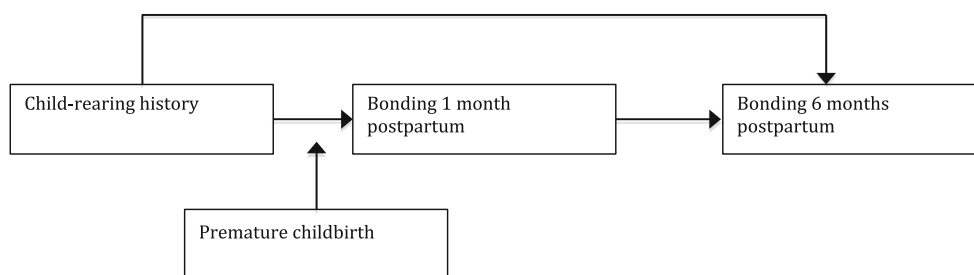
infant also play a central role in the infant's development (Ramchandani et al. 2013). Some researchers found an effect of perceived child-rearing history on parenting in father–infant dyads (Capaldi et al. 2003; Chen and Kaplan 2001; Kerr et al. 2009; Shannon et al. 2005), whereas other studies did not find any association (Belsky et al. 2005), or an association less pronounced than in mother–infant dyads (Van IJzendoorn 1995). In addition, little is known about the quality of bonding among fathers with preterm infants. To date, very few studies have investigated the impact of preterm birth on the father–infant relationship, and these studies have revealed contradictory findings (for example, studies have demonstrated either more paternal involvement and bonding with a preterm infant (Brown et al. 1991; Harrison 1990), or, in contrast, a father–preterm infant relationship of a lower quality (Feldman et al. 2003). To our knowledge, no prior study has examined the joint impact of prematurity and perceived child-rearing history on parental bonding in fathers.

In sum, the present study aimed to further investigate links between prematurity, perceived child-rearing history and emotional bonding with a newborn infant (see Fig. 1), in both mothers and fathers. First, we examined whether or not infant's gestational age has an effect on parental emotional bonding. Given the equivocal nature of previous studies among preterm samples (which were described above), no directional hypothesis was put forward. Next, we examined the influence of parents' recollections of their own child-rearing history on emotional bonding. We expected that parents' recollections of their own upbringing would either facilitate the process of bonding with their infant if they recalled having experienced a warm and affectionate nurturing period themselves, or would impede bonding with their infant if the parents recalled having experienced a constrained or neglected upbringing. Finally, we expected that parents with bonding problems in the first month after birth would continue to have more bonding problems over time. This study is the first to examine the joint impact of parental recollections of child-rearing history and premature birth on parental emotional bonding in a large sample of mothers and fathers of full-term and preterm infants.

## Method

### Participants

Both parents (i.e., mother and father as a couple) of healthy newborn full-term infants ( $\geq 37$  weeks GA, mothers  $n = 72$ , fathers  $n = 69$ ), moderately preterm infants (32–37 weeks GA, mothers  $n = 69$ , fathers  $n = 68$ ) or



**Fig. 1** Conceptual model

very preterm infants ( $\leq 32$  weeks GA, mothers = 70, fathers = 61) participated in our study. Parents with a poor understanding of the Dutch language were excluded from participation. Although we intended to approach all eligible parents, due to practical reasons we were unable to do so. We therefore are unable to determine the exact ratio of participation to refusal.

In the case of twins ( $n = 28$ ), parents were asked to participate with their first-born infant only. The infants' gestational age ranged from 24 to 42 weeks, with a birth weight ranging from 592 to 4,865 g. Maternal age ranged from 20 to 46 years, paternal age ranged from 20 to 51 years. More than 90 % of the parents had Dutch nationality. The majority of parents were cohabiting and/or married (97 %), and were first-time parents (65 %). Most parents had completed a minimum of higher general secondary education (at least 'intermediate vocational level': mothers 85 %, fathers 76 %). Demographic background information is presented per group (term/moderate preterm/very preterm) in the 'results' section. Six months postpartum, the dropout rate was 12 % for mothers and 20 % for fathers. Various reasons for dropout were given, such as unreachable family (no contact), severe illness of the infant or the mother, parents being too busy, or family problems. Parents who dropped out of the study at 6 months reported bonding scores at 1 month that were similar to the scores of the group that was followed up.

## Procedure

Eight hospitals in the south of The Netherlands participated in the present study. Ethical and local feasibility approval was obtained for all eight participating hospitals. A nurse/gynecologist or pediatrician approached eligible parents in the maternity wards of six general hospitals in cases of full-term or moderate preterm birth, and—in the event of a very preterm birth—in the Neonatal Intensive Care Units of two specialized hospitals in The Netherlands. Nurses informed parents about the aim and design of the study, and gave

them an information brochure (see Tooten et al. 2012). All parents who participated in the study gave their written consent. When parents agreed to participate, nurses reported the infants' birth data to the researchers (e.g., gestational age, birth weight, length of hospital stay etc.). Parents—mothers as well as fathers—were asked to fill out questionnaires at 1 and 6 months postpartum (calculated from the date of birth of the infant). Mothers and fathers were instructed to complete the questionnaires separately from one another. Data were collected between September 2009 and September 2012.

## Measures

### *Parents' Child-Rearing History*

Adult recollections of being parented during childhood and the attitudes towards their care-givers during childhood were assessed by The Parental Bonding Instrument (PBI) (Parker et al. 1979) at 6 months postpartum. Participants (both mothers and fathers) completed two similar forms, one about their mother and one about their father. The PBI consists of 25 statements on a four-point Likert scale ranging from 'very like' (my mother/father respectively) to 'very unlike' (my mother/father respectively). Scoring is reversed if statements reflect a negative emotion. Two scales labeled 'Care' (12 items) and 'Overprotection' (13 items) measured perceived parenting styles retrospectively. Examples of items on the Care scale are: 'Could make me feel better when I was upset' and 'Did not praise me' (reversed coding). Examples of items on the Overprotection scale are: 'Did not want me to grow up' and 'Let me decide things for myself' (reversed coding). A high score on the Care scale indicates affectionate, warm and caring experiences with the care-giver, and high scores on the Overprotection scale refer to a dominant and overprotective care-giver, as remembered by the participant. The PBI has been found to be a reliable, valid and stable instrument (Parker 1990; Wilhelm et al. 2005), and is applicable to Dutch samples (Arrindell et al. 1989). The internal consistency (for separate subscales Care and Overprotection,

mother and father form) varied in this study between  $\alpha = .82$  and  $.89$ . The pattern of correlations was very homogeneous within a participant. In other words, the amount of Care experienced from one's mother and father during childhood was highly correlated. The same pattern was found for Overprotection. To reduce multicollinearity issues, a composite Parental Care score ('Care') and a composite Parental Overprotection ('Overprotection') score were created by averaging the scores of the mother and father form for each subscale. These composite scores were treated as continuous variables in the further data analyses.

### *Emotional Bonding*

The quality of bonding with the infant was assessed by means of the Postpartum Bonding Questionnaire (PBQ) (Brockington et al. 2001), which was completed by mothers and fathers at 1 month postpartum and again at 6 months postpartum. At the first month after birth, most preterm infants were still hospitalized, whereas all infants had been discharged from the hospital at 6 months. The PBQ is a 25-item scale reflecting parents' feelings or attitudes towards the baby, and gives an early indication of disorders in the relationship with the infant. Positive items, such as 'I feel happy when my baby smiles or laughs', are scored from (0) 'always' to (5) 'never'. However, if a statement reflects a negative emotion, such as 'I feel distant from my baby', scoring is reverse-coded (from (5) 'always' to (0) never). Consequently, high scores indicate lower feelings of bonding. The present study made use of the total score of the PBQ. A validation study of the Dutch version of the PBQ (Van Bussel et al. 2010) concluded that the PBQ is a reliable and valid indication of the early emotional bond between a mother and her newborn infant. The internal consistency of the PBQ in this study was  $\alpha = .79$  for mothers and  $\alpha = .71$  for fathers.

### *Data Analysis*

To investigate group differences and differences between mothers and fathers in child-rearing history and emotional bonding—the key variables—a general linear model (GLM) was set up with the gestational age group as between-subjects factor, and gender (father/mother) as within-subjects factor. 'Within-subjects' refers here to dyads, as the mother-father parent dyad is the unit of analysis (mother and father of same infant) (Kenny et al. 2006). Given that the between-subject factor gestational age group has three ordered levels, two planned orthogonal contrasts were conducted: (C1) contrasting the full-term group with the preterm groups, and (C2) the moderately preterm group with the very

preterm group. Age, education, and parity (parent of first infant or experienced parent) were included as control variables. Full-information Maximum Likelihood was used to estimate the GLM, in order to cope with missing data.

Second, a model comparison approach within an autoregressive modeling framework (AR) was used to study the link between perceived child-rearing history and emotional bonding, 1 and 6 months postpartum. Bonding with the infant at 1 month (PBQ1) was linked to background variables, gestational age group, and to the Care and Overprotection scales of the PBI. Bonding with the infant at 6 months (PBQ6) was predicted by background variables, gestational age group, care and overprotection, and also by the bonding with the infant at 1 month (PBQ1). This last part is the autoregressive part, and enables an assessment of the stability of emotional bonding with the infant over time. If you are experiencing bonding problems at 1 month postpartum, does this persist to 6 months postpartum? At each time-point there is a dyadic outcome: the PBQ for the mother and for the father within the same parent dyad. To account for this dyadic data structure, the regression sub-equations for mother and father were linked, and residual error terms of the outcomes were correlated at each time point. All AR models were fitted by means of Full Information Maximum Likelihood. Model fit was evaluated on the basis of commonly recommended goodness-of-fit indices (Hu and Bentler 1999), including the  $\chi^2$  of the model fit, the root mean square error of approximation (RMSEA), and the Tucker-Lewis Index (TLI). A hierarchical model comparison was carried out. We started with the most complex autoregressive model, in which emotional bonding at 6 months postpartum (PBQ6) was not only predicted by the previously reported quality of emotional bonding at 1 month postpartum (PBQ1), but also directly by all other predictors (background variables, Care, Overprotection, Prematurity, and the interaction terms between Prematurity and Care and Prematurity and Overprotection have direct paths to PBQ6). In the second model, the effects of background variables on PBQ6 were eliminated. In the third model, the Prematurity x Child-rearing history interactions were dropped as predictors of PBQ6. In the fourth model, Prematurity was removed and, finally, in the fifth model the effects of Care and Protection were eliminated. The final model is the most parsimonious model and implies that any link between perceived child-rearing history and bonding has already been established at 1 month postpartum, and that neither perceived child-rearing history nor prematurity has any additional modifying effect on bonding over time. We were looking for a model that provides the most parsimonious explanation for the data, but that still shows an adequate fit.



**Table 1** Infant birth characteristics and parental demographics

	FT	MP	VP	<i>p</i>
<i>Infant birth characteristics</i>	N = 72	N = 69	N = 70	
Gestational age (weeks)	39.5 (1.4)	34.6 (1.3)	29.6 (1.8)	<.001
Birth weight (g)	3,447 (505)	2,342 (562)	1,329 (384)	<.001
5-min Apgar score	9.7 (.7)	9.2 (1.2)	7.91 (1.6)	<.001
Incubator, days	.20 (1.2)	7.3 (8.6)	37.9 (21.7)	<.001
Hospital, days	2.7 (2.3)	18.1 (11.1)	60.6 (26.9)	<.001
Male sex, n (%)	33 (45.8)	40 (58.0)	37 (52.9)	.350
<i>Parental characteristics</i>				
Marital status, n (%)				.426
Married/reg. partners	43 (59.7)	40 (58.0)	36 (51.4)	
Cohabiting	26 (36.1)	28 (40.6)	29 (41.1)	
Single/divorced	2 (2.8)	1 (1.4)	5 (7.1)	
Marital status unknown	1 (1.4)	0 (0.0)	0 (0.0)	
<i>Maternal characteristics</i>	N = 72	N = 69	N = 70	
Maternal age (years)	33.2 (4.3)	31.3 (5.0)	31.0 (5.3)	.021
Parenting experience (first-time), n (%)	37 (51.4)	49 (71.0)	54 (78.3)	.002
Educational level, n (%)				.004
Low	7 (9.7)	13 (18.8)	12 (17.1)	
Medium	15 (20.8)	27 (39.1)	32 (45.7)	
High	48 (66.7)	29 (42.0)	24 (34.3)	
Unknown	2 (2.8)	0 (0)	2 (2.9)	
<i>Paternal characteristics</i>	N = 69	N = 68	N = 61	
Paternal age (years)	35.4 (4.8)	34.2 (5.1)	33.9 (5.7)	.234
Parenting experience (first-time), n (%)	37 (52.9)	46 (67.6)	48 (73.8)	.046
Educational level, n (%)				.125
Low	13 (18.8)	17 (25.0)	18 (29.5)	
Medium	14 (20.3)	15 (22.1)	20 (32.8)	
High	40 (58.0)	36 (52.9)	21 (34.4)	
Unknown	2 (2.9)	0 (0.0)	2 (3.3)	

FT full-term, MP moderate preterm, VP very preterm

Values are expressed as mean (sd), unless otherwise specified

## Results

Infant birth characteristics and parental demographic data are presented in Table 1. Naturally, the full-term, moderate preterm and very preterm infants differed on gestational age [ $F(2,207) = 752.3, p < .001$ ], birth weight [ $F(2,206) = 328.7, p < .001$ ], 5 min-Apgar score [ $F(2,203) = 39.5, p < .001$ ], days spent in the incubator [ $F(2,204) = 153.8, p < .001$ ] and days spent in the hospital [ $F(2,204) = 221.4, p < .001$ ], as these characteristics are inherent to the groups. Furthermore, mothers in the full-term group had a significantly higher educational level than the mothers in the preterm groups [ $\chi^2(6) = 19.40, p = .004$ ]. Mothers in the full-term group were also significantly older than the mothers in the preterm groups [ $F(2,204) = 3.94, p = .02$ ]. In addition, infants in the full-term group were less often the first child for

parents than was the case in the preterm groups (mothers  $\chi^2(2) = 12.32, p = .002$ , fathers ( $\chi^2(2) = 9.67, p = .045$ ).

Table 2 presents the adjusted means and effect sizes of the key predictor and outcome variables for mothers and fathers of full-term, moderately preterm and very preterm group. For both mother and father, no support was found for significant differences between the gestational age groups in perceived child-rearing history; neither on the Care scale nor on the Overprotection scale. With respect to emotional bonding measured by the PBQ, mothers in the full-term group reported significantly lower feelings of bonding than mothers in the preterm groups at both time-points (Cohen's *d*: PBQ1 =  $-.04$ , PBQ6 =  $-.35$ ). There were no differences between the two preterm groups. In contrast, for fathers, there was no support for any significant

**Table 2** Adjusted means, z-values, p values and effect sizes of predictor and outcome variables: gestational age group differences

	Mothers						Fathers															
	C1		C2		C2		C1		C1		C2											
	z	p	Cohen's d	z	p	Cohen's d	z	p	VP	MP	FT	VP	MP	FT	z	p	Cohen's d					
Care	29.0	27.6	27.9	-1.22	.22	.83	.02	.22	.83	.02	.22	.83	.02	26.9	27.7	28.0	1.01	.31	.17	.29	.78	.03
Overprotection	10.2	11.1	9.6	.19	.86	.03	-.12	-1.31	.19	-.12	-1.31	.19	-.12	8.8	9.8	9.3	.74	.46	.12	-.49	.63	-.05
PBQ 1	8.6	5.6	7.2	-2.52	.01	-.04	1.64	1.64	.10	.15	1.64	.10	.15	13.9	12.7	11.6	-1.67	.10	-.27	-.90	.37	-.09
PBQ 6	7.1	4.9	5.6	-2.09	.04	-.35	.80	.80	.43	.07	.80	.43	.07	10.0	8.9	9.2	-.97	.33	-.16	.25	.80	.02

FT Full-term, MP Moderate preterm, VP very preterm

Planned contrasts: (C1) contrasting the preterm groups versus the full-term group, (C2) contrasting the very preterm group versus the moderate preterm group

**Table 3** Adjusted means, z-values, p values and effect sizes of predictor and outcome variables: gender differences

	Mothers	Fathers	z	p	Cohen's d
Care	28.2	27.5	.46	.64	-.09
Overprotection	10.3	9.3	.67	.50	.12
PBQ 1	7.1	12.7	-4.08	<.01	-.77
PBQ 6	5.9	9.4	-2.60	.01	-.49

differences in PBQ scores between the gestational age groups at either time point.

The within-dyad pairwise comparisons between mothers and fathers revealed no gender differences on the two child-rearing history scales (see Table 3). However, at both time points fathers reported significantly lower feelings of bonding (PBQ) in comparison to mothers (Cohen's d: PBQ1 = -.77, PBQ6 = -.49).

The model comparison results of the dyadic autoregressive path models are presented in Table 4. All five models provided an adequate fit with the data, as the null-hypothesis that the model fits just as well as the saturated model could not be refuted (Chi square p-values  $p > .05$ ). We therefore turn to comparative fit indices for model selection. For the TLI, values above 1 are an indication of overly complex models (i.e., overfitting), which cancels out models 1 and 2. Among models 3 and 4, model 4 manifests itself as more parsimonious with similar goodness-of-fit and the highest TLI. Among models 4 and 5 (most parsimonious model), model 5 displayed a poorer fit, with TLI dropping below .95. Thus, the fourth model, in which the PBQ6 was predicted by the PBQ1 and also directly by the child-rearing history scales, will be the model of choice ( $\chi^2$  (df = 54, N = 211) = 58.9,  $p = .30$ , TLI = .963, RMSEA = .021). The Chi square tests for nested models corroborate these results and support the selection of model 4.

The parameter estimates for the selected model are displayed in Fig. 2. We chose to report unstandardized regression coefficients to allow straightforward comparison between the effects for mothers and for fathers. At 1 month postpartum, higher Care scores were significantly related to a lower score on the PBQ1, reflecting fewer bonding problems (Mothers:  $b = -.194$ ,  $p = .008$ , Fathers:  $b = -.281$ ,  $p = .014$ ). For mothers, surprisingly, preterm birth ( $b = -.845$ ,  $p = .003$ ) was significantly related to fewer bonding problems at 1 month postpartum. In contrast, gestational age group did not influence bonding in fathers ( $b = -.547$ ,  $p = .117$ ). For fathers, a higher educational level ( $b = 1.498$ ,  $p = .003$ ) and higher age ( $b = .222$ ,  $p = .033$ ) predicted more bonding problems. The explained variance for PBQ1 was comparable among mothers and fathers, respectively 15 and 16 %.

**Table 4** Hierarchical model comparison

	$\chi^2$	Df	$p^a$	$\Delta \chi^2$	$\Delta$ df	$p^b$	TLI	RMSEA
Model 1	23.3	36	.95	.	.	.	1.144	.000 (CI .000–.003)
Model 2	27.6	42	.96	4.3	6	.651	1.141	.000 (CI .000–.000)
Model 3	55.3	50	.28	27.7	8	.001	.956	.022 (CI .000–.051)
Model 4	58.9	54	.30	3.6	4	.465	.963	.021 (CI .000–.049)
Model 5	70.9	58	.12	12	4	.017	.909	.033 (CI .000–.056)

<sup>a</sup> Versus saturated model with  $\chi^2 = 0$  and  $df = 0$

<sup>b</sup> Versus previous model ( $H_0$  = more parsimonious model fits as well as more complex model)

At 6 months, emotional bonding was strongly related to previous emotional bonding at 1 month postpartum (PBQ1) for both parents (Mothers  $b = .564$ ,  $p < .001$ , Fathers  $b = .507$ ,  $p < .001$ ), which indicates that the quality of bonding remains relatively stable during this period of time. At 6 months, the quality of bonding of fathers was not only predicted by earlier reported bonding at 1 month, but there was also a direct effect of Care on bonding problems ( $b = -.167$ ,  $p = .049$ ). For mothers, the results pointed in the same direction but were non-significant ( $b = -.082$ ,  $p = .170$ ). Overall, this leads to the suggestion that more perceived parental care continues to have a protective effect on the quality of bonding at 6 months, after controlling for the quality of bonding at 1 month postpartum. The explained variance for PBQ6 was again similar among mothers and fathers, respectively 41 and 38 %.

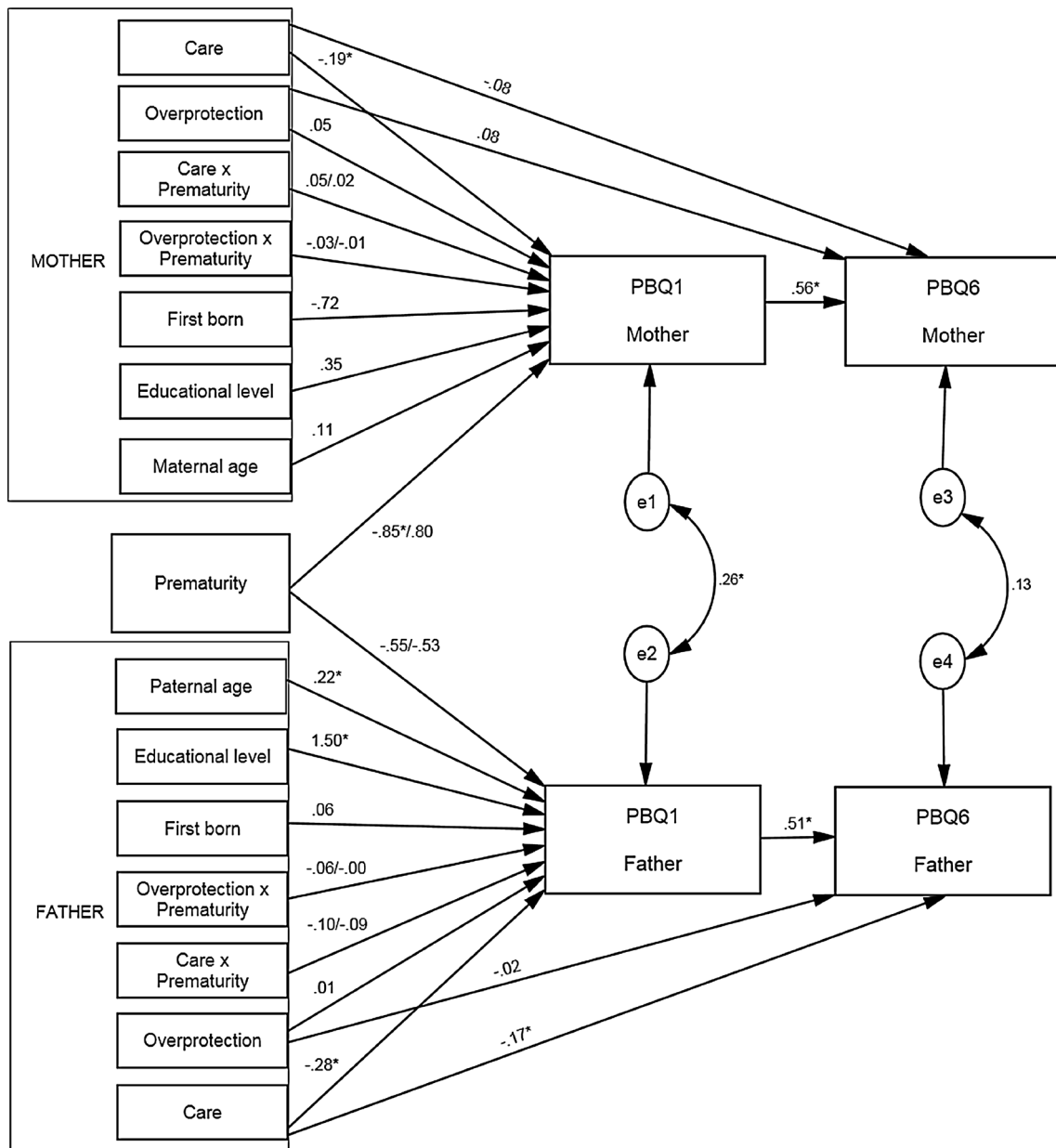
## Discussion

In the present study, we examined the impact of infant and parent-related factors on the quality of parental bonding in the first months postpartum. With respect to the impact of infants' prematurity on parental bonding, different results were found for mothers and fathers. For mothers, bonding scores at 1 month postpartum were influenced by the infants' prematurity. Mothers of preterm infants reported *more* feelings of bonding than mothers of full-term infants. This result is in line with some other recent studies that demonstrated that mothers of preterm infants had an equal or even higher quality of relationship with their preterm infant as compared to mothers of full-term infants (for a review, see Korja et al. 2012). Our finding could signify that the medical status, the greater needs of a fragile preterm infant, as well as the constant concerns that mothers have, lead to 'compensatory care' (Beckwith and Cohen 1978). Beckwith and Cohen (1978) proposed that a homeostatic mechanism exists within the caregiver-infant dyad, entailing that caregivers with fragile or sick infants provide *more* parental care in order to compensate for and

reduce negative effects for the infant. Mothers of preterm infants may thus adopt a more active attitude and enhance their sensitive behavior (Holditch-Davis et al. 2003). This active attitude of mothers might originate intuitively (as a homeostatic mechanism), but could also be, at least to some extent, the result of contemporary changes in the neonatal intensive care units. During the past few decades, neonatal intensive care units have developed a more family-centered approach, in which hospital staff encourage parents to become actively involved in the care for their newborn preterm infant (e.g., by practicing Kangaroo care) (Griffin 2006; Pallas-Alonso et al. 2012). The support parents have received from the hospital staff may have led to enhanced sensitivity to their preterm infant, and might explain the differences in maternal bonding scores between the term and preterm groups.

For fathers, infants' prematurity was not found to be correlated with their bonding scores. A preterm birth might not lead to compensatory care or enhanced sensitivity in fathers, at least not in the first months after birth. In line with this, the fathers in our study reported lower feelings of bonding than the mothers at both time-points. This finding corresponds to the results of a previous study in which fathers reported lower feelings of bonding in comparison to mothers at 2 months postpartum (in families with full-term infants) (Edhborg et al. 2005). Although somewhat speculative, this may originate from the fact that mothers are more involved than fathers in direct care-giving practices, such as nursing and breastfeeding, during the first months. Mothers have probably spent more time with their infant during the first postpartum period in the hospital and afterwards during the first period at home, while their husbands were back at work (as fathers generally only have right to 2 days of paternity leave in The Netherlands (Rijksoverheid Kraamverlof 2012)). Besides the fact that fathers are generally less available in the first months, fathers and mothers may have different roles in care-giving; compared to mothers, fathers usually spend more time in play during interaction-time (Lewis and Lamb 2003). It may be the case that fathers become more involved as infants grow older and become more capable of interacting





**Fig. 2** Unstandardized dyadic path model for parental bonding problems with infant. \*Significant estimate,  $p < .05$ . Two contrasts were tested for the effects of prematurity (1. Preterm vs full-term, 2 Very preterm vs moderate preterm). Effect coding for first born:

experienced parents = 1, first born infant = -1. Continuous covariates were mean-centered. Correlations among predictor variables are not shown

and playing, and they take on a more compensatory role at that time in order to stimulate the preterm child’s cognitive or social capacities.

For mothers as well as fathers, parents’ perceptions of their own child-rearing history have a significant impact upon the parental bonding process with the newborn infant at 1 month postpartum. The effects observed were largely in line with hypothesis: parents who reported having received good care from their own parents, reported more emotional bonding with their own newborn infant 1 month

postpartum. This effect was present for parents of full-term and preterm infants. For parents of full-term infants, these results are in line with previous research, which demonstrated that the recollection of a negative child-rearing history was associated with maternal bonding problems and eventually led to negative parenting behavior towards the infant (Choi et al. 2010; Muzik et al. 2012). Several other studies, which did not focus on bonding problems in particular but rather on parenting behavior in general, have also shown that mothers who indicated that they had

experienced high levels of care in childhood consistently parent in an affectionate manner, whereas parents who reported having experienced negative parenting themselves are more at risk of displaying similar difficulties in the parent–infant relationship (Page et al. 2007, for example). In our present study, perceived child-rearing history continued to have an effect on bonding at 6 months postpartum, even after controlling for bonding scores at 1 month postpartum (a significant effect for fathers; the results for mothers pointed in the same direction but were not statistically significant ( $p = .17$ )). This finding could be explained by the fact that, if people remember being raised in a warm and stimulating manner, the chances are high that the relation with their parents will still be a positive one when they themselves become parents. Moreover, research has demonstrated that individuals with positive recollections of their own child-rearing history are more inclined to seek support from significant others (such as one's own parents) in stressful situations (Mikulincer and Florian 1998). As a consequence, the parents in our sample who recalled their own child-rearing history as warm and positive have probably sought and received more practical or psychological support from their own parents in nurturing and caring for their newborn infant in the first months postpartum, which—in turn—has resulted in an even better bond with their infant at 6 months postpartum.

Finally, mothers and fathers showed similarity in the stability of bonding scores. The quality of bonding at 1 month postpartum strongly predicted bonding at 6 months postpartum. This was in line with a recently published study in which mothers with poor bonding in the first month postpartum were almost 16 times more likely to still be experiencing bonding problems at 1 year postpartum (O'Higgins et al. 2013).

The present study was not without its limitations. One drawback was the generalizability of our findings to mothers with actual bonding disorders. In our sample, almost all parents had bonding scores below clinical thresholds. Therefore, we cannot draw conclusions about the association between child-rearing history, prematurity and serious bonding disorders from which mothers with postnatal depression, for instance, can suffer (Kumar 1997). Another limitation was the fact that the PBI was completed by parents 6 months after the birth of their infant, with the possible bias of a self-report questionnaire that retrospectively measures experiences that happened during childhood. The (preterm) birth and early experiences with their newborn infant could have influenced the way parents remembered their own upbringing. Other factors, such as the quality of the current relationship with their parents or the well-being of the parent in general, could have affected the way they perceive their child-rearing history. However, many researchers agree that it is

not the actual parenting one has received, but the perception of these experiences by the individual that counts, because this perception determines whether or not the individual believes himself/herself to have been rejected or overprotected (Belsky and Isabella 1985). Not only the timing of the PBI, but also the fact that both our measures (PBI and PBQ) were self-report questionnaires, is a limitation. Moreover, these questionnaires measure perceptions of parent–child relationships, and the associations found in the present study may therefore also reflect consistencies in a cognitive model of care-giving qualities. Nevertheless, in contrast to the PBI, the PBQ was found to be significantly associated with gestational age, indicating that, for all their overlap, the PBQ and PBI do measure different concepts.

In sum, our study revealed that mothers of preterm infants reported more feelings of bonding than mothers of full-term infants. The extent to which the supporting role of hospital staff in the NICU contributes to parental bonding in parents with a preterm infant could be the focus of future studies. Despite this 'positive' finding, it remains important for researchers and clinicians to further investigate and assess the quality of parental bonding in parents of preterm infants, since high quality of parental bonding might diminish the risk of developmental problems in those infants, as was previously demonstrated in studies on parent–infant interaction (see Landry et al. 1997, for example). Furthermore, parents who recalled having experienced a warm and caring child-rearing history reported higher feelings of emotional bonding with their newborn infant. This association was present for mothers as well as for fathers, and both for parents of full-term and preterm infants. This indicates that clinicians working with parents of newborn infants should pay attention to parental recollections of their own upbringing during early screening among parents of full-term and preterm infants. Clinicians could ask parents about the relationship with their own parents and recollections of being raised by them, and—if appropriate or necessary—discuss the potential links with the quality of bonding with their own newborn infant. Also, clinicians should be aware that the quality of bonding with the infant remains relatively stable over time. This indicates that if parents initially report low feelings of emotional bonding, and no intervention is offered, they are likely to continue to experience these feelings in the future.

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