

Mother-to-Infant Emotional Involvement at Birth

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Abstract *Objectives* To study mother-to-infant emotional involvement at birth, namely factors (socio-demographics, previous life events, type of delivery, pain at childbirth, support from partner, infant characteristics, early experiences with the newborn, and mother's mood) that interfere with the mother's positive, negative and not clear emotions toward the newborn. *Methods* The Bonding Scale (an extended Portuguese version of the 'New Mother-to-Infant Bonding Scale') and the Edinburgh Postnatal Depression Scale were administrated during the first after delivery days to 315 mothers recruited at Júlio Dinis Maternity Hospital (MJD, Porto, Portugal). *Results* A worse emotional involvement with the newborn was observed when the mother was unemployed, unmarried, had less than grade 9, previous obstetrical/psychological problems or was depressed, as well as when the infant was female, had neonatal problems or was admitted in the intensive care unit. Lower total bonding results were significantly predicted when the mother was depressed and had a lower educational level; being depressed, unemployed and single predicted more negative emotions toward the infant as well. No significant differences in the mother-to-infant emotional involvement were obtained for events related to childbirth, such as type of delivery, pain and partner support, or early experiences with the newborn; these events do not predict mother's bonding results either. *Conclusion* The study results support the need for screening and

supporting depressed, unemployed and single mothers, in order to prevent bonding difficulties with the newborn at birth.

Keywords Bonding · Depression · Emotional involvement · Infant · Mother

Introduction

Maternal bonding has been fundamentally described as constituted by two related aspects: The mother's concerns and actions about the safety and well-being of the infant [1–3], as well as the mother's affectional tie with the child and the unique place he/she holds in her representational world [4]. Several authors [5, 6] have suggested that maternal bonding is related to both: A behavioral repertory as well as a unique emotional and representational involvement, both being directed to keep the necessary care and proximity for infant's survival.

Winnicott [1] had first noticed a particular disposition on the majority of the mothers, the primary maternal preoccupation, which mixed high levels of concern with the child and correct identification of the infant's needs, permitting their subsequent adequate satisfaction. Klaus and Kennell [2] referred to bonding as being a unique, specific, long-term emotional tie, which is established since the first contacts between the mother and the newborn, and is facilitated by the mother's hormonal system as much as it is elicited by the presence of the neonate. When the mother's proximity and contact with the newborn is improved, the bonding is facilitated and a more adequate mother-infant interaction is observed, leading to a better development of the child [7]. Attending to a representational level, Daniel Stern [4] observed that women

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progressively construct during pregnancy a representation of the child and of herself as a mother, which facilitates mother-infant interaction after delivery.

More recently, George and Solomon [5] have highlighted the importance of studying ‘maternal attachment,’ and not only infant attachment toward the mother. In the trial of Bowlby’s [6] conceptual framework, which considered that infant (and specie) survival could only be guaranteed by the proximity of the mother, several researchers and clinicians have more recently pointed out that: [1] Maternal bonding is a bi-directional process in which the child also participates [3, 8]. Certain infant behaviors are strong social elicitors of the mother’s responses and improve maternal attachment. For example, infant crying, eye contact and social facial expressions facilitate mutual emotional involvement in the dyad. This highlights the importance of infant’s competencies in the mother bonding process improvement [9, 10]. Mother bonding and child attachment are interdependent, seeing that one is determined and is developed by the establishment of the other, also meaning that in the extent that the child is able to show his/her attachment to the mother, the mother has more cues to bond with the child [2]. So, maternal bonding develops progressively and is not completely established at birth, and mothers respond more affectionately to their infants as they continue to contact and interact with them in the postpartum period [7, 11–13]. The time after delivery may be critical for the establishment of the bonding, but it would be extremely dangerous for the specie survival if maternal attachment could not be elicited in other moments as well [3].

Research in this area has some discrepancies at least in two issues: Is maternal emotional involvement with the infant established since delivery? Which are the factors that facilitate or restrain maternal emotional involvement with the neonate?

In fact, while some studies report that most mothers are very happy and satisfied with the newborn and show emotional affection toward him/her as soon as they first contact or at least in the first days after delivery [12, 14–18], several other authors have pointed out that a high number of mothers (30–50%) do not feel emotionally involved with the neonate immediately after delivery and are quite indifferent and disappointed with him/her during the first postpartum week [19–22].

An extensive list of determinant factors, concerning mother, infant, and environment’s characteristics that may contribute to mother-to-infant emotional involvement, has been pointed out, as presented below.

For some authors, bonding is elicited by a specific neurobiological system. Changes in mother’s hormonal levels (namely, high levels of cortisol and progesterone during pregnancy followed by a decline of progesterone and

the associated rise in estrogen, oxytocin and prolactin after delivery), favored by several behaviors related to delivery and childbearing, as touching and breastfeeding, elicit maternal emotional involvement with the newborn [23–25].

Several psychological aspects seem to also be related to the mother’s emotional involvement with the child. Mothers with more support and more intimate and positive relationship with the partner [26, 27], as well as mothers with a secure attachment style [28, 29] are usually more attached and adequate in the interaction with the infant. Early life experiences are also linked to mothering behavior, as mothers who received inconsistent care during childhood engage in more instrumental and less affectionate behavior with the infant [30]. More recently, some studies suggest that mother’s early postpartum mood interfere in bonding. Depressed mothers at delivery show a worse bonding than non-depressed mothers [13, 31], while mothers with mild sub-clinical hypomania present better bonding [13]. Kumar [32] had described how mothers with severe depression had prolonged problems in developing a loving attitude toward their child, as described by the presence of two main themes: (1) Alienation, indifference, detachment and lack of love; (2) resentment, hate, hostility or impulse to harm the child. In this study, mothers with severe disturbances of the relationship with their newborn did not refer history of damaged early childhood nor disturbed current relationship, nor certain infant characteristics, but an unexpected and early postnatal onset of depressive symptoms.

Seeing that infants contribute to their mothers’ bonding, it is not surprising that some of their characteristics play a role in this process. In fact, maternal attachment may be absent or restrained when the child is not wanted or the child gender is not wished [33], as well as when the newborn is not able to participate in the interaction with the mother or has a difficult behavior, such as crying excessively [22, 32].

Nevertheless, issues related to childbirth are the ones that have been most studied, and are considered major determinants of the mother-to-infant emotional involvement.

First-time mothers and mothers who had difficult or complicated labor and delivery, with severe pain, are less involved with the infant in the days following childbirth [20, 21, 34]. Regarding the type of delivery, initial reaction toward the newborn is not as positive following caesarean, particularly emergency caesarean, when compared to vaginal delivery [35–39]; this may depend on the delay in seeing and taking care of the child [39, 40]. Similarly, epidural anesthesia seems to have a negative impact on maternal bonding, which may be caused by both the lower levels of cortisol involved [41] and the neonates’ interactive behavior negatively influenced by the anesthesia [42, 43].

Emotional involvement seems to be particularly dependent on the delay in holding and seeing the child after delivery: Mothers who immediately see or hold the newborn have a better bonding than mothers who have a delayed contact [44]. A close skin-to-skin contact after childbirth seems to improve immediate and subsequent bonding, which reverts in a better mother-infant interaction and a subsequently more adequate development of the child [2, 7]. Several studies have shown that the more the mother interacts and participates in the care of the infant right after delivery, the more emotionally involved and affectionate she will get toward him/her [7, 45–47]. So, proximity improves while separation interrupts the bonding process, which is negatively affected by prolonged separation, namely when motivated by medical problems, prematurity or very low birth weight [31].

Childbirth has been considered a critical moment for bonding due to several reasons. During the first after delivery hours, hormones stimulate mother's sensitivity, reactivity and receptivity to the newborn, improving the bonding [47]. At a representational level, seeing the infant for the first time is a very significant event for the mother [48]. But also, the neonate is particularly awake, attentive and available for interaction with the mother during the first 24 h of life, more than during the following days, and shows several behaviors that elicit mother's proximity and bonding [7, 49].

Other studies have pointed out that mother's emotional involvement with the infant depends on social values related to the complexity of the cultural system she belongs to [50].

Whilst several authors have alerted that parental emotional involvement with the infant is a decisive and important aspect of the interaction and care quality they provide, and consequently, influences the child development and well being [2–4, 22, 51], only a few empirical studies have investigated risk and protective factors for mother-to-infant emotional involvement [5, 29].

The study aimed to investigate mother-to-infant involvement at birth. Based on previously published research, we considered a large range of factors—such as socio-demographics, previous life events, type of delivery, pain at childbirth, support from partner, infant characteristics, mother's early experiences with the newborn and mother's mood—that interfere with the mother's positive, negative and not clear emotions toward the newborn.

Several biological, psychological, social and cultural dimensions, related to the mother and the infant, determine maternal bonding, and some of them were considered in the present study. Maternal emotional involvement starts during pregnancy [52–54], but improves essentially during the first contacts with the newborn, and depends on the

circumstances of this event [2, 3, 7]. The emotional involvement of certain mothers may also be disrupted in part by the difficulty or pain of childbirth. As far as we know, delivery may be a difficult experience for some mothers; pain may interfere in their emotional state, as well as in their availability to attach with the newborn [20, 21, 55, 56]. These are the reasons why the pain at childbirth is one of the main variables studied.

Method

Participants were recruited at the Júlio Dinis Maternity Hospital (MJD, Porto, Portugal), during the first 2 days after delivery. All mothers, admitted between January 1 and February 28 2003, were contacted; the compliance rate was 98%. The aims and procedures of the study were explained and confidentiality was guaranteed. After informed consent, an interview was performed with each participant to collect social, demographic and background data, as well as information about childbirth and the infant; Bonding Scale and Edinburgh Postnatal Depression Scale (EPDS) were then administered. This research was conducted in accord with prevailing ethical principles. Commission (December, 2002).

Sample

The sample was composed of 315 mothers. The exclusion criteria were: Not reading or writing Portuguese and multiple gestations.

Mothers' age ranged from 15 to 44 years, 57.9% were between 19 and 28 years old (Mean = 26.6 years). Almost all participants were Caucasian (98.7%), catholic (89.3%), and Portuguese (91.9%). Half of the sample hadn't completed grade 9 (46.0%); nevertheless, 41.5% of the mothers had between grade 9 and 12, and some of them high-school education (12.5%). Mothers were employed (71.4%), unemployed (18.3%), students (4.0%) or housewives (6.3%). Most participants were married (68.3%) or cohabiting (17.6%) with the infant's father (average of 4.0 years of joint life), living with the partner (72.0%) or with the partner and other relatives (13.9%); only few of them were not living with the partner (14.1%) [separated/divorced (0.4.0%) or single (10.1%)].

Most infants [male (52.4%) and female (47.6%)] were born with a normal gestational age of 37–40 weeks (86.9%) and weight (≥ 2.5 and ≤ 4.0 Kg), but 11.1% were premature and 8.6% were born with low weight. Some infants received low Apgar scores (≤ 7) at minute 1 (27.8%) and 5 (3.8%), were medicated with antibiotic (7.8%), received special care (7.4%) or where admitted in the intensive care unit (6.4%).

Measures

Bonding Scale

The Bonding Scale [14] is a validated and extended Portuguese version of the ‘New Mother-to-Infant Bonding Scale’ [13]. The scale has 12 self-report items in a four-point Likert scale (0–3), according to the intensity of the emotion toward the newborn (‘Very Much,’ ‘A Lot,’ ‘A Little’ or ‘Not at All’). Three sub-scales were identified: ‘Positive Bonding,’ composed of three items (Loving, Protective, and Joyful) and measuring the positive emotional involvement; ‘Negative Bonding,’ composed of six items (Mad, Aggressive, Sad, Resentful, Dislike, and Disappointed) and evaluating the negative emotional involvement; ‘Bonding Not Clear,’ composed of three items (Fearful, Possessive, Neutral or Felt Nothing) and signaling the presence of emotions not clearly related to the parent’s emotional involvement with the infant. This instrument showed reasonable scores of internal consistency ($\alpha = 0.53$), and of test-retest reliability ($r = 0.50$) [14].

Edinburgh Postnatal Depression Scale

Portuguese version [57] of the EPDS [58], a ten-item self-report questionnaire in a Likert scale of four points (0–3) addressed to depressive symptoms was used. The scale showed good internal consistency ($\alpha = 0.85$) and test-retest reliability ($r = 0.75$) [59] as well as good external validity with the SADS psychiatric interview; when a cut-off of 9 ($r = 0.89$) or 13 ($r = 0.96$) is considered, mothers are generally clinically depressed [57, 60].

Statistical Analysis

To explore differences in mothers’ positive, negative and not clear bonding results attending to the independent variables presented below multivariate analysis of variance (MANOVAs) were performed. To examine differences in mothers’ total bonding results in terms of the same variables independent sample *t*-tests were used. Separate stepwise linear regressions were performed to identify which of these variables could predict mothers’ positive, negative, not clear, and total bonding results. Independent studied variables were the following: Socio-demographics (age, place of birth, years of education, marital status, living with the partner, living with the extended family and employment status), previous life events (history of obstetrical problems, history of psychological problems, adverse life events, and parity), type of delivery (vaginal delivery without anesthesia, vaginal delivery with epidural anesthesia, caesarean with

general anesthesia, caesarean with epidural anesthesia and instrumental delivery), pain at childbirth (none, some, a lot during labor, delivery, and after delivery), support from partner (during labor, delivery, and after delivery), infants’ characteristics (gender, weight, gestational age, intensive care admission, and neonatal problems), early experiences with the newborn (touching, holding and breastfeeding), and mother’s mood.

Results

Socio-demographics

Mothers with grade 9 or more had better total bonding results and showed more positive emotions toward the infant compared to mothers with less than grade 9 (see Table 1). Significant differences were also found attending to mother’s marital and employment status: Unmarried mothers showed more not clear emotions toward the newborn compared to married mothers and unemployed mothers reported less positive emotions toward the infant than employed mothers. However, mothers with less than grade 9 and mothers with grade 9 or more did not differ in terms of negative and not clear emotions toward the neonate, single and married mothers did not differ in terms of positive, negative and total bonding results, and unemployed and employed mothers did not differ in terms of negative, nor clear and total bonding results. No significant differences were found in positive, negative, not clear and total bonding results between mothers that were 20 or more years old and less than 20 years old, Portuguese and foreign mothers, mothers living with the partner and those who were not and mothers living with the extended family and those who were not.

Previous Life Events

Mothers with history of psychological problems compared to those without showed more not clear emotions toward the newborn, and mothers with history of obstetrical problems showed less positive emotions toward the neonate than mothers without (see Table 2). However, mothers with history of psychological problems and without did not differ in positive, negative, and total bonding results, and mothers with history of obstetrical problems and without did not differ in negative, not clear and total bonding results. No significant differences were observed either in terms of positive, negative, not clear and total bonding results when we compared primiparous and multiparous mothers or when we compared mothers with history of adverse life events and without.

Table 1 Socio-demographics: MANOVAs for mother positive, negative, and not clear bonding results and *t*-test for total bonding results

	<i>N</i>	Positive		Negative		Not clear		Total	
		Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>t</i>
<i>Age</i>									
<20	27	7.89 (1.37)		0.56 (1.80)		2.07 (1.54)		5.71 (2.68)	
≥20	278	7.91 (1.57)	0.005 [1,305]	0.46 (1.12)	0.144 [1,305]	1.74 (1.43)	1.315 [1,305]	5.26 (3.35)	0.806 [1,303]
<i>Place of birth</i>									
Foreign	21	8.14 (1.59)		0.57 (1.36)		1.52 (1.36)		6.05 (3.28)	
Portuguese	291	7.90 (1.54)	0.473 [1,312]	0.47 (1.18)	0.129 [1,312]	1.78 (1.45)	0.603 [1,312]	5.65 (2.68)	0.641 [1,310]
<i>Years of education</i>									
<Grade 9	133	7.47 (1.86)	2.654***	0.54 (1.15)		1.70 (1.54)		5.23 (2.83)	
≥Grade 9	158	8.27 (1.12)	[1,291]	0.46 (1.26)	0.299 [1,291]	1.86 (1.41)	0.871 [1,291]	5.96 (2.61)	2.265* [1,289]
<i>Marital status</i>									
Unmarried	98	8.05 (1.43)		0.66 (1.58)		2.03 (1.61)		5.36 (3.31)	
Married	215	7.87 (1.58)	0.986 [1,313]	0.40 (.96)	3.421 [1,313]	1.63 (1.34)	5.329* [1,313]	5.84 (2.40)	1.302 [1,311]
<i>Living with partner</i>									
No	36	7.92 (1.32)		0.53 (1.11)		1.86 (1.38)		5.53 (2.56)	
Yes	275	7.92 (1.57)	0.000 [1,311]	0.48 (1.21)	0.059 [1,311]	1.74 (1.46)	0.216 [1,311]	5.70 (2.75)	0.352 [1,309]
<i>Living with extended family</i>									
Yes	86	8.00 (1.29)		0.52 (1.18)		1.76 (1.37)		5.72 (2.55)	
No	223	7.87 (1.63)	0.411 [1,309]	0.47 (1.21)	0.139 [1,309]	1.74 (1.47)	0.008 [1,309]	5.67 (2.81)	0.152 [1,307]
<i>Employment status</i>									
Unemployed	90	7.64 (1.81)		0.52 (1.30)		1.79 (1.51)		5.33 (3.04)	
Employed	223	8.04 (1.40)	4.207* [1,313]	0.46 (1.15)	0.164 [1,313]	1.74 (1.42)	0.074 [1,313]	5.83 (2.58)	1.475 [1,311]

*** *P* < 0.001; * *P* < 0.05

Table 2 Previous life events: MANOVAs for mother positive, negative, and not clear bonding results and *t*-test for total bonding results

	<i>N</i>	Positive		Negative		Not clear		Total	
		Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>t</i>
<i>History of obstetrical problems</i>									
Yes	61	7.59 (1.82)		0.59 (1.17)		1.61 (1.47)		5.39 (2.69)	
No	252	8.00 (1.45)	3.594 [1,313] ^a	0.45 (1.20)	0.654 [1,313]	1.79 (1.43)	0.792 [1,313]	5.57 (2.73)	0.948 [1,313]
<i>History of psychological problems</i>									
Yes	80	8.11 (1.32)		0.56 (1.43)		2.15 (1.67)		5.40 (3.02)	
No	233	7.86 (1.60)	1.633 [1,313]	0.45 (1.10)	0.523 [1,313]	1.62 (1.33)	8.304 [1,313]*	5.79 (2.61)	1.104 [1,313]
<i>Adverse life events</i>									
Yes	116	8.07 (1.44)		0.58 (1.23)		1.96 (1.53)		5.53 (2.80)	
No	197	7.84 (1.59)	1.660 [1,313]	0.42 (1.17)	1.253 [1,313]	1.63 (1.38)	3.684 [1,313]	5.78 (2.68)	0.775 [1,313]
<i>Parity</i>									
Primiparous	212	8.01 (1.44)		0.50 (1.28)		1.86 (1.39)		5.65 (2.79)	
Multiparous	101	7.73 (1.70)	2.307 [1,313]	0.43 (0.99)	0.299 [1,313]	1.53 (1.53)	3.481 [1,313]	5.77 (2.58)	0.368 [1,313]

* *P* < 0.01

^a 0.05 > *P* < 0.06

Type of Delivery

Women with different types of delivery did not differ neither in terms of positive nor in terms of negative, not clear bonding or total bonding results (see Table 3).

Pain at Childbirth

Mothers with no pain during labor, some or a lot, as well as mothers with no pain during delivery, some or a lot, or mothers with no pain after delivery, some and a lot do not

Table 3 Type of delivery: MANOVAs for mother positive, negative, and not clear bonding results and *t*-test for total bonding results

Type of delivery	N	Positive		Negative		Not clear		Total	
		Mean (SD)	F	Mean (SD)	F	Mean (SD)	F	Mean (SD)	t
Vaginal delivery without anesthesia	87	7.63 (1.82)		1.57 (1.44)		0.43 (0.83)		5.62 (2.45)	
Vaginal delivery with epidural anesthesia	72	8.22 (1.22)		1.97 (1.62)		0.64 (1.70)		5.61 (3.34)	
Caesarean with general anesthesia	70	8.03 (1.24)		1.63 (1.46)		0.56 (1.29)		5.84 (2.53)	
Caesarean with epidural anesthesia	46	7.99 (1.57)		1.89 (1.26)		0.35 (0.97)		5.76 (2.69)	
Instrumental delivery	29	7.90 (1.70)	2.169 [4,303]	1.79 (1.21)	1.178 [4,303]	0.21 (0.68)	0.679 [4,303]	5.90 (2.68)	0.123 [4,303]

Table 4 Pain at childbirth: MANOVAs for mother positive, negative, and not clear bonding results and *t*-test for total bonding results

	N	Positive		Negative		Not clear		Total	
		Mean (SD)	F	Mean (SD)	F	Mean (SD)	F	Mean (SD)	t
<i>Labor</i>									
None	50	7.70 (1.78)		0.50 (1.26)		1.76 (1.22)		5.44 (2.56)	
Some	92	7.99 (1.39)		0.48 (1.35)		1.72 (1.42)		5.79 (3.05)	
A lot	160	7.98 (1.52)	0.722 [1,302]	0.47 (1.10)	0.013 [1,302]	1.78 (1.52)	0.057 [1,302]	5.70 (2.75)	0.286 [1,301]
<i>Delivery</i>									
None	94	7.94 (1.53)		0.53 (1.22)		1.69 (1.34)		5.72 (2.53)	
Some	84	7.86 (1.59)		0.48 (1.48)		1.69 (1.41)		5.59 (3.17)	
A lot	125	7.97 (1.49)	0.139 [1,303]	0.43 (0.98)	0.183 [1,303]	1.84 (1.55)	0.677 [1,303]	5.70 (2.74)	0.004 [1,302]
<i>After delivery</i>									
None	40	8.07 (1.64)		0.37 (0.77)		1.68 (1.16)		6.03 (2.29)	
Some	126	7.89 (1.53)		0.49 (1.28)		1.75 (1.46)		5.65 (2.84)	
A lot	135	7.93 (1.50)	0.224 [1,303]	0.50 (1.25)	0.168 [1,303]	1.79 (1.50)	0.897 [1,303]	5.64 (2.75)	0.326 [1,300]

differed in terms of positive, negative, not clear on total bonding results (see Table 4).

Support from Partner

Mothers with partner’s support during labor and without; mothers with partner’s support during delivery and without; or mothers with partner’s support after delivery and without did not significantly differ when positive bonding results, negative bonding results, not clear bonding results or total bonding results were addressed (see Table 5).

Infant Characteristics

Mothers with infants in intensive care had lower total bonding results as well as less positive, more negative, and more not clear emotions toward him/her, compared to those whose infants were not in intensive care (see Table 6). Also, mothers of infants with neonatal problems showed worse bonding than mother of infants without neonatal

problems. Mothers of male infants reported more positive emotions toward them compared to mothers of female infants. However, no significant differences were obtained in mothers’ positive, negative, not clear, and total bonding results attending to the child weight (less versus 2.5 kg or more) or the child gestational age at birth (less versus 37 weeks or more). Mothers of male and female infants did not differed in terms of negative, not clear and total bonding results; and mothers of infants with neonatal problems did not showed a significant different positive, negative or not clear bonding toward him/her than mothers of infants without neonatal problems.

Early Experiences with the Newborn

No significant differences regarding positive bonding results, negative bonding results, not clear bonding results and total bonding results were obtained between mothers that could touch their child within 60 min after delivery and those that could not; mothers that could

Table 5 Support from partner: MANOVAs for mother positive, negative, and not clear bonding results and *t*-test for total bonding results

<i>N</i>	Positive		Negative		Not clear		Total		
	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>t</i>	
<i>Support at labor</i>									
Yes	39	7.85 (1.81)		0.51 (1.29)		1.44 (1.33)		5.75 (2.70)	
No	146	7.93 (1.57)	0.072 [1,302]	0.47 (1.22)	0.033 [1,302]	1.86 (1.50)	2.515 [1,302]	5.68 (2.90)	0.137 [1,300]
<i>Support at delivery</i>									
Yes	63	7.65 (1.93)		0.56 (1.23)		1.62 (1.42)		5.77 (2.81)	
No	122	8.04 (1.42)	2.436 [1,302]	0.44 (1.24)	0.347 [1,302]	1.84 (1.50)	0.967 [1,302]	5.66 (2.69)	0.337 [1,300]
<i>Support after delivery</i>									
Yes	26	7.69 (1.81)		0.73 (1.12)		2.08 (1.60)		5.79 (2.71)	
No	277	7.96 (1.50)	0.753 [1,303]	0.45 (1.21)	1.277 [1,303]	1.72 (1.43)	1.441 [1,303]	4.88 (3.04)	1.612 [1,301]

Table 6 Infant characteristics: MANOVAs for mother positive, negative, and not clear bonding results and *t*-test for total bonding results

<i>N</i>	Positive		Negative		Not clear		Total		
	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>t</i>	
<i>Gender</i>									
Female	144	7.81 (1.75)		0.40 (1.10)		1.67 (1.49)		5.73 (2.85)	
Male	133	8.17 (1.23)	3.866 [1,277]*	0.50 (1.17)	0.542 [1,277]	1.84 (1.38)	0.955 [1,277]	5.82 (2.52)	0.280 [1,275]
<i>Weight (kg)</i>									
<2.5	24	7.63 (2.02)		0.54 (1.21)		1.62 (1.47)		5.46 (2.71)	
≥2.5	265	7.96 (1.49)	1.030 [1,289]	0.47 (1.21)	0.082 [1,289]	1.75 (1.42)	0.161 [1,289]	5.74 (2.79)	0.487 [1,287]
<i>Gestational age</i>									
<37	29	7.48 (2.06)		0.48 (1.09)		1.52 (1.35)		5.48 (2.53)	
≥37	248	7.94 (1.48)	2.289 [1,277]	0.49 (1.25)	0.000 [1,277]	1.81 (1.43)	1.074 [1,277]	5.65 (2.53)	0.306 [1,275]
<i>Neonatal problems</i>									
Yes	39	7.74 (1.77)		0.46 (0.99)		1.85 (1.27)		5.00 (2.95)	
No	203	7.99 (1.49)	0.841 [1,242]	0.42 (1.15)	0.037 [1,242]	1.65 (1.41)	0.683 [1,242]	6.03 (2.57)	2.339 [1,240]*
<i>Intensive care</i>									
Yes	16	6.94 (2.21)		1.00 (1.59)		2.50 (1.83)		3.44 (2.71)	
No	227	8.03 (1.46)	7.727 [1,243]**	0.40 (1.08)	4.369 [1,243]*	1.63 (1.34)	6.051 [1,243]*	6.00 (2.58)	3.829 [1,243]**

** *P* < 0.01; * *P* < 0.05

hold their child within 60 min after delivery and those that could not; or mothers that breastfed their child within 60 min after delivery and those that did not (see Table 7).

Mother’s Mood

Mothers with an EPDS ≥ 9 showed significantly more negative and not clear emotions toward the infant, as well as lower bonding results than mothers with an EPDS < 9; nonetheless these two groups did not differ in terms of positive emotional involvement with the newborn (see Table 8). For an EPDS cut off of 13, depressed mothers had significantly more negative

emotions and lower bonding results toward the infant than non-depressed mothers, but these two groups did not differ in terms of positive and not clear bonding results.

Predicting Variables

Being depressed (EPDS ≥ 13), unemployed and single predicted more negative emotions toward the newborn; as well as being depressed (EPDS ≥ 13) and having less than grade 9 predicted a worse bonding total result (see Table 9). However, no significant predicting variables were found for mother’s positive and not clear bonding results.

Table 7 Early experiences with the infant: MANOVAs for mother positive, negative, and not clear bonding results and *t*-test for total bonding results

	<i>N</i>	Positive		Negative		Not clear		Total		
		Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>t</i>	
<i>Touching</i>										
<60	56	8.00 (1.31)		0.37 (1.21)		1.71 (1.34)		5.69 (2.79)		
≥60	58	7.98 (1.46)	0.004 [1,303]	0.59 (1.15)	0.906 [1,303]	1.74 (1.42)	0.011 [1,303]	5.75 (2.60)	0.141 [1,301]	
<i>Holding</i>										
<60	41	8.10 (1.36)		0.27 (0.92)		1.85 (1.37)		5.73 (2.82)		
≥60	73	7.93 (1.40)	0.378 [1,303]	0.60 (1.30)	2.115 [1,303]	1.66 (1.39)	0.530 [1,303]	5.67 (2.60)	0.179 [1,301]	
<i>Breastfeeding</i>										
<60	59	7.90 (1.76)		0.19 (0.73)		1.56 (1.26)		5.73 (2.82)		
≥60	102	8.01 (1.49)	0.183 [1,161]	0.34 (0.86)	1.377 [1,161]	1.51 (1.46)	0.047 [1,161]	5.67 (2.60)	0.179 [1,159]	

Table 8 Mother’s mood: MANOVAs for mother positive, negative, and not clear bonding results and independent samples *t*-tests for mother total bonding results

	<i>N</i>	Positive		Negative		Not clear		Total		
		Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>F</i>	Mean (<i>SD</i>)	<i>t</i>	
<i>EPDS</i>										
<9	98	7.94 (1.55)		0.40 (1.01)		1.79 (1.36)		5.76 (2.55)		
≥9	45	7.82 (1.34)	0.190 [1,143]	1.31 (2.05)	12.717 [1,143]**	2.60 (1.60)	9.898 [1,143]*	3.91 (3.66)	3.055 [1,143]*	
<13	126	7.96 (1.47)		0.56 (1.27)		1.98 (1.51)		5.42 (2.82)		
≥13	17	7.47 (1.55)	1.650 [1,143]	1.65 (2.37)	8.588 [1,143]*	2.47 (1.18)	1.622 [1,143]	3.35 (4.08)	2.674 [1,143]*	

** *P* < 0.001; * *P* < 0.05

Table 9 Predicting variables: Stepwise linear regression analyses for mother positive, negative, not clear, and total bonding results

	Model	<i>R</i> ²	<i>B</i>	<i>F</i>	<i>P</i>
Positive bonding	NS				
Negative bonding	EPDS ≥ 13	0.178	0.477	11.438	0.001
	Unemployed	0.254	0.340	8.852	0.000
	Single	0.309	0.244	7.616	0.000
Not clear bonding	NS				
Total bonding	EPDS ≥ 13	0.139	−0.372	8.582	0.005
	<Grade 9	0.204	−0.255	6.671	0.003

Discussion

Several aspects influence mothers’ initial emotional involvement with the newborn and some of them were considered in this study. According to previous research, the results showed that maternal bonding depended on mother’s socio-demographics, previous life events and mood, as well as on infant variables. However, on the contrary to what we expected from the literature, our results did not confirm that any event related to childbirth, neither the type of delivery (vaginal, caesarean,

instrumental, with general anesthesia, or with epidural anesthesia) [35, 36, 41], nor the pain [20, 21, 32], nor the support from the partner during delivery [61], nor the early experiences with the infant [44, 62] interfered in the mother’s bonding.

The results showed that both unemployed mothers and mothers with less than grade 9 presented less positive emotions toward the newborn, and also that mothers with less years of education had worse bonding with the neonate, as pointed out in some studies [2]. Moreover, not clear emotions toward the newborn are more prevalent both in unmarried mothers and in mothers with history of psychological problems, suggesting that the absence of a relationship with the child’s father [26, 27] and previous psychological problems [30] interferes with mother bonding toward the newborn.

In addition, results supported the idea that maternal bonding is an interactive process between the mother and the child, seeing that some infant’s characteristics interfered in the emotions the mother had toward him/her. In fact, mother’s positive emotions were higher when the newborn was male—As reported in some studies [63, 64]—And lower when the child was admitted in the intensive care unit. Also, negative as well as not clear

emotions were higher toward neonates admitted in the intensive care unit, similarly to other studies [31]. A worse bonding was observed in mothers of newborns with neonatal problems, namely in mothers of neonates admitted in the intensive care unit. We can conclude that maternal emotional involvement is restrained when the infant has neonatal problems or is admitted to intensive care, which can be explained namely by the fact that mother and infant are separated, by the fact that the infant may not survive so the mother is highly preoccupied and confused about her involvement with him/her [31], and by the fact that the newborn is not as able to participate in the interaction with the mother [22].

Mother's depressive symptoms have a large impact on her ability to bond; particularly negative and not clear emotions toward the infant are more intense when the mother is depressed. Moreover, the best predictor for negative emotional involvement as well as for worse bonding with the neonate is the fact that the mother is depressed. Factors that contribute to the presence of more negative emotions toward the infant are: The mother being depressed, unemployed and single. Factors that contribute to a worse bonding with the neonate are: The mother being depressed and having less than grade 9. Based on these results we may conclude that maternal emotional involvement with the child is seriously affected by the mother's mood, a result that has been recently getting more support in literature [13, 31, 32]. To attend to the mother's early postpartum mood should be a priority in health care facilities, in order to help women with problems in getting emotionally involved with the newborn.

To identify parents who have difficulties in getting emotionally involved with the neonate, as much as to improve circumstances that interfere with the mother-to-infant emotional involvement is important. As reported here and in the literature, mothers who are single, unemployed [20] and depressed [13, 31, 32] are at high-risk of having disturbed initial bonding with the neonate. Risk factors pointed out in this study can help to identify mothers who need support in their initial interactions with the child, and suggest main dimensions to improve (for example mothers' mood) in order to prevent bonding difficulties, which have a negative impact on the child development. This study only took into account the mother's initial emotional involvement with the neonate. Although extensive literature has been published about the impact of postpartum depression on mother-infant interaction at 3 months or later, there is a lack of research about mother's mood effects in the beginning of the relationship with the child that may interfere in their later relationship.

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References

1. Winnicott, D. (1957). *The child, the family, and the outside world classics in child development*. USA: Winnicott.
2. Klaus, M. H., & Kennell, J. H. (1976). *Maternal-infant bonding*. Saint Louis: The C. V. Mosby Company.
3. Kennell, J. H., Trause, M. A., & Klaus, M. H. (1975). Evidence for a sensitive period in the human mother. In Ciba Foundation (Ed.), *Parent-infant interaction* (pp. 87–102), Vol 33. Amsterdam: Association Scientific Publishers.
4. Stern, D. (1995). *The motherhood constellation*. New York, NY: Harper Collins.
5. George, C., & Solomon, J. (1999). Attachment and caregiving: The caregiving behavioral system. In J. Cassidy & P. Shaver (Eds.), *Handbook of attachment: Theory, research and clinical applications* (pp. 649–667). New York, NY: The Guilford Press.
6. Bowlby, J. (1958). The nature of the child's tie to his mother. *International Journal of Psychoanalytic*, 39, 350–373.
7. Klaus, M. H., Kennell, J. H., & Klaus, P. H. (1995). *Bonding: Building the Foundations of Secure Attachment and Independence*. USA: Addison Wesley Publishing Company.
8. Fleming, A. S., O'Day, D. H., & Kraemer, G. W. (1999). Neurobiology of mother-infant interactions: Experience and central nervous system plasticity across development and generations. *Neuroscience Biobehavioral Review*, 235, 6736–6785.
9. Eibl-Eibesfeldt, I. (1971). *Love and Hate: The natural history of behavior patterns*. New York, NY: Holt, Rinehart, & Winston, Inc.
10. Richards, M. P. M. (1971). Social interaction in the first weeks of human life. *Psychiatric Neurology Neurochirurgia*, 74, 35–42.
11. Figueiredo, B., Costa, R., Marques, A., Pacheco, A., & Pais, A. (2007). Mother and father-to-infant initial emotional involvement. *Early Child Development and Care*, 177(5), 521–532.
12. Fleming, A. S., Rubble, D., Krieger, H., & Wong, P. Y. (1997). Hormonal and experiential correlates of maternal responsiveness during pregnancy and the puerperium in human mothers. *Hormone and Behavior*, 31, 145–158.
13. Taylor, A., Atkins, R., Kumar, R., Adams, D., & Glover, V. (2005). Mother-to-infant bonding scale: Links with early maternal mood. *Archives of Women's Mental Health*, 81, 45–51.
14. Figueiredo, B., Marques, A., Costa, R., Pacheco, A., & Pais, A. (2005). Bonding: Escala para avaliar o envolvimento emocional dos pais com o bebé. *Psychological*, 40, 133–154.
15. Fleming, A. S., Ruble, D. N., Flett, G., & Shaul, D. L. (1988). Postpartum adjustment in first-time mothers: Relations between mood, maternal attitudes and mother infant interactions. *Development Psychology*, 241, 71–81.
16. Troy, N. W. (1993). Early contact and maternal attachment among women using public health care facilities. *Applied Nursing Research*, 64, 161–166.
17. Troy, N. W. (1995). The time of first holding of the infant and maternal self-esteem related to emotions of maternal attachment. *Women Health*, 223, 59–72.
18. Chalmers, B., Samarskaya, M. E., Tkatchenko, E., & Wallington, T. (1998). Women's perceptions of birth in St Petersburg, Russian Federation. *Journal of Reproductive Infant Psychology*, 16, 243–258.
19. MacFarlane, J. A., Smith, D. M., & Garrow, D. H. (1978). The relationship between mother and neonate. In S. Kitzinger & J. A. Davis (Eds.), *The place of birth*. New York, NY: Oxford University Press.

20. Newton, N., & Newton, M. (1962). Mother's reaction to their newborn babies. *Journal of the American Medical Association*, *181*, 206–210.
21. Robson, K. S., & Kumar, R. (1980). Delayed onset of maternal affection after childbirth. *The British Journal of Psychiatry*, *136*, 347–353.
22. Robson, K. S., & Moss, H. (1970). Patterns and determinants of maternal attachment. *Journal of Pediatric*, *77*, 976–985.
23. Insel, T. R. (1992). Oxytocin—A neuropeptide for affiliation: evidence from behavioral, receptor autoradiographic, and comparative studies. *Psychoneuroendocrinology*, *17*(1), 3–35.
24. Insel, T. R. (1997). A neurobiological basis of social attachment. *American Journal of Psychiatry*, *154*(6), 726–735.
25. Neumann, I. D. (2003). Brain mechanisms underlying emotional alterations in the peripartum period in rats. *Depression and Anxiety*, *17*(3), 111–121.
26. Isabella, R. A. (1994). Origins of maternal role satisfaction and its influences upon maternal interactive behavior and infant-mother attachment. *Infant Behavior and Development*, *17*, 381–387.
27. Isabella, R. A., & Belsky, J. (1985). Marital change during the transition to parenthood and security of infant-parent attachment. *Journal of Family Issues*, *6*(4), 505–522.
28. Edelstein, R. S., Alexander, K. W., Shaver, P. R., Schaaf, J. M., Quas, J. A., Lovas, G. S., & Goodman, G. S. (2004). Adult attachment style and parental responsiveness during a stressful event. *Attachment & Human Development*, *6*(1), 31–52.
29. Slade, A., Belsky, J., Aber, J. L., & Phelps, J. L. (1999). Mothers' representations of their relationships with their toddlers: Links to adult attachment and observed mothering. *Development of Psychology*, *35*(3), 611–619.
30. Krpan, K. M., Coombs, R., Zinga, D., Steiner, M., & Fleming, A. S. (2005). Experiential and hormonal correlates of maternal behavior in teen and adult mothers. *Hormones and Behavior*, *47*(1), 112–122.
31. Feldman, R., Weller, A., Leckman, J. F., Kuint, J., & Eidelman, A. (1999). The nature of the mother's tie to her infant: Maternal bonding under conditions of proximity, separation and potential loss. *Journal of Child Psychology and Psychiatry*, *40*(6), 929–939.
32. Kumar, R. C. (1997). "Anobody's child": Severe disorders of mother-to-infant bonding. *The British Journal of Psychiatry*, *171*, 175–181.
33. Carek, D. J., & Capelli, A. J. (1981). Mother's reactions to their newborn infants. *Journal of the American Academy of Child Psychiatry*, *20*, 16–31.
34. Robson, K. S. (1967). The role of eye-eye contact in maternal infant attachment. *Journal of Child Psychology Psychiatry*, *8*, 13–25.
35. Cummins, L. H., Scrimshaw, S. C. M., & Engle, P. L. (1988). Views of cesarean birth among primiparous women of Mexican origin in Los Angeles. *Birth*, *15*, 164–170.
36. DiMatteo, M. R., Morton, S. C., Lepper, H. S., Damush, T. M., Carney, M. F., Pearson, M., & Kahn, K. L. (1996). Cesarean childbirth and psychosocial outcomes: A meta-analysis. *Health Psychology*, *15*(4), 303–324.
37. Garel, M., Lelong, N., & Kaminski, M. (1987). Psychological consequences of caesarean childbirth in primiparas. *Journal of Psychosomatic Obstetrics and Gynecology*, *63*, 197–209.
38. Marut, J. S., & Mercer, R. T. (1979). Comparison of primiparas' perceptions of vaginal delivery and cesarean births. *Nursing Research*, *28*(5), 260–266.
39. Tulman, L. J. (1986). Initial handling of newborn infants by vaginal delivery and cesarean-delivered mothers. *Nursing Research*, *35*, 296–300.
40. Kearney, M. H., Cronenwett, L. R., & Reinhart, R. (1990). Cesarean delivery and breastfeeding outcomes. *Birth*, *17*, 97–103.
41. Taylor, A., Littlewood, J., Adams, D., Doré, C., & Glover, V. (1994). Serum cortisol levels are related to moods of elation and dysphoria in new mothers. *Psychiatry Research*, *54*, 241–247.
42. Ransjo-Arvidson, A. B., Matthiesen, A. S., Lilja, G., Nissen, E., Widstrom, A. M., & Uvnas-Moberg, K. (2001). Maternal analgesia during labor disturbs newborn behavior: Effects on breastfeeding, temperature, and crying. *Birth*, *28*(1), 5–12.
43. Sepkoski, C. M., Lester, B. M., Ostheimer, G. W., & Brazelton, T. B. (1992). The effects of maternal epidural anesthesia on neonatal behavior during the first month. *Development Medical and Child Neurology*, *34*(12), 1072–1080.
44. Huckabay, L. M. (1999). The effect on bonding behavior of giving a mother her premature baby's picture. *Scholarly Inquiry for Nursing Practice*, *13*(4), 349–362.
45. Widstrom, A. M., Wahlberg, V., Matthiesen, A. S., Eneroth, P., Uvnas-Moberg, K., Werner, S., & Winberg, J. (1990). Short-term effects of early suckling and touch of the nipple on maternal behaviour. *Early Human Development*, *21*(3), 153–163.
46. Gomes-Pedro, J., Bento de Almeida, J., Silveira da Costa, C., & Barbosa, A. (1984). Influence of early mother-infant contact on dyadic behaviour during the first month of life. *Development Medical and Child Neurology*, *26*(5), 657–664.
47. Simpson, J. A. (1999). Attachment theory in modern evolutionary perspective. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment* (pp. 115–140). New York, NY: Guilford Press.
48. Lee, R. E. (1995). Women look at their experience of pregnancy. *Infant Mental Health Journal*, *16*(3), 192–205.
49. Field, T. (1990). *Infancy*. Cambridge: Harvard University Press.
50. Lozoff, B., Jordan, B., & Malone, S. (1988). Childbirth in cross-cultural perspective. *Marriage & Family Review*, *12*(3–4), 35–60.
51. Brazelton, T. B., & Cramer, B. G. (1990). *Earliest relationship: Parents, infants, and the drama of early attachment*. New York: Addison-Wesley Publishing.
52. Figueiredo, B., Costa, R., Pacheco, A., Conde, A., & Teixeira, C. (2007). Anxiété, dépression et investissement émotionnel de l'enfant pendant la grossesse. *Devenir*, *19*(3), 243–260.
53. Lawson, K. L., & Turriff-Jonasson, S. I. (2006). Maternal serum screening and psychosocial attachment to pregnancy. *Journal of Psychosomatic Research*, *60*(4), 371–378.
54. Righetti, P. L., Dell'Avanzo, M., Grigio, M., & Nicolini, U. (2005). Maternal/paternal antenatal attachment and fourth-dimensional ultrasound technique: A preliminary report. *The British Journal of Psychiatry*, *96*, 129–137.
55. Niven, C. (1988). Labor pain: Long-term recall and consequences. *Journal of Reproductive Infant Psychology*, *6*, 83–87.
56. Thune-Larsen, K. B., & Moller-Pedersen, K. (1988). Childbirth experience and postpartum emotional disturbance. *Journal of Reproductive Infant Psychology*, *6*(4), 229–240.
57. Augusto, A., Kumar, R., Calheiros, J. M., Matos, E., & Figueiredo, E. (1996). Post-natal depression in an urban area of Portugal: Comparison of childbearing women and matches controls. *Psychological Medicine*, *26*, 135–141.
58. Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry*, *150*, 782–786.
59. Figueiredo, B. (1997). *Postpartum depression, mother-infant interaction and child development*. Unpublished doctoral dissertation, Minho University, Braga.
60. Areias, M. E., Kumar, R., Barros, H., & Figueiredo, E. (1996). Comparative incidence of depression in women and men, during pregnancy and after childbirth. Validation of the Edinburgh Postnatal Depression Scale in Portuguese mothers. *The British Journal of Psychiatry*, *169*(1), 30–35.

61. Dragonas, T. G. (1992). Greek fathers' participation in labor and care of the infant. *Scandinavian Journal of Caring Science*, *63*, 151–159.
62. Klaus, M. H., & Kennell, J. H. (1992). Pregnancy, birth and the first days of life. In M. D. Levine, W. B. Carey, & A. C. Crocker (Eds.), *Developmental-behavioral pediatrics* (pp. 16–26). Philadelphia, PA: WB Saunders Co.
63. Brown, J. V., Bakeman, R., Snyder, P. A., Fredrickson, W. T., Morgan, S. T., & Hepler, R. (1975). Interactions of black inner-city mothers with their newborn infants. *Child Development*, *46*, 677–686.
64. Craig, S., Tyson, J. E., Samson, J., & Lasky, R. E. (1982). The effect of early contact on maternal perception of infant behavior. *Early Human Development*, *62*, 197–204.