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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 postpartum experiences with the infant and mother's mood) that interfere in mother 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 two after delivery days to 315 mothers recruited at Júlio Dinis Maternity Hospital (Porto, Portugal).

Results: A worse emotional involvement with the newborn was observed when the mother was primiparous, unemployed, unmarried, had less than grade 9, previous psychological problems or was depressed, as well as when the infant was female, had neonatal problems or was admitted in the intensive care unit. Total bonding results were significantly improved when the mother was not depressed and had a higher educational level, while being depressed, unemployed and single predicted more negative emotions toward the infant. No significant differences in mother-to-infant emotional involvement were obtained for events related to childbirth, such as type of delivery, pain and partner support, or early postpartum experiences with the newborn; these events do not predict mother's bonding results either.

Conclusion: The importance of improving circumstances that beneficiate mother-to-infant emotional involvement, as well as of screening and supporting depressed, unemployed and single mothers, in order to prevent bonding difficulties with the child.

Key words: 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, as well as the mother's affectional tie with the child and the unique place he/she holds in her representational world. Several authors 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 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 (3). Attending to a representational level, Daniel Stern (4) observed that women 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 (7,8). 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). (2) 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. (3) 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 (11,12,13). 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 (7).

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 (12,14,15,16,17,18), several other authors have pointed out that a high number of mothers (30-50%) don't feel emotionally involved with the neonate immediately after delivery and are quite indifferent and disappointed with him/her during the first postpartum week (19,20,21,22).

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 (23,24,25). These hormonal changes are implicated in the mother's high reactivity toward the neonate after delivery, activate initial bonding, and improve the proximity with the infant in order to guarantee its survival. Maternal bonding had been observed as being associated with these hormones (oxytocin, cortisol, prolactin, etc.) levels/changes, which explain differences in the mother's reactivity, responsiveness, sensitivity, proximity and/or emotional involvement with the newborn (7,8,9,12,26,27). Oxytocin and prolactin, for example, ensures reproduction related physiological processes and in a synergic manner accompanying behaviors as well, for the survival of the offspring (25). Oxytocin and prolactin production is improved when the mother breastfeeds and in turn stimulates the mother to be emotionally involved and to keep proximity with the child (7,9,28). Adrenal activation after birth is stimulated by infant crying and a good predictor of maternal responsiveness and proximity with the neonate, as another example (26,27).

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 (29,30), as well as mothers with a secure attachment style (31,32) 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 (33). 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 (13,34), while mothers with mild sub clinical hypomania present a better bonding (13). Kumar (35) 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 or disturbed current relationship, or 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 (36), 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 (22,35).

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 have difficult or complicated labor and delivery, with severe pain, are less involved with the infant in the days following childbirth (20,21,37). Regarding the type of delivery, initial reaction toward the newborn is not as positive following caesarean, particularly emergency caesarean, when compared to vaginal delivery (38,39,40,41,42); this may depend on the delay in seeing and taking care of the child (42,43). Similarly, epidural anesthesia seems to have a negative impact on maternal bonding, which may be caused by both the lower levels of cortisol involved (44) and the neonates' interactive behavior negatively influenced by the anesthesia (45,46).

Emotional involvement seems to be particularly dependent of 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 (47). 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 (2,3). 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 (3,28,48,49). 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 (34).

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 (49). At a representational level, seeing the infant for the first time is a very significant event for the mother (50). But also, the neonate is particularly awake, attentive and available for interaction with the mother during the first 24 hours of life, more than during the following days, and shows several behaviors that elicit mother's proximity and bonding (3,51).

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 (52).

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 (2,4,7,22,53), only a few empirical studies have investigated risk and protective factors for mother-to-infant emotional involvement (5,32).

This study is aimed to investigate the circumstances that improve and restrain mother's emotional involvement with the infant at birth. In order to accomplish this, a large

range of different factors pointed out in literature was considered, such as: socio-demographics, previous life events, type of delivery, pain at childbirth, support from partner, infant characteristics, mother's early postpartum experiences with the infant and mood.

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, but emerges essentially during the first contacts with the newborn, and depends on the circumstances of this event, which explain our particular attention to it. To understand the reasons why the emotional involvement of certain mothers is disrupted was also an interest of ours. 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 (20,21,54,55). 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 (Porto, Portugal), during the first two after delivery days. 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 were then administered. This research was conducted in accord with prevailing ethical principles.

1. 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%); only few of them were not living with the partner (13.9%) [separated/divorced (.4%) or single (13.5%)]; they usually lived with the partner (86.1%) (average of 4.0 years of joint life), the majority without (67.1%) but some with other relatives (13.9%).

Most infants [male (52.4%) and female (47.6%)] were born with a normal gestational age of 37 to 40 weeks (86.9%) and weight ($\geq 2.5\text{Kg}$ and $\leq 4.0\text{Kg}$), 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%).

2. 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 4-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 3 items (Loving, Protective and Joyful) and measuring the positive emotional involvement; 'Negative Bonding', composed of 6 items (Mad, Aggressive, Sad, Resentful, Dislike, Disappointed) and evaluating the negative emotional involvement; 'Bonding Not Clear', composed of 3 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 ($\alpha = .53$), and of test-retest reliability ($r = .50$).¹⁴

Edinburgh Postnatal Depression Scale

Portuguese version⁵⁶ of the Edinburgh Postnatal Depression Scale (EPDS) (57), a 10 items self-report questionnaire in a Likert scale of 4 points (0-3) addressed to depressive symptoms was used. The scale showed good internal consistency ($\alpha = .85$) and test-retest reliability ($r = .75$) (58) as well as good external validity with the SADS psychiatric interview; when a cut-off of 9 ($r = .89$) or 13 ($r = .96$) is considered mothers generally are clinically depressed (56,59).

3. Statistical Analysis

Multivariate analyses of variance (MANOVAs) were performed to explore differences in mothers' positive, negative and not clear bonding results attending to the independent variables presented below. 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 and psychological problems, parity and adverse life events), 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), early postpartum experiences with the infant (touching, holding and breastfeeding), infants' characteristics (gender, weight, intensive care admission, neonatal problems, gestational age) and mother's mood.

RESULTS

Socio-demographics

MANOVAs involving mothers' positive, negative and not clear bonding were performed. No significant differences were found in bonding in terms of age (Wilks' Lambda = .97, $F[1,305] = .45$, $P = .717$), place of birth (Wilks' Lambda = .99, $F[1,312] = .71$, $P = .550$), living with the partner (Wilks' Lambda = .99, $F[1,311] = .08$, $P = .974$), living with the extended family (Wilks' Lambda = .99, $F[1,309] = .25$, $P = .859$) or employment status (Wilks' Lambda = .98, $F[1,312] = 1.52$, $P = .209$). Nevertheless, the univariate *F* values revealed that employed mothers have more positive emotions toward the infant than not employed mothers. Significant differences were found in bonding in terms of years of education (Wilks' Lambda = .93, $F[1,291] = 6.94$, $P = .000$) and marital status (Wilks' Lambda = .98, $F[1,313] = 2.67$, $P = .048$): mothers with grade 9 or more had more

positive emotions toward the infant than mothers with less than grade 9 and unmarried mothers had more not clear emotions toward the newborn compared to married mothers. Negative bonding did not significantly differ according to socio-demographics considered in this study (cf. table 1).

INSERT TABLE 1

Regarding mothers' total bonding according to socio-demographics, independent samples *t* tests showed that mothers with grade 9 or more ($M = 5.96, SD = 2.61$) have better results compared to mothers with less than grade 9 ($M = 5.23, SD = 2.83$) ($t = 2.265, P = .024$).

However, we found no significant differences in total bonding results between mothers that were 20 or more years old ($M = 5.26, SD = 3.35$) and less than 20 years old ($M = 5.71, SD = 2.68$) ($t = .806, P = .421$); Portuguese ($M = 5.65, SD = 2.68$) and foreign mothers ($M = 6.05, SD = 3.28$) ($t = .641, P = .522$); single ($M = 5.36, SD = 3.31$) and married mothers ($M = 5.84, SD = 2.40$) ($t = 1.302, P = .195$); mothers living with the partner ($M = 5.70, SD = 2.75$) and those who weren't ($M = 5.53, SD = 2.56$) ($t = .352, P = .725$); mothers living with the extended family ($M = 5.72, SD = 2.55$) and those who weren't ($M = 5.67, SD = 2.81$) ($t = .152, P = .880$); or employed ($M = 5.83, SD = 2.58$) and unemployed mothers ($M = 5.33, SD = 3.04$) ($t = 1.475, P = .141$).

Previous life events

MANOVAs involving mothers' positive, negative and not clear bonding results indicated that emotional involvement did not differ according to the following life events: history of obstetrical problems (Wilks' Lambda = .99, $F[1, 313] = 1.48, P = .219$), adverse life events (Wilks' Lambda = .98, $F[1, 313] = 1.88, P = .132$) and parity (Wilks' Lambda =

.98, $F[1, 313] = 1.78, P = .151$). Significant differences were found in bonding in terms of psychological problems (Wilks' Lambda = .97, $F[1, 313] = 3.07, P = .028$)

Univariate F test also revealed that mothers with history of obstetrical problems ($M = 7.59, SD = 1.82$) and without ($M = 8.00, SD = 1.45$) ($F[1,313] = 3.594, P = .059$); mothers with history of psychological problems ($M = 8.11, SD = 1.32$) and without ($M = 7.85, SD = 1.60$) ($F[1,313] = 1.633, P = .202$); primiparous ($M = 8.01, SD = 1.44$) and multiparous mothers ($M = 7.73, SD = 1.70$) ($F[1,313] = 2.307, P = .130$); or mothers with history of adverse life events ($M = 8.07, SD = 1.44$) and without ($M = 7.84, SD = 1.59$) ($F[1,313] = 1.660, P = .199$) did not differ in terms of positive bonding results. Mothers with history of obstetrical problems ($M = .59, SD = 1.17$) and without ($M = .45, SD = 1.20$) ($F[1,313] = .65, P = .419$); mothers with history of psychological problems ($M = .56, SD = 1.43$) and without ($M = .45, SD = 1.10$) ($F[1,313] = .523, P = .470$); primiparous ($M = .50, SD = 1.29$) and multiparous mothers ($M = .43, SD = .99$) ($F[1,313] = .585, P = 3.481$); or mothers with history of adverse life events ($M = .58, SD = 1.23$) and without ($M = .42, SD = 1.17$) ($F[1,313] = .264, P = 3.684$) did not differ in terms of negative bonding results. When mothers' not clear emotional involvement was addressed, significant differences were not observed when we compared mothers with history of obstetrical problems ($M = 1.61, SD = 1.47$) and without ($M = 1.79, SD = 1.63$) ($F[1,313] = .792, P = .374$); primiparous ($M = 1.86, SD = 1.39$) and multiparous mothers ($M = 1.54, SD = 1.53$) ($F[1,313] = 3.481, P = .063$); or mothers with history of adverse life events ($M = 1.96, SD = 1.53$) and without ($M = 1.63, SD = 1.38$) ($F[1,313] = 3.684, P = .056$). However, mothers with history of psychological problems ($M = 2.15, SD = 1.67$) compared to those without ($M = 1.62, SD = 1.33$) showed higher not clear bonding results ($F[1,313] = 8.304, P = .004$).

Independent samples *t* tests showed that mothers with history of obstetrical problems ($M = 5.39, SD = 2.69$) and without ($M = 5.57, SD = 2.73$) ($t = .948, P = .344$); mothers with history of psychological problems ($M = 5.40, SD = 3.02$) and without ($M =$

5.79, *SD* = 2.61) ($t = 1.104, P = .270$); or mothers with history of adverse life events ($M = 5.53, SD = 2.80$) and without ($M = 5.78, SD = 2.68$) ($t = .775, P = .439$); or primiparous ($M = 5.65, SD = 2.79$) compared to multiparous mothers ($M = 5.77, SD = 2.58$) ($t = .368, P = .713$) did not differ in terms of total bonding results.

Type of delivery

MANOVAs performed according to the type of delivery were not significant for mothers' positive, negative and not clear bonding results (Wilks' Lambda = .95, $F[1, 313] = 1.31, P = .205$). Univariate F test also showed that women with vaginal delivery without anesthesia ($M = 7.63, SD = 1.827$), vaginal delivery with epidural anesthesia ($M = 8.22, SD = 1.22$), caesarean with general anesthesia ($M = 8.03, SD = 1.24$), caesarean with epidural anesthesia ($M = 7.98, SD = 1.57$) and instrumental delivery ($M = 7.90, SD = 1.70$) did not differ in terms of positive bonding results ($F[4,304] = 1.591, P = .177$). Women with vaginal delivery without anesthesia ($M = 1.58, SD = 1.43$), vaginal delivery with epidural anesthesia ($M = 1.97, SD = 1.62$), caesarean with general anesthesia ($M = 1.63, SD = 1.46$), caesarean with epidural anesthesia ($M = 1.87, SD = 1.26$) and instrumental delivery ($M = 1.79, SD = 1.21$) did not differ in terms of negative bonding results ($F[4,304] = .938, P = .442$). Women with vaginal delivery without anesthesia ($M = .43, SD = .83$), vaginal delivery with epidural anesthesia ($M = .64, SD = 1.70$), caesarean with general anesthesia ($M = .56, SD = 1.29$), caesarean with epidural anesthesia ($M = .35, SD = .97$) and instrumental delivery ($M = .21, SD = .68$) did not differ in terms of not clear bonding results ($F[4,304] = .918, P = .454$).

ANOVAs used to test differences in mothers' total bonding results considering the type of delivery did not identify a significant difference: women with vaginal delivery without anesthesia ($M = 5.62, SD = 2.45$), vaginal delivery with epidural anesthesia ($M = 5.61, SD$

= 3.34), caesarean with general anesthesia ($M = 5.84, SD = 2.53$), caesarean with epidural anesthesia ($M = 5.76, SD = 2.69$) and instrumental delivery ($M = 5.90, SD = 2.68$) did not differ in terms of total bonding result ($F[4,303] = .123, P = .974$).

Pain at childbirth

MANOVAs for positive, negative and not clear bonding were performed according to pain at labor (Wilks' Lambda = .99, $F[1,300] = .27, P = .947$), delivery (Wilks' Lambda = .99, $F[1,301] = .32, P = .929$) and after childbirth (Wilks' Lambda = 1.00, $F[1,299] = .13, P = .992$) and no significant differences were found.

Univariate F test performed for positive emotional involvement showed no significant differences between mothers with: no pain during labor ($M = 7.70, SD = 1.78$), some ($M = 7.99, SD = 1.39$) and a lot ($M = 7.98, SD = 1.52$) ($F[2,302] = .722, P = .467$); no pain during delivery ($M = 7.94, SD = 1.53$), some ($M = 7.86, SD = 1.59$) and a lot ($M = 7.97, SD = 1.49$) ($F[2,303] = .139, P = .870$); or no pain after delivery ($M = 8.07, SD = 1.64$), some ($M = 7.89, SD = 1.53$) and a lot ($M = 7.93, SD = 1.50$) ($F[2,301] = .224, P = .799$). Regarding negative emotional involvement, differences were not significant between mothers with no pain during labor ($M = .50, SD = 1.26$), some ($M = .48, SD = 1.35$) and a lot ($M = .47, SD = 1.10$) ($F[2,302] = .013, P = .987$); no pain during delivery ($M = .53, SD = 1.22$), some ($M = .48, SD = 1.48$) and a lot ($M = .43, SD = .98$) ($F[2,303] = .183, P = .833$); or no pain after delivery ($M = .37, SD = .77$), some ($M = .49, SD = 1.28$) and a lot ($M = .50, SD = 1.25$) ($F[2,301] = .168, P = .845$). Mothers with no pain during labor ($M = 1.76, SD = 1.22$), some ($M = 1.72, SD = 1.42$) and a lot ($M = 1.78, SD = 1.52$) ($F[2,302] = .057, P = .945$); no pain during delivery ($M = 1.69, SD = 1.34$), some ($M = 1.69, SD = 1.41$) and a lot ($M = 1.84, SD = 1.55$) ($F[2,303] = .390, P = .677$); or no pain after delivery ($M = 1.68, SD =$

1.16), some ($M = 1.75, SD = 1.46$) and a lot ($M = 1.79, SD = 1.50$) ($F[2,301] = .109, P = .897$) did not differ in terms of not clear bonding results.

ANOVAs were performed considering pain during labor, delivery and after delivery and revealed that mothers' with no pain during labor ($M = 5.44, SD = 2.56$), some ($M = 5.79, SD = 3.05$) and a lot ($M = 5.70, SD = 2.75$) ($F[2,301] = .286, P = .751$); no pain during delivery ($M = 5.72, SD = 2.53$), some ($M = 5.59, SD = 3.17$) and a lot ($M = 5.70, SD = 2.74$) ($F[2,302] = .004, P = .996$); or no pain after delivery ($M = 6.03, SD = 2.29$), some ($M = 5.65, SD = 2.84$) and a lot ($M = 5.64, SD = 2.75$) ($F[2,300] = .326, P = .722$) did not significantly differ in terms of total bonding results.

Support from partner

MANOVAs for positive, negative and not clear bonding were performed regarding partners' support during labor (Wilks' Lambda = .99, $F[1,300] = 1.26, P = .290$), delivery (Wilks' Lambda = .99, $F[1,300] = 1.29, P = .279$) and after delivery (Wilks' Lambda = .99, $F[1,301] = .88, P = .448$). No significant differences were found. Univariate F test revealed that mothers with partner's support during labor ($M = 7.94, SD = 1.52$) and without ($M = 7.94, SD = 1.55$) ($F[1,302] = .000, P = .992$); mothers with partner's support during delivery ($M = 8.04, SD = 1.39$) and without ($M = 7.84, SD = 1.66$) ($F[1,302] = 1.298, P = .255$); or mothers with partner's support after delivery ($M = 7.96, SD = 1.50$) and without ($M = 7.69, SD = 1.81$) ($F[1,302] = .753, P = .386$) did not significantly differ in terms of positive bonding results. Regarding negative bonding results, no significant differences were found between mothers' with partner's support during labor ($M = .42, SD = 1.10$) and without ($M = .62, SD = 1.16$) ($F[1,302] = 1.628, P = .203$); mothers with partner's support during delivery ($M = .42, SD = 1.16$) and without ($M = .54, SD = 1.25$) ($F[1,302] = .727, P = .395$); or mothers with partner's support after delivery ($M = .45, SD = 1.21$) and without ($M = .73,$

$SD = 1.11$) ($F[1,302] = 1.277, P = .259$). No significant differences between mothers' with partner's support during labor ($M = 1.79, SD = 1.44$) and without ($M = 1.63, SD = 1.44$) ($F[1,302] = .668, P = .415$); mothers with partner's support during delivery ($M = 1.85, SD = 1.53$) and without ($M = 1.64, SD = 1.33$) ($F[1,302] = 1.643, P = .201$); or mothers with partner's support after delivery ($M = 1.72, SD = 1.43$) and without ($M = 2.08, SD = 1.60$) ($F[1,302] = 1.441, P = .231$) were obtained when not clear bonding results were addressed.

No significant differences in total bonding results were found between mothers' with partner's support during labor ($M = 5.73, SD = 2.70$) and without ($M = 5.68, SD = 2.90$) ($t = .137, P = .891$); mothers with partner's support during delivery ($M = 5.77, SD = 2.81$) and without ($M = 5.66, SD = 2.69$) ($t = .337, P = .736$); or mothers with partner's support after delivery ($M = 5.79, SD = 2.71$) and without ($M = 4.88, SD = 3.04$) ($t = 1.612, P = .108$).

Infant characteristics

MANOVAs for positive, negative and not clear bonding were performed regarding infant characteristics. No significant differences were found regarding: gender (Wilks' Lambda = .98, $F[1,277] = 1.82, P = .144$), weight (Wilks' Lambda = 1.00, $F[1,289] = .38, P = .768$) gestational age (Wilks' Lambda = .99, $F[1,277] = 1.02, P = .385$) and neonatal problems (Wilks' Lambda = .99, $F[1,242] = .57, P = .634$). Significant differences were found regarding intensive care admission (Wilks' Lambda = .94, $F[1,243] = 5.13, P = .002$). Univariate F test revealed that mothers of male infants and mothers of infants with no intensive care admission had more positive emotions toward them compared to mothers of female infants and mothers of infants admitted in the intensive care unit. Also, mothers with infants in intensive care had both more negative and more not clear emotions toward him/her, compared to those whose infants were not in intensive care (cf. table 2).

INSERT TABLE 2

Independent samples *t* tests for mothers' total bonding results were significant for the following infant characteristics: intensive care admission ($t = 3.829, P = .000$) and neonatal problems ($t = 2.339, P = .020$); mothers of newborns not in intensive care ($M = 6.00, SD = 2.58$) as well as mothers of newborns without neonatal problems ($M = 6.03, SD = 2.57$) had better bonding compared to those whose children were in intensive care ($M = 3.44, SD = 2.71$) or have neonatal problems ($M = 5.00, SD = 2.95$).

However, no differences in total bonding results were found between mothers with: a female ($M = 5.73, SD = 2.85$) and a male neonate ($M = 5.82, SD = 2.52$) ($t = .280, P = .779$); a child with less than 2.5 Kg ($M = 5.46, SD = 2.17$) and a child with 2.5 Kg or more ($M = 5.74, SD = 2.79$) ($t = .487, P = .626$); or a less than 37 weeks of gestation infant ($M = 5.48, SD = 2.53$) and a infant with 37 weeks or more ($M = 5.65, SD = 2.53$) ($t = .306, P = .760$).

Early experiences with the infant

MANOVAs for positive, negative and not clear bonding were performed related with touching the child within 60 minutes after delivery (Wilks' Lambda = 1.00, $F[1,303] = .28, P = .841$), holding the child within 60 minutes after delivery (Wilks' Lambda = 1.00, $F[1,303] = .34, P = .800$) and breastfeeding the child within 60 minutes after delivery (Wilks' Lambda = .99, $F[1,161] = .71, P = .551$). No significant differences were found.

Univariate *F* values showed no significant differences as well: between mothers that could touch their child within 60 minutes after delivery ($M = 9.94, SD = 1.53$) and those that could not ($M = 7.89, SD = 1.54$) ($F[1,303] = .064, P = .801$); mothers that could hold

their child within 60 minutes after delivery ($M = 7.96, SD = 1.58$) and those that could not ($M = 7.87, SD = 1.42$) ($F[1,303] = .198, P = .657$); or mothers that breastfed their child within 60 minutes after delivery ($M = 8.01, SD = 1.49$) and those that did not ($M = 7.90, SD = 1.76$) ($F[1,161] = .183, P = .670$) regarding positive bonding results. Considering negative bonding results, no significant differences were found between mothers that could touch their child within 60 minutes after delivery ($M = .466, SD = 1.25$) and those that could not ($M = .51, SD = 1.10$) ($F[1,303] = .064, P = .800$); mothers that could hold their child within 60 minutes after delivery ($M = .45, SD = 1.23$) and those that could not ($M = .53, SD = 1.17$) ($F[1,303] = .309, P = .579$); or mothers that breastfed their child within 60 minutes after delivery ($M = .34, SD = .86$) and those that did not ($M = .19, SD = .73$) ($F[1,161] = 1.377, P = .242$). No significant differences were found in not clear bonding results between mothers that could touch their child within 60 minutes after delivery ($M = 1.78, SD = 1.46$) and those that could not ($M = 1.63, SD = 1.40$) ($F[1,303] = .560, P = .455$); mothers that could hold their child within 60 minutes after delivery ($M = 1.78, SD = 1.50$) and those that could not ($M = 1.68, SD = 1.37$) ($F[1,303] = .356, P = .551$); or mothers that breastfed their child within 60 minutes after delivery ($M = 1.51, SD = 1.46$) and those that did not ($M = 1.56, SD = 1.26$) ($F[1,161] = .047, P = .828$).

Independent samples *t* tests did not show significant differences in terms of total bonding results between mothers that could touch their child within 60 minutes after delivery ($M = 5.69, SD = 2.79$) and those that could not ($M = 5.75, SD = 2.60$) ($t = .141, P = .888$); mothers that could hold their child within 60 minutes after delivery ($M = 5.73, SD = 2.82$) and those that could not ($M = 5.67, SD = 2.60$) ($t = .179, P = .858$); or mothers that breastfed their child within 60 minutes after delivery ($M = 5.73, SD = 2.82$) and those that did not ($M = 5.67, SD = 2.60$) ($t = .179, P = .859$).

Mother's mood

MANOVAs for positive, negative and not clear bonding were performed according to mother's mood, and significant differences were found either when an EPDS cut off of 9 (Wilks' Lambda = .89, $F[1,143] = 5.98$, $P = .001$) and 13 (Wilks' Lambda = .94, $F[1,143] = 2.89$, $P = .038$) was considered.

Univariate F values confirmed that mothers with EPDS ≥ 9 showed significantly more negative and not clear emotions toward the infant than mothers with EPDS < 9 ; nonetheless these two groups of women did not differ in terms of positive emotional involvement with the newborn. Independent samples *t* test was performed to examine differences in total bonding results attending to depressive symptoms: mothers with EPDS < 9 showed better bonding with the infant compared to mothers with EPDS ≥ 9 .

For an EPDS cut off of 13, the univariate F values showed that mothers did not differ in terms of positive and not clear bonding. Nevertheless, mothers with EPDS ≥ 13 had significantly more negative emotions toward the infant than mothers with EPDS < 13 . The independent samples *t* test showed that mothers with EPDS < 13 had better bonding compared to those with EPDS ≥ 13 (cf. table 3).

INSERT TABLE 3

Predicting variables

For mother positive and not clear bonding results no significant predicting variables were found. However, having EPDS ≥ 13 , being unemployed and single predicted a higher negative bonding result. Also, a better total bonding result was predicted by having EPDS < 13 and grade 9 or more (cf. table 4).

INSERT TABLE 4

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 didn't confirm that any event related to childbirth, neither the type of delivery (vaginal, caesarean, instrumental, with general anesthesia, or with epidural anesthesia) (38,39,44), nor the pain (20,21,35), nor the support from the partner during delivery (60), nor the early postpartum experiences with the infant (47,61) 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). Also, not clear emotions toward the newborn are more prevalent in unmarried mothers, suggesting the interference of the relationship with the partner in the mother bonding with the child (29,30), as well as more prevalent in mothers with history of psychological problems, suggesting the interference of such previous problems in the mother availability to be emotionally involved with the newborn after delivery (33).

In addition, results supported the idea that maternal bonding was 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 in some studies (62,63) 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 (34). 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 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 (34), 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 greatly affected by mother's mood, a result that has been recently getting more support in literature (13,34,35). 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 (13,34,35) 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 important dimensions to improve (for example mothers' mood) in order to prevent bonding difficulties, which have a negative impact on the child development. This study takes only in account the mother initial emotional involvement with the neonate. Although extensive literature has been published about the impact of postpartum depression on mother-infant interaction at three 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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Table 1 – Socio-demographics: MANOVAs for mother positive, negative and not clear bonding results

		N	Mother					
			Positive		Negative		Not Clear	
			Mean (SD)	F	Mean (SD)	F	Mean (SD)	F
Age	<20	27	7.89 (1.37)		.56 (1.80)		2.07 (1.54)	
	≥ 20	278	7.91 (1.57)	.005 [1,305]	.46 (1.12)	.144 [1,305]	1.74 (1.43)	1.315 [1,305]
Place of Birth	Foreign	21	8.14 (1.59)		.57 (1.36)		1.52 (1.36)	
	Portuguese	291	7.90 (1.54)	.473 [1,312]	.47 (1.18)	.129 [1,312]	1.78 (1.45)	.603 [1,312]
Years of Education	< grade 9	133	7.47 (1.86)		.54 (1.15)		1.70 (1.54)	
	≥ grade 9	158	8.27 (1.12)	2.654* ** [1,291]	.46 (1.26)	.299 [1,291]	1.86 (1.41)	.871 [1,291]
Marital Status	Unmarried	98	8.05 (1.43)		.66 (1.58)		2.03 (1.61)	
	Married	215	7.87 (1.58)	.986 [1,313]	.40 (.96)	3.421 [1,313]	1.63 (1.34)	5.329* [1,313]
Living with the Partner	No	36	7.92 (1.32)		.53 (1.11)		1.86 (1.38)	
	Yes	275	7.92 (1.57)	.000 [1,311]	.48 (1.21)	.059 [1,311]	1.74 (1.46)	.216 [1,311]
Living with extended family	Yes	86	8.00 (1.29)		.52 (1.18)		1.76 (1.37)	
	No	223	7.87 (1.63)	.411 [1,309]	.47 (1.21)	.139 [1,309]	1.74 (1.47)	.008 [1,309]
Employment Status	Unemployed	90	7.64 (1.81)		.52 (1.30)		1.79 (1.51)	
	Employed	223	8.04 (1.40)	4.207* [1,312]	.46 (1.15)	.164 [1,312]	1.74 (1.42)	.074 [1,312]

***P<.001; *P<.05; .05>P<.06

Table 2 – Infant characteristics: ANOVAs for mother positive, negative and not clear bonding results

		N	Positive		Negative		Not Clear	
			Mean	F	Mean	F	Mean	F
			(SD)		(SD)		(SD)	
Gender	female	144	7.81 (1.75)		.40 (1.10)		1.67 (1.49)	
	male	133	8.17 (1.23)	3.866* [1,277]	.50 (1.17)	.542 [1,277]	1.84 (1.38)	.955 [1,277]
Weight (Kg)	<2.5	24	7.63 (2.02)		.54 (1.21)		1.62 (1.47)	
	≥2.5	265	7.96 (1.49)	1.030 [1,289]	.47 (1.21)	.082 [1,289]	1.75 (1.42)	.161 [1,289]
Gestational Age	<37	29	7.48 (2.06)		.48 (1.09)		1.52 (1.35)	
	≥37	248	7.94 (1.48)	2.289 [1,277]	.49 (1.25)	0.000 [1,277]	1.81 (1.43)	1.074 [1,277]
Neonatal Problems	Yes	39	7.74 (1.77)		.46 (.99)		1.85 (1.27)	
	No	203	7.99 (1.49)	.841 [1,242]	.42 (1.15)	.037 [1,242]	1.65 (1.41)	.683 [1,242]
Intensive Care	Yes	16	6.94 (2.21)		1.00 (1.59)		2.50 (1.83)	
	No	227	8.03 (1.46)	7.727** [1,243]	.40 (1.08)	4.369* [1,243]	1.63 (1.34)	6.051* [1,243]

**P<.01; *P<.05

Table 3: Mother's mood: ANOVAs for mother positive, negative and not clear bonding results and independent samples *t* tests for mother total bonding results.

ERDS		N	Positive		Negative		Not Clear		Total		**P<.00 1; *P<.01
			Mean	F[1,143]	Mean	F[1,143]	Mean	F[1,143]	Mean	t	
			(SD)		(SD)		(SD)		(SD)		
ERDS	<9	98	7.94 (1.55)		.40 (1.01)		1.79 (1.36)		5.76 (2.55)		
	≥9	45	7.82 (1.34)	.190	1.31 (2.05)	12.717**	2.60 (1.60)	9.898*	3.91 (3.66)	3.055*	
	<13	126	7.96 (1.47)		.56 (1.27)		1.98 (1.51)		5.42 (2.82)		
	≥13	17	7.47 (1.55)	1.650	1.65 (2.37)	8.588*	2.47 (1.18)	1.622	3.35 (4.08)	2.674*	

Table 4: Predicting variables: Stepwise linear regression analyses for mother positive, negative, not clear and total bonding results.

	Model	R ²	B	F	P
Positive Bonding	NS				
	EPDS \geq 13	.178	.477	11.438	.001
Negative Bonding	Unemployed	.254	.340	8.852	.000
	Single	.309	.244	7.616	.000
Not Clear Bonding	NS				
	EPDS<13	.139	.372	8.582	.005
Total Bonding	Grade 9 or more	.204	.255	6.671	.003