



**Universitat Autònoma
de Barcelona**

Doctorat en Psicologia Clínica i de la Salut

Departament de Psicologia Clínica i de la Salut

Doctoral Thesis

**Comparative study of the factors involved in the
mother-infant bonding in women with and
without postpartum depression**

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Recerca de Gènere

Barcelona, 2015

***Dedicated to all the women that are struggling with motherhood
while suffering from a mental health disease.***

“my mother, poor fish,
wanting to be happy, beaten two or three times a
week, telling me to be happy: "Henry, smile!
why don't you ever smile?"

and then she would smile, to show me how, and it was the
saddest smile I ever saw.”

— **Charles Bukowski**

*“I don't enjoy doing anything with my baby. Nothing really. Breastfeeding him at any time, place
and take out my breasts anywhere to feed him is no fun for me. I don't enjoy having him in top
of me all the time either. I bath him so that he is not dirty, taking him for a stroll is very
complicated. It is very difficult for me to assimilate that he is in my life now. I have a friend that
had her baby few days after me and she posted a picture in Facebook of the baby, her husband
and herself with a description of “this baby has made us the happiest people in the world” and
when I read that I thought: I don't feel like the happiest person, but the saddest.
I would also like to feel the happiest like them.*

No.

I don't enjoy doing anything with my baby”.

—**Description of a mother interviewed at the 4th week of postpartum**

The present thesis was developed with the support from the Consejo Nacional de Ciencia y Tecnología (CONACyT) provided by the Government of Mexico, which granted the author with a scholarship during the Doctorate program (2012-2015).

ACKNOWLEDGEMENTS

This doctoral thesis was possible thanks to the support and the collaboration of many people to whom I wish to recognize and thank.

Gracias a mi madre Rosa quien alimenta mi vida con su amor y apoyo incondicional para alcanzar nuevos horizontes, cumplir sueños y vencer cualquier obstáculo. Nunca ha perdido la sonrisa, ni el amor por los demás y me inspira como madre y mujer a hacer el mejor esfuerzo todos los días de mi vida. Madre: te aplaudo, te admiro, te quiero, siempre.

Gracias a mi hermano Paco, quien dejó lo que hacía para cruzar un océano para cuidarme y apoyarme a seguir en el doctorado cuando yo no pude caminar. Tu corazón y valía son grandes hermano. Gracias, siempre.

Moltes gràcies als meus directores de tesi, Lluïsa García-Esteve i Susana Subirà pels seus ensenyaments i tot el seu suport. Gràcies a Lluïsa per la seva saviesa clínica i els seus consells de vida. Gràcies a Susana per la seva amabilitat i acompanyament constant.

Moltes gràcies també per la seva amable suport i constant col·laboració a l'Anna Torres, Bea González, Estel Gelabert i a tot el fabulós equip de la Maternitat. Sense la seva ajuda aquesta tesi no podria haver-se realitzat.

Gracias a Alejandro Vera por el inmenso apoyo brindado para hacer posible mi formación.

Gracias a mis compañeras de aventura y cómplices del doctorado: Yuria, Ari, Lucero. Ustedes me enseñaron el arte de hacerse indestructible gracias a la amistad, al apoyo incondicional y cómo las mujeres podemos hacernos más fuertes unas a las otras. Gracias por llenarme el corazón de amor y ánimo en los momentos más oscuros y por ayudarme a construir una sensación de hogar lejos de nuestro país y nuestra gente. Esta tesis tiene también el nombre de cada una de ustedes como artífices.

Gracias a Selene y a Javier, quienes me apoyaron con gran afecto desde el primer día en Barcelona. Su ayuda incondicional en los peores y más lluviosos días será un recuerdo eterno.

Gracias a Gabriela Ramírez por su amistad y compañía desde lo lejos y sobre todo por quedarse a mi lado en el momento en que más la necesitaba.

Thanks also to my friends-citizens of the world (Daniela, Tiago, Laura, Anubhav, Kiki, Felipe, Viviana, Camille, MC, Vicky). A very special thank you to Robert, the sweetest and most wonderful friend in the whole world. 謝謝你親愛的朋友. The shared memories with all of you will remain in my heart forever.

Y sobre todo mi agradecimiento a todas las madres que participaron en los estudios. Su generosidad para compartir sus experiencias y su gran lucha personal serán siempre una inspiración en mi desarrollo profesional.

ACRONYMS

BIMMH- Birmingham Interview for Maternal Mental health

CAMIR- Adult Attachment Questionnaire, CAMIR

EPDS- Edinburgh Postnatal Depression Scale

GHQ-12- General Mental Health Problems Questionnaire, 12 item version.

MABS- Mother and Baby Scales

MDE- Major Depressive Episode

MIBD- Mother-infant bonding disturbance/disorder

MIBS- Mother-to-infant Bonding Scale

MPAS- Maternal Postnatal Attachment Scale

PBQ- The Postpartum Bonding Questionnaire

PPD- Postpartum Depression

PTSD- Posttraumatic Stress Disorders

S-PBQ- Spanish version of the Postpartum Bonding Questionnaire

STAI-S- State Scale of the Anxiety State-Trait Inventory

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1. JUSTIFICATION AND STRUCTURE OF THE STUDY

The early interaction between a mother and her baby is a decisive experience during the postpartum. This interaction creates the first social bond in the life of a human being that is essential for the survival of the baby (Bowlby, 1982). There has been a progress in the last two decades of the research in the early relationship between a mother and her infant. This topic has become of great relevance and interest for the perinatal mental health due to the identification of the significative long-lasting consequences associated to the difficulties in the mother-baby dyad in the first year of postpartum. Some of the most important consequences of mother-infant bonding disturbances in the offspring are seen in their emotional adaptation (Hay & Pawlby, 2003, *quoted by* Parfitt & Ayers, 2012), their cognitive development (Murray, Fiori-Cowley, Hooper, & Cooper, 1996), their language development (Trevarthen & Aitken, 2001), functional and biological brain development (Schore, 2001), type of attachment (Tomlinson, Cooper, & Murray, 2005), future child psychopathology (Skovgaard et al., 2008), child temperament, stress regulation and emotional regulation (Waxler, Thelen, & Muzik, 2011), among others.

There are countries where these topics have been more explored than others with findings that have been translated into the design and implementation of new clinical interventions in the perinatal mental health discipline. In Spain this is still a recent research priority as well as perinatal mental health services in the Health Systems. This offers an opportunity to provide research evidence on these subjective processes that expand the comprehension of the mother-infant bonding process and open new research lines as well as translates into evidence-based effective specific mental health interventions in Spanish population.

One of the most productive advances of the research in perinatal mental health throughout the world is by now the study and assessment of postpartum depression. There is wide research evidence available that identifies the prevalence, risk factors, high-risk populations, valid and reliable assessment strategies and interventions for mothers with depressive disorders in the postpartum with a higher acceptance of the health professionals for its use and understanding. A prevalence of 10-15% of mothers have been identified to suffer from postpartum depression present in all the countries and socio economical groups (Cox, Murray, & Chapman, 1993). Routine check-ups in the postpartum period now include the assessment of risk for depression in mothers and a multidisciplinary collaboration between health professionals (e.g. family doctors, gynecologists, nurses, psychiatrists, clinical psychologists, social workers) more frequent nowadays. In contrast the mother-infant early relationship is still a recent interest for assessment and intervention. Previously, a mother-infant bonding disorder was thought to be a severe symptom of a postpartum depression in the mother. Nevertheless, research evidence has shown that a disorder in the early interaction between a mother and her baby appears also in non-depressed mothers and it does not appear in all depressed mothers. It can have its own risk factors as well as a particular development and symptomatology that qualifies it as an independent disorder to be identified separately (Brockington, 2011; Brockington, Aucamp, & Fraser, 2006).

Until now there is no data yet that identifies the prevalence of mother-infant bonding disorders in the general population. Brockington (2011) estimates a prevalence of 1% of this type of disorders according to the results of several studies in mothers that are patients from psychiatric wards and mother-baby units. An important obstacle for the estimation of the frequency is that mother-infant bonding disorders in general population can be easily overlooked, underreported or identified very late when the gravity and the negative consequences are already severe. Also the lack of specific and reliable assessment strategies is a central difficulty for the early identification of these disorders. Besides, an excessive social pressure in mothers to perform at their best while being in charge of most of parenting tasks is an additional burden in cultures with a traditional family model like the Spanish (Rodríguez, Peña, & Torío, 2009) and the idealization of motherhood as a stage of happiness and perfection in the life of a woman are also important factors for mothers to deny a bonding disturbance difficulting the ask for help.

Studies have identified that these disorders are more frequent in mothers with mental health problems. The perinatal period can be a very challenging stage in the life of mothers with psychosocial risks and in those who already suffer from a mental disorder, exposing them to a higher vulnerability to develop a difficult bonding with their babies. Studies have confirmed in other countries that maternal depression is one of the most frequent risk factors related to mother-infant bonding disturbances (Brockington, Fraser, & Wilson, 2006; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Parfitt & Ayers, 2009; Wilson & Durbin, 2010). This identifies a specific group of mothers that would require an early assessment, specific interventions and additional support in their parenting tasks. Nevertheless the assessment of mother-infant bonding disorders in mothers with postpartum depression has relied mostly in self-report measures. Also there is still few information about the additional risk factors that could be contributing to a major vulnerability in some depressed mothers more than other depressed mothers that can develop a normal bond with their baby. It is of relevance to identify the risk factors associated to a mother-infant bonding disturbance that could guide early assessment and intervention strategies during the first months of life of the infant so the negative consequences related to a bonding disturbance can be diminished. Also health care Centers and perinatal health professionals require efficient screening strategies for early identifications to provide the optimal health attention to the mothers and babies that are at risk to suffer from this problematic. Since postpartum depression has been identified frequently related with bonding disturbances, studying both of them can offer a window of opportunity to learn more about this interactive relationship, identify early interventions and prevent future negative long-term effects in their offspring. The research in mothers clinically diagnosed with postpartum depression can also be considered an opportunity for a more detailed exploration of the bonding process in mothers with a mental disorders and high risk of presenting early postpartum difficulties in their parenting.

For all these reasons, this doctoral thesis had as general aim *to study the early mother-infant bonding process in postpartum depressed mothers and compare them with mothers without depression.*

The partial results of the study have been presented and discussed in the following academic events:

1. **Palacios-Hernández, B;** Torres, A; Imaz, M.L; Subirá, S; Navarro, P; Gelabert, E; Roda, E; González, A; Martín-Santos, R; García-Esteve, LI. **El Vínculo materno-filial en mujeres con episodio depresivo mayor en el posparto: análisis preliminar (Mother-infant bonding in women with a major depressive episode in the postpartum: a preliminar analysis).** II Jornadas de Trabajo de Salud Mental Perinatal de la Sociedad Marcé Española de Salud Mental Perinatal (MARES). May 10th, 2013. Barcelona, Spain. Oral communication.
2. **Palacios-Hernández, B;** Torres, A; Lasheras, G; Farre, B; Subirá, S; Diez, S; Navarro, P; Imaz, M.L; González, A; García-Esteve, LI. **Mother-infant bonding in mothers with postpartum depression.** 2014 International Marcé Society Biennial Scientific Meeting. September 10th, 2014. Swansea, Wales. United Kingdom. Oral Communication.
3. García-Esteve, LI; **Palacios-Hernández, B.** **International Workshop to develop the Stafford Interview, the sixth edition of the Birmingham Interview for Maternal Mental health (BIMMH).** September 14-16th, 2014. Stafford, United Kingdom. Collaborative workshop coordinated by Prof. Ian Brockington with the participation of other 7 experts in perinatal mental health from 6 different countries. The objective of the workshop was to discuss and analyze the experience using the 5th Edition of the BIMMH and to design a new version of the Interview.

Some results from the doctoral thesis have been submitted for publication in international peer-reviewed scientific journals as described below.

Article 1 (Study 1)

Title: Assessment of psychometric properties of the Postpartum Bonding Questionnaire (PBQ) in Spanish mothers

Authors: Lluïsa García-Esteve; Anna Torres; Gracia Lasheras; **Bruma Palacios-Hernández;** Borja Farré-Sender; Susana Subirá; Manuel Valdés; Ian Brockington.

Journal: Archives of Women's Mental health

Impact Factor: 1.96 (2013/2014)

Status: Submitted with corrections asked by the Journal.

Article 2 (Study 2):

***Title:* Severity of postpartum depressive episode and early mother-infant bonding disturbances**

***Authors:* Bruma Palacios-Hernández; Susana Subirá; Anna Torres; Estel Gelabert; Purificación Navarro; Anna Plaza; Rocío Martín-Santos; Lluïsa García-Esteve.**

***Journal:* Journal of Affective Disorders**

***Impact Factor:* 3.7 (2014)**

***Status:* Submitted for publication**

Article 3 (Study 3):

***Title:* Assessment of mother-infant bonding in mothers with mental health disorders: A comparison of the Spanish version of the PBQ with the MPAS and MIBS.**

***Authors:* Bruma Palacios-Hernández; Anna Torres; Estel Gelabert; Susana Subirá; Borja Farré-Sender; Lluïsa García-Esteve.**

***Journal:* Archives of Womens' Mental health**

***Impact Factor:* 1.96 (2013/2014)**

***Status:* Draft. Under revision by coauthors.**

2. THEORETICAL FRAMEWORK

2.1. Mother-Infant bonding

Mothering is a complex process that demands a set of behaviors and feelings which are developed only under specific circumstances and they are not inherently determined as a behavioral pattern (Spinner, 1978). This perspective challenges the perception that the maternal behavior is an instinctive behavior that always appears when a woman becomes a mother. For Brockington (2004) the central and most important psychological process after the childbirth is the development of the relationship of the mother with the infant. The term *bonding* is usually used to explain a reciprocal and meaningful between two individuals and has been frequently used to characterize the early relationship between a mother and her baby (Spinner, 1978). Broad, Curley & Keverne (2006) refers that the mother-infant bonding is very important in all mammalian species. It is more specially important in the human babies since most of their cortical brain grows in the postpartum period in a social environment that helps promotes social skills facilitated by a main caregiver (usually the mother) that becomes a secure base from which to explore and develop other social relationships.

The work of John Bowlby (1977; 1982) and future collaborators (Ainsworth, Blehar, Waters, & Wall, 1978) centered the analysis in the *attachment* process and helped to bring interest in the research of the early relationship between the parents and their infant. This was a relevant epistemological break point in the comprehension of the early relationship between a mother and her baby and allowed to identify that something else beyond the biology is constructed between them after childbirth that will be essential for the child's future development. Nevertheless it is important to clarify that **attachment** is not a synonym for **bonding** although until this date unfortunately they are still used as equivalent terms. Some of the most important theories will be discussed in the following chapters identifying a clear conceptual evolution of the bonding process as a result of the research of the early interaction between a mother and her infant and also the differences with other related concepts.

2.1.1. Historical background and evolution of the concept of mother-infant bonding

2.1.1.1. Bonding in mammalian species

The term bonding has been used to describe an interactive relationship between two or more individuals. From the evolutionary and physiological point of view there are processes that provide specific conditions that promotes the bonding process, being this essential for the survival of the infant as Bowlby identified in 1977.

Curley & Keverne (2005) described that in all mammalian species, bonding usually refers to a mother and her infant and involves specific hormonal mechanisms, brain reward mechanisms and sensory recognition. The babies of all mammals are born helpless and very vulnerable so the early bonding with someone that will be the main caregiver is a life-or-death matter. Although physiological mechanisms are essential for the bonding process their connection with social factors is decisive for its development. Curley & Keverne, (2005) described that in primates, where mother and baby live in large social groups for survival purposes, the bonding is very much required for the brain growth which is postponed in its greater part until the postpartum period. Under these particular circumstances the brain most complex development is done in a social environment, where the adult bonding will become essential for the interaction with the group. The figure that acts as an attachment figure, usually the mother, provides a secure base to the infant from which to explore and develop other social relationships (Broad, Curley, & Keverne, 2006).

Studies in human mothers have identified the physio-psychological factors that facilitates the maternal reaction after the birth. Studies have reported that skin-to skin contact and breastfeeding promote oxytocin to be released in the mothers after birth that produces a state of calmness and more receptivity towards the baby (Jonas, Nissen, Ransjö-Arvidson, Mathiesen, & Uvnäs-Moberg, 2008; Nissen, Gustavsson, Widström, & Uvnäs-Moberg, 1998; Uvnäs-Moberg, Widström, Nissen, & Björvell, 1990). Nevertheless these processes are not enough for a women to get ready to be a mother.

According to Stern, Bruschiweiler-Stern, & Freeland (1998) women have also to develop a new mental configuration that requires a reorganization of their identity to become and assume herself as a mother. Winnicott suggested in 1958 that there was a development of a state that he called "primary maternal preoccupation" that occurred at the end of a pregnancy, where the women thoughts were centered in the unborn baby and prepared mentally and emotionally to meet the new demands. This preoccupation for the unborn baby is essential for the maternal preparation and consequently for the future bonding when the baby is born (Winnicott, 1958) . This same idea was supported later by Brockington (2011) when he identified as one of the risk factors for a mother-infant bonding disorder a lack of affective attachment with the foetus during the pregnancy.

We can conclude that the early bonding is not restricted only to a hormonal state in the mother but also requires of a series of complex affective and sensorial states, planning and decision making that provides the base for parenting. In other words, the early bonding does not appear as a physiological guarantee response in the mother towards her baby after childbirth, but requires of a group of affective, cognitive and sensorial processes, besides the physiological, to develop it when the child is born. The characteristics of these elements appear even before

childbirth, during pregnancy and in the past own history and development of the mother as well, and is in the early postpartum where they act to prepare the mother to bond with her newborn.

2.1.1.2. The attachment theory, similarities and differences with the mother-infant bonding

The concept of bonding cannot be understood without the contribution of John Bowlby (1907-1990), one of the most important researchers of the early relationship between the mother or main caregiver and her infant and the beginner of a theoretical model called the **attachment theory**. He incorporated principles from the psychoanalysis, ethology and control theory. His theories were based on the work on *imprinting*, which refers to the identification in some species of the development of strong bonds to a mother (caregiver) figure during the early days after the birth, without any link to the food. Bowlby proposed a theory about *attachment* that analyzes the characteristics of the strong relationship between the caregiver and a baby. An attachment behavior is defined by Bowlby (1982) as *a specific and circumscribed aspect of the relationship between a child and caregiver that is involved with making the child safe, secure and protected*.

The main characteristics of Bowlby's attachment theory were that: a) there is a specific attachment behavior from the infant directed towards one or a few specific individuals, b) the attachment lasts for a large part of the life of a human being, specially the early attachments, c) very intense emotions are engaged in the formation, maintenance disruption and renewal of the attachment relationships, d) learning to differentiate the familiar from the strange is a key process in the attachment, e) attachment behaviors are organized and mediated by behavioral systems incorporating representations of the environment and the self and the systems are activated by certain conditions (e.g. hunger, strangeness) and terminated by others (e.g. happy interaction with the mother), and f) the attachment has a biological function occurring in almost all species of mammals and persists throughout adult life.

One of the central objective of the attachment, is that this behavior has a survival value to the baby (Bowlby, 1977) one of the main common characteristics with the concept of bonding that was developed latter. According to this theory, the function of the attachment behavior is the protection of the baby from predators or any risk situation. As a consequence the possibility to explore her/his environment, requires from the mother to act as a secure base from which to explore and to which the baby can return when she/he gets tired or is in a frightening situation. This process constructs a behavioral system that will remain stable mainly though the rest of the life. The parents will be responsible for providing the baby with a **secure base** and also **encourage** her/him **to explore away** from it. For this to happen, the parents require to be able to

be sensitive enough to understand their infant's demands, needs and meet them as well as ease the baby's anxiety, fear or frustration and provide a loving and secure base that can be available when required. Parenting will correspond to how these conditions are provided to the infant by her/his main caregivers. Children can be exposed to certain patterns of pathogenic parenting like being unresponsive to the infant's needs (deprivation of maternal care in the early ages), to her/his care, with reactions of rejection or neglecting behavior, threats by the parents of not to love or abandon the child as means to control their child or discipline her/ him, among others.

Following these ideas, Bowlby (1977) and later his followers (Ainsworth, Blehar, Waters, & Wall, 1978) suggested 4 types of parent-infant attachment: *secure*, *avoidant*, *resistant* and *disorganized*. The quality of the attachment is determined by the caregiver's response to the infant when he/she feels unsafe or threatened. The first of the three attachments can be considered *organized types*. At six months of age, infants can anticipate the responses that their caregivers have to their distress and shape their own behaviors to deal with it accordingly. The ideal attachment is the one where the infant is able to create a representational model of herself/himself as being able to help herself/himself and be also worthy of being helped if needed. In the opposite side Benoit (2004) refers that of the four attachment types, the disorganized attachment is the most powerful predictor for severe mental health and adjustment problems in the children. This was the base of the idea that the quality of the infant-parent early attachment is a powerful predictor of a child's later social and emotional outcome.

2.1.1.3. The mother-infant bonding process

While the research based on the attachment theory advanced, studies identified different activities involved in the process mainly through the first months of postpartum when the baby was still unable to react in an organized pattern (*attachment*) towards his/her caregiver. Studies began focusing in the circumstances of the early interaction. '**Bonding**' was a concept proposed by Klaus and Kennell (1976) who suggested that the bonding between a parent and her/his child depended on the skin-to-skin contact during a very early and critical period.

They proposed that negative consequences could exist for the future development of the infant if this direct contact was absent in the first days of the newborn. Although this concept of 'bonding' was proven to be erroneous afterwards and have no relationship with the attachment process proposed by Bowlby, it did help attract the interest towards what happens in the early moments between a mother and her baby after the birth. We could say that although both **bonding** and

attachment were born referring to the same dyadic interaction they evolved to be complementary but *different* concepts.

The difficulty to differentiate the term *bonding* from *attachment*, is that both of them have been frequently used as synonyms although they focus on different processes and timing of the mother-infant dyad. **Mother-infant bonding** refers to the early relationship between a mother and her infant which main characteristic is the mother's emotional response towards her baby (Brockington, 2011; Taylor, Atkins, Kumar, Adams, & Glover, 2005) especially during the first year after the birth of the infant (Condon & Corkindale, 1998).

Although *bonding* and *attachment* are processes developed through a dyadic reciprocal relationship between the mother and her infant, the first refers to the very early **maternal affection** while *attachment* is a later process and is based mainly on the **infant reaction** (emotions and behaviors) in a organized pattern towards her mother or with the principal caretaker (Brockington, 2011; Myers, 1984; Taylor, Atkins, Kumar, Adams, & Glover, 2005) and is a more stable pattern that will last throughout life.

The mother-infant bonding is assessed usually during the first year of life of the newborn and is mainly focused in the maternal affection, perceptions and attitudes towards her baby through interviews of questionnaires (Wittkowski, Wieck, & Mann, 2007) as well as observational methods, although these last ones are more frequently used to study *attachment* behaviors.

Until now there is a big diversity of terms proposed by researchers to assess the process of the mother-infant bonding process or aspects of it. A systematic review done with the objective of identifying the association between parental psychopathology and mother-infant bonding disturbances show that in a total of 144 scientific articles that studied the topic, 23 different terms were used to refer to the maternal affective, cognitive and behavioral participation in the early mother-infant relationship (see Table 1).

Those articles were published between 1960 and 2014 and the heterogeneity of terms used in the research activities provides an idea of the complexity of finding a definitive term to identify the bonding process both for assessment and research issues. This diversity is a strong indicator of the dynamic evolution of the concept still going on to the date which by itself represents a challenge for clinical assessment and research purposes.

| | Terms | No. Articles |
|----|---|---------------------|
| 1 | Mother-infant interaction/Dyadic interaction | 77 |
| 2 | Mother-infant bonding | 13 |
| 3 | Mother-infant relationship | 13 |
| 4 | Maternal Sensitivity | 6 |
| 5 | (Mother-child-mother) Attachment | 5 |
| 6 | Parenting and mother-baby (emotional) exchanges | 4 |
| 7 | Mother-infant behaviors/maternal attitude | 3 |
| 8 | Maternal Synchrony /dyadic synchrony | 3 |
| 9 | Maternal Responsiveness | 3 |
| 10 | Child rearing patterns | 2 |
| 11 | Maternal Perceptions of infant patterns | 2 |
| 12 | Primary (maternal) caregiving | 2 |
| 13 | Maternal mental/internal representations | 1 |
| 14 | Maternal Reflective Functioning | 1 |
| 15 | Sensitivity in the caregiver in the interaction | 1 |
| 16 | Touch behavior and content of child directed speech | 1 |
| 17 | Thoughts of harm related to the Newborn | 1 |
| 18 | Maternal aggression, infanticidal ideas and behavior | 1 |
| 19 | Child Physical Abuse | 1 |
| 20 | Maternal emotional availability | 1 |
| 21 | Maternal self-efficacy and hostile reactive parenting | 1 |
| 22 | Maternal affect and speech to the baby | 1 |
| 23 | Maternal attitudes toward care of the baby | 1 |
| | <i>Subtotal</i> | <i>144</i> |

Condon and Corkindale (1998) proposed a theoretical model helpful to better understand the bonding. They state that the strength of the relationship between the mother and her child is related to the frequency and intensity of the following four subjective experiences in the mother: ***pleasure in the proximity, tolerance, need of gratification and protection*** and ***knowledge acquisition***.

- 1) *Pleasure in proximity* refers to the desire of interaction of the mother with the infant preferable over the separation. If the bonding is strong then there will be pleasure, enjoyment and satisfaction as a result of this interaction that will promote to be more frequent and close. If the bonding is weak, then the opposite emotional response (boredom or tension) to the proximity will appear in the parent.
- 2) The second experience is *tolerance*. This is related with a greater willingness and ability to tolerate the infant behaviors that without the strong bonding would be perceived as frustrating. Without tolerance some mothers may perceived the caretaking of their babies as a burden considering to realize too many personal sacrifices in their life due to motherhood (e.g. the baby being identified as interfering with her interests and projects as an individual).
- 3) The third experience, the *need of gratification and protection* involves a desire in the mother to gratify the needs, both physical and emotional, of her baby frequently over her own needs. If the bonding is strong, the mother will feel a strong urge to protect her baby and be worried for her/his security being able to recognize the vulnerability of the

newborn. This subjective experience has been called by other authors as “*maternal responsiveness*” and requires from the mother or the principal caregiver an emotional sensitivity and empathy towards the baby.

- 4) The last experience, the *knowledge acquisition*, involves a more cognitive aspect of the mother centered in the strong maternal interest to understand her baby, learn to understand the infant’s cues, needs, screams and ways of communication and what is going inside his/her self. This aspect has been also described as “*maternal sensitivity*” that improves through the time after the childbirth and helps improve the interaction between mother and baby as well as promotes the learning of specific ways to communicate and facilitates the caretaking tasks as well as increases the sense of parental competence.

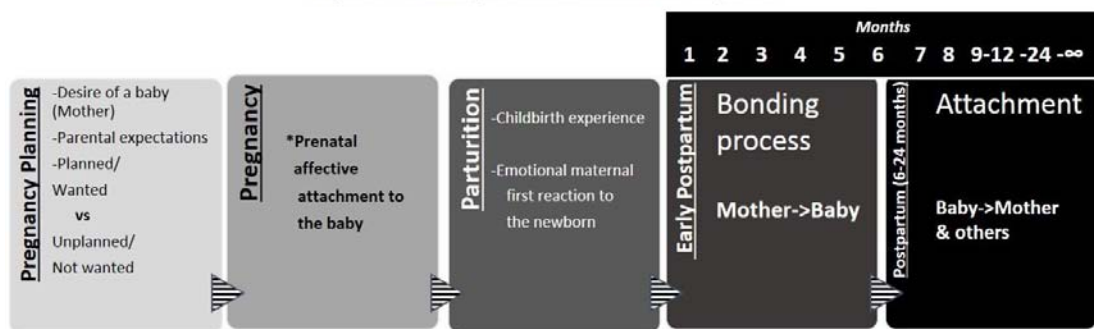
Bonding requires a second individual involved and that is the baby. Although the participation of the newborn is very much a passive interaction with the mother in the first months of life, during the first year she/he goes through different processes with the mother or main caregiver. Spinner (1978) suggested that the development of a meaningful relationship with an adult is a long and continuous process that involves several stages. A first stage demands that the baby develops a sense of individuation in response of her/his own sensations and perceptions. In a second step, the baby discriminates people from inanimate objects, creating a social responsiveness. The third stage involves a social response from the baby (eg. smiles, gestures) towards adults that become familiar to her/him. In a fourth step, the baby develops expectations from the adult in charge of her/his care. Around the 6-8 months of life and as a result of the interaction, the infant develops a sense of trust that is essential for all her/his close relationships. Spinner (1978) suggested that the parents that were deprived of love in their own childhood would find very difficult to love and parent their own infant. As a **result** of the ***bonding process*** the infant will later develop a behavioral pattern that constructs her/his attachment behavior that will be a more estable way of interacting not only with the caregiver but with most of the other persons in his/her life.

The mother-infant bonding process will be then characterized by how the four subjective experiences suggested by Condon and Corkindale (1998) will be developed by the mother while she interacts with her baby as well as how the baby will react towards them. The key of the process is the **interaction** and both members of the dyad, mother and baby, have the ability to affect each other and modify the interaction as well as the result of that interaction. Nevertheless due to the newborn vulnerability and strong dependency for her/his survival, the role of the mother will be more important while the baby is more dependent and affected by her attitudes. Is in the early bonding where the mother with her maternal interaction with the baby directs in a way the process. Research evidence have shown that mothers with mental health problems, specially those suffering from mood disorders, have difficulties on the *knowledge acquisition* or the *tolerance*, usually suffering from a dyadic miscommunication that creates greater tension and

frustration to the mother disturbing the bonding process. Through this perspective the quality of the four maternal subjective experiences can also be seen as indicators to identify the status and quality of the early mother-infant relationship.

In conclusion, we can say that the mother-infant bonding is an ongoing process that requires from previous experiences to be developed in the mother when the child is born. It is also mediated by several factors present before the pregnancy, during pregnancy and in childbirth. It can also be considered that it evolves in the later postpartum into an attachment pattern that will be activated in the infant to be applied in future relationships. Some of the factors that have been identified to be of relevance for the bonding process are the previous relationship of the mother with her own parents, the mother's desire for a baby, the planning of the pregnancy, the diverse expectations and fantasies related with the unborn child and the affective attachment that exists or not during the pregnancy by the mother to the fetus, as well as the childbirth experience, the baby's characteristics (e.g. physical features, temperament, physical difficulties). Figure 2 provides a graphic description of the evolution and the most relevant processes we suggest have a role in the bonding process.

Figure 2. Bonding and Attachment development



2.1.2. Diagnosis of a mother-infant bonding disturbance. Characteristics and criteria.

The most used systemized classifications of mental health problems such as the Diagnostic and Statistical Manual of Mental Disorders [DSM-V] (5th ed.; American Psychiatric Association, 2013) and the International Statistical Classification of Diseases [ICD-10] (10th ed.; World Health Organization, 1992) includes guidelines to identify the symptomatology and criteria for the diagnosis. Under these diagnostic classifications systems a disorder is consider to be a syndrome characterized by a distinct pattern of symptoms at specified levels of intensity, frequency, duration, and/or onset age, and other variables (Egger & Emde, 2011).

Nevertheless until now a mother-infant bonding disorder has yet not been recognized in the current International Classification of Diseases (ICD-10) nor the Diagnostic and Statistical Manual V (DSM-V, 2013). Several studies have used diferent terms to describe it, such as *bonding disorder*, *mother-infant relationship disorder*, and it is mainly focused on the difficulty of the mother to

establish a healthy interaction with her infant after she/he is born and take care of the baby's needs obtaining from this process pleasure and satisfaction. The DSM-V (American-Psychiatric-Association, 2013) only identifies disorders related with attachment problems from the infant to her/his parents basing the diagnosis in the symptomatology visible in the infant from 9 months to 5 years old and not in the parent. The ICD-10 (World-Health-Organization, 1992) also has a similar diagnosis using the term of *reactive attachment disorder of childhood* with strong similarities with the one included in the DSM-V. See Table 2 for the specific criteria.

| Table 2. Attachment disorders criteria in DSM-V and ICD-10 | |
|---|---|
| ICD-10 (WHO, 1992) | DSM-V (APA, 2013) |
| <p>Code:</p> <ul style="list-style-type: none"> • 2015 ICD-10-CM F94.1 Reactive attachment disorder of childhood | <p>Code:</p> <ul style="list-style-type: none"> • F94.1 Reactive attachment disorder |
| <p>Diagnostic criteria</p> <p>A. Markedly disturbed and developmentally inappropriate social relatedness in most contexts, beginning before age 5 years, as evidenced by either (1) or (2):</p> <p>(1) persistent failure to initiate or respond in a developmentally appropriate fashion to most social interactions, as manifest by excessively inhibited, hypervigilant, or highly ambivalent and contradictory responses (e.g., the child may respond to caregivers with a mixture of approach, avoidance, and resistance to comforting, or may exhibit frozen watchfulness)</p> <p>(2) diffuse attachments as manifest by indiscriminate sociability with marked inability to exhibit appropriate selective attachments (e.g., excessive familiarity with relative strangers or lack of selectivity in choice of attachment figures)</p> <p>B. The disturbance in Criterion A is not accounted for solely by developmental delay (as in Mental Retardation) and does not meet criteria for a Pervasive Developmental Disorder.</p> <p>C. Pathogenic care as evidenced by at least one of the following: (1) persistent disregard of the child's basic emotional needs for comfort, stimulation, and affection (2) persistent disregard of the child's basic physical needs (3) repeated changes of primary caregiver that prevent formation of stable attachments (e.g., frequent changes in foster care)</p> <p>D. There is a presumption that the care in Criterion C is responsible for the disturbed behavior in Criterion A (e.g., the disturbances in Criterion A began following the pathogenic care in Criterion C). Specify type: – Inhibited Type: if Criterion A1 predominates in the clinical presentation – Disinhibited Type: if Criterion A2 predominates in the clinical presentation</p> | <p>Diagnostic Criteria</p> <p>A. A consistent pattern of inhibited, emotionally withdrawn behavior toward adult caregivers, manifested by both of the following:</p> <ol style="list-style-type: none"> 1. The child rarely or minimally seeks comfort when distressed. 2. The child rarely or minimally responds to comfort when distressed. <p>B. A persistent social and emotional disturbance characterized by at least two of the following:</p> <ol style="list-style-type: none"> 1. Minimal social and emotional responsiveness to others. 2. Limited positive affect. 3. Episodes of unexplained irritability, sadness, or fearfulness that are evident even during nonthreatening interactions with adult caregivers. <p>C. The child has experienced a pattern of extremes of insufficient care as evidenced by at least one of the following:</p> <ol style="list-style-type: none"> 1. Social neglect or deprivation in the form of persistent lack of having basic emotional needs for comfort, stimulation, and affection met by caregiving adults. 2. Repeated changes of primary caregivers that limit opportunities to form stable attachments (e.g., frequent changes in foster care). 3. Rearing in unusual settings that severely limit opportunities to form selective attachments (e.g., institutions with high child-to-caregiver ratios). <p>D. The care in Criterion C is presumed to be responsible for the disturbed behavior in Criterion A (e.g., the disturbances in Criterion A began following the lack of adequate care in Criterion C).</p> <p>E. The criteria are not met for autism spectrum disorder.</p> <p>F. The disturbance is evident before age 5 years.</p> <p>G. The child has a developmental age of at least 9 months.</p> <p><i>Specify if:</i></p> <p>Persistent: The disorder has been present for more than 12 months.</p> <p><i>Specify current severity:</i></p> <p>Reactive attachment disorder is specified as severe when a child exhibits all symptoms of the disorder, with each symptom manifesting at relatively high levels.</p> |

A problem in the relationship of a parent with the infant has only been addressed in the latest version of the DSM-V (2013) included under the section of *conditions that may be focus of clinical attention*. Nevertheless these problems are not consider mental disorders only issues that can be encountered in the clinical practice, as a group of situations called *Parent-child relational problem*. They are described as relationship problems between a parent or the main caregiver and the child that can have a significant impact on the health of the infant and be related with maltreatment or neglect, with significant medical and psychological consequences for the child. Under this category, the DSM-V includes also several types of *child physical abuse*, *child neglect* and *child psychological abuse*. Since these issues are not consider mental disorders, they do not include a diagnosis criteria, only descriptions to be used for its recognition (See Table 3).

Boris, Zeanah, Larrieu, Scheeringa, & Heller (1998) suggested that there was already a general consensus which stated that difficulties of children, younger than 3 years old, with their caregivers included a group of symptomatology that was not assesed in other disorders. Brockington (2011) concurs with these ideas suggesting that disturbances of emotional response to infants should be consider disorders, since they cannot be consider normal due to the sense of threaten to the survival of the newborn.

The idea of a disorder related with the mother-infant bonding is recognized on the axis II of the American Psychological Association's Diagnostic Classification of Mental health and Developmental Disorders of Infancy and Early Childhood (Zero-to-Three) also called DC:0-3R (Zero-to-Three, 2005). This classification was developed to include the infant and preschool mental health problems that the DSM lacks. Under this classification it can be diagnosed "over-involved", "under-involved", "anxious-tense", "angry-hostile" and "abusive" relationships with the children. The Axis II of this classification is used to assess the child's relationships with all her/his primary's caregivers.

For the present study a **mother-infant bonding disorder** (MIBD) was defined as a disturbance in the maternal emotional response towards her baby present in the early interaction between a mother and her infant after the childbirth and during the first year of postpartum.

Studies (Brockington, 2011; Klier & Muzik, 2004) have shown that the MIBD can be present in several types such as a delay, ambivalence or lack of maternal response, maternal rejection, or anger and hostility towards the baby. To cover the lack of especific diagnostic criteria for mother-infant relationship disorders, Brockington (2011) based in the results of several studies and clinical experience, proposed a specific criteria to identify a mother-infant relationship disorder which is detailed in Table 4.

| Table 3. Parent-child relational problem DSM -V (APA, 2013) | | |
|---|---|--|
| Z62.820 Parent-child relational problem | | |
| <p>Problems Related to Family Upbringing The term <i>parent</i> is used to refer to one of the child's primary caregivers, who may be a biological, adoptive, or foster parent or may be another relative (such as a grandparent) who fulfills a parental role for the child. This category should be used when the main focus of clinical attention is to address the quality of the parent-child relationship or when the quality of the parent-child relationship is affecting the course, prognosis, or treatment of a mental or other medical disorder.</p> <p>Some examples of behavioral problems include: inadequate parental control, supervision, and involvement with the child; parental overprotection; excessive parental pressure; arguments that escalate to threats of physical violence; and avoidance without resolution of problems. Cognitive problems may include negative attributions of the other's intentions, hostility toward or scapegoating of the other, and unwarranted feelings of estrangement. Affective problems may include feelings of sadness, apathy, or anger about the other individual in the relationship. Clinicians should take into account the developmental needs of the child and the cultural context.</p> | | |
| <p>Child Maltreatment and Neglect Problems Maltreatment by a family member (e.g., caregiver, intimate adult partner) or by a nonrelative can be the area of current clinical focus, or such maltreatment can be an important factor in the assessment and treatment of patients with mental or other medical disorders.</p> | | |
| <p style="text-align: center;">Child Physical Abuse</p> <p>Child physical abuse is non-accidental physical injury to a child—ranging from minor bruises to severe fractures or death—occurring as a result of punching, beating, kicking, biting, shaking, throwing, stabbing, choking, hitting (with a hand, stick, strap, or other object), burning, or any other method that is inflicted by a parent, caregiver, or other individual who has responsibility for the child. Such injury is considered abuse regardless of whether the caregiver intended to hurt the child. Physical discipline, such as spanking or paddling, is not considered abuse as long as it is reasonable and causes no bodily injury to the child.</p> <p>Codes: Child Physical Abuse, Confirmed (995.54/ T74.12XA; 995.54/T74.12XD) Child Physical Abuse, Suspected (995.54/T76.12XA; 995.54/T76.12XD)</p> | <p style="text-align: center;">Child Neglect</p> <p>Child neglect is defined as any confirmed or suspected egregious act or omission by a child's parent or other caregiver that deprives the child of basic age-appropriate needs and thereby results, or has reasonable potential to result, in physical or psychological harm to the child. Child neglect encompasses abandonment; lack of appropriate supervision; failure to attend to necessary emotional or psychological needs; and failure to provide necessary education, medical care, nourishment, shelter, and/or clothing.</p> <p>Codes Child Neglect, Confirmed (995.52/T74.02XA; 995.52/T74.02XD) Child Neglect, Suspected (995.52/T76.02XA; 995.52/T76.02XD)</p> | <p style="text-align: center;">Child Psychological Abuse</p> <p>Child psychological abuse is non-accidental verbal or symbolic acts by a child's parent or caregiver that result, or have reasonable potential to result, in significant psychological harm to the child. (Physical and sexual abusive acts are not included in this category.) Examples include berating, disparaging, or humiliating the child; threatening the child; harming/abandoning—or indicating that the alleged offender will harm/abandon—people or things that the child cares about; confining the child (as by tying a child's arms or legs together or binding a child to a furniture or another object, or confining a child to a small enclosed area [e.g., a closet]); egregious scapegoating of the child; coercing the child to inflict pain on himself or herself; and disciplining the child excessively (i.e., at an extremely high frequency or duration, even if not at a level of physical abuse) through physical or nonphysical means.</p> <p>Codes: Child Psychological Abuse, Confirmed (995.51/T74.32XA; 995.51/T74.32XD) Child Psychological Abuse, Suspected (995.51/T76.32XA; 995.51/ T76.32XD)</p> |
| <p>Source: DSM-V (APA, 2013)</p> | | |

| Table 4. Criteria to identify Mother-Infant relationship disorder | | |
|---|--|--|
| Mild Disorder | | |
| These mothers experience delay in the onset, ambivalence, or loss of the maternal emotional response to the infant. *A to D are necessary. | | |
| A. Either the mother expresses disappointment about her maternal feelings, eg. She has no feelings. Or she feels estranged or distant from the baby – this is “not her baby”, or she is “baby-sitting” for someone else. | | |
| B. The definitions of threatened or established rejection are not met. | | |
| C. The disorder has lasted at least one week. | | |
| D. These feelings are distressing and have resulted in an appeal for help from family or professional staff. | | |
| Infant-focused anxiety | | |
| Mild anxiety | Severe anxiety | |
| The mother feels anxious, when alone with her infant. | This anxiety leads to reduced contact. | |
| Pathological anger: 3 grades – mild, moderate and severe. | | |
| Mild anger | Moderate anger | Severe anger |
| * The mother has lost verbal control, shouting, screaming or swearing at the baby on at least two occasions. * She has expressed her anger in no other way. (Anger experienced inwardly, and controlled with difficulty, does not qualify, and a mother who loses verbal control only once is considered to be within normal.) | *In addition to loss of verbal control, * either the mother experiences impulses to harm the child (e.g. to smother, throw, shake or strike it), * Or there has been some minor episode of abuse, such as shaking the pram. (Note: Discrimination between aggressive impulses and those experienced by mothers with obsessive-compulsive disorder.) | In addition to loss of verbal control or impulses to harm the child, at least one episode of frank child abuse has occurred. |
| Threatened rejection | Established rejection | |
| These mothers all lack a positive emotional response to the baby, but in addition, they have betrayed a wish to relinquish the child. <i>The main difference between threatened and established rejection is the permanence of this relinquishment.</i> In mothers with threatened rejection, the baby is not at present wanted, and the wish is for temporary transfer of care. They lack marked aversion to the child, and have not experienced a wish for its “disappearance”. | A, B or C are required: A. The mother expresses dislike, resentment or hatred for her child. Sometimes this was expressed in the terms, “I wish it had been still born”, or “It has ruined my life”. B. She has expressed the desire for permanent relinquishment of care. C. She has experienced a wish that the child disappear – occasionally be stolen, usually die from sudden infant death syndrome. | |
| Source: Brockington, I.F; Aucamp, H. M. and Fraser, C. (2006) <i>Severe disorders of the mother–infant relationship: definitions and frequency.</i> <i>Arch Womens Ment Health</i> 9: 243–251. | | |

2.1.3. Prevalence of mother-infant bonding disturbances

Studies from different countries have reported the prevalence of mother-infant bonding disorders with a large diversity of assessment instruments, different periods of assessment during the first year of postpartum, as well as with general population samples and women with psychiatric problems. This heterogeneity in the assessment and timing, as well as the techniques used bring difficulties while trying to estimate a prevalence of MIBD across countries.

A literature review carried out to identify the state of the research on mother-infant bonding show that until March 22th, 2015, there has been in the last 12 years (2003-2015) an important increase of articles published on this topic (database: SCOPUS; keywords: mother-infant bonding (OR) mother-infant early relationship (OR) mother-infant interaction (OR) mother-infant bonding disorder). This literature review identified a total of 8969 articles (publication date: 1935-2015) in 137 countries, with the United States of America, the United Kingdom and Canada as the countries with more studies published. From the total of articles, only 25 corresponded to Spanish studies on mother-infant bonding and mother-infant early relationships (publication dates: 1997-2014) showing that this is still a recent topic of research in Spain.

According to Brockington (1996) any type of mother-infant bonding disorder is prominent in 10–25% of the women referred to psychiatrists after childbirth. Brockington (2011) suggests that based on the referral rate to specialized services in the United Kingdom, there could be a population frequency of about 1% of these disorders. A mother-infant bonding disorder can be present in several types and levels of severity such as a delay, ambivalence or lack of maternal response, maternal rejection, or anger and hostility towards the baby (Brockington 2011; Klier & Muzik, 2004). One of the first surveys to identify the prevalence was developed in the United States of America, where Robson & Moss (1970) found a delay in the maternal emotional response in about 10% of mothers.

A systematic review was developed to search for studies published (until March 27th, 2014), that assessed the association between parental psychopathology and mother-infant bonding disturbances. This review allow to identify studies that reported disturbances of mother-infant bonding in both general and clinical population of mothers using several assessment techniques and different periods of bonding assessment. Characteristics of some of the studies are reported in Table 5. It was identified on this review that one of the most frequently used assessment instruments in the last two decades to identify mother-infant bonding disorders are the Postpartum Bonding Questionnaire [PBQ] (Brockington, Fraser, & Wilson, 2006; Brockington, et al., 2001) and the Birmingham Interview for Maternal Mental health [BIMMM] (5th ed. Brockington et al. 2006a). Both are instruments used to assess and also research the MIBD and the PBQ has been validated in several countries.

Analyzing only studies that used the PBQ and the Birmingham Interview for Maternal Mental health and its assessment criteria to identify MIBD, prevalence rates of some type of MIBD show important differences in mothers from general population when compared with mothers suffering from a mental health problem. The prevalence of MIBD is higher in clinical samples that has been recruited from mostly mother-baby units or psychiatric programs. Prevalence of MIBD in mothers from **general population**, recruited in the Obstetrics Units from General Hospitals mainly, have shown a range of **7.1-8.6%** in countries such as Germany [7.1%, n=862] (Reck, Klier, Pabst, Stehle, Steffenelli, Struben and Backenstrass 2006), Sweden [8.5%, n=465] (Edhborg, Matthiesen, Lundh and Widström 2005) and Belgium [8.6%, n=263] (van Bussel, Spitz & Demyttenaere 2010). Prevalence rates of MIBD are higher in samples of mothers with diverse types of psychiatric problems showing a range of **22.2-38.8%**, in samples from the United Kingdom like the one from Parfitt and Ayers, (2012) [22.2%, n=45], Brockington et al. (2001) [27.9%, n=104], Brockington, Aucamp and Fraser (2006c) [28.6%, n=200,] and Brockington, et al. (2006c) [38.8%, n=129]. Outside of Europe, in a Chinese sample of 62 mothers with postnatal depression (Siu, Chow, Kwok, Li, Koo, Cheung, Yeung & Hung, 2010) 67% of them presented a MIBD. Details of each study are reported in Table 5.

Table 5. Studies that report mother-infant bonding disturbances

| Study | Country | Instruments to measure bonding | Instruments to measure Mental health | Population | N | Bonding Assessment Time | Results |
|--|----------------|---|--|--|-----|-------------------------|--|
| (Brockington, et al., 2001) | United Kingdom | The PBQ & Birmingham Interview for Maternal Mental health (BIMMH) | Not specified | Clinical & General Population Mothers from General practice or obstetric clinics with normal bonding, babies with abnormalities and bonding disorders. | 104 | Data not available | 29/104 (27.9%) women have a bonding disorder (mild, rejection, anger or anger plus rejection) |
| (Brockington, Aucamp, & Fraser, 2006) | United Kingdom | Birmingham Interview for Maternal Mental health (BIMMH) | Not specified. | Clinical Population *Mothers referred to health services. | 200 | 5 - 56 weeks Postpartum | -10.6% established rejection -14.6% threatened rejection of their infants. *28.6% various degrees of pathological anger, which was severe in 8.3%. |
| (Brockington, Fraser, & Wilson, 2006) | United Kingdom | The PBQ & Birmingham Interview for Maternal Mental health (BIMMH) | PPD: 87 mothers had some degree of depression (clinically diagnosed in a mother-baby unit) | Clinical Population Mothers referred to specialist mother-and-baby services | 129 | Data Not available | 50 of 129 mothers have some kind (delay, ambivalence, second loss or rejection) of bonding disorder (38.75%) |
| (Noorlander, Bergink, & van den Berg, 2008). | Netherlands | PBQ. (Only 23 items, without the 4 subscale) *Observed Interaction: Bethlem Mother- Infant Interaction Scale. | PPD: The Clinical Global Impression (CGI) used to assess severity (Guy 1976). | Clinical Population Mother-infant pairs admitted to the psychiatric mother-baby unit. | 25 | Data not available | Women with PPD reported significantly higher scores on the PBQ in the first week of admission compared with women with a postpartum psychosis. Significant differences were found on the scales “impaired bonding”, “rejection and anger”, and “anxiety about care”. |

Table 5. Studies that report mother-infant bonding disturbances (*Continuation...*)

| Study | Country | Instruments to measure bonding | Instruments to measure Mental health | Population | N | Bonding Assessment Time | Results |
|-------------------------|----------------|---|---|---|-----|--|---|
| (Siu, et al., 2010) | China | The PBQ & Birmingham Interview for Maternal Mental health (5 th ed) | PPD: *Clinical diagnosis (ICD-10; WHO,1992) during their first postpartum year. *EPDS ≥10 *BDI (Beck Depression Inventory) | Clinical Population Mothers attending a Perinatal Specialist Out-patient Psychiatrist Clinic. | 62 | During their 1 st year postpartum | 43 of 62 (69.4%) mothers presented any form of mother-infant relationship impairment. *Using the Scale 1 (cut-off point 12) were 36/43 identified. *Using the Total score of PBQ (cut-off point) 26) 32/43 were identified. |
| (Parfitt & Ayers, 2012) | United Kingdom | Birmingham Interview for Maternal Mental health (BIMMH) | Semi-structured clinical interviews | Clinical and general population (40 couples + 5 mothers) | 85 | 4 -8 Postpartum | 23 participants (27%; 13 men, 10/45women) reported strong levels of anger toward their infant. |
| (Muzik, et al, 2013) | USA | PBQ. (Only 23 items, without the 4 subscale) | Childhood maltreatment and PTSD: telephone interview using DSM-IV criteria | Clinical Population and a healthy control | 150 | 4 months postpartum (over the phone) and during a home visit at 6 months postpartum. | Mothers in the CA+ group (child abuse and neglect histories) reported significantly more bonding problems ($t=2.74$, $p00.01$) and postpartum psychopathology (depression: $t0-3.44$, $p00.00$; PTSD: $t0-5.97$, $p0 0.00$) compared to the CA- group by 6 months postpartum |
| (Loh & Vostanis, 2004) | United Kingdom | PBQ Semi-structured interview Interview Rating Scale for Mother-Infant Interaction, (IRS), from the Birmingham Interview for Maternal Mental health (BIMMH) | EPDS, Structured interview, Checklist of Symptoms, (a modified version of Hamilton's Depression Rating Scale, Hamilton, 1967) | Clinical Population (Mother and Baby Service of a Psychiatric Hospital) | 41 | First year of postpartum | 27 mothers reported ant type of mother-infant bonding disturbances (65.8%) and the 31.7% were severe bonding disorders (n=13). |

Table 5. Studies that report mother-infant bonding disturbances (Continuation..)

| Study | Country | Instruments to measure bonding | Instruments to measure Mental health | Population | N | Bonding Assessment Time | Results |
|--|----------------|---|---|---|---------------------------|-------------------------------------|--|
| (Edhborg, Matthiesen, Lundh, & Widstrom, 2005) | Sweden | PBQ | Mental health not assessed | General Population. Healthy parents at a Hospital Maternity Clinic | 465 mothers & 429 fathers | At one week Postpartum | At one week postpartum, 9 mothers (8.5%) and 3 fathers scored above the recommended cut-off 12 on the PBQ subscale “impaired bonding”, showing “mild bonding disorder” (Brockington et al., 2001). |
| (Reck, et al., 2006) | Germany | PBQ | PPD: EPDS Clinical Interview (SCID) [54 patients classified as depressed]. | General Population. | 862 | During the first 2 weeks postpartum | Using the cut-off values of PBQ scale ‘bonding impairment’ and ‘rejection and anger’ an ‘impaired bonding’ was found in 7.1% of the sample. |
| (Figueiredo & Costa, 2009) | Portugal | Mother-to-Infant Bonding Scale (Taylor, 2005) | Postpartum Depression [PPD]: EPDS≥10 | General Population (Women From a Obstetrics Outpatient Hospital Unit) | 91 | 3 months Postpartum | More mothers showed elevated negative emotions toward the child 3 months before (34.1%) than 3 months after delivery (4.5%). |
| (van Bussel, Spitz, & Demyttenaere, 2010) | Belgium | PBQ | Mental health not assessed | General Population Mothers in a routine antenatal clinical | 263 | At 8-12 weeks of Postpartum | Of the 257 women who participated, 22 women were identified with a probable disordered mother–infant relationship (using the Scale 1 cut off point from 2001 of “impaired bonding”.) |
| (Edhborg, Nasreen, & Kabir, 2011) | Bangladesh | PBQ | EPDS STAI-S | Community population | 672 | 2-3 months postpartum | 75 (11.3%) of the mothers reported impaired bonding, e.g. mild bonding disturbances, to their infants |

Previous research results have shown that parental mental health problems (Brockington, 2004b; Parfitt & Ayers, 2012) particularly in the mother has proven to be frequently related to a bonding disorder in the early postpartum. This could explain why the prevalence rates of MIBD are higher in samples of mothers with diverse types of psychiatric problems.

2.1.4. Negative consequences associated to a mother-infant bonding disorder

There is evidence reporting that the quality of parenting is one of the most important potential mediator for effects on fetus and the child (Stein, et al., 2014). The negative effect associated with a mother-infant bonding disorder can be considered to be exponential; this refers to the ability of affecting not only the mother directly, but also the infant and the whole family with medium and long-term effects. First, a bonding disorder affects the mental and emotional wellbeing of the mother and is an important source of stress and unhappiness. Women with a disturbed relationship with their babies usually have strong feelings of guilt and failure as a mothers. Second, because the disorder occurs during a decisive developmental stage in the life of the baby, its effects can be long-lasting and decisive in the child's development and future wellbeing. And third, there are significant adverse effect in the family associated to a disturbance in the emotional bonding between a mother and her baby; e.g. conflicts between the mother and her partner usually identified in depressed mothers with bonding difficulties with their babies (Reay, et al., 2011), fear to re-experience a bonding disturbance in future children affecting her perceptions and decisions towards future motherhood as well as their ways of relating with other sons and daughters. Recently the effects of a bonding disorder in the family, has beginning to be of more interest to study, including to explore the father's own parenting process with their babies (Parfitt, & Ayers, 2009; Parfitt, Pike, & Ayers, 2014).

As we can see, the negative consequences associated to these type of disturbances are large and significant. From all of these negative effects, evidence of medium and long-term consequences have been confirmed in the infant's future development, especially regarding their behavior, social and emotional wellbeing.

Among the most important negative effects of mother-infant bonding disorders on their offspring according to research evidence are the following:

1. **Emotional self-regulation** - One of the most important process in the early childhood is the emotional regulation of the infant which is learned and developed through the early social interactions mainly with the help of the mother or the main caregiver. At the early

months of life mothers must help the baby to regulate their emotional state, avoiding high levels of frustration. As children grow and develop their own regulatory capacities then the parents should diminish their intervention but keep the monitoring and suggestion for better managing emotional responses to learn better strategies to deal with complex emotional states (Waxler, Thelen, & Muzik, 2011). Socioemotional adaptation difficulties were reported in children with mothers with psychological difficulties affecting the early relationship with their infants (Hay & Pawlby, 2003). There is strong evidence of the adverse effect in emotional regulation of the child found especially with depressed mothers where deficient maternal interactions and caregiving consequently affect the infant's responsivity (Field, 2010). The repeated exposure to the maternal emotional unavailability and insensitive caregiving or mechanical caring, can cause that infants of depressed mothers may learn to be non-responsive and less empathetic to themselves and others (Waxler, Thelen, & Muzik, 2011).

2. **Social adaptation and relationship problems.** Studies have identified an association between unwanted pregnancy and difficulties in the social relationships of the children (David, 2011). An unwanted pregnancy is one of the most frequent factors associated to a later mother-infant bonding disorder with that unwanted baby (Brockington, 2011) that is associated later with problems to establish friendships and stable partner-relationships (David, 2011). A cohort study in Denmark identified that the parent's negative expectations of the child added to deviant handling and reactions to the child recorded in the first months of the child's life were significant predictors of a relationship disturbance when the infant was 1.5 years old (Skovgaard, et al., 2008)
3. **Cognitive and language development.** Maternal diminished interaction with her baby and disturbances in early mother-infant interactions were identified as predictors for a poor infant cognitive outcome at 18 months (Murray, Fiori-Cowley, Hooper, & Cooper, 1996). Also the language development has been identified to be negatively affected. A study (Parfitt, Pike, & Ayers, 2014) reported that the mother's negative perceptions of her relationship with her baby were an important predictor of the child's language development and also the presence of a postnatal maternal posttraumatic stress disorder could predict a less optimal infant cognitive development. Negative consequences in the learning process and school performance related with the cognitive and language affectations of the infant have been also linked to early mother-infant bonding disturbances (Brockington, 2011).
4. **Child psychopathology.** Mother-infant disorders can increase the risk for future mental health disorders in the child (Skovgaard, et al., 2008), such as affective and anxiety disorders (David, 2011), suicidal risk and personality disorders. David (2011) reported in a longitudinal study later detailed, that the greatest difference found in adults that were born from unwanted pregnancies when compared with a control group and their siblings

(wanted by their mothers) was a higher frequency of psychiatric treatments during a 35-year period that they were assessed.

5. **Child's type of attachment.** Maternal mental health (postpartum depression) assessed at 2 months after childbirth and poor parenting were associated with insecure infant attachment when the child was 18 months old (Tomlinson, Cooper, & Murray, 2005). Also in a review by Wan & Green (2009) it was identified that low parenting sensitivity and severe mental maternal health were related to insecure and disorganized infant attachments.

6. **Risk of child abuse, maltreatment and filicide.** One of the most severe consequences of a disturbed mother-infant relationship is the risk of severe physical and emotional child abuse and filicide. According to Brockington (2011), maternal rejection is often accompanied with hate and aggression towards the infant with behaviors such as shouting, swearing, ideas and impulses to harm the baby. In severe mother-infant bonding disorders the child can be exposed to her/his mother's persistent hostility and aggression with long-lasting physical, emotional and psychopathological consequences (Sundermann & DePrince, 2015). The most negative consequences of a mother-infant bonding disorder is the death of the child and the suicide of the mother. There is evidence reporting that in most of the filicide cases where the infants have been killed by their mothers, there was a history of child abuse and maltreatment (Shelton, Hoffer, & Muirhead, 2015) and in a significant percentage of cases the filicide is followed by the suicide of the mother (Debowska, Boduszek, & Dhingra, 2015).

A longitudinal study developed in the Czech Republic provided important information of the long-lasting negative consequences in the children that suffer from a disturbed early relationship with their mothers. The study known as the Prague Study (David, 2011) identified 220 babies born from mothers that were two-times denied their legal request for abortion for the same pregnancy. They were followed and assessed 5 times during 35 years of their lives to identify the outcomes of being born unwanted by their mothers. Each baby was individually pair-matched with 220 babies born from accepted pregnancies as well as their own siblings to control for potential confounding variables.

This large longitudinal study assessed several aspects of the children psychosocial development. The main results confirmed the hypothesis that an unwanted pregnancy caused a less favorable development in the children and this effect was not shared with their siblings that had been wanted

by their mothers; this negative effect was more visible in women that presented more emotional instability and were less socially integrated than the control group.

The specific results for each of the 5 assessments are detailed in Table 6.

| Table 6. Main results of the Prague Study (David, 2011) | | |
|--|--------------------------|---|
| Assessment | Participants' Age | Results of comparison between unwanted children vs wanted children & siblings |
| 1 | 9 years | <p>Unwanted children:</p> <ul style="list-style-type: none"> -Received less breastfeeding by their mothers of not breastfeeding at all -Had lower school grades in language courses and were the worst evaluated in their school performance and their behavior by their teachers and mothers -Were more rejected as friends by their schoolmates -The boys were perceived less favorable by their mothers than the girls and were left to be taken care with a different person more frequently |
| 2 | 14-16 years | <p>Unwanted teenagers reported:</p> <ul style="list-style-type: none"> -A significant lower school performance -More teen-pregnancy and school dropout in secondary level studies -More jobs that did not require any professional orientation or training |
| 3 | 21-23 years | <p>Mothers of unwanted children reported:</p> <ul style="list-style-type: none"> -Less maternal satisfaction over their children's performance and more dissatisfaction about their academic and social achievements <p>Unwanted young adults reported:</p> <ul style="list-style-type: none"> -Less job satisfaction, more conflicts with their coworkers and supervisors and less satisfactory relationships with partners and friends -Higher dissatisfaction with their mental wellbeing and were looking for professional treatment or were already in one -Two-times more prison sentences -Significant differences in the scale of Psychosocial inability (higher than controls). |
| 4 | 28-31 years | <p>Unwanted Adults reported:</p> <ul style="list-style-type: none"> -Lower scores in psychosocial adaptation scale than the control group. Although the differences were lower, the differences among unwanted adult women and their controls were higher than the ones found between the men. -More unwanted women were single or divorced, reported maternity difficulties or unemployment -Unwanted women were less sociable and more frequently depressed and received more psychiatric treatments than their siblings or the control group. |
| 5 | 32-35 years | <ul style="list-style-type: none"> -Being born from an unwanted pregnancy was significantly related to psychiatric treatment in the adulthood -An unwanted pregnancy predicted 3 of 10 indicators of poor mental health, specially psychiatric hospitalization or external treatment, and the presence of anxiety and depressive disorders. -The unwanted children without siblings reported the highest percentage of psychiatric treatments compared with the control group. |

2.2. Mother-infant bonding and risk factors for bonding disturbances

The birth of a child and the postpartum are by themselves challenging periods for a woman. These times demand full time physical dedication from the parents as well as emotional and psychological abilities to meet the demands and needs that the caretaking of a baby will require. Sometimes this early interaction between a mother and her infant can be altered or disturbed by several factors with extended effects on the child and family as has been described in the previous sections.

Studies have shown that some of the factors that can affect maternal behaviors and affective response towards her newborn are: woman's past experiences with her own parents (Choi, et al., 2013; Della Vedova, Ducceschi, Cesana, & Imbasciati, 2011; Myers, 1984), deprived maternal childhood history like abuse or emotional deprivation (Muzik, et al., 2013; Spinner, 1978), type of delivery (Herguner, Cicek, Annagur, Herguner, & Ors, 2014) a young age in the mother (Spinner, 1978), to have an occupation (Wai Wan, et al., 2007), low level of education (Richman, Miller, & LeVine, 1992), low social support and no support from the partner (Feldman, Greenbaum, Mayes, & Erlich, 1997; Herguner, Cicek, Annagur, Herguner, & Ors, 2014; Myers, 1984; Spinner, 1978), low socio-economic status (Fuentes, Faria, Soares, & Crittenden, 2009), unwanted pregnancy (Barber, Axinn, & Thornton, 1999; Brockington, 2011; David, 2011; Myers, 1984), impaired prenatal affiliation/attachment to the fetus (Brockington, 2011; Walsh, Hepper, Bagge, Wadephul, & Jomeen, 2013), difficulties or traumatic events during pregnancy and delivery (Brockington, 2011; Gharaibeh & Hamlan, 2012; Myers, 1984) and parental psychopathology (Brockington, 2004b; Parfitt & Ayers, 2009; Stein, et al., 2014).

Factors related to the baby can also affect the early relationship with the parents such as the infant suffering from medical conditions, abnormalities, prematurity and/or low birth weight, and babies with difficult temperament that can be considered a challenge in their parenting (Feldman, 2007; Feldman, Greenbaum, Mayes, & Erlich, 1997; Jordan, et al., 2014). Another factor related indirectly to the baby is the parity, specially if the baby is the first one for the mother. Several studies have reported that first-time mothers have more difficulties in the early interaction with their infants due to maternal inexperience compared with multiparous mothers. Many primiparous mothers can experience high levels of anxiety, worries about the care and more probabilities to suffer a delay in the affective response towards their babies as Robson & Kumar (1980) reported. Further studies have found that primiparous depressed mothers present even bigger difficulties, i.e. bathing their infants at 3 months postpartum than multiparous depressed mothers (Righetti-Veltima, Conne-Perréard, Bousquet, & Manzano, 2002) and a more negative description of their babies than those who had a previous baby at 6 weeks postpartum (Green, Richards, Kitzinger, & Coupland, 1991).

Another baby factor that has been identified with a negative effect on the mother-infant bonding, this one strongly related to cultural and social aspects, is the sex of the infant, in particular when the baby is a girl. Important evidence supports the idea of a *gender disadvantage* in specific mental health disorders, influenced by culture and ethnicity (Chandra & Satyanarayana, 2010). This particular disadvantage exposes a person to greater and specific mental health risks in their life just because of their gender. For example, in Asian cultures it has been identified an association between having a baby girl and postpartum depression (Klainin & Arthur, 2009) showing that the gender of the infant has an effect on the maternal emotional response in the postpartum due in part to preferences related with the social and economic benefits associated to the male gender. This adverse effect has also been seen in the bonding process. A study in Bangladesh reported that depressive symptoms and giving birth to a girl were negatively associated to a mother's emotional bonding to her infant (Edhborg, Nasreen, & Kabir, 2011). Outside Asia, the gender negative factor has also been identified in a longitudinal study from the United States which reported that mothers of male infants at 5 and 10 months used more words and more affectionate terms than mothers of female infants (Ahl, Fausto-Sterling, García-Colic, & Seifer, 2013).

Breastfeeding is another factor that has been associated to the early bonding process both in a negative and positive way. Links between breastfeeding and a greater response to baby cues and maternal brain activations in regions involved with empathy and maternal sensitivity has been identified (Kim, et al., 2011). It has also been suggested as a facilitator of the bonding process improving mother's self-efficacy and her emotional involvement with the child (Figueiredo, Dias, Brandão, Canário, & Nunes-Costa, 2013).

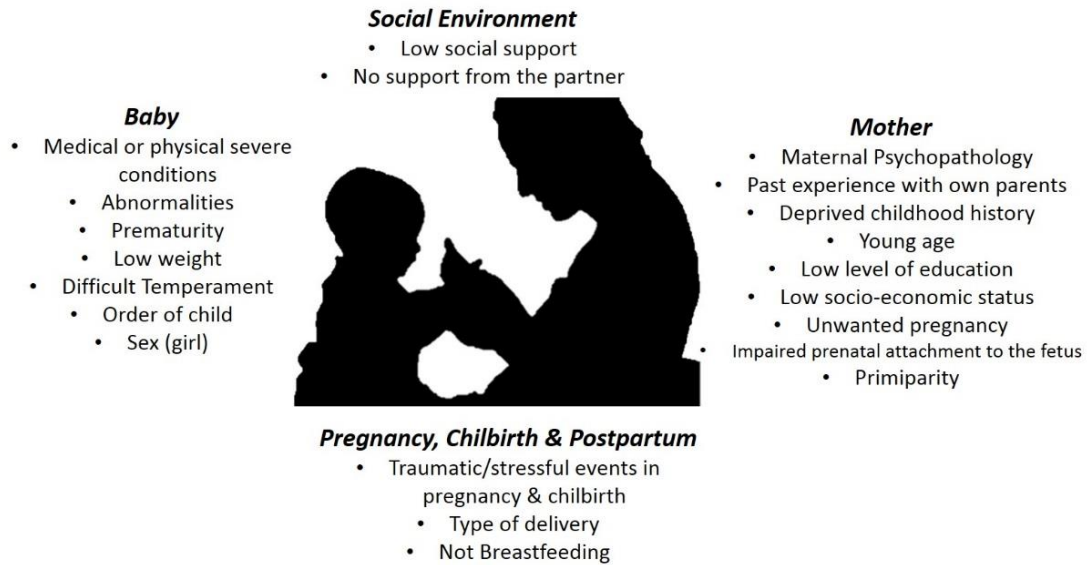
The effect of breastfeeding on bonding transforms to negative, when the breastfeeding ceases very early in the postpartum or it never occurs. But when maternal psychopathology is present, it seems to add a major adverse effect between the bonding and breastfeeding relationship. Ystrom (2012) has suggested that not breastfeeding could be consider an early symptom of maternal emotional difficulty towards her baby and the result of maternal prenatal emotional status. Green, Richards, Kitzinger, & Coupland, (1991) reported that depressed mothers provided the most negative descriptions of their babies if they had given up breastfeeding at 6 weeks postpartum.

Not breastfeeding has also been related to the presence or a higher risk of maternal psychopathology, such as depression and anxiety, as Ystrom (2012) identified in mothers that stop to breastfeed their babies before the first 6 months postpartum. Mothers with depressive symptoms in the early postpartum show a higher discontinuity for breastfeeding at 4 or 8 weeks. They experience more breastfeeding problems and lower levels of breastfeeding self-efficacy (Dennis & McQueen, 2007) as well as not breastfeeding later during the first year of postpartum (Akman, et al., 2008; Stuebe, et al., 2014). Breastfeeding seems to be an activity affected by

maternal depression (Field, 2010; Stuebe, et al., 2014) but also a factor related to disturbances in the mother-infant bonding process.

Figure 3 lists the risk factors associated to a mother-infant bonding disturbance.

Figure 3. Risk factors for mother-infant bonding disturbances



2.2.1. Maternal Psychopathology and Bonding

Mental disorders are frequent during pregnancy and the postnatal period, with confirmed adverse effects on the mother, her child, and family. The most frequent mental disorders non-psychotic seen in the pregnancy and postpartum are depression, anxiety, posttraumatic stress disorders (PTSD), eating disorders, personality disorders (Howard, Molyneaux, Dennis, Rochat, & Milgrom, 2014) as well as psychosis in the postpartum. The frequency of most of the mental health disorders present in women during the perinatal period is almost the same as in other life moments. However the fact that it occurs on this moment increases the risk for future negative outcomes not only for the women but also extended to the future child and the entire family increasing the impact of the consequences as was previously described. A recent review (Stein, et al., 2014) analyzes the research evidence which identifies a sequential negative effect beginning at how perinatal disorders and symptoms can compromise the quality of parenting; then longitudinal studies has proven that a compromised early parenting is associated with disturbances in child development and finally a disturbed parenting can be a strong mediator between perinatal mental health and child outcomes. As well, the processes of pregnancy, delivery, postpartum, caretaking of a newborn and motherhood each one by itself are a source of stress and worries that can trigger mental health disorders and increase the vulnerability of

women's mental wellbeing. Some examples of this can be seen in women that suffer from traumatic experiences during their pregnancies or deliveries causing them to develop a Posttraumatic Stress Disorder or women with anxiety disorders before conception that can experience pregnancy and delivery as a difficult experience causing higher levels of anxiety or crisis, or how the gain of weight and change in body size during pregnancy can be a sensitive topic in women with eating disorders with high probabilities of relapses in their disorder if not treated (Howard, Molyneaux, Dennis, Rochat, & Milgrom, 2014).

Maternal psychopathology has been one of the most frequent risk factor related to a bonding disorder in the early postpartum (Mäntymaa, 2006; Stein, et al, 2014). A study with mothers with childhood abuse and neglect histories reported significantly more bonding problems and psychopathology at 6 months postpartum compared to a healthy sample (Muzik, et al., 2013). Mäntymaa (2006) reports that maternal psychopathology has an impairing effect on the mother's capability to interact with her infant, regardless of the clinical diagnosis and that infants of mothers with mental health problems exhibited abnormal interactive behaviors. In a sample of 263 Belgian mothers a study by van Bussel, Spitz & Demyttenaere (2010) show that maternal feelings of bonding were moderately associated with maternal mood during the assessment of the early emotional tie between a woman and her newborn infant at 2 periods, the first period between the 8-12 weeks and the second at 20-25 weeks of postpartum.

Mental health disorders affect the ability of the individuals to react and respond to their daily-life needs impacting as well their parenting capabilities. Stein, et al. (2014) report some examples for these parenting difficulties, such as a difficulty for the parents to focus their attention on the baby or caretaking tasks if they have rumination and mood disturbances. Parental difficulties like disengagement and withdrawal, poor responsiveness towards their infant, missing the cues, intrusiveness, and difficulties appreciating the baby's needs, emotions and thoughts are also related to postnatal parental disorders. Most of the research of parental psychopathology and disturbances in the early bonding with the infant has been focus in maternal postpartum depression that clearly reports diminished sensitivity and lack of attention in the mother. Stein, et al. (2014) also reports evidence that show maternal disorders associated with other mental health problems like mothers with eating disorders that can apply in their infants over-controlling and intrusive behaviors specially during feeding activities or the case of poor emotional responsiveness and difficulties in baby care in mothers with either schizophrenia and personality disorders. A study (Gutiérrez-Zotes, Farnós, Vilellaa, & Labad, 2013) with Spanish mothers with no psychiatric history reported that psychoticism personality traits were related to more intrusive thoughts of harming their infants. A lack of support to recover emotional equilibrium when the infant is distressed is also identified in parents with mental health disorders. The transmission of emotional states or behaviors from the parent to the baby has also been seen in mother-baby dyads where maternal depression is present. Similar patterns have been reported in infants with

socially anxious mothers, developing fear or avoidance of strangers mimicking the observed maternal behavior (Stein, et al., 2014).

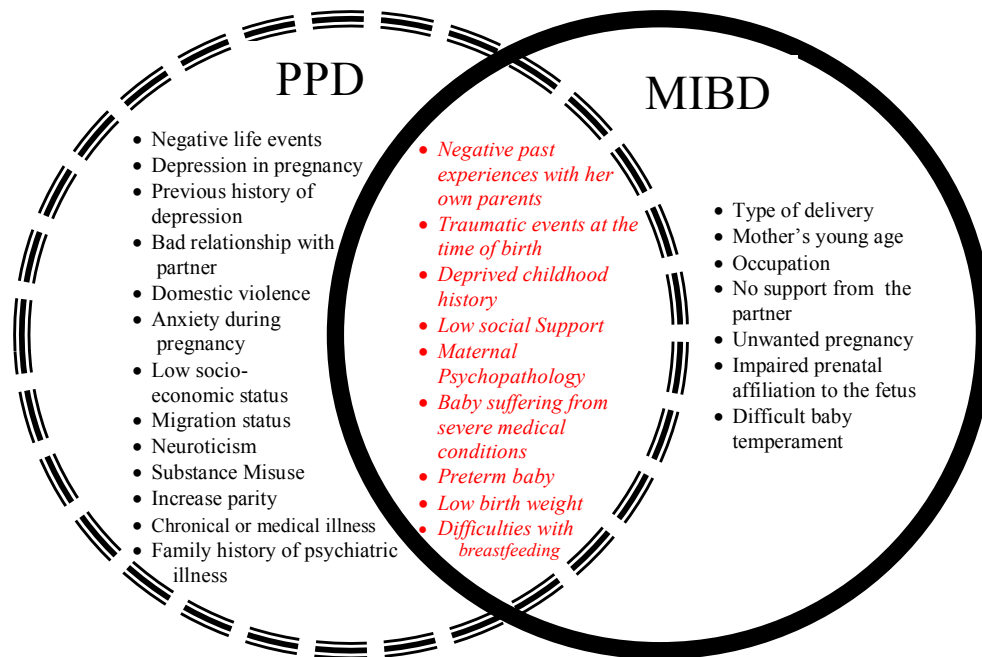
2.2.2. Mother-infant bonding and postpartum depression

One of the most studied mental health disorder related to the mother-infant bonding process is postpartum depression (PPD). This could be explained because PPD was one of the first studied mental health disorder in the perinatal period and an important affective problem among women after their childbirth. In a meta-analysis, O'hara and Swain, (1996) identified a prevalence rate of non-psychotic postpartum depression based on the results of a large number of studies of 10–15% among the general population of women. Consistent with this rate and other prevalence studies for PPD (Cooper, Campbell, Day, Kennerley, & Bond, 1988; Cox, Murray, & Chapman, 1993), in Spain an 8.9% (N=1123) of mothers who attended their routine postnatal check-up presented a depressive disorder at 6 weeks after delivery (García-Esteve, Ascaso, Ojuel, & Navarro, 2003).

Nevertheless a later review of 143 studies from 40 countries (Halbreich & Karkun, 2006) revealed that the prevalence of postpartum depression seems to have a wide range of variability depending on the country and the specific population assessed showing cases where the population rate was of 60% in low-income countries and high-risk samples. Differences are also shown between major and minor depression during the first year of postpartum. A meta-analysis by Gaynes, et al. (2005) reported that the prevalence for a major depression estimates ranged from 1.0-5.9% and for both major and minor depression, a range of 6.5-12.9 % in women during the first 12 months of postpartum.

A review by Howard, Molyneaux, Dennis, Rochat, & Milgrom (2014) identified that some of the most relevant risk factors for postpartum depression are: negative life events, depression or unhappiness during the pregnancy, low partner support and/or marital difficulties, a previous history of depression during life, a previous history of domestic violence, anxiety during pregnancy, low social support, low socio-economic status, migration status, neuroticism, substance misuse, increased parity, chronic or medical illness, family history of psychiatric illness, preterm birth and low birth weight. Much of these risk factors are shared with the ones that can affect the mother-infant early relationship (Figure 1). These similarities could be a key to understand the higher difficulty in depressed mothers to establish a healthy early interaction with their babies. Strong research evidence have reported that mothers with PPD seem to be more sensible to develop a bonding disorder with an important quantity of evidence to confirm that depression is one of the most frequent risk factors.

Figure 1. Risk factors for Postpartum Depression (PPD) and Mother-Infant bonding disorders (MIBD).



In her review, Field (2010) reported that an interaction disturbance in mothers with depression and their infants seem to be present across all cultures and socioeconomic status groups. Noorlander, Bergink, & van den Berg, (2008) reported that mothers with postpartum depression show significantly higher scores of bonding problems compared with mothers with postpartum psychosis in the first week after childbirth. Condon & Corkindale (1998) reported that high levels of depression was one of the strongest predictive factors for a weak mother-to-infant interaction as well as anger in the mother and the mother's perception of a difficult child. Nagata, et al. (2000) identified that the mothers with high levels of maternity blues in the first weeks of postpartum, had worse scores in the maternal attachment that assessed *acceptance of children, anxiety regarding children* and *involvement with the children*. Muzik et al. (2013) while studying the bonding impairment in women with childhood maltreatment stories, postpartum depression and posttraumatic stress disorder symptoms along the first six months of postpartum compared with women without psychopathology and traumatic childhood events found that the greatest risk for bonding disturbance was psychopathology and not the maltreatment history itself or any current psychosocial risk. As well, the presence of depression and posttraumatic stress disorder (PTSD) increased the risk for bonding problems in the first 6 months after birth. Using the PBQ to identify MIBD, several studies have reported significant associations between bonding disorders and PPD in mothers with psychiatric problems (Wittkowski, Williams, & Wieck, 2010) as well as mothers from the general population (Høivik, Burkeland, Linaker, & Berg-Nielsen, 2013; Reck, et al., 2006).

Several meta-analysis and reviews have identified a medium to a strong effect of depression in the mother-infant early interaction (See Table 7). A meta-analysis of 19 studies by Beck (1995) showed a medium to large effect of postpartum depression on maternal-infant interaction during the first year after delivery. Beck concludes that if a mother is emotionally unavailable it would be

harder for her to promote a synchronic interaction with her baby since it is more probable that a depressed mother cannot understand the smiles or cues of the baby or fail to respond and therefore meet her infant's need and enjoy their positive feedback. A diminished synchronic mother-infant interaction is also identified to be more frequent in depressed mothers when compared with non-depressed in a review by Field (1992). A meta-analysis with 46 studies that studied the mother-infant interaction through direct observation by Lovejoy, Graczyk, O'Hare, & Neuman, (2000) identified that the depression was related to disengaged and negative behaviors as well as lower levels of positive behavior in the mothers. Lovejoy et al, (2000) also identified that the effects of maternal depression were strongest in those women that presented more disadvantages (e.g. lower socio-economic status). In a review, Field (2010) reported that depressed mothers show less sensitivity and responsive attitude towards their infants and some inadequate caregiving practices seem to be more present in breastfeeding, sleep routines and healthcare practices (e.g. vaccinations and safety practices). Also, thoughts about harming the baby seem to be more frequent in depressed mothers as well as the use of harder punishment with their infants. This idea was identified in an early review by Field (1992) describing that depressed mothers provided more negative perceptions of their children's behavior. These behaviors and emotional mood are common to depressive persons. Also related to depressive symptomatology, the mothers with PPD show a flat affect and a lesser stimulation and contingent responsiveness during the early interaction with their babies as well as develop specific parenting profiles, such as withdrawn and under stimulating or the opposite, intrusive and over stimulating reported by Field (1992). In a qualitative study, Barr (2008) identified that mothers with postpartum depression reported to live in a liminal state, a perception of not being able to complete the passage to accept and adapt to the social role of a mother. The maternal perception seem to be delayed with also a delay in becoming competent in parenting skills and a lack of maternal attachment towards their babies. Barr (2008) also identified that the depressed mothers continued to care for their infants but in a "mechanical type of baby caring".

Negative early effects on the offspring of depressed mothers have also been identified. In the meta-analysis by Martins & Gaffan (2000) studies reported that infants of depressed mothers were more likely to show avoidant or disorganized forms of attachment. This idea is supported by the review of Wan & Green (2009) where it is identified an association between insecure and disorganized infant attachment and severe maternal psychopathology and low parenting sensitivity. A review by Waxler, Thelen and Muzik (2011) confirmed these associations between maternal depression and insecure attachment in their offspring having an adverse impact in the children's emotional and social development. Waxler et al. (2011) also identified strong research evidence that supports the association between maternal depression and difficulties in early emotion regulation of their infants, which the later has been related with behavioral problems and psychopathology in the adulthood.

Table 7. Effects of maternal depression on mother-infant early interaction identified in Meta-analysis and Literature reviews

| Article | Type | # of studies (Publication Years) | Objective | Sample size | Effect Size <i>r</i> /Cohen's <i>d</i> / <i>x</i> ² | Effects of depression on mother-infant interaction |
|--|-------------------|----------------------------------|---|---|--|--|
| (Beck, 1995) | Meta-analysis | 19 (1983-1993) | To determine the magnitude of the effect of PPD on maternal-infant interaction during the first year after delivery. | 829 mother-baby dyads | Using <i>r</i> *PPD & Maternal Interactive behavior: medium effect size *PPD & Infant interactive behavior: medium effect size (large effect with <i>Cohen's d</i>) *PPD & Dyadic interactive behavior: large effect | -Maternal emotional unavailable or affective unresponsiveness, block synchrony of interaction behaviors between mother-baby. -Depressed mothers may not pick up on their infant's cues or smiles failing to meet their baby's needs and enjoy their positive feedback. |
| (Martins & Gaffan, 2000) | Meta-analysis | 7 (1991-1999) | To compare women with and without PPD and the assessment of the attachment type in children with less than 3 years old. | 482 mothers depressed and non depressed | More avoidant and disorganized attachment from 17% to 28% on average on infants of depressed mothers. | -Infants of depressed mothers were less likely to show secure attachment, and more likely to show avoidant or disorganized forms of attachment, that infants of control mothers. |
| (Lovejoy, Graczyk, O'Hare, & Neuman, 2000) | Meta-analysis | 46 (1974-1996) | To assess the strength of the association between depression and parenting behavior and to identify variables that moderated the effects (only Direct Observational studies). | 1816 depressed mother + 1059 control mother | <i>Cohen's d</i> * Depressed mothers exhibited significantly higher levels of Disengaged and negative behavior, than non depressed mothers. *Depressed mothers exhibited significantly lower levels of Positive behavior than non depressed mothers. | *Depression associated with disengaged and negative behavior and lower levels of positive maternal behavior. <i>Moderator variables:</i> *Effects of Prior depression were apparent for all behaviors. *Socioeconomic status, child age, and methodological variables moderated the effects for positive behavior. * Strongest effects in disadvantaged mothers. |
| (Field, 2010) | Literature review | ND | Studies (2000-2010) are reviewed on PPD effects on early interactions, parenting, safety practices and on early interventions. | ND | NA | Caregiving activities appear to be compromised by PPD (<i>feeding practices, breastfeeding, sleep routines and well-child visits, vaccinations and safety practices.</i>) |

| Table 7. Effects of maternal depression on mother-infant early interaction identified in Meta-analysis and Literature reviews (Continuation....) | | | | | | |
|---|----------------------|---|--|--|---|--|
| Article | Type | # of studies (Publication Years) | Objective | Sample size | Effect Size <i>r</i>/Cohen's <i>d</i>/<i>x</i>² | Effects of depression on mother-infant interaction |
| (Field, 1992) | Literature review | ND | To demonstrate the impact of maternal depression on early infant interactions and development. | ND | NA | *Depressed mothers show either withdrawn and understimulating or intrusive and overstimulating behaviors. * Depressed mothers show flat affect and provide less stimulation and less contingent responsivity during early interactions. * Depressed mothers and their infants matched negative behavior states more often and positive behavior states less often than did the nondepressed dyads. *Mother-infant interaction is more synchronic in non-depressed than depressed dyads. *Depressed mothers are noted to have negative perceptions of their children's behavior. |
| (Wan & Green, 2009) | Review | ND | To consider impact of maternal psychopathology on the child's attachment to the mother, and the role of this in mediating the known transmission of developmental and clinical risk to children. | ND Mothers with depression and psychotic disorder. | NA | *Association between insecure/disorganised infant attachments and severe maternal psychopathology, whether chronic or current, in the presence of comorbid disorder, maternal insecure or unresolved attachment state of mind, trauma/loss, or low parenting sensitivity. |

2.3. Assessment of mother-infant bonding

In the last decades, it has been developed and validated specific instruments to identify and research for disorders occurred in the early mother-infant interaction. The most frequent assessment strategies include self-reports, easy to apply, specialized interviews or check lists with external raters such as nurses or mental health professionals, interactive tests to assess the mother-baby dyad that can be rated or videotaped in both clinical settings or in direct observations at home.

Since the most important aspect of the mother-infant bonding is the maternal emotional response toward their babies, one of the most useful and frequent strategies of assessment and research is the self-administered scales. Some of the most used *self reports* are the Maternal Postpartum Attachment Scale [MPAS] (Condon & Corkindale, 1998), the Postpartum Bonding Questionnaire [PBQ] (Brockington et al. 2001), the Mother-to-Infant Bonding Scale [MIBS] (Taylor et al. 2005) among others (see Table 8).

There are also confirmatory *interviews* such as The Yale Inventory of Parent Thoughts and Actions [YIPTA] (Leckman, Mayes, Feldman, Evans, & Cohen, 1994) or The Birmingham Interview for Maternal Mental health [BMMHI] (Brockington, et al. 2006a) and its latest version, the Stafford Interview for Maternal Mental health (Brockington et al, 2014 *unpublished*). There is also other semi-structured interview, called the Contextual Assessment of Maternity Experience [CAME] (Bernazzani, et al., 2005) that assess three main aspects related to maternity: i) recent life adversity or stressors; ii) the quality of social support and key relationships including the partner; and iii) maternal feelings toward pregnancy, motherhood and the baby. This last section of the CAME interview includes 6 items that assess the feelings towards the child during the first few weeks following birth (three items) and at the moment of the assessment (three items).

The risk of using only self-rating and interviews is that they can be vulnerable to response bias, simulation and dissimulation (Brockington, 2011). Several authors supports that the best assessment for the mother and infant early interaction are the *direct observations*. The direct observation and the *filming of mother-infant interaction* during play or feeding has been used to study mother-infant interaction, and very briefs videotapes (5 to 15 minutes) have become frequent in the last decades to support the research on this topic (e.g. Care-Index, Crittenden, 2005).

The use and validation in different countries of instruments measuring mother-child bonding disorders facilitates the identification, early intervention, and the comparison of results between studies and different cultures.

Table 8. Self-report instruments that measure maternal affective response to her baby and early interaction

| Authors | Name/ Country | Objective | Population in which it was validated | Reliability | Characteristics | Validated in Other Countries |
|--|--|---|--|--|--|---|
| (Warner, Appleby, Whitton, & Faragher, 1997) | MAQ (Maternal Attitudes Questionnaire)/ UK | To assess maternal cognitions about the role change, expectations about motherhood and herself as a mother in the postpartum. | N=483 mothers from a screening program in 2 maternity units. | Conbrach's Alfa: Internal reliability: 0.84 | 14 items with a 4 likert scale answer options. *4 items identifies maternal affective response toward the baby/motherhood: | No |
| (Brockington, et al., 2001) | PBQ (Postpartum Bonding Questionnaire) /UK | To assess mother-infant bonding disorders | N=104 mothers. mothers from normal population; mothers of babies with fetal abnormalities; depressed mothers with normal bonding; depressed mothers with various degrees of impaired mother-infant bonding | Test-re test reliability: Pearson's product moment correlation coefficients for the scale scores between the first and second administration were 0.95, 0.95, 0.93 and 0.77 for the four scales | 25 items with a liker-type of 5 answer options (always, very often, quite often, sometimes, rarely, never). 4 subscales: impaired bonding, rejection and anger, anxiety about the care of the baby and risk of abuse. | Germany The Netherlands China Norway Belgium Japan |
| (Brockington, Fraser, & Wilson, 2006) | PBQ (Postpartum Bonding Questionnaire) /UK | To validate the PBQ in other samples. | Mothers referred to specialists mother-and-baby services with a variety of postpartum psychiatric disorders. | | The same 25 items and 4 subscales reported in Brockington et al, 2001. *The subscales cut-off points were improved and a new cut off point using the total score is suggested (≥ 26 for some kind of bonding disorders and ≥ 30 for severe bonding disorders). | |

| Table 8. Self-report instruments that measure maternal affective response to her baby and early interaction (Continuation...) | | | | | | |
|--|--|---|--|---|--|--|
| Authors | Name/Country | Objective | Population in which it was validated | Reliability | Characteristics | Validated in Other Countries |
| (Taylor, Atkins, Kumar, Adams, & Glover, 2005) | Mother-to-infant Bonding Scale (MIBS)/ UK | To assess the feelings of a mother towards her new baby | N=162 mothers who had given birth 3 days ago in a Maternity Hospital. | The internal reliability: .71 (Cronbach's alpha). | 8 items with a likert-type 4 options as answers (very much, a lot, a little, not at all). | Belgium France Japan Portugal <i>Used in samples from:</i> Greece United States of America |
| (Condon & Corkindale, 1998) | Maternal Postnatal Attachment Scale(MPAS)/ Australia | To assess mother-infant attachment | N=200 mothers assessed at 4 and 8 months postpartum | The Cronbach's alpha was .78. (4 weeks of postpartum), .79 (4 months of postpartum) and .78 (8 months of postpartum). | 19 items with a 5 point likert scale with 1 indicating low attachment and 5, high attachment. 3 subscales: quality of attachment, absence of hostility, and pleasure in interaction. | Belgium Iran <i>Used in populations from:</i> Germany United Kingdom United States of America |
| (Kumar, Robson, & Smith, 1984) | Maternal Adjustment and Maternal Attitudes(MAMA) /UK | To investigate patterns of change in maternal adjustment, the marital relationship and attitudes to the baby. | N=99 first time mothers with repeated measures who were in a longitudinal survey of mental health. | Adequate test-retest and split-half reliabilities and comparisons with independently gathered interview data showed criterion-related validity. | Self-report. 60 items. *5 subscales: body image, somatic symptoms, marital relationships, attitudes to sex, attitudes to pregnancy and the baby. Includes a pregnancy and postnatal version. The postnatal version includes a subscale of maternal adjustment and attitudes to the baby with 12 items and a four-point scale from 1 (never) to 4 (very often). | Australia Israel Sweden |
| (Nagata, et al., 2000) | Japan | To evaluate the maternal attachment to children and factors involved. | N=417 mothers recruited from an Obstetrics Department in a Hospital. | Cronbach Alpha Coefficient: .80 | Constructed based on words and phrases. 21 items with 3 subscales: acceptance of children, anxiety regarding children, involvement with children. The rating of each item has a 4-option scale (not at all, not really, most of the time, always) | No data |

| Table 8. Self-report instruments that measure maternal affective response to her baby and early interaction (Continuation...) | | | | | | |
|--|--|--|---|--|---|-------------------------------------|
| Authors | Name/Country | Objective | Population in which it was validated | Reliability | Characteristics | Validated in Other Countries |
| (Hall & Papageorgiou, 2005) | PNTQ (Postnatal Negative Thoughts Questionnaire)/ UK | To detect and measure postpartum negative thoughts in the mother. | N= 181 mothers with babies ages 0–7 months who were receiving routine care from health visitors under the National Health Service. | Cronbach’s Alpha- Internal consistency: 0.78 | 2 factors: 1) Appraisal of cognition, emotion, and situation (ACES, 9 items) and 2) Baby-related and motherhood negative thoughts (BRM-NT, 8 items). Items were scored on a scale from 0 to 3: (0, not at all; 1, occasionally; 2, frequently; and 3, almost always.) | No data |
| (Høivik, Burkeland, Linaker, & Berg-Nielsen, 2013) | MABISC (The Mother and baby Interaction Scale). Developed in UK and used in Norway. | A pilot study, to investigate preliminary indicators of the internal consistency, stability, principal components and convergent validity of the 10-item MABISC. | A total of 77 mothers from six GP practices in Trondheim, Norway participated. Mothers were assessed at 2 months (T1) and 4 months (T4) of postpartum. The PBQ (Brockington et al, 2001) and the EPDS were also applied. | The internal consistency corresponded to a Cronbach’s alpha of 0.69. | 10 items that reflect the mothers’ reactions to their infants. Items are scored on a five-point scale (always=0, most of the time=1, occasionally=2, not often=3, never=4) | No data |

2.3.1. The Postpartum Bonding Questionnaire (PBQ)

Of the existing instruments that assess mother-infant bonding we decided to use as the principal measure for the present study the Postpartum Bonding Questionnaire [PBQ] (Brockington, et al., 2001; Brockington, 2006c) for several reasons. It has become one of the most widely used, validated and reliable self-report for identifying problems in mother-infant relationship during the postpartum period in different countries. It was constructed based on the clinical experience result from the treatment of mothers with bonding disturbances in mental health specialized settings. The structure of the instrument also offers an easy application and rating as well as a simple alternative for mothers to report their own thoughts and emotional responses toward their babies in the postpartum. Another strength of this questionnaire is its association to a clinical interview (The Birmingham Interview for Maternal Mental health, Brockington et al, 2006a) to explore in-depth the early interaction with specific criteria to confirm different levels of bonding disturbances.

The PBQ was designed in the United Kingdom by Brockington, Oates, George, Turner, Vostanis, Sullivan, Loh & Murdoch in 2001 and was originally composed of 84 items designed with the discourse of the mothers attended in perinatal specialist mental health services and later reduced to 25 in the final version. The instrument intends to investigate maternal feelings about their baby according to recent experience in postpartum. The items measure the frequency of maternal feeling in scored on a six-point scale from 0 to 5 with 6 options: “always”, “very often”, “sometimes”, “rarely” and “never”. The final 25 items were selected from factorial analysis with orthogonal varimax rotation from the combined 84-item. The items were identified to conform 4 subscales that were responsible for the 50% of the variance.

The scales are the following: Scale 1, *General factor termed impaired bonding* (34% of the variance) consists of 12 items; Scale 2, *Rejection and anger* (8% of the variance) comprises 7 items; Scale 3, *Anxiety about care* (3,7% of the variance) integrated by 4 items and the Scale 4, *Risk of abuse* (3,4% of the variance) consists of 2 items. Brockington and colleagues conducted two studies validating the PBQ (Brockington et al., 2001; Brockington et al., 2006c). In the first validation of 2001, 104 mothers were recruited from various sources, including general population from maternity clinics, mothers with babies with some abnormality, or high-risk pregnancies, mothers with a depressive disorder but with a normal mother-infant relationship and mothers with a bonding disorder. From the total sample, 51 of the mothers were interviewed using as a gold standard the 3rd edition of the Structured Interview for pregnancy-associated disorders (later called Birmingham Interview for Maternal Mental health [BIMMH]), in order to diagnose the

existence of bonding disorders and to determine cut-off scores. The cut off scores for the diagnosis of bonding disorders for each scale were: Scale 1 >12, Scale 2 >16, Scale 3 > 9 and for Scale 4 >2. In the second validation of 2006, 125 mothers were recruited from other specialists and reported some kind of mother-infant bond disorders and other comorbid mental disorders (e.g. depression, anxiety, post-traumatic stress disorder and obsessive). All 125 mothers were interviewed using the 5th edition of the BIMMH. As a result of this second validation, the authors suggested to adjust the cut off points of Scale 2, >12, and for Scale 4 >1. Also the total score ranged from 0 to 125 it is suggested to be used with a general cut off of a total score of ≥ 26 to identify **some kind of bonding disturbance** and a cut off ≥ 40 to identify **severe bonding disturbances**.

Since its publication, the instrument has been used in other populations and cultures such as Sweden (Edhborg, Matthiesen, Lundh, & Widström, 2005) and the United States of America (Muzik, et al., 2013). It has also been translated and validated until today in Germany (Reck, et al., 2006), China (Siu, et al., 2010), Norway (Burkeland & Høivik, 2006, unpublished), Belgium (van Bussel, Spitz, & Demyttenaere, 2010) and recently in Japan (Haneko & Honjo, 2014; Suetsugu, Honjo, Ikeda, & Kamibeppu, 2015) as well as used to validate other instruments related to the maternal-infant relationships assessment (Hall & Papageorgiou, 2005; Høivik, Burkeland, Linaker, & Berg-Nielsen, 2013; van Bussel, Spitz, & Demyttenaere, 2010; Wittkowski, Wieck, & Mann, 2007). Its factorial structure, however, has not been able to be replicated in later validation studies (Reck, et al., 2006; Wittkowski, Williams, & Wieck, 2010).

Reck et al. (2006) carried out a factor analysis obtaining a unifactorial model and a new 16 item version, which most of them charged in the general factor of "Impaired bonding". Wittowski et al. (2010) removed the two items from Scale 4 and found a new structure with 3 factors, partially related to the first, second and third factor of Brockington et al. (2001, 2006c), although the assignment of items to each factor were slightly different. The scale 4, related to the risk of abuse has had most of the problems to be replicated with sufficient reliability in other populations and countries. See Table 9.

The diverse studies published using the PBQ have confirmed its utility in assessing mothers from general populations as well as those with mental health problems. Due to the high prevalence of bonding disorders in mothers suffering from depression in the postpartum, the authors suggest to use the PBQ and the Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987) together, specially in clinical settings.

Table 9. Validation studies for the Postpartum Bonding Questionnaire (PBQ)

| Authors | Country | Objective | Population in which it was validated | Method | Reliability | Results |
|---------------------------------------|---------|---|--|---|---|---|
| (Brockington, et al., 2001) | UK | To propose the PBQ as a valid instrument to assess mother-infant bonding disorders. | N=104 mothers. Mixed sample (general population; mothers with babies with fetal abnormalities; depressed mothers with normal bonding; depressed mothers with various degrees of impaired mother-infant bonding). | -84 items developed based on their work with patients referred and mothers from general population. -55 mothers interviewed with the <i>Birmingham Interview for Maternal Mental health</i> and assigned to diagnostic groups. -A principal component analysis using Varimax rotation and orthogonal solution to select 25 final items. -Sensitivity and Specificity were calculated with the percentages of mothers identified with the threshold suggested for the 4 factors of the PBQ and diagnostic groups. Short term test-retest (2 days) was calculated in an additional series of 30 mothers. | Test-re test reliability: Pearson's product moment correlation coefficients for the scale scores between the first and second administration: 0.95, 0.95, 0.93 and 0.77 for the four scales | -Factor 1 explained 34% of the variance and is a general factor (impaired bonding). -A final 4-factor model was selected (50% of the variance). - <i>Sensitivity (SE) & Specificity (SP)</i> : Factor 1: SE=0.93, SP=0.85 Factor 2: SE=0.57, SP=1.0 Factor 3: SE=0.43, SP=0.96 Factor 4=SE=0.18, SP=1.0 |
| (Brockington, Fraser, & Wilson, 2006) | UK | To validate the PBQ in other samples. | 125 Mothers with some mental health disorder in the postpartum. | -Mothers completed the PBQ with their current symptoms and at their worst (looking back over the postpartum period). Scores at their worst were used for the analysis. - <i>All mothers were interviewed with the Birmingham Interview</i> (5th ed., Brockington et al, 2006). -Diagnoses: Blind to the PBQ scores, the interviewers studied the interviews and assigned the mothers to diagnostic groups with a criteria different than the first validation. These preliminary diagnoses were used to calculate inter-rater reliability. They met to reach a consensus diagnosis that was used to calculate positive predictive value of the scales using the original cut-off points. | Not reported | - The same 25 items and 4 subscales reported in Brockington et al, 2001. were confirmed. -The inter-rater reliability of the preliminary diagnoses ranged between 0.67 - 0.97 (Cohen's Kappa). -The subscales cut-off points were improved and a new cut off point using the total score is suggested (≥ 26 for some kind of bonding disorders and ≥ 40 for severe bonding disorders). *Sensitivity (SE) & Specificity (SP) (Total Score): Any Disorder: ≥ 26 (SE=0.84, SP=0.74) Severe Disorder: ≥ 40 (SE=0.89, Positive predictive value=0.73). |

| Table 9. Validation studies for the Postpartum Bonding Questionnaire (PBQ) (Continuation....) | | | | | | |
|--|---------|---|--|---|---|---|
| Authors | Country | Objective | Population in which it was validated | Method | Reliability | Results |
| (Reck, et al., 2006) | Germany | To carry out initial analyses of the psychometric properties of the German version of the PBQ. | 862 mothers from general population assessed at two weeks postpartum | <p>-A principal component analysis was used to assess the validity of the four scale structure of the questionnaire. Specification of the number of important factors was achieved by means of a scree plot.</p> <p>-Loadings of each item on each factor were calculated using varimax rotation.</p> <p>-The EPDS and the SCID was used to assigned mothers with a minor and major depressive episode.</p> <p>-Group differences in mean PBQ scores between patients with or without depression were established on the basis of Cohen's d effect sizes.</p> <p>-The relationship between EPDS and PBQ scores was examined using Spearman's rank correlation coefficients.</p> <p><i>*No interview was used to identify mother-infant bonding disorders.</i></p> | <p>Cronbach's alpha:</p> <p>*25-item structure: 0.85</p> <p>*16 item-structure:0.85</p> | <p>-The original 4 factor structure of the PBQ scale was not confirmed.</p> <p>-A one-factor solution (with 16 items) is proposed (23.9% of the total variance).</p> <p>-According to the factor solution of Brockington and using his cut off points for Factor1 (≥ 12) and Factor 2 (≥ 17) they found a 7.1% rate of mothers with bonding impairment (CI 95% 5.5-9%).</p> |
| (Wittkowski, Wieck, & Mann, 2007) | UK | The psychometric properties of the MIB and the PBQ, were examined in a sample of first-time mothers in order to establish their reliability and validity. | 96 primiparous women from general population. | <p>-Two assessments were done for the MIB, the first immediately after birth (T1) and the second one at 2-4 days of postpartum (T2).</p> <p>-Spearman correlation coefficients were calculated to examine associations between the questionnaires and to determine convergent and concurrent validity.</p> <p><i>*No interview was used to identify mother-infant bonding disorders.</i></p> | <p>Total PBQ scale Cronbach's Alpha: 0.76.</p> <p>Subscales 1 (0.79), 2 (0.63) and 3 (0.63).</p> <p>Subscale 4 reported 0 variance.</p> <p>-For the MIB at Time 1:0.55, Time 2: 0.49.</p> | <p>-Significantly more positive feelings towards their baby at day 2-4 postpartum (Time 2) than immediately after birth (Time 1).</p> <p>-<i>Convergent and Concurrent validity:</i> MIB scores at Time 1 and 2 were significantly associated with each other ($p=0.505$, $p<0.01$, 2-tailed), sharing 25.5% of variance.</p> <p>-Significant positive correlations were also observed between PBQ and MIB scores at Time 1 ($p=0.378$, $p<0.01$, 2-tailed) and MIB scores at Time 2 ($p=0.300$, $p<0.01$, 2-tailed), which supports the convergent validity of these scales.</p> <p>-With the exception of risk of abuse, all PBQ subscales were significantly and positively correlated with each other and with the PBQ total score (all $p<0.01$).</p> |

Table 9. Validation studies for the Postpartum Bonding Questionnaire (PBQ) (Continuation...)

| Authors | Country | Objective | Population in which it was validated | Method | Reliability | Results |
|---|---------|--|---|--|---|---|
| (van Bussel, Spitz, & Demyttenaere, 2010) | Belgium | To study the reliability and validity of three self-report questionnaires: the MPAS, the PBQ and the MIBS. | 263 mothers participants at a routine antenatal clinical. | - A monocentric prospective observational cohort study. 263 mothers completed the three measures at 8–12 weeks (T4) and 202 mothers at 20–25 weeks (T5) postpartum. - PBQ thresholds: the PBQ thresholds described by Brockington et al. (2001, 2006) were used to differentiate participants with bonding problems. <i>*No interview was used to identify mother-infant bonding disorders</i> | Cronbach's alpha was calculated for T4 & T5 <i>PBQ</i> T4=0.87 T5=0.78 <i>MPAS</i> T4=0.75 T5=0.68 <i>MIBS</i> T4=0.67 T5=0.58 | -The internal reliabilities of the PBQ and the MPAS were high at T4 but dropped at T5. -Moderately strong correlations between the scales of the PBQ, the MPAS and the MIBS supported their construct validity. -The responses on the total PBQ and the MIBS at T5 were significantly lower compared to the responses at T4. -Moderate-to-strong correlations were found between the T4 and T5 scores of the total MPAS, the total PBQ and the MIBS. |
| (Wittkowski, Williams, & Wieck, 2010) | UK | To examine the factor structure and psychometric properties of the PBQ. | 132 women admitted to a Mother and Baby Unit for psychiatric inpatient treatment. | -A cross-sectional survey. -Mothers completed the PBQ and the Beck Depression Inventory (BDI-II) mean age of the baby of 3.07 months. -Confirmatory factor analysis (CFA) and exploratory factor analysis (EFA) techniques. -Principal component analyses. Varimax rotation was used to achieve a simple structure and to allow for comparison with other studies. <i>*No interview was used to identify mother-infant bonding disorders</i> | The internal consistency was calculated for the 3 factors that were confirmed with the EFA. <i>*Factor 1=0.94</i> <i>*Factor 2= 0.93</i> <i>*Factor 3=0.72</i> | -The original four-factor structure of the PBQ was not replicated by CFA and EFA in this sample. -A three-factor solution was identified as the most stable and clinically meaningful solution. Items pertaining to risk of abuse had to be omitted alongside one other item, resulting in a 22-item solution. -Factors pertaining to impaired bonding, anxiety and irritability, and anxiety about child care responsibilities were identified in the CFA but were not entirely replicated in the EFA. |
| (Siu, et al., 2010) | China | To validate the Chinese version of the PBQ. | 62 women with PPD at a Specialist Out-patient Psychiatrist Clinic during their first postpartum year. A mean of 16 weeks when the PBQ was administered. | -An expert panel evaluated the content validity and a focus group discussion explored the face validity and acceptability of the PBQ. -The cut-off points for the 4 scale scores and the total score suggested by Brockington et al. (2006b) were used. - <i>The mothers were interviewed with the Birmingham Interview</i> (5 th ed, Brockington et al., 2006a) as a gold standard -The EPDS and the BDI was also filled. | Not reported | -43 (69.4%) had mother-infant relationship impairment of any kind. -24% suffered mild impairment of mother-infant relationship. 1/3 (29.1%) of the participants felt rejection towards their infant. -With the total score of ≥ 26 for any type of bonding disorders, sensitivity=0.74 and a specificity= 1.0. -With the cut off ≥ 40 of the total score to identify severe disorders, the sensitivity=0.83 and specificity=0.96. |

Table 9. Validation studies for the Postpartum Bonding Questionnaire (PBQ) (Continuation...)

| Authors | Country | Objective | Population in which it was validated | Method | Reliability | Results |
|--|---------|--|--|---|--|---|
| (Høivik, Burkeland, Linaker, & Berg-Nielsen, 2013) | Norway | To examine, psychometric properties of the 10-item MABISC. | A total of 77 mothers from one of the six GP practices in Trondheim, Norway participated. | -Internal consistency, and convergent validity were calculated for the PBQ for convergent validity of the MABISC. -The MABISC, EPDS and PBQ were applied in the two times (T1: 2 months; T2: 4 months postpartum). <i>*No interview was used to identify mother-infant bonding disorders</i> | The internal consistency of the PBQ total score was Cronbach's alpha = 0.92. | -The PBQ reported significant correlations with the MABISC at T1 and T2 as well as with the EPDS, T1 and T2. |
| (Haneko & Honjo, 2014) | Japan | To examine the psychometric properties of the PBQ in Japanese mothers. | 1786 Japanese mothers, recruited during their infants' 3 months check-ups at a public health center. | -The PBQ and the EPDS were used. -Factor analysis with unweighted least-squares method. -To accurately determine the number of factors, they calculated the eigenvalues for each factor and examined a screen plot. <i>*No interview was used to identify mother-infant bonding disorders</i> | *25-item version Cronbach's alpha coefficient: .86. *16-item Japanese version: Cronbach's alpha coefficient: .85. | -The original 4 factor-structure was not confirmed. -A factor analysis with 16 items and Factor 1 had an eigenvalue of 5.02, (31.4% of the total variance). -Using the cut-off values of the original PBQ, the rate of bonding disorders was 5.3% for the total score and 7.7% using the cut off point for scale 1 (impaired bonding). |
| (Suetsugu, Honjo, Ikeda, & Kamibeppu, 2015) | Japan | To develop the Japanese version of the PBQ and to examine the scale structure of the PBQ among Japanese mothers. | N=244 mothers in local obstetric hospitals in Japan. | -The PBQ was administered to a cross-section of mothers 4 weeks after delivery (T1) and again 2 weeks later (T2) to 199 mothers as a retest to examine reliability. -Exploratory factor analysis were used to evaluate the factor structure of the PBQ. -Correlations with the Mother-to-Infant Bonding Scale (MIBS), the Maternal Attachment Inventory (MAI), Edinburgh Postnatal Depression Scale (EPDS), and socio-demographic variables were calculated. -Correlations and internal consistency (reliability & validity) were calculated with results of T1. <i>*No interview was used to identify mother-infant bonding disorders.</i> | At Time 1, the internal consistency of the PBQ was alpha = 0.842. | -A 14-item version of the PBQ was extracted by exploratory analysis consisted of four factors: 'impaired bonding', 'rejection and anger', 'anxiety about care', and 'lack of affection'. -Significant correlations of the total scores of the PBQ and the 14-item version of the PBQ positively with the MIBS and negatively with the MAI. -Moderate significant correlations with total scores were also found with the EPDS. *Did not explored the validity of the threshold. |

2.3.2. The Birmingham Interview for Maternal Mental health

The Birmingham Interview for Maternal Mental health [BIMMH] is one of the few interviews specifically designed to assess the emotional and psychosocial well being of the mother during pregnancy and the postpartum. There were conducted 100 interviews for the first three editions and later other international research centers translated the Interview in German, Arabic, Kannada, Chinese and Spanish. In 2006, the 5th edition of the BIMMH was published, by Ery Press with 16 authors collaborating on it (Brockington et al., 2006a) being a group of researchers and clinical professionals with wide expertise in perinatal mental health from different countries around the world (United Kingdom, China, Germany, India, Peru and Finland) under the coordination of Ian Brockington. The interview has a semi-structured format and was used as a gold Standard for the diagnosis of mother-infant bonding disorders in the validation studies of the PBQ (Brockington, Aucamp, & Fraser, 2006). This edition has also been used in several studies in New Zealand, India, Italy, Taiwan, Malta, Egypt and the United Kingdom. It has also been translated to nine languages for clinical and research purposes (Arabic, German, Italian, Japanese, Kannada, Maltese, Mandarin, Spanish and Polish) showing its utility in the assessment of a wide diversity of maternal mental health in women from different populations and cultures.

The main objective of the BIMMH is to explore the social, psychological and psychiatric course of the pregnancy, childbirth and the postpartum period. The BIMMH (5th ed.) is integrated by 120 compulsory probes and 175 ratings. It includes suggestions of questions and additional topics to be explored with the women. It can be developed in a retrospective form during the postpartum period, asking the mother aspects of her pregnancy and the parturition. Also it can be developed in 3 separate times, during pregnancy, after the childbirth and in the postpartum to assess the mother-infant early relationship. If developed in one single time it takes an average of two hours to complete. The interview assess 8 sections of the woman's mental health wellbeing:

1. Psychiatric and obstetric history
2. Social and psychological background to this pregnancy
3. Pre-partum psychiatric disorders
4. Parturition
5. Social and psychological background to the puerperium
6. Postpartum psychiatric disorders
7. Mother–infant relationship
8. Conclusion (Diagnosis and Treatment Plan)

Section seven from the BIMMH (5th ed.) is dedicated exclusively to explore the mother-infant early relationship during the first year of postpartum. This section can be conducted as a separate interview and includes 23 probes with its ratings. The ratings can also be added to produce a total

score for that section. The aspects are assessed according the mother's perspective and include topics such as the baby's temperament, her/ his development, the emotional response and involvement of the mother in the baby caretaking, the timing and quality of the feelings towards her baby, the presence of anxiety, anger and rejection towards the baby, as well as maternal abusive conduct, among others. The complete list of topics and ratings explored can be consulted in the Appendix 4.

The interview can be audio or videotape with the permission of the mother, if not the case, the interviewer must record in narrative the speech of the mother in each rating. The authors suggests to record verbatim the answers of the mother so that other rater can judge the nature and severity of the symptoms and the data provided by the mother in her own words and promote that pairs of raters rate independently and measure their reliability. In case that there are disagreements between the raters, consensus ratings should be obtained through agreement as the most efficient way to obtain reliability in the final diagnosis (Brockington, Roper, Edmunds, Kaufman, & Meltzer, 1992). This rating strategy also allows to compare results between mothers within a specific group or sample and also correct ratings contrasting the symptomatology seen in the whole group.

An updated version of the BIMMH, the sixth Edition was developed at the end of 2014, now called the Stafford Interview with new ratings (Brockington, Chandra, Bramante, Dubow, Fakher, García-Esteve, Palacios-Hernández, Parfitt, Shieh, 2014, unpublished).

3.RESEARCH DEVELOPMENT

3.1. Description of the research activities

Studies related to mother-infant bonding in mothers with mental health disorders is less frequent since the access to this population can be a challenge outside specialized mother-baby units that are still very few around the world and non-existent in Spain. The existence of one of the few Perinatal Psychiatry Program in Spain in a Teaching Hospital where clinical intervention and research are developed provided the opportunity to have access to a clinical sample and develop a comparative study of the factors related with mother-infant bonding disorders in this type of population.

The present doctoral thesis was developed as a result of a collaboration of the “Vulnerability, Psychopathology and Gender Research Group” from the Universitat Autònoma de Barcelona with the research group of perinatal mental health and gender from the Perinatal Psychiatry Program in the Hospital Clinic Universitari in Barcelona, Spain. The findings reported in this doctoral thesis include research activities that form part of larger previous research projects related with postpartum depression and maternal mental health. For that reason the activities reported in the studies are a result of a joint collaboration with the research groups to extend the knowledge of postpartum depression towards mother-infant bonding. To fulfill the specific objectives of the study the research activities were organized in three consecutive studies, each one with a specific methodological design and sample of mothers. The studies and a description of the main research activities developed are detailed below.

Study 1: Assessment of psychometric properties of the Postpartum Bonding Questionnaire (PBQ) in Spanish mothers.

To have a reliable instrument to assess bonding disorders in the Spanish mothers was a priority for the study. The assessment of a large sample of mothers from both general and clinical samples was able through a joint collaboration of two research groups that already had started this task. This study allowed the integration and completion of the final data base, collaboration with the data analysis and the writing of the final report.

Study 2: Severity of postpartum depressive episode and early mother-infant bonding disturbances

A previous larger study focused in postpartum depression allowed the identification and analysis of mother-infant disturbances using the Spanish version of the PBQ in a specific sample of

mothers with a clinical diagnosis of a major depressive episode in the early postpartum. The integration of the database through the examination of clinical records, as well as the data analysis and the writing of the final report were the main research activities of this study. Study 2 enable the identification of the prevalence of MIBD in depressed mothers and the differences between depressed mothers with a bonding disorders and those with normal bonds.

**Study 3: Assessment of mother-infant bonding in mothers with mental health disorders:
A comparison of the Spanish version of the PBQ with the MPAS and MIBS.**

This last study allowed the design and implementation of an assessment protocol for mother-infant bonding and the identification of a bonding disorder in a clinical sample. This was an opportunity to compare the psychometric properties of three self-report questionnaires that assess mother-infant bonding and their utility in clinical samples. The assessment included a specialized interview designed to assess the relationship between the mother and her baby and self-report additional bonding measures that were all translated to Spanish. Mothers with mental health disorders in the postpartum were assessed, interviewed with their babies and diagnosed with a bonding disorder if any. The results also allowed a preliminary validation of the cut off points of the Spanish version of the PBQ, MPAS and MIBS using the interview as the 'gold standard' as well as a more detailed exploration of the bonding process in mothers with mental health disorders. Additionally the study enable to implement and demonstrate the utility of a specific assessment strategy designed with research evidence in a clinical setting.

The objectives, hypothesis, summaries and results of each study are detailed in the following sections.

3.2. Objectives and Hypothesis

Main Objective

The present doctoral thesis had as the **main objective** to study the mother-infant bonding in women that does and does not suffer from postpartum depression in their early postpartum.

Specific Objectives and Hypothesis

To fulfill the main objective three specific studies previously described were developed. The **specific objectives and hypothesis** are presented for each one of the studies.

3.2.1. Study 1: Assessment of psychometric properties of the Postpartum Bonding Questionnaire (PBQ) in Spanish mothers.

Specific Objective:

- To assess the psychometric properties of the Spanish version of the PBQ in a sample of Spanish postpartum women.

Hypothesis:

- The Postpartum Bonding Questionnaire (PBQ, *Brockington et al, 2001*) has good psychometric properties as an instrument to identify risk for bonding disturbances in Spanish mothers during their early postpartum period.

3.2.2. Study 2: Severity of postpartum depressive episode and early mother-infant bonding disturbances

Specific Objectives:

- To estimate the prevalence of mother-infant bonding disturbances in a sample of depressed mothers at 4-6 weeks of postpartum.
- To identify the socio-demographic, reproductive and mental health characteristics that are risk factors for bonding disturbances in depressed mothers at 4-6 weeks of postpartum.

Hypothesis:

- Mothers with postpartum depression and a mother-infant bonding disturbances will report a higher frequency of sociodemographic, obstetric and mental health risk factors than mothers without bonding disturbances with postpartum depression in the early postpartum.

3.2.3. Study 3: Assessment of mother-infant bonding in mothers with mental health disorders: A comparison of the Spanish version of the PBQ with the MPAS and MIBS.

Specific Objectives:

- To estimate and compare the validity, reliability and most adequate cut off points for the Spanish version of the PBQ, MPAS and MIBS to screen for mother-infant bonding disturbances using the Birmingham Interview for Maternal Mental health (5th ed. Brockington et al, 2006a) as the gold standard in mothers with mental health disorders.
- To analyze the characteristics of the mother-infant bonding in mothers with a mental health disorder during the postpartum.

Hyphotesis

- The PBQ will report good screening properties to identify the risk for a mother-infant bonding disorder in mothers with mental health disorders.
- The MPAS will report good screening properties to identify the risk for a mother-infant bonding disorder in mothers with mental health disorders.
- The MIBS will report good screening properties to identify the risk for a mother-infant bonding disorder in mothers with mental health disorders.
- Mothers with mental health disorders and a mother-infant bonding disorder will present significant differences in sociodemographics, reproductive and mental health characteristics, adult attachment and mental health symptomatology when compared with mothers with mental health disorders and a normal bond with their babies.

3.3. Summaries of Studies

Since each study had a different methodology and population, a summary that describes the purpose, method and main results of each study is presented below.

3.3.1. Study 1: Assessment of psychometric properties of the Postpartum Bonding Questionnaire (PBQ) in Spanish mothers.

Summary

Background and Purpose: The Postpartum Bonding Questionnaire (PBQ) was developed to assess mother-infant bonding disturbances in the postpartum period. The aim of this study was to examine the psychometric properties of the Spanish version of the PBQ in a sample of Spanish postpartum women.

Methods: Eight hundred forty mothers were recruited in the postpartum visit (4-6 weeks after delivery): 513 from a Gynecology Unit (forming the general population sample), and 327 mothers from a Perinatal Psychiatry Program (forming the clinical sample). All women were assessed by means of the Edinburgh Postnatal Depression Scale (EPDS) and the Postpartum Bonding Questionnaire (PBQ).

Results: Neither the original four-factor structure nor alternative structures (Reck et al. 2006; Wittkowski et al. 2010) were replicated by the Confirmatory Factor Analyses. An Exploratory Factor Analysis showed a four-factor solution. The Schmid-Leiman transformation found a *general factor* that accounted for 61% of the variance of the PBQ. Bonding impairment showed higher associations with depressive symptomatology in both samples.

Conclusions: The Spanish version of the PBQ showed adequate psychometric properties for use with clinical and general populations of Spanish postpartum women. The results suggest that the PBQ could be summarized by a general factor, and confirm the utility of the use of the total score for detecting bonding impairment.

3.3.2. Study 2: Severity of postpartum depressive episode and early mother-infant bonding disturbances

Summary

Background: Studies have confirmed the negative effect of depression in early maternal relationship with her newborn with high prevalence for mother-infant bonding disturbances (MIBD)

in mothers with postpartum depression. Nevertheless, there is still less information about what differences depressed mothers with a MIBD from those with normal bonds with their babies.

Method: A cross-sectional study was developed with the aims a) to estimate the prevalence of MIBD in women diagnosed with a major depressive episode (MDE) and, b) to identify the socio-demographic, reproductive and mental health risk factors associated with bonding disturbances. Seventy-seven consecutive MDE women diagnosed using the semi-structural clinical interview (SCID-I) (DMS-IV-TR) at 4-6 weeks postpartum. All mothers filled self-rate questionnaires related to mother-infant bonding (PBQ), depressive symptoms (EPDS), anxiety (STAI-S) and general mental health problems (GHQ-12) among other data.

Results: Thirty-four percent of depressed mothers reported some type of MIBD (PBQ ≥ 26). Univariate analysis showed that EPDS items 7 and 9 and PBQ item 24 were associated with high-risk bonding difficulties. Multivariate analyses identified that a higher severity of depressive symptoms in postpartum (0.85, 95%CI: 0.25-1.45) and not breastfeeding (7.99, 95%CI: 0.29-15.69) were significant risk factors for a MIBD.

Limitations: The design of the study was cross-sectional limiting any inference for causal relationships.

Conclusion: Results highlight the importance of early assessment of MIBD in depressed mothers. We encourage the use of the PBQ and EPDS together in clinical settings and specific interventions to strengthen the interaction between mothers and their infants specially if the intensity of depressive symptoms is high and artificial feeding is to be elected.

3.3.3. Study 3: Assessment of mother-infant bonding in mothers with mental health disorders: A comparison of the Spanish version of the PBQ with the MPAS and MIBS.

Summary

Background: The *Postpartum Bonding Questionnaire* (PBQ), the *Maternal Postpartum Attachment Scale* (MPAS) and the *Mother-to-infant Bonding Scale* (MIBS) are three of the most used self-reports questionnaires to assess mother-infant bonding difficulties with adequate psychometric properties reported in several countries. Nevertheless their design and characteristics differ from each other and the validation of the cut-off points in Spanish postpartum mothers for its use in clinical settings has not been done. The identification of the qualities of reliable measures could facilitate professional early identifications of mother-infant bonding disturbances (MIBD) and interventions.

Method: Forty-five mothers with mental health disorders were recruited to compare the PBQ, MPAS and MIBS validity and reliability and estimate their optimal cut off points to screen for MIBD

with a clinical interview as the 'gold standard'. Characteristics of the mother-infant bonding in a clinical sample were also identified.

Results: All measures reported good validity and reliability rates and cut off points for each are suggested for its use in clinical samples. The PBQ reported the highest screening qualities and reliability. The intensity of mental health disorders was associated with bonding disturbances and specific associations of depression and anxiety were found with particular bonding difficulties.

Limitations: The size of the sample and the absence of mothers with severe bonding disorders limits the generalization of the findings.

Conclusion: An early assessment at 4-6 weeks postpartum appears to be the optimal choice to assess high-risk mothers with mental health disorders and support them in their early relationship with their babies through specific interventions.

4.RESULTS

4.1. Study 1

Assessment of psychometric properties of the Postpartum Bonding Questionnaire (PBQ) in Spanish mothers.

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Introduction

One of the most important processes in the postpartum period is the development of mother-infant bonding (Brockington 2004; Brockington 2011). Taylor uses the term “bonding” to describe how the mother feels towards her infant. The term refers to the unique emotional tie between the mother and her infant and is characterized by positive feelings, emotional warmth and affection towards the child (Taylor et al. 2005); it differs from attachment, which includes the infant’s behavior towards the mother (Taylor et al. 2005; Tietz et al. 2014). This relationship is particularly relevant because much of the growth and maturation of the human brain is postponed until the postpartum period; the brain must develop in a social environment focused initially on the primary caregiver, usually the mother (Broad et al. 2006). The mother-infant bond provides an attachment figure for the baby, which will be the basis for future social ties (Yarrow 1972) and keep the baby protected and safe – a fundamental parental function for child survival (Bowlby 1982). Mäntymaa suggests that good-quality mother-infant interaction behavior facilitates the infant’s later socio-emotional, behavioral and cognitive development and is even related to the child’s physical health (Mäntymaa 2006, cited by Korja et al. 2012). Disruption of mother- infant bonding affects the infant neurobehavioral development: in animal models it has demonstrated long-lasting effects on socio-emotional behaviors such as anxiety-like and maternal behaviors (Mogi et al. 2011). Fonagy stressed the importance of the parent-infant relationship for the emergence of mentalizing (imaginative mental activity, namely, perceiving and interpreting human behavior), a capacity with a social-cognitive basis (Fonagy et al. 2012). Consequently, it is widely accepted that early impaired bonding is a risk factor for infant development.

In recent years, specific instruments have been developed and validated to detect and prevent bonding disorders. Among the most useful and frequently applied assessment strategies are the

self-administered scales that allow an evaluation of mothers' emotional responses to their babies (Taylor et al. 2005). These instruments include the Maternal Postpartum Attachment Scale (MPAS: Condon and Corkindale 1998), the Postpartum Bonding Questionnaire (PBQ: Brockington et al. 2001), the Mother-to-Infant Bonding Scale (MIBS) (Taylor et al. 2005) and Zeanah's Working Model of the Child Interview (Zeanah and Benoit 1995). There are also confirmatory interviews such as The Yale Inventory of Parent Thoughts and Actions (YIPTA: Leckman et al. 1994) and The Birmingham Interview for Maternal Mental health (BIMMH: Brockington et al. 2006b). Validation of instruments measuring mother-child bonding disorders in different countries facilitates detection and early intervention, and also the comparison of results between studies.

Of the existing instruments we have focused on The Postpartum Bonding Questionnaire (PBQ) (Brockington et al. 2001), for several reasons. This reliable, validated tool is widely used in a number of countries for identifying problems in the mother-infant relationship during the postpartum period. It is based on clinical experience and is very easy to apply. The PBQ was designed in the United Kingdom by Brockington and colleagues in 2001. Originally composed of 84 items, the final version of the instrument has 25. It is designed to investigate mothers' feelings about their babies and their recent postpartum experience. The items measure the frequency of maternal feeling scored on a six-point scale from 0 to 5 with six options: "always", "very often", "quite often", "sometimes", "rarely" and "never". The final 25 items were selected from a factor analysis with orthogonal varimax rotation from the combined 84 items. The four final scales were responsible for 50% of the variance: Scale 1, a general factor termed Impaired Bonding (34% of the variance) consisted of 12 items; Scale 2, Rejection and anger (8% of the variance) comprised seven items; Scale 3, Anxiety about care (3.7% of the variance) comprised four, and Scale 4, Risk of abuse (3.4% of the variance) consisted of two. Brockington and colleagues conducted two studies validating the PBQ (Brockington et al. 2001; Brockington et al. 2006c). In 2001, 104 mothers were recruited from various sources, including general populations from maternity clinics, mothers with babies with some abnormality, high-risk pregnancies, mothers with a depressive disorder but with a normal mother-infant relationship, and mothers with a bonding disorder. Fifty-one of these mothers were interviewed using as a gold standard the Third edition of the Structured Interview for pregnancy-associated disorders (which later became the BIMMH), in order to diagnose the existence of bonding disorders and to determine cut-off scores. The cut-off scores used for each scale were: Scale 1 >12, Scale 2 >16, Scale 3 >9 and Scale 4 >2. In the 2006 study, 125 mothers were recruited from other specialists and all showed some type of mother-infant bond disorder and other comorbid mental disorders (depression, anxiety, post-traumatic stress disorder and obsessive). All mothers were interviewed using the Fifth edition of the BIMMH. As a result of this second validation, the authors suggested adjusting the cut-off points of Scale 2, >12, and Scale 4 >1. In addition, the total score ranged from 0 to 125. A general cut off score of 26 was proposed to identify "any type of bonding disorder" and a cut off ≥ 40 to identify severe disturbances.

Since its publication, the instrument has been used in other locations (Edhborg et al. 2005; Muzik et al. 2013), and so far has been translated and validated in Germany (Reck et al. 2006), China (Siu et al. 2010), Belgium (van Bussel et al. 2010) and used to validate other instruments related to the assessment of maternal-infant relationships (Wittkowski et al. 2007; van Bussel et al. 2010; Høivik et al. 2013). However, later validation studies have not been able to replicate its factor structure (Reck et al. 2006; Wittkowski et al. 2010). Reck et al. (2006) carried out a factor analysis obtaining a one-factor model and a new 16 item version, most of which loaded on the general factor of "Impaired bonding". Wittkowski et al. (2010) removed items from Scale 4 and found a new structure with three factors, partially related to Brockington's first, second and third factors, although the assignment of items to each factor was slightly different.

The PBQ has proven to be useful in several clinical populations such as mothers suffering from depression (Hornstein et al. 2006; Moehler et al. 2006; Noorlander et al. 2008) or posttraumatic stress disorder (PTSD) (Ayers et al. 2007; Parfitt and Ayers 2009). PTSD has a negative effect on parental bonding (Parfitt and Ayers 2009), and depression in the early postnatal period has shown long-term effects in the mother-infant bonding process (Moehler et al. 2006). Depressive mothers perceive their bonding to the infant more negatively than mothers suffering of psychosis (Hornstein et al. 2006; Noorlander et al. 2008). Interestingly, in contrast to women with postpartum psychosis, the subjective experience of bonding in depressed women correlates with the observation of mother-infant interaction (Noorlander et al. 2008). This finding reinforces the use of both subjective measures of bonding, and objective measures of mother-infant interaction.

Due to the need to assess these disorders in Perinatal Mental health Programs in Spain, it is essential to have valid, reliable tools to evaluate mother-infant bonding disorders in the Spanish population. At present, there is no Spanish-language instrument for identifying problems in the mother- infant relationship during postpartum which can guide early diagnosis and treatment or can be used in the investigation of the factors associated with this disorder. The present study was conducted with the aim of assessing the psychometric properties of the Spanish version of the PBQ in a sample of Spanish women during postpartum period.

Method

Participants and Procedure

Participants were 840 mothers recruited in the postpartum visit (4-6 weeks postpartum), over a five-year period (2008-2013). A sample of mothers was recruited from the general population (n=513) attended at a Gynecology Unit, and a clinical sample (n=327) comprising mothers

enrolled on a Perinatal Psychiatry Program treated for a psychiatric disorder during their pregnancy or in the postpartum period.

The mean age of the mothers was 34 years (SD = 4.5; range 18-50). The majority (98%) had a partner at the time of the evaluation. The average number of children per mother was 1.5; primiparous women represented the largest group (58.2%), followed by mothers with two children (35.3%) and those with three children (5.8%). The entire range was one to five children. Some form of assisted reproduction had been required in 12.1% of the mothers. Clinical sample mothers, when compared with the general population sample, had more children (1.7 ± 0.79 vs. 1.5 ± 0.66 ; $t[477.6] = 4.22$, $p < 0.001$), and had more frequently no partner at the time of the evaluation (4.7% vs. 1%; $p < 0.01$, Fisher's Exact Test). Mothers from the general population required some form of assisted reproduction more frequently than clinical sample mothers (15.7% vs. 4.6%; $p < 0.001$, Fisher's Exact Test). There were no differences between the samples in mean age.

Approval was obtained from the institutional review board, and all women provided written informed consent before entering the study. Once enrolled, at the postpartum visit (between four and six weeks postpartum), the Edinburgh Postnatal Depression Scale (EPDS) was administered to assess current depressive symptoms, and the PBQ to assess disturbances in the mother-infant bond. Socio-demographic information was also recorded.

Instruments

Postpartum Bonding Questionnaire (PBQ, Brockington et al. 2001): this instrument was used to assess mother-infant bonding. It assesses the risk of presenting disorders in the mother-infant relationship during the postpartum period and includes four subscales with a total of 25 items which are rated by the mother on a 0-5 scale. The subscales are: general factor, rejection and pathological anger, infant-focused anxiety and incipient abuse scale. The PBQ was translated to Spanish by the translation-retranslation method recommended for cross-cultural studies (Brislin 1970).

Edinburgh Postnatal Depression Scale (Cox et al. 1987): a 10-item scale designed to assess the presence of postpartum depression. Each item is scored on a 4-point scale (from 0-3), with the total score ranging from 0 to 30. The Spanish validation obtained a cut off point of ≥ 11 to identify the presence of postpartum depression (Garcia-Esteve et al. 2003).

Socio-demographic data. Mothers completed a form which records information on sociodemographic and obstetric variables and affective disorders throughout life and during pregnancy.

Statistical analyses

Analyses were performed using the SPSS (version 18.0) software program, and M-Plus 3.0 (Muthén and Muthén 1998). The latter was used to conduct the confirmatory factor analyses (CFA). A series of CFA, using the maximum likelihood procedure as the technique for parameter estimation (Hoyle 1995), was carried out to test the factor structures proposed by previous studies (Brockington et al. 2001; Reck et al. 2006; Wittkowski et al. 2010). Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Relative chi-square (χ^2 / df) were used in the present study as fit indices. As rules of thumb, CFI and TLI values ≥ 0.90 , RMSEA values ≤ 0.05 , and χ^2/df ratios < 3 are indicators of a good model fit (Hoyle and Painter 1995; Kline 1998; Byrne 2001).

A series of Exploratory Factor Analyses (EFA) was performed using the principal components extraction method and retaining different numbers of factors (from two to five), and then rotated using the oblique promax method. The number of factors was determined by inspecting the scree plot and by considering the criteria of interpretability. The agreement between factor loadings of the two samples was analyzed with Tucker's congruence index (Lorenzo-Seva and ten Berge 2006). Subsequently, we performed a second-order analysis. A principal component analysis of the first order factor correlation was conducted, and Schmid-Leiman transformation was computed (Schmid and Leiman 1957), using the SPSS syntax provided by Wolff and Preising (2005).

Inter-correlations between factors were computed by means of Pearson correlations, and the agreement between factor loadings was analyzed using congruence coefficients. Cronbach's alpha coefficients as well as the correlations of each item with their corrected scale were calculated to assess the internal consistency. The association between depressive symptomatology and impaired bonding was analyzed by means of Pearson correlation, Chi-Square test or Student's t-test as appropriate.

Results

Confirmatory Factor Analysis

Table 1 shows the fit indices corresponding to the four-factor model proposed by the original author (Brockington et al. 2001; Brockington et al. 2006c), Wittkoski's three-factor model (2010), and the one-factor model proposed by Reck et al. (2006). The Table shows the fit indices for the total sample, the general population sample and the clinical sample. None of the models achieved satisfactory index-of-fit indices.

Table 1. *Fit indices from Confirmatory Factor Analysis for the proposed models*

| Model | χ^2 | | χ^2 / df | CFI | TLI | RMSEA | 95% CI |
|---------------------------|----------|-----|---------------|-----|------|-------|---------|
| Total sample | | | | | | | |
| 4f model (Brockington) | 2422.15 | 269 | 9.0 | 0.7 | 0.69 | 0.100 | 0.096 - |
| 3f model (Wittkoski) | 1943.40 | 186 | 10. | 0.7 | 0.70 | 0.109 | 0.104 - |
| 1f model (Reck) | 1324.66 | 104 | 12. | 0.7 | 0.71 | 0.121 | 0.115 - |
| General population | | | | | | | |
| 4f model (Brockington) | 1536.88 | 269 | 5.7 | 0.6 | 0.55 | 0.098 | 0.093 - |
| 3f model (Wittkoski) | 1124.43 | 186 | 6.0 | 0.6 | 0.58 | 0.101 | 0.096 - |
| 1f model (Reck) | 680.10 | 104 | 6.5 | 0.6 | 0.60 | 0.106 | 0.098 - |
| Clinical sample | | | | | | | |
| 4f model (Brockington) | 1334.34 | 269 | 4.9 | 0.7 | 0.68 | 0.113 | 0.107 - |
| 3f model (Wittkoski) | 1083.63 | 186 | 5.8 | 0.7 | 0.69 | 0.125 | 0.118 - |
| 1f model (Reck) | 749.76 | 104 | 7.2 | 0.7 | 0.68 | 0.141 | 0.132 - |

df = degrees of freedom; χ^2 / df = Relative chi-square; CFI = Comparative Fit Index; TLI: Tucker-Lewis Index; RMSEA= Root Mean Square Error of Aproximation; CI= Confidence Interval

Exploratory Factor Analysis

Since no model confirmed the original structure of the PBQ, we conducted a series of exploratory factor analyses, extracting a different number of factors. The Kaiser-Meyer-Olkin coefficient was 0.92, suggesting a good fit of the data to the factor analysis; the Bartlett's test of sphericity was significant ($p < 0.001$), which indicates that there were significant relationships between the items. The factor analysis revealed five factors with eigenvalues higher than 1, while the inspection of the scree plot suggested the extraction of two to five factors. Consequently, careful analysis of factor solutions (between two and five factors) resulted in the selection of the four-factor solution based on psychological interpretability. The four-factor solution accounted for 52.9% of common variability in the total sample (factor 1: 33.2%, factor 2: 9.4%; factor 3: 5.7%; factor 4: 4.6%) (Table 2). The scale loading pattern of each factor was different from Brockington's model. The first factor, which described signs of impaired bonding, included eight items (Q1, Q2, Q3, Q15, Q16, Q17, Q22 and Q23) which reflected topics such as emotional distance, regret about having the baby, unavailability to take care of the baby, or nostalgia for earlier times when the baby was not yet born. The second factor, related to anxiety about care, comprised eight items (Q7, Q10, Q12, Q13, Q19, Q20, Q21 and Q25) referring to maternal distress ("My baby cries too much", "My baby makes me feel anxious", "I am afraid of my baby" or "My baby irritates me"). The third factor included items which identify a lack of enjoyment and affection for the baby (inversely scored: "I love to cuddle my baby", "I love my baby to bits", "My baby is the most beautiful in the world", "I enjoy playing with my baby" and "I feel happy when my baby smiles or laughs"). This third factor includes five items, of which three belong to the first original factor (Q4, Q8, Q9, Q11 and Q16). The fourth and last factor describes rejection and risk of abuse, and includes four items related to negative feelings regarding their

babies and behaviors that puts the baby’s welfare at risk (Q14, Q15, Q18 and Q24) (“I feel angry with my baby”, “I resent my baby”, “I have done harmful things to my baby” and “I feel like hurting my baby”). Congruence coefficients between sample pairs of factors were: factor 1 (0.75), factor 2 (0.98), factor 3 (0.43) factor 4 (0.62). The congruence coefficients were low for all factors with the exception of factor 2, related to anxiety about care.

Table 2. Factor loadings of the first four components obtained in the Exploratory Factor Analysis

| PBQ | Total Sample | | | | General Population Sample | | | | Clinical Sample | | | |
|-------------------------|--------------|-------------|-------------|-------------|---------------------------|-------------|-------------|-------------|-----------------|-------------|-------------|-------------|
| | Factor | Factor | Factor | Factor | Factor | Factor | Factor | Factor | Factor | Factor | Factor | Factor |
| Q1 | 0.68 | 0.02 | 0.18 | -0.18 | 0.52 | 0.02 | 0.37 | -0.12 | 0.88 | -0.04 | -0.08 | -0.02 |
| Q2 | 0.71 | 0.17 | -0.09 | -0.07 | 0.49 | 0.13 | 0.00 | 0.07 | 0.64 | 0.23 | -0.02 | -0.01 |
| Q3 | 0.75 | 0.06 | -0.04 | -0.11 | 0.62 | -0.02 | 0.14 | -0.06 | 0.86 | 0.07 | -0.23 | 0.11 |
| Q4 | 0.24 | -0.06 | 0.62 | 0.04 | -0.01 | -0.04 | 0.40 | 0.38 | 0.54 | -0.07 | 0.41 | -0.11 |
| Q5 | 0.82 | -0.16 | 0.02 | 0.04 | 0.74 | -0.04 | -0.22 | -0.06 | 0.70 | -0.15 | 0.20 | 0.13 |
| Q6 | 0.78 | -0.05 | -0.05 | -0.03 | 0.45 | 0.07 | 0.01 | 0.12 | 0.70 | -0.10 | 0.13 | 0.05 |
| Q7 | 0.00 | 0.64 | -0.26 | 0.09 | -0.06 | 0.75 | -0.22 | -0.05 | -0.08 | 0.53 | -0.03 | 0.19 |
| Q8 | 0.03 | 0.01 | 0.73 | 0.09 | 0.19 | -0.05 | 0.46 | 0.22 | 0.22 | 0.05 | 0.66 | -0.25 |
| Q9 | 0.13 | -0.12 | 0.71 | 0.10 | -0.15 | -0.15 | 0.75 | -0.05 | 0.21 | -0.07 | 0.76 | -0.15 |
| Q10 | 0.00 | 0.73 | 0.06 | 0.10 | 0.01 | 0.71 | 0.00 | 0.03 | -0.05 | 0.78 | 0.18 | -0.02 |
| Q11 | 0.24 | 0.06 | 0.61 | -0.13 | -0.03 | -0.01 | 0.75 | 0.11 | 0.62 | 0.04 | 0.19 | -0.15 |
| Q12 | -0.14 | 0.81 | 0.01 | -0.01 | -0.15 | 0.78 | 0.00 | 0.03 | -0.09 | 0.82 | -0.05 | -0.10 |
| Q13 | 0.37 | 0.45 | -0.11 | 0.05 | 0.15 | 0.46 | -0.08 | 0.23 | 0.20 | 0.53 | 0.06 | -0.04 |
| Q14 | 0.00 | 0.22 | -0.02 | 0.66 | 0.06 | 0.35 | -0.08 | 0.48 | -0.34 | 0.22 | 0.69 | 0.32 |
| Q15 | 0.33 | -0.14 | 0.06 | 0.59 | 0.36 | -0.14 | -0.07 | 0.57 | -0.03 | -0.04 | 0.72 | 0.29 |
| Q16 | -0.23 | -0.01 | 0.77 | 0.00 | -0.06 | -0.03 | 0.52 | 0.06 | 0.03 | -0.04 | 0.63 | -0.29 |
| Q17 | 0.71 | -0.29 | -0.09 | 0.27 | 0.87 | -0.21 | -0.11 | -0.10 | 0.39 | -0.27 | 0.36 | 0.35 |
| Q18 | -0.31 | 0.14 | 0.16 | 0.59 | 0.00 | 0.02 | 0.10 | 0.63 | -0.11 | 0.16 | -0.03 | 0.56 |
| Q19 | 0.03 | 0.79 | 0.01 | 0.03 | -0.05 | 0.78 | 0.06 | -0.08 | 0.03 | 0.83 | 0.01 | 0.05 |
| Q20 | 0.33 | 0.50 | -0.07 | -0.05 | 0.15 | 0.59 | -0.12 | -0.07 | 0.36 | 0.49 | -0.03 | -0.06 |
| Q21 | 0.21 | 0.40 | 0.07 | 0.28 | 0.17 | 0.43 | -0.02 | 0.16 | 0.14 | 0.48 | 0.27 | 0.16 |
| Q22 | 0.49 | 0.27 | 0.14 | -0.13 | 0.25 | 0.25 | 0.46 | -0.22 | 0.66 | 0.25 | -0.09 | 0.09 |
| Q23 | 0.66 | 0.14 | 0.05 | -0.03 | 0.57 | 0.13 | 0.07 | 0.01 | 0.60 | 0.18 | 0.09 | 0.03 |
| Q24 | -0.03 | -0.06 | -0.06 | 0.65 | -0.25 | -0.08 | 0.05 | 0.77 | 0.23 | -0.08 | -0.20 | 0.79 |
| Q25 | -0.16 | 0.70 | 0.16 | -0.10 | -0.18 | 0.59 | 0.29 | -0.10 | 0.09 | 0.71 | -0.18 | 0.00 |
| Non-rotated eigenvalues | 8.30 | 2.34 | 1.43 | 1.16 | 5.83 | 2.27 | 1.67 | 1.40 | 9.24 | 2.35 | 1.60 | 1.21 |

PBQ= Postpartum Bonding Questionnaire. Factor loadings ≥ 0.40 are printed in bold.

Intercorrelations among the factors

The intercorrelations between the four new factors obtained in the Exploratory Factor Analysis in the total sample, general population, and clinical sample are displayed in Table 3. In general, we observed a high correlation between the factors, obtaining values from 0.43 to 0.67 in the total sample. In the clinical sample, intercorrelations between factors were higher than those observed in the general population sample.

Table 3. *Intercorrelations between the factors obtained in the Exploratory Factor Analysis*

| | Factor1 | Factor2 | Factor3 |
|----------------------------------|---------|---------|---------|
| Total sample | | | |
| Factor2 | 0.56*** | | |
| Factor3 | 0.67*** | 0.42*** | |
| Factor4 | 0.47*** | 0.41*** | 0.43*** |
| General population sample | | | |
| Factor2 | 0.45*** | | |
| Factor3 | 0.45*** | 0.29*** | |
| Factor4 | 0.44*** | 0.38*** | 0.33*** |
| Clinical sample | | | |
| Factor2 | 0.61*** | | |
| Factor3 | 0.70*** | 0.45*** | |
| Factor4 | 0.44*** | 0.40*** | 0.43*** |

*** $p < 0.001$

Schmid-Leiman Transformation

To test the possibility of a general factor (already suggested by Reck et al. 2006) due to the high correlations between the four new factors identified by the exploratory analysis, we conducted a Schmid- Leiman transformation (1957), a procedure which estimates the percentage of variance explained by the general factor. The results are shown in Table 4, where a general factor is reflected with 22 items of the 25 that reported saturations higher than .41. In the total sample, a second-order General Factor [GF] accounted for 61% of the variance, and the four primary factors accounted for the remaining 39%. These results support the idea that the best solution is to consider one general factor which explains most of the variance of the PBQ.

Reliability

Table 5 displays the reliability results of the PBQ's Spanish version. Cronbach's alpha coefficients in the total sample were 0.90 for the General Factor (PBQ total score), and ranged from 0.56 to 0.85 for the four new primary factors. In the total sample, all corrected item-scale correlations were ≥ 0.30 , with the exception of item 18, "I have done harmful things to my baby".

Table 4. Estimated parameters of a hierarchical model using Schmid-Leiman Transformation

| 2nd order | Total sample | | | | General population sample | | | | Clinical sample | | | | | | |
|-----------|--------------|-------------|-------------|-------------|---------------------------|-------------|-------------|-------------|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 1st order | | | | 2nd order | | | | 1st order | | | | | | |
| | Factor1 | Factor2 | Factor3 | Factor4 | Factor1 | Factor2 | Factor3 | Factor4 | Factor1 | Factor2 | Factor3 | Factor4 | | | |
| Q1 | 0.63 | 0.34 | 0.02 | 0.11 | -0.14 | 0.60 | 0.32 | 0.01 | 0.28 | -0.09 | 0.62 | 0.51 | -0.03 | -0.05 | -0.02 |
| Q2 | 0.62 | 0.36 | 0.13 | -0.05 | -0.05 | 0.53 | 0.30 | 0.10 | 0.00 | 0.06 | 0.67 | 0.37 | 0.15 | -0.01 | -0.01 |
| Q3 | 0.59 | 0.38 | 0.04 | -0.03 | -0.09 | 0.52 | 0.38 | -0.02 | 0.10 | -0.05 | 0.62 | 0.49 | 0.05 | -0.13 | 0.10 |
| Q4 | 0.69 | 0.12 | -0.04 | 0.38 | 0.03 | 0.48 | -0.01 | -0.03 | 0.30 | 0.29 | 0.69 | 0.31 | -0.05 | 0.23 | -0.10 |
| Q5 | 0.64 | 0.41 | -0.12 | 0.01 | 0.03 | 0.37 | 0.46 | -0.03 | -0.16 | -0.05 | 0.68 | 0.40 | -0.10 | 0.11 | 0.12 |
| Q6 | 0.58 | 0.39 | -0.04 | -0.03 | -0.02 | 0.49 | 0.28 | 0.05 | 0.01 | 0.09 | 0.62 | 0.40 | -0.07 | 0.07 | 0.05 |
| Q7 | 0.29 | 0.00 | 0.46 | -0.16 | 0.07 | 0.31 | -0.03 | 0.53 | -0.16 | -0.04 | 0.38 | -0.04 | 0.36 | -0.02 | 0.17 |
| Q8 | 0.68 | 0.02 | 0.01 | 0.45 | 0.07 | 0.57 | 0.12 | -0.04 | 0.34 | 0.17 | 0.66 | 0.13 | 0.03 | 0.37 | -0.23 |
| Q9 | 0.66 | 0.07 | -0.09 | 0.43 | 0.08 | 0.24 | -0.09 | -0.10 | 0.55 | -0.04 | 0.69 | 0.12 | -0.05 | 0.43 | -0.13 |
| Q10 | 0.62 | 0.00 | 0.53 | 0.04 | 0.08 | 0.53 | 0.01 | 0.51 | 0.00 | 0.02 | 0.68 | -0.03 | 0.53 | 0.10 | -0.02 |
| Q11 | 0.66 | 0.12 | 0.05 | 0.37 | -0.10 | 0.54 | -0.02 | -0.01 | 0.55 | 0.08 | 0.63 | 0.36 | 0.02 | 0.11 | -0.14 |
| Q12 | 0.44 | -0.07 | 0.58 | 0.00 | -0.01 | 0.45 | -0.09 | 0.55 | 0.00 | 0.02 | 0.45 | -0.05 | 0.55 | -0.03 | -0.09 |
| Q13 | 0.58 | 0.19 | 0.33 | -0.07 | 0.04 | 0.54 | 0.09 | 0.33 | -0.06 | 0.17 | 0.58 | 0.11 | 0.36 | 0.03 | -0.04 |
| Q14 | 0.55 | 0.00 | 0.16 | -0.01 | 0.51 | 0.55 | 0.03 | 0.25 | -0.06 | 0.36 | 0.58 | -0.19 | 0.15 | 0.39 | 0.30 |
| Q15 | 0.60 | 0.16 | -0.10 | 0.04 | 0.46 | 0.51 | 0.22 | -0.10 | -0.05 | 0.43 | 0.66 | -0.02 | -0.03 | 0.41 | 0.26 |
| Q16 | 0.41 | -0.11 | -0.01 | 0.47 | 0.00 | 0.32 | -0.04 | -0.02 | 0.39 | 0.04 | 0.40 | 0.02 | -0.03 | 0.36 | -0.26 |
| Q17 | 0.51 | 0.36 | -0.21 | -0.06 | 0.21 | 0.40 | 0.53 | -0.15 | -0.08 | -0.07 | 0.57 | 0.22 | -0.18 | 0.20 | 0.32 |
| Q18 | 0.32 | -0.16 | 0.10 | 0.10 | 0.46 | 0.49 | 0.00 | 0.01 | 0.07 | 0.47 | 0.23 | -0.07 | 0.11 | -0.02 | 0.52 |
| Q19 | 0.60 | 0.02 | 0.57 | 0.01 | 0.03 | 0.50 | -0.03 | 0.55 | 0.04 | -0.06 | 0.67 | 0.02 | 0.56 | 0.01 | 0.05 |
| Q20 | 0.55 | 0.17 | 0.36 | -0.04 | -0.04 | 0.41 | 0.09 | 0.42 | -0.09 | -0.06 | 0.60 | 0.20 | 0.33 | -0.02 | -0.05 |
| Q21 | 0.69 | 0.11 | 0.29 | 0.04 | 0.22 | 0.54 | 0.10 | 0.31 | -0.01 | 0.12 | 0.76 | 0.08 | 0.32 | 0.15 | 0.15 |
| Q22 | 0.64 | 0.25 | 0.20 | 0.08 | -0.10 | 0.54 | 0.16 | 0.18 | 0.34 | -0.17 | 0.68 | 0.38 | 0.17 | -0.05 | 0.08 |
| Q23 | 0.69 | 0.33 | 0.10 | 0.03 | -0.02 | 0.59 | 0.35 | 0.09 | 0.05 | 0.01 | 0.71 | 0.35 | 0.12 | 0.05 | 0.02 |
| Q24 | 0.29 | -0.02 | -0.04 | -0.04 | 0.51 | 0.28 | -0.16 | -0.06 | 0.03 | 0.58 | 0.29 | 0.13 | -0.06 | -0.11 | 0.72 |
| Q25 | 0.41 | -0.08 | 0.51 | 0.10 | -0.08 | 0.40 | -0.11 | 0.42 | 0.21 | -0.08 | 0.45 | 0.05 | 0.48 | -0.10 | 0.01 |
| % | 61% | 9% | 14% | 7% | 8% | 51% | 11% | 17% | 12% | 10% | 61% | 11% | 12% | 7% | 9% |

% = total variance explained. Loadings ≥ 0.40 are printed in bold.

Table 5. Cronbach's alpha coefficients for the factors obtained by the Factor Analysis and for all items

| Factor | N. Items | Total Sample | | General Population Sample | | Clinical Sample | |
|--|-------------|---|----------|---|----------|---|----------|
| | | Corrected <i>r</i> Mdn (min- α) | α | Corrected <i>r</i> Mdn (min- α) | α | Corrected <i>r</i> Mdn (min- α) | α |
| Factor 1 (Q1, Q2, Q3, Q15, Q16, Q17, Q22, Q23) | 8 | 0.62 (0.48-0.69) | 0.85 | 0.43 (0.36-0.58) | 0.73 | 0.67 (0.48-0.70) | 0.88 |
| Factor 2 Q7, Q10, Q12, Q13, Q19, Q20, Q21, Q25 | 8 | 0.55 (0.42-0.73) | 0.83 | 0.48 (0.42-0.63) | 0.79 | 0.59 (0.40-0.80) | 0.85 |
| Factor 3 (Q4, Q8, Q9, Q11, Q16) | 5 | 0.59 (0.39-0.63) | 0.75 | 0.36 (0.26-0.39) | 0.51 | 0.69 (0.44-0.72) | 0.81 |
| Factor 4 (Q14, Q15, Q18, Q24) | 4 | 0.38 (0.28-0.45) | 0.56 | 0.36 (0.26-0.49) | 0.51 | 0.37 (0.25-0.46) | 0.56 |
| PBQ total score [General Factor] (Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, Q21, Q21, Q23, Q24, Q25) | 25 | 0.56 (0.18-0.65) | 0.90 | 0.40 (0.13-0.58) | 0.84 | 0.61 (0.13-0.70) | 0.92 |

α = Cronbach's alpha; Mdn = Median

Frequency and characteristics of bonding disorder

Taking into consideration the cut-off values for the total PBQ score suggested by Brockington et al (2006), 2.9% of mothers in the general population group reported a bonding disorder and 0.6% a severe bonding disorder; in the clinical group, the figures were 15.9% and 6.4% respectively, and in the total sample 8% and 2.8% of mothers respectively.

Relationship between bonding disorder and depressive symptomatology

EPDS scores in the total sample showed significant associations with General Factor (GF) ($r = 0.59$; $p < 0.001$), as well as the PBQ factors impaired bonding ($r = 0.53$; $p < 0.001$), anxiety about care ($r = 0.51$; $p < 0.001$), lack of enjoyment ($r = 0.40$; $p < 0.001$), and rejection and risk of abuse ($r = 0.32$; p

<0.001). The clinical sample presented higher scores than the general population sample on depressive symptomatology (12.1±7.5 vs. 4.9±3.8; $t[363.1] = 14.9, p < 0.001$).

Table 6 shows the association between the presence of depressive symptomatology (EPDS ≥ 11) and a bonding disorder according to the PBQ. Depressive symptomatology was significantly associated with bonding disorder regardless of the type of group of mothers analyzed in both groups, and with all subscales.

Table 6. Association between PBQ and EPDS¹

| | Total Sample | | | General Population Sample | | | Clinical Sample | | |
|--|--------------|-----------|--------------|---------------------------|-----------|--------------|-----------------|-----------|--------------|
| | EPDS ≥ 11 | EPDS <11 | Significance | EPDS ≥ 11 | EPDS <11 | Significance | EPDS ≥ 11 | EPDS <11 | Significance |
| <i>PBQ Total score (GF), M (SD)</i> | 19.9 (15.1) | 8.1 (6.2) | $p < 0.001$ | 17.8 (11.8) | 8.0 (6.0) | $p < 0.001$ | 20.5 (15.9) | 8.7 (7.1) | $p < 0.001$ |
| <i>Factor1, M (SD)</i> | 5.5 (6.3) | 1.3 (2.1) | $p < 0.001$ | 4.5 (4.8) | 1.1 (1.8) | $p < 0.001$ | 5.8 (6.7) | 1.7 (2.7) | $p < 0.001$ |
| <i>Factor2, M (SD)</i> | 11.0 (6.8) | 6.0 (4.2) | $p < 0.001$ | 10.8 (5.6) | 6.1 (4.2) | $p < 0.001$ | 11.0 (7.1) | 5.7 (4.2) | $p < 0.001$ |
| <i>Factor3, M (SD)</i> | 2.2 (3.5) | 0.6 (1.3) | $p < 0.001$ | 1.4 (2.2) | 0.5 (1.2) | $p < 0.01$ | 2.5 (3.8) | 0.8 (1.5) | $p < 0.001$ |
| <i>Factor 4, M(SD)</i> | 1.1 (1.9) | 0.3 (0.9) | $p < 0.001$ | 0.9 (1.5) | 0.2 (0.8) | $p < 0.004$ | 1.1 (2.0) | 0.4 (1.0) | $p < 0.001$ |
| <i>PBQ Total score ≥ 26 ("bonding disorder"), n %</i> | 51 (26.7%) | 9 (1.5%) | $p < 0.001$ | 11 (26.2%) | 4 (0.8%) | $p < 0.001$ | 40 (26.8%) | 5 (3.8%) | $p < 0.001$ |
| <i>PBQ Total score ≥ 40 ("severe bonding disorder"), n %</i> | 20 (10.5%) | 0 (0%) | $p < 0.001$ | 3 (7.1%) | 0 (0%) | $p < 0.001$ | 17 (11.4%) | 0 (0%) | $p < 0.001$ |

PBQ= Postpartum Bonding Questionnaire; EPDS: Edinburgh Postnatal Depression Scale; GF= General Factor.

¹EPDS scores were available only for a sample of 794 mothers.

Discussion

In this assessment of the Spanish version of the PBQ, good psychometric properties were identified for its use in Spanish clinical and general populations of postpartum women. The Spanish PBQ showed adequate reliability and a factorial validity in which a general factor of bonding disorder emerged as the best solution.

Neither the original four-factor solution (Brockington et al. 2001; Brockington et al. 2006c) nor the alternative models proposed by Wittkowski et al. (2010), and Reck et al. (2006) were confirmed in our sample. The construction of the test and the characteristics of the original factor analysis (Brockington et al. 2001) might shed light on the diversity in the factor solutions found in PBQ. Brockington et al. (2001) performed a factor analysis including 84 items, which was used

to select 25 items that were representative of the four main factors. As a result, subsequent factor analyses did not exactly replicate the conditions of the original one. In our study, we identified a four-factor solution related to impaired bonding, anxiety about care, lack of enjoyment, and rejection and risk of abuse. Factor 3, lack of enjoyment, represents the main change to the original PBQ and includes items that reflect the mother's lack of affection or enjoyment; whereas factor 4, related to rejection and risk of abuse, includes the two risk of abuse items (18 and 24) as well as items 14 'I feel angry with my baby' and 15 'I resent my baby', suggesting that in the Spanish population these items could be considered more severe than in previous validations. The congruence of factor solutions between samples (clinical and general population) was poor in three factors (factors 1, 3 and 4), and was only good in factor 2, related to anxiety about care. For example, items Q14 and Q15 loaded on factor 4 in the general population sample, but on factor 3 in the clinical population. Consequently, the results of our factor solution must be considered with caution and need to be replicated in other Spanish samples. Furthermore, these results may suggest the need to adapt the PBQ to specific populations (i.e., clinical vs. general population).

In contrast, the Spanish PBQ was consistently summarized by a general factor in both the clinical and the general population samples. In 2006, Brockington suggested considering a PBQ total score of 26 or higher as identifying some type of bonding disorder, and a score of 40 or higher as identifying severe bonding disorder or maternal rejection. We recommend the use of the PBQ total score for detecting the presence of bonding disorder. Several reasons could be given to support this proposal. In our study, we conducted a second-order analysis in which a general factor of impaired bonding explained 61% of the variance in the total sample, 61% of the variance in the clinical sample, and 51% in the general population sample. In the German validation, Reck et al. (2006) found a general factor that explained 23.9% of the variance in which nine items had no significant loadings, leading to the creation of the shorter 16-item version of the PBQ. In Wittkowski's study (2010) intercorrelations between factors were between 0.67 and 0.92.

Three items did not load meaningfully on this general factor: Q7 "My baby winds me up", Q18 "I have done harmful things to my baby", Q24 "I feel like hurting my baby". Item Q7 loaded on factor 1 *impaired bonding* in Brockington's study (2001), on factor 2 *rejection and anger* in Wittkowski's study (2010), and was not removed in Reck's study (2006). In contrast, items Q18 and Q24 constitute the factor 4 *risk of abuse* in Brockington's study (2001), were omitted in Wittkowski's study (2010), and also showed lower loadings with the general factor in Reck's study (2006). These items were therefore removed in the German validation of PBQ. In the original study, this factor accounted for only 3.4% of the total variance (Brockington et al. 2001). Some authors recommend omitting these items due to its low validity and diagnostic accuracy, and because mothers with obsessional thoughts would tend to score positively (Wittkoski et al. 2007). However, these items

could help to detect a proportion of mothers at high risk of abusing their infants (Brockington et al. 2001). In light of this, we opted to maintain all the items from the original version.

Bonding impairment showed higher associations with depressive symptomatology, with correlations ranging from 0.30 to 0.60. The clinical sample showed higher scores on the PBQ than the general population sample, but these differences were mainly explained by differences in EPDS scores. Other studies also found significant associations between PBQ and depressive symptomatology, though of smaller magnitude (Reck et al. 2006). Depressive symptoms are related to reduced parenting responsiveness, affection and reciprocity, increased intrusive behaviors, and less positive descriptions of their children (Wan and Green 2009). Nevertheless, Brockington (2006a) postulates that mother-infant bonding impairment and postpartum depression represents two distinctive entities. Clinical observations of postnatal depressive mothers with normal bonding and of mothers without depressive symptomatology but impaired bonding also support this distinction (Brockington et al. 2006a). Further studies in mothers with clinical diagnoses of postnatal depression are needed to examine the nature of the association between the two entities.

Regarding clinical implications, as suggested by Klier (2006), the Spanish PBQ could be used to detect bonding disorders between mother and baby, as well as to assess the severity of the disorder. Cut offs for the PBQ total score proposed by Brockington et al. (2006c) (26 or higher for some type of bonding disorder, and 40 or higher for severe bonding disorder) could be used for detecting bonding disorders until the Spanish version of PBQ is validated against a gold standard (interview). Furthermore, the PBQ can be useful to assess the evolution of the disorder and the progression of the therapy (Brockington et al. 2001), assessing the status of a bonding impairment beyond the recovery from the maternal depression (Klier 2006).

The main limitation of the study is the lack of a clinical interview for mother-infant bonding disorder. It is necessary to establish cut off scores for detecting bonding disorders validated in Spanish population.

In conclusion, this study provides a Spanish version of the PBQ, an easy-to-use, reliable instrument for detecting and assessing mother-infant bonding alterations in the postpartum period. This tool has demonstrated its utility in detecting early bonding alterations in clinical and general populations.

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4.2. STUDY 2:

Severity of postpartum depressive episode and early mother-infant bonding disturbances

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Introduction

Depression is one of the most frequent non-psychotic perinatal mental disorders (Howard et al., 2014) with a prevalence of 10–15% of postpartum depression (PPD)[†] in the general population (Gaynes et al., 2005). If depression occurs during the early postpartum there is a high risk of an impairing effect on the mother's early interaction with her baby (Mäntymaa, 2006) often referred as a mother-infant bonding disturbance (MIBD). A MIBD is a disorder in the mother's emotional response towards her baby (Brockington, 2011; Taylor et al., 2005) present as a delay, ambivalence or lack of maternal response, maternal rejection, or anger and hostility towards the baby (Brockington, 2011; Klier and Muzik, 2004). In severe cases of bonding disorders a high risk of abuse of the baby is associated; if this disorder is not identified and treated on time it can expose the infant to an extended maltreatment with long-lasting psychosocial consequences and in the worst case, the risk of filicide (Shelton et al., 2015). An association between PPD and MIBD has been identified across cultures and socioeconomic status groups (Field, 2010) in diverse studies (Condon and Corkindale, 1998; Muzik et al., 2013; Nagata et al., 2000; Sockol et al., 2014; Wittkowski et al., 2010) showing a medium to a strong effect of depression in the mother-infant early interaction (Beck, 1995; Field, 2010; Lovejoy et al., 2000).

[†] Abbreviations:

PPD: Postpartum depression

MIBD: Mother-infant bonding disturbances

MDE: Major Depressive Episode

PBQ: Postpartum Bonding Questionnaire

EPDS: Edinburgh Postnatal Depression Scale

Prevalence rates of mother-infant bonding disturbances (MIBD) assessed with the Postpartum Bonding Questionnaire (PBQ) (Brockington et al., 2001; Brockington et al., 2006a) and the Birmingham Interview for Maternal Mental health (Brockington et al., 2006b) are higher (22.2-38.8%) in mothers with mental health problems (Brockington et al., 2006a; Brockington et al., 2006c; Parfitt and Ayers, 2012) than in mothers from general population (7.1-8.6%) (Edhborg et al., 2005; Reck et al., 2006; van Bussel et al., 2010). Negative outcomes not only in the mother but also on her child's future development such as difficulties in early emotional regulation and social skills (Field, 2010; Waxler et al., 2011), poor cognitive and language development (Parfitt et al., 2014; Murray et al., 1996), behavioral problems, attention and hyperactivity disorders in childhood (Stein et al., 2014) and adult psychopathology (Skovgaard et al., 2008) are associated to mother-infant bonding disturbances (Brockington, 2004b; Kingston et al., 2012; Murray and Cooper, 1997).

Motherhood can be challenging to depressed mothers, showing frequent emotional unavailability (Beck, 1995), less sensitivity and responsiveness towards their infants, more inadequate caregiving practices, in breastfeeding, sleep routines and healthcare practices, thoughts about harming the baby and the use of harder punishment (Field, 2010) that hinders a synchronic interaction where adaptation to the role of a mother can be delayed (Barr, 2008). Although depression in mothers obstructs an early relationship with their babies, not all depressed mothers develop a bonding disturbance. What differences the depressed mothers that develop a MIBD from those also depressed who do not has not been fully identified. The fact that both PPD and MIBD share common risk factors such as previous history of maternal psychopathology (Howard et al., 2014; Muzik et al., 2013), difficulties with breastfeeding (Stuebe et al., 2014; Ystrom, 2012), prematurity and severe medical conditions of the baby (Howard et al., 2014; Jordan et al., 2014) among others, could explain the high frequency of bonding disturbances in mothers with PPD. Nevertheless most of the previous research have only relied in the self-report of depressive symptomatology without any clinical confirmation or use clinical samples including mothers with different types of psychiatric diagnoses that difficult a more detailed exploration in depressed mothers clinically diagnosed.

A detailed identification in depressed mothers of the risk factors associated with a MIBD can be of high clinical relevance since PPD is frequent in all the countries. This represents a group of high-risk mothers that requires specific interventions different from the one than a depressed women in other stage of her life receives (Field, 2008). Besides the fact that parenting difficulties are frequently underreported by depressed mothers represents an important obstacle for early detection and treatment (Whitton et al., 1996). A prevalence of 10% of mothers with a MDE at 6 weeks postpartum was found in a Spanish sample (Ascaso et al., 2003) but to the date, there is no information that identifies the risk probability of suffering a MIBD in this population and assessment for MIBD is not

frequent between perinatal professionals. Considering the long time negative consequences related to a bonding disturbance for both the mother and the baby, early identification and specific interventions should be a priority in clinical settings.

To explore these matters we studied a sample of women clinically diagnosed with a MDE at 4-6 weeks postpartum. The aims of the study were 1) to estimate the prevalence of mother-infant bonding disturbances, in depressed mothers and 2) to identify the socio-demographic, reproductive and mental health characteristics that are risk factors for bonding disturbances in depressed mothers.

Materials and Method

Design and participants

This was a cross sectional study. A convenience consecutive sampling was obtained recruiting patients from an outpatient Perinatal Psychiatry Program at a teaching hospital in Spain. Mothers diagnosed with a major depressive episode in the postpartum [DSM-IV-TR criteria diagnosis] were invited to participate in the study. The study was reviewed and approved by the Ethical Committee of the Hospital. A total of 77 mothers agreed to participate and signed a consent form.

Data collection

Data was collected between December 2008 and December 2012. At their 4-6 week postpartum assessment, women filled out several self-rate questionnaires to report socio-demographic data, information related to reproductive health, as well as specific instruments to assess mother-infant bonding, depressive symptoms, anxiety and general mental health problems. Other data was retrieved through clinical records.

Measures and procedure

A specific data questionnaire designed by researchers (García-Esteve and Navarro 2005, unpublished) was used to collect *socio-demographic data*, *mental health background* and *reproductive health information* as well as the participants' clinical records.

Postpartum Depression (PPD) was assessed on both a dimensional level with the use of the Spanish validated version of the *Edinburgh Postnatal Depression Scale (EPDS)* by Cox et al., 1987; García-Esteve et al., 2003) and in a categorical level using the Structured Clinical Interview for DSM-IV-TR, (SCID-I; First et al., 1996). The SCID-I was applied by a psychiatrist or a clinical psychologist to confirm the presence of a major depressive episode. The EPDS is a 10-item self-rated questionnaire used to identify frequency and severity of postpartum depressive symptoms with each item scored 0-

3, with a normal response scoring 0, a severe response scores 3 a minimum total score of 0 and a maximum of 30.

Mother-infant bonding was identified with the *Postpartum Bonding Questionnaire* (PBQ), a self-report questionnaire designed by Brockington et al. (2001; 2006a) with 25 items to be rated in a 0-5 scale organized in 4 factors: general factor/impaired bonding, rejection and anger, anxiety about care of the baby and risk of abuse. The instrument has been validated in several countries reporting an adequate level of internal consistency but heterogeneity has been reported in the confirmation of the 4 factors (Burkeland and Høivik 2006 unpublished, cited by Høivik et al., 2013; Reck et al., 2006; Siu et al., 2010; Suetsugu et al., 2015; van Bussel et al., 2010). A recent study (García-Esteve et al., 2015 *in press*) confirmed good psychometric properties in the PBQ in Spanish postpartum mothers with mental health disorders with a good internal consistency for the 25 items (Cronbach's alpha; 0.899). García-Esteve et al. (2015 *in press*) reported a general factor that accounted for 61% of the total variance of the Spanish PBQ and supported the use of the cut off points for the total score (Brockington et al., 2006a) to identify MIBD. In accordance with this previous results and since there has been no validation at the present for specific cut off points in Spanish sample to the date, the original cut off points from the total score (range 0-125) were used for the present study to identify a MIBD (Brockington et al., 2006a). This option has been used in previous studies (Siu et al., 2010; van Bussel et al., 2010). The authors suggested a cut off point of ≥ 26 to identify *some* type of bonding disorder and a cut off point of ≥ 40 for *severe* bonding disturbances. For these cut off points the predictive positive value of the PBQ was .79, with a sensitivity of .84 and specificity of .74 (Brockington et al., 2006a).

Postpartum Anxiety was assessed with the validated Spanish version of the *State-Trait Anxiety Inventory*, (Spielberger et al., 1982). We used the State Scale (STAI-S) that assess how the mother feels in the moment she is answering the instrument that includes 20 items with a 4 Likert-type choices. *Mental health Problems* were identified with the Spanish version of the *General Health Questionnaire* in its 12-item version (GHQ-12) (Goldberg and Williams, 1988; Navarro et al., 2007). This measure has a range for a total score of 0-12. The GHQ-12 focus on the inability to carry out normal activities and facing new and distressing experiences.

Data Analysis

The statistical analyses were carried out using the SPSS Version 19.0 (SPSS Inc., Chicago, IL, USA.). With the cut off points proposed by Brockington et al. (2006a), two groups of mothers were constructed using the PBQ's total score. Group 1 was formed by depressed women with a normal

mother-infant bond (PBQ ≤ 25) and Group 2 corresponded to depressed mothers with some type of mother-infant bonding disorder (PBQ ≥ 26). From Group 2 we created two subgroups: Group 2a included depressed mothers with a *mild bonding disorder* (PBQ total score between 26 and 39) and Group 2b identified mothers with a *severe bonding disorder* (PBQ ≥ 40). Descriptive analyses were used to identify the frequencies of all the variables and the prevalence of mother-infant bonding disturbances. In order to compare Group 1 against Group 2 we used the chi-squared test and Fisher's two-sided exact p to identify the significant differences between the dichotomous and categorical variables and to compare some item-to-item from the EPDS and the PBQ. T-test analyses were used to compare Group 1 against Group 2 for quantitative variables. A Kruskal-Wallis Test was used to identify differences between Group 1, Group 2a and Group 2b in the mental health scales. Spearman non parametric correlations were used to identify the association between item-to-item of the PBQ and the EPDS. Finally, multivariate analysis were used with linear regression models to identify risk factors for mother-infant bonding disturbances using the PBQ total score as the dependent variable. Statistical significance was set at $p < 0.05$ for all the analyses.

Results

Sample Characteristics

The mean age of the postpartum depressed mothers (N=77) was 34.6 (range 22-45) with most of them, (76.6%) between 31 and 40 years old. Eighty-one percent of the sample was composed by Spanish mothers and the rest 18.7% from Latin-American countries. The maximum level of education was university studies (52%), most of the mothers had a good income (69.9%), were employed (83.5%) and had a current partner-relationship (94.7%). About their mental health background, 44.6% of the mothers were in a psychiatric pharmacological treatment at the moment of the assessment, 69.4% had a previous history of psychiatric treatment while the 38.4% had a close relative with a psychiatric disorder. Regarding their reproductive health and new born characteristics, 61.6% were first-time mothers, 43.1% did not planned their pregnancy but only 9.4% of them reported having thoughts about ending it. A previous history of elective abortion, a legal right in Spain, was present in 23.6%.

Most of the pregnancies were full term (72.6%) with a mean pregnancy age of 38 weeks, 22.6% of them had a premature baby (<37 weeks) and 53.2% of them had a female baby. Almost half of the depressed mothers (46.7%) were not breastfeeding their babies and from those not breastfeeding, 54.3% of them were in a psychiatric pharmacological treatment at the time of the assessment.

Mother-infant bonding disorder prevalence and mental health problems

A 33.8% (95% CI, 23.0 - 44.6) of depressed mothers scored ≥ 26 in the PBQ reporting some type of bonding disorder. From those mothers, 57.7% of them had a *mild* bonding disorder that represent the 22.7% (95% CI, 12.4-33.1) of the total sample. A *severe* bonding disorder was identified in the 42.3% of the MIBD representing the 14.3% (95% CI, 6.3-22.3) of the total sample. Table 1 shows a progressive increase in all the means of the depressive symptoms (EPDS), anxiety (STAI-S) and general mental health problems (GHQ-12) in each bonding group. When the three groups were compared (Depressed mothers with normal bonds, depressed mothers with a mild bonding disorder and depressed mothers with a severe bonding disorder) only the depressive symptoms reported statistically significant differences.

Table 1
Mental health symptomatology according to the severity of mother-infant bonding disorder (MIBD)

| Symptomatology | Depressed mothers with normal bonds [1] (n=51) | Depressed mothers with MIBD (n=26) | | | Kruskal-Wallis Test Comparison between groups [1] [2a] & [2b] |
|---------------------------------------|--|------------------------------------|---------------------------------|-------------------------|---|
| | | Mild ^a [2a] (n=15) | Severe ^b [2b] (n=11) | Any ^c (n=26) | |
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | <i>p</i> |
| Depressive symptoms (EPDS) | 15.8 (6.7) | 18.9 (3.6) | 21.2 (5.9) | 19.9 (4.7) | 0.02 |
| Anxiety state (STAI-S) | 34.2 (12.3) | 37.7 (8.3) | 38.5 (9.9) | 38.0 (8.8) | 0.49 |
| General Health Questionnaire (GHQ-12) | 8.6 (2.3) | 9.9 (2.3) | 10.9 (1.9) | 10.3 (2.1) | 0.16 |

Note: ^a Mothers with a PBQ total score: 26-39. ^b Mothers with a PBQ total score ≥ 40 . ^c Mothers with a PBQ total score ≥ 26

Depressed mothers with a bonding disorder compared to those with a normal bond

Table 2 shows that the depressed mothers with MIBD were more *primiparous*, *did not breastfeed their babies* and have *higher means in the EPDS* as well as in the *GHQ-12*, when compared with depressed mothers with normal bonds. These differences are statistically significant. When the means of the PBQ, EPDS, STAI-S and GHQ-12 were analyzed in all depressed mothers, significant differences show higher means of the PBQ in mothers with *pharmacological psychiatric treatment* in comparison with those who did not reported any treatment (26.27 vs 18.07, $p < 0.05$). Also depressed mothers that did not breastfeed their babies show significant higher means in all the measures (PBQ; 29.34 vs 16.18, $p < 0.00$) (EPDS; 19.49 vs 15.45, $p < 0.00$) (STAI-S; 39.46 vs 32.43, $p < 0.01$) (GHQ-12; 10.39 vs 8.33, $p < 0.01$) in comparison with those who did breastfeed.

Table 2.-Socio demographic, reproductive health and mental health variables in mothers with normal bond (MNB) vs mothers with some type of bonding disorder (MBD)

| | MNB N=51 | | MBD N=26 | | p |
|---|-------------------|-------------------|-------------------|-------------------|--------------|
| | N (%) / Mean (SD) | N (%) / Mean (SD) | N (%) / Mean (SD) | N (%) / Mean (SD) | |
| <i>Socio-demographic variables</i> | | | | | |
| Age | 34.5 (4.1) | 34.8 (4.7) | | | 0.812 |
| Level of education | | | | | |
| Without any school certificate or primary studies | 8 (15.7) | 4 (15.4) | | | 1.000 |
| Secondary studies | 14 (27.5) | 10 (38.5) | | | 0.382 |
| University/ bachelor degree | 27 (52.9) | 12 (46.2) | | | 0.460 |
| Working status | | | | | |
| Housewife | 1 (3.8) | 2 (7.7) | | | 0.274 |
| Employed | 44 (86.3) | 20 (76.9) | | | 0.174 |
| Unemployed | 4 (7.8) | 4 (15.4) | | | 0.437 |
| Unsatisfactory relationship with partner | 12 (23.5) | 3 (11.5) | | | 0.236 |
| <i>Reproductive health and newborn variables</i> | | | | | |
| Premature baby | 10 (19.6) | 4 (15.4) | | | 0.752 |
| Pregnancy not planned | 22 (43.1) | 9 (34.6) | | | 0.378 |
| Primiparity | 25 (49.0) | 19 (73.1) | | | 0.018 |
| Sex of the infant-girl | 24 (47.1) | 17 (65.4) | | | 0.127 |
| Not breastfeeding | 18 (35.3) | 17 (65.4) | | | 0.018 |
| Experienced elective abortion in the past | 12 (23.5) | 5 (19.2) | | | 0.599 |
| Experienced thoughts of ending the pregnancy | 5 (19.2) | 1 (3.8) | | | 0.655 |
| <i>Psychopathological variables</i> | | | | | |
| History of previous psychiatric treatment | 34 (66.7) | 16 (61.5) | | | 0.465 |
| Family history of psychiatric disorders | 18 (35.2) | 10 (38.5) | | | 0.835 |
| Psychopharmacological treatment in postpartum | 19 (37.3) | 14 (53.8) | | | 0.109 |
| <i>Mental health symptoms</i> | | | | | |
| Depressive symptoms (EPDS) | 15.8 (6.7) | 19.9 (4.7) | | | 0.003 |
| Spielberg Anxiety state (STAI-S) | 34.2 (12.2) | 38.0 (8.8) | | | 0.166 |
| General Mental health Problems (GHQ-12) | 8.6 (3.9) | 10.3 (2.1) | | | 0.018 |

Item-to-item comparison between depressive symptoms (EPDS) and bonding difficulties (PBQ)

The correlational analysis identified specific depressive symptomatology from the EPDS more associated than others with specific bonding difficulties reported by the PBQ. The depressive symptoms more associated to bonding difficulties in the PBQ are **item 7** (*I have been so unhappy that I have had difficulty sleeping*) and **item 9** (*I have been so unhappy that I have been crying*). **Item 7** of the EPDS also show significant correlations with *any type of bonding disturbance* (PBQ \geq 26) and *severe bonding disturbance* (PBQ \geq 40). The most frequent bonding difficulties (PBQ) associated with depressive symptomatology in the mother (EPDS) are the PBQ items **13** (*I feel trapped as a mother*), **10** (*My baby irritates me*), **23** (*I feel the only solution is for someone else to look after my baby*) and **2** (*I wish the old days when I had no baby would come back*). The highest correlations for **EPDS items 7** and **9** and the total score of the EPDS were found with **item 13** of the **PBQ** (*I feel trapped as a mother*). Due to its clinical relevance it is important to highlight the association found between **EPDS item 10** (*The thought of harming myself has occurred to me*) that assess risk of suicide in the mother

and **PBQ item 24** (*I feel like hurting my baby*) which represents a risk of abuse for the infant. The risk of maternal suicide (**EPDS item 10**) was also associated with the bonding difficulties of *I feel trapped as a mother* (**PBQ item 13**), *I wish my baby would somehow go away* (**PBQ item 17**), *My baby irritates me* (**PBQ item 10**), *I wish the old days when I had no baby would come back* (**PBQ item 2**) and *I regret having this baby* (**PBQ item 5**). See Table 3.

Comparison with a chi-squared test and Fisher's two-sided exact p identified significant differences between the groups of mothers that answered positively the most correlated items of the EPDS (7 and 9) and item 10 that assess suicide risk as well as with the different levels of bonding disorder, plus PBQ items 18 and 24 related with *risk of abuse* to the infant. The only significant differences reported that all the mothers with a *mild bonding disorder* also reported sleeping problems due to unhappiness (EPDS item 7) ($n=15$ $p<0.03$); mothers that reported *feelings of hurting her baby* (PBQ item 24) also reported *suicidal thoughts* (EPDS item 10) ($n=4$, 100%, $p<0.02$) and mothers with *suicidal thoughts* also reported *sleeping problems* (EPDS item 7) ($n=25$, 100%, $p<0.01$).

Risk factors as predictors of bonding disorder in depressed mothers

Linear regression analyses were performed using the PBQ total score as the dependent variable for maternal bonding. We included all the socio-demographic, reproductive and mental health factors and introduced them in 5 partial models (Table 6). *Not breastfeeding*, *primiparity*, *pharmacological psychiatric treatment at the time of the assessment* and *depressive symptoms* (EPDS) were the only significant variables ($p<0.05$) resulting from the linear regression partial models. These significant variables were included into a final model that explained the 28.1% of the variance. In the final model only *depressive symptoms* and *not breastfeeding* reported a significant association with maternal bonding difficulties. These results indicate that the severity of postpartum depressive symptoms as well as not breastfeeding their babies are independently associated with higher bonding disturbances (see Table 4).

Table 3.- Non-parametric correlations item-to-item between PBQ and EPDS

| PBQ | EPDS 1 <i>I have been able to laugh and see the funny side of things</i> | EPDS 2 <i>I have looked forward with enjoyment to things</i> | EPDS 3 <i>I have blame myself unnecessarily when things go wrong</i> | EPDS 4 <i>I have been anxious or worried for no good reason</i> | EPDS 5 <i>I have felt scared or panicky for no very good reason</i> | EPDS 6 <i>Things have been getting on top of me</i> | EPDS 7 <i>I have been so unhappy that I have had difficulty sleeping</i> | EPDS 8 <i>I have felt sad or miserable</i> | EPDS 9 <i>I have been so unhappy that I have been crying</i> | EPDS 10 <i>The thought of harming myself has occurred to me</i> | EPDS <i>Total score</i> |
|---|---|---|---|--|--|--|---|---|---|--|----------------------------|
| <i>PBQ 1. I feel close to my baby</i> | .312** | .312** | .126 | .340** | .241* | .083 | .244* | .195 | .089 | .122 | .267* |
| <i>PBQ 2. I wish the old days when I had no baby would come back</i> | .129 | .172 | .321** | .252* | .420*** | .230* | .332** | .321** | .218 | .246* | .367** |
| <i>PBQ 3. I feel distant from my baby</i> | .143 | .074 | .151 | .076 | .123 | .113 | .117 | .018 | -.057 | .118 | .083 |
| <i>PBQ 4. I love to cuddle my baby</i> | .317** | .350** | .021 | .182 | .229* | .189 | .248* | .217 | .212 | .102 | .275* |
| <i>PBQ 5. I regret having this baby</i> | .127 | .214 | .101 | .152 | .197 | .044 | .201 | .278* | .156 | .245* | .272* |
| <i>PBQ 6. The baby does not seem to be mine</i> | .287* | .394*** | .224* | .135 | .320** | .128 | .207 | .215 | .245* | .166 | .318** |
| <i>PBQ 7. My baby winds me up</i> | .104 | .034 | .134 | .205 | .118 | .236* | .164 | .130 | .233* | .192 | .243* |
| <i>PBQ 8. I love my baby to bits</i> | .268* | .305** | .137 | .106 | .194 | .128 | .215 | .214 | .260* | .083 | .218 |
| <i>PBQ 9. I feel happy when my baby smiles or laughs</i> | .230* | .314** | .197 | .233* | .240* | .182 | .209 | .241* | .225* | .143 | .343** |
| <i>PBQ 10. My baby irritates me</i> | .149 | .200 | .133 | .251* | .279* | .320** | .328** | .227* | .301** | .275* | .324** |
| <i>PBQ 11. I enjoy playing with my baby</i> | .238* | .313** | .221 | .196 | .211 | .190 | .229* | .223 | .225* | .074 | .266* |
| <i>PBQ 12. My baby cries too much</i> | .030 | .061 | .180 | .152 | .054 | .276* | .255* | .174 | .225 | .010 | .183 |
| <i>PBQ 13. I feel trapped as a mother</i> | .256* | .189 | .375** | .202 | .263* | .422*** | .345** | .427*** | .378** | .330** | .478*** |
| <i>PBQ 14 I feel angry with my baby</i> | .121 | .074 | -.051 | .056 | .174 | .220 | .141 | .147 | .136 | .106 | .147 |
| <i>PBQ 15. I resent my baby</i> | .275* | .144 | -.042 | .063 | .079 | .036 | .150 | .145 | .130 | .072 | .143 |
| <i>PBQ 16. My baby is the most beautiful baby in the world</i> | .093 | .165 | .117 | -.024 | .101 | .218 | .068 | .175 | .210 | .148 | .160 |
| <i>PBQ 17. I wish my baby would somehow go away</i> | .105 | .144 | .024 | -.037 | .114 | .155 | .013 | .039 | .021 | .282* | .149 |
| <i>PBQ 18. I have done harmful things to my baby</i> | .012 | -.142 | -.039 | -.037 | -.076 | -.064 | .065 | -.021 | -.033 | .032 | -.079 |
| <i>PBQ 19. My baby makes me feel anxious</i> | .212 | .172 | .160 | .245* | .218 | .229* | .340** | .205 | .316** | .183 | .335** |
| <i>PBQ 20. I am afraid of my baby</i> | -.038 | .114 | .134 | .220 | .152 | .243* | .100 | .145 | .281* | -.058 | .199 |
| <i>PBQ 21. My baby annoys me</i> | .078 | .066 | .058 | .113 | .182 | .199 | .257* | .188 | .164 | .183 | .159 |
| <i>PBQ 22. I feel confident when caring for my baby</i> | .049 | .127 | .126 | .260* | .177 | .240* | .165 | .141 | .167 | .065 | .275* |
| <i>PBQ 23. I feel the only solution is for someone else to look after my baby</i> | .193 | .328** | .129 | .230* | .344** | .143 | .289* | .269* | .349** | .158 | .423*** |
| <i>PBQ 24. I feel like hurting my baby</i> | .144 | .087 | -.054 | .111 | .088 | -.136 | .148 | .097 | -.030 | .352** | .101 |
| <i>PBQ 25. My baby is easily comforted</i> | .132 | .096 | -.023 | .223 | .086 | .187 | .174 | .057 | .179 | .152 | .162 |
| PBQ Total score | .237* | .265* | .260* | .291* | .343** | .298** | .343** | .301** | .317** | .234* | .397** |
| Any type of Bonding disturbance (PBQ≥26) | .137 | .138 | .158 | .185 | .233* | .241* | .260* | .146 | .200 | .129 | .269* |
| Mild bonding disturbance (PBQ= 26-39) | -.009 | -.072 | .119 | .087 | .183 | .136 | .110 | .012 | .098 | -.026 | .055 |
| Severe bonding disturbance (PBQ≥40) | .195 | .267* | .079 | .151 | .109 | .172 | .227* | .184 | .160 | .204 | .301** |

Correlations are significant at ***p<0.001 (2-tailed), **p<0.01 (2-tailed) and *p<0.05 (2-tailed).

Table 4.- Linear regression partial models on maternal-infant bonding and factors associated

| <i>Dependent variable: PBQ total score</i> | <i>B</i> | <i>Standard Error</i> | <i>β</i> | <i>t</i> | <i>p</i> | <i>95% CI for B</i> |
|--|----------|-----------------------|----------|----------|-------------|---------------------|
| Partial Model 1- Socio-demographics (R=.256; R ² =.065; Adjusted R ² = -.022; F=.382; Sig. F= .539) | | | | | | |
| Maternal age | -0.20 | 0.49 | -0.05 | -0.42 | 0.68 | -1.18-0.77 |
| Country of origin (1= Spain, 0=others) | 3.89 | 5.58 | 0.09 | 0.67 | 0.49 | -7.27-15.04 |
| Level of education (1=primary studies, 0=secondary or higher level of studies) | -4.64 | 6.38 | -0.10 | -0.73 | 0.47 | -17.39-8.10 |
| Working status (1=unemployed, 0=employed) | 4.55 | 7.36 | 0.08 | 0.61 | 0.54 | -10.15-19.25 |
| Bad relationship with partner | -8.89 | 5.18 | -0.21 | -1.71 | 0.09 | -19.23-1.46 |
| Partial Model 2-Reproductive Health 1 (R=.571; R ² =.326; Adjusted R ² =.242; F= 3.872; Sig. F= .003) | | | | | | |
| Not breastfeeding | 13.19 | 3.71 | 0.43 | 3.55 | 0.00 | 5.73-20.65 |
| Number of children | -5.24 | 4.02 | -0.20 | -1.30 | 0.12 | -13.33-2.85 |
| Number of children under 3 years old | -6.42 | 4.66 | -0.19 | -1.38 | 0.17 | -15.77-2.94 |
| Pregnancy not planned | -0.541 | 4.01 | 0.02 | -0.13 | 0.89 | -8.60-7.52 |
| Experienced elective abortion in the past | -5.02 | 4.66 | -0.14 | -1.08 | 0.29 | -14.38-4.34 |
| Experienced thoughts of ending the pregnancy | -0.88 | 8.09 | -0.02 | -0.11 | 0.91 | -17.13-15.38 |
| Partial Model 3-Reproductive Health 2 (R=.374; R ² =.140; Adjusted R ² =.052; F= 1.590; Sig. F= .180) | | | | | | |
| Primiparity | 10.67 | 5.02 | 0.29 | 2.13 | 0.04 | 0.59-20.75 |
| Gestational age (weeks) | 1.40 | 2.00 | 0.21 | 0.70 | 0.49 | -2.63-5.43 |
| Infant weight (grams) | -0.01 | 0.01 | -0.42 | -1.73 | 0.09 | -0.02-0.00 |
| Sex of the infant-(1= girl, 0=boy) | -4.44 | 5.10 | -0.12 | -0.87 | 0.39 | -14.67-5.81 |
| Premature baby (1<37 weeks, 0≥37 weeks) | -2.62 | 11.24 | -0.06 | -0.23 | 0.82 | -25.20-19.96 |
| Partial Model 4-Mental health history (R=.297; R ² =.088; Adjusted R ² =.047; F= 2.128; Sig. F= .105) | | | | | | |
| History of previous psychiatric treatment | 3.07 | 4.58 | 0.08 | 0.67 | 0.51 | -6.08-12.23 |
| Family history of psychiatric disorders | 0.52 | 4.25 | 0.02 | 0.12 | 0.90 | -7.97-9.01 |
| Pharmacological psychiatric treatment in postpartum | 9.81 | 4.05 | 0.29 | 2.42 | 0.02 | 1.73-17.89 |
| Partial Model 5-Mental health problems in postpartum (R=.465; R ² =.216; Adjusted R ² =.182; F= 6.339; Sig. F= .001) | | | | | | |
| EPDS | 1.26 | 0.46 | 0.49 | 2.75 | 0.01 | 0.35-2.18 |
| STAI-S | 0.12 | 0.20 | -0.08 | -0.58 | 0.56 | -0.53-0.29 |
| GHQ-12 | 0.14 | 0.87 | 0.03 | 0.16 | 0.88 | -1.60-1.87 |
| Final model (R=.530; R ² =.281; Adjusted R ² =.237; F= 6.348; Sig. F= .000) | | | | | | |
| EPDS | 0.85 | 0.30 | 0.31 | 2.82 | 0.01 | 0.25-1.45 |
| Not breastfeeding | 7.99 | 3.86 | 0.23 | 2.07 | 0.04 | 0.29-15.69 |
| Pharmacological psychiatric treatment in postpartum | 5.10 | 3.69 | 0.15 | 1.39 | 0.17 | -2.23-12.47 |
| Primiparity | 6.17 | 3.64 | 0.18 | 1.70 | 0.09 | -1.10-13.44 |
| <i>Dependent variable: PBQ total score</i> EPDS: Edinburgh Postnatal Depression Scale; STAI-S: Spielberg anxiety state; GHQ-12: General Health Questionnaire-12 | | | | | | |

Discussion

Our study identifies a 33.8% of prevalence of bonding disturbances in mothers with a MDE in the postpartum of which 42.3% are severe. Severity of the depressive symptoms and not breastfeeding their babies were the most important factors related to bonding disturbances in postpartum depressed

mothers. The depressive symptoms of *I have been so unhappy that I have had difficulty sleeping* (EPDS item 7) and *I have been so unhappy that I have been crying* (EPDS item 9) were the most associated to bonding difficulties identified by the PBQ; in particular *I feel trapped as a mother* (PBQ item 13). It stands out the significant association between the maternal suicide risk (EPDS item 10) and the risk of abuse of the infant (PBQ item 24).

The prevalence of MIBD in our sample is in the reporting range found in other European clinical samples with mothers with mental health disorders (Brockington et al., 2001; Brockington et al., 2006a; Brockington et al., 2006c; Parfitt and Ayers, 2012). Two previous studies that assessed the prevalence for MIBD with the PBQ and a MDE with clinical interviews reported in Germany a prevalence of 17% of MIBD (Reck et al., 2006) and a 67% in China (Siu et al., 2010). Differences in prevalence rates could be explained because the German sample comes from the general population different to a clinical sample such as ours and the Chinese one, which usually present more risk factors and a higher inability to deal with daily activities that force them to look for psychiatric treatment. The prevalence of severe MIBD in our sample (14.3%) is lower than the 24% found in the Chinese depressed sample of Siu et al. (2010) using the same threshold of the PBQ. This difference is probably explained by the differences in age (our sample includes older mothers than the Chinese, 34.6 years vs 31 years) and the higher level of education found in ours. These variables have been identified as protective factors for bonding disturbances in previous findings. Cultural differences in the postnatal care (Woolett and Dosanjh-Matwala, 1990) could also explain the lower prevalence of MIBD in our study with the Chinese sample. A third study reported a higher severe MIBD prevalence of 31.7% in a sample of British mothers (Loh and Vostanis, 2004). Nevertheless, the study reported differences in the measures of depression (EPDS ≥ 10) and the MIBD (Birmingham Interview for Maternal Mental health) that might explain the differences found.

Our findings confirms the risk association of mental health disorders in early bonding (Mäntymaa, 2006) but is the severity of the depressive symptoms the most strongly associated to a disturbance in the early bonding process as Brockington et al. (2006c) had previously suggested. In our study a significant progressive increase in the mean of the EPDS is related to the increase of scores in the PBQ. Mothers from our sample with the highest scores of depression (EPDS) reported the highest bonding disturbance symptoms (PBQ) and mothers that reported a lower severity of depressive symptoms, despite their MDE, seem able to develop a satisfactory early interaction with her baby. If depressed mothers in the early postpartum are more emotionally unavailable (Beck, 1995), have less sensitivity towards the needs of her baby and are more at risk to fail to respond to her infant's requests (Field, 2010) then is logical to expect that a mother with a high severity of these difficulties will have a higher difficult to bond with her baby.

The analysis of the severity of the depression also allowed to identify the specific depressive symptoms more frequently correlated with the bonding difficulties (PBQ). Sleeping problems and crying caused by unhappiness (**EPDS Item 7** and **EPDS item 9**) were the depressive symptoms more frequently associated with the bonding difficulties (PBQ). It is frequent the disturbance of maternal sleep after the childbirth due to the parenting tasks and previous findings have confirmed the impact of maternal poor sleep during the postpartum on the development of postpartum depression (Lawson et al., 2015). Nevertheless in our mothers the sleeping disturbance is clearly related to a state of unhappiness connecting it to severe depression. Also important to highlight is the association between maternal risk of suicide (**EPDS item 10**) and ideas of harming the baby (**PBQ item 24**). This is a relevant association since the **EPDS item 10** (*The thought of harming myself has occurred to me*) has been used in clinical assessment as a red flag that triggers an in-depth risk assessment of the mother's mental health wellbeing also identified in previous studies as an item significantly associated with severe depression in postpartum women (Sit, Seltman, & Wisner, 2011).

The correlation between **EPDS item 10** and **PBQ item 24**, associates risk of maternal suicide with risk of infant abuse. We could support the idea of O'Hara (1997) and Blum (2007) that when depression is more severe we can expect that grave bonding difficulties such as thoughts about harming the baby will appear as well. There is also evidence that have identified intrusive thoughts of harming one's baby as a frequent experience in mothers under high stress in the early postpartum (Fairbrother & Woody, 2008). We could think that these thoughts could appear one or another in specific maternal psychosocial states, nevertheless these two symptoms shown together have been frequently identified in mothers that have killed their babies and afterwards commit suicide (Camperio Ciani & Fontanesi, 2012; Debowska et al., 2015). Cattaruzza (2014) suggests that depressed mothers have difficulties expressing their anger (e.g. aggression felt toward the infant who they believe is the cause of all the changes in her life) although in those cases where murderous wishes are present with more frequency the aggression is turned towards themselves with suicidal ideation. An additional analysis in our study identified that all mothers that reported feelings of hurting their babies, also reported suicidal ideas and sleeping difficulties. Also the bonding difficulties associated with the risk of maternal suicide (**EPDS item 10**) are the **PBQ items 13, 17, 10, 2** and **5** that describe a general wish of not having the baby anymore and feelings of regret and being trapped as a mother of that baby. For these matters, we consider that when these 3 items (**EPDS 7, 9** and **PBQ 24**) appear together in a mother they could be considered as red flags of a very important risk for the mother-baby dyad's wellbeing. They could be consider an alarm indicator of a mother-infant bonding in high risk that will require an extense assesment and immediate intervention if the disorder is confirmed.

Depressed mothers with a MIBD tended to not breastfeed at 4-6 weeks of postpartum more than those with a normal bond. Our study did not identify the specific reasons for not breastfeeding. However, the choice of breastfeeding maintaining their antidepressant SSRIs medication was provided by a psychiatrist to all the mothers and the final decision was taken by the mother after an analysis of risk and benefits; 45.7% of them decided not to breastfeed although they did not accept a pharmacological antidepressant treatment. Our results show a direct association between depressive symptomatology, breastfeeding and the early bonding. Previous research support two hypothesis; the first one is that breastfeeding facilitates the maternal-infant bonding so to not breastfeed has a negative impact in the early interaction and the second one is that depression negatively affects the breastfeeding process.

Breastfeeding has been suggested as a facilitator of the bonding process improving mother's self-efficacy and her emotional involvement with the child (Figueiredo et al., 2013). Also breastfeeding facilitates a greater response to baby cues and maternal brain activations in regions involved with empathy and maternal sensitivity (Kim et al., 2011). These considerations could explain in our study why the mothers that did not breastfeed their babies show more difficulties to bond with their babies. In the same line with this idea previous findings have reported more breastfeeding problems and lower levels of breastfeeding self-efficacy in mothers with depressive symptoms in the early postpartum experience (Dennis and McQueen, 2007). Green et al. (1991) reported that depressed mothers provided the most negative descriptions of their babies if they had given up breastfeeding at 6 weeks postpartum. Ystrom (2012) suggested that not breastfeeding could be consider an early symptom of maternal emotional difficulty towards her baby and the result of maternal prenatal emotional status. An additional analysis with the depressed mothers that did not breastfeed their babies show that almost half of them reported higher means in all the mental health measures than the ones that did breastfeed. This could support the idea that mental health problems affect the breastfeeding of the baby (Field, 2010; Stuebe et al., 2014). Although both depression and not breastfeeding seem to be interconnected our multivariate analyses show that they can also have an independent negative effect on the bonding process and if both are present, we could consider the possibility of an accumulative higher risk for a mother to develop a MIBD.

The higher frequency of general mental health problems reported by the depressed mothers with bonding disturbances suggests that these mothers *perceived* themselves with a higher inability to carry out normal activities. These findings describe a psychological state of vulnerability in the depressed mothers with a MIBD characterized by a sense of being overwhelmed with the daily situations. A high level of distress could be related with both the joint effect of the depressive symptomatology and the bonding disturbance in the mothers. A study by Fairbrother and Woody (2008) reported that the maternal perception of the mother-infant relationship and a low social support

predicted the thoughts of intentionally harming their infant at 4 weeks postpartum. According to Cooper and Murray (1995) some mothers could be specifically vulnerable to childbirth as a stressor, developing depressive symptoms after childbirth more than other events. Whitton, Appleby and Warner (1996) called this to be a *cognitive vulnerability* to the impact of motherhood and parenting confirming a correlation between depressive symptoms and negative maternal cognitions. Mothers with a MDE and a MIBD in our study may have perceived childbearing as a very distressing experience. This idea would explain why some of the PBQ items more frequently correlated with the items of the EPDS indicate the perception of motherhood as a burden (*I feel trapped as a mother, I feel the only solution is for someone else to look after my baby, I wish the old days when I had no baby would come back*). This cognitive distortion in depressed postpartum mothers could produce negative thoughts such as unrealistic expectations of themselves as mothers and often guilt related with the care of their babies for not being good enough that could indicate an inability to cope (Whitton et al., 1996). All these misconceptions difficult the acceptance of additional help also related with a masochist way of thinking very frequent in depression (Cattaruzza, 2014) that could explain why more than half of our sample were not in a psychiatric pharmacological treatment.

Most of the depressed mothers with bonding disturbances in our study were *primiparous* and the majority of those with normal bonding have more than one children. The inexperience in parenting of first-time mothers usually increases the worries about the care of the baby with higher probability to suffer a delay in the affective response towards their babies as Robson and Kumar (1980) reported. Further studies have found that primiparous depressed mothers present bigger difficulties, such as bathing their infants at 3 months postpartum than multiparous depressed mothers (Righetti-Veltama et al., 2002) or a more negative description of their babies than those who had a previous baby at 6 weeks postpartum (Green et al., 1991). Identifying different levels of bonding difficulties in first-time mothers should be of clinical importance as has been already suggested (Brockington et al., 2006c; Klier and Muzik, 2004; Wittkowski et al., 2007).

Several limitations should be considered in interpreting our results. First, the sample size is a limitation of the study and results have to be replicated in a bigger sample of mothers with postpartum depression. Second, the cross-sectional design of the study that limits any inference for causal relationships. Also we only used a self-report to assess a bonding disturbance and not an interview as 'gold standard' to confirm a MIBD. The variety of reasons for the mothers to not breastfeed their babies was not identified in detail and could be masquerading other factors related with a bonding alteration that need to be further explored (e.g. not breastfeeding as a personal choice, for medical reasons or lack of social support).

This study has also strengths. The assessment of the depressive maternal state with a clinical interview enables us to confirm the presence of a major depressive episode in the mothers at the early postpartum. The use of the EPDS provided data that not only helped screen for the frequency, severity and specificity of the symptomatology associated to different levels of bonding disturbance but it also was useful as a screening tool for high risk bonding difficulties in association with the PBQ. The double assessment of postpartum depression enriched the analysis and the identification of specific depressive symptomatology can guide mental health professionals' early detection of high risk in mothers with severe specific depressive symptomatology in the early postpartum.

Conclusion

In summary, this is the first study to report prevalence of MIBD using the PBQ in Spanish mothers with a MDE in the early postpartum. Almost a third of our sample had a MIBD and nearly half reported a *severe* bonding disturbance according to the PBQ original cut off points. The negative association of a severe depression in the early bonding process was confirmed in this sample as seen in other cultures and socioeconomic groups. Also our study identifies that specific depressive symptomatology such as sleeping problems and crying due to unhappiness as well as suicidal maternal thoughts are associated with severe bonding difficulties which if present could serve as a signal alarm to identify high-risk mothers.

The prevalence of MIBD detected, compared with other studies, confirms severe depressed mothers, specially *primiparous* and *without breastfeeding*, as a high risk population for bonding disturbances. Taking into consideration that depressed mothers feel overwhelmed by childbearing and usually present difficulties to recognize her difficulties as a problem the ask for help will be also limited reducing the chance for an early MIBD detection. Due to the negative consequences associated to a MIBD in severe depressed mothers we encourage the screening for bonding difficulties in all mothers with PPD using also the EPDS items 7 and 9 as well as PBQ item 24 as red flags for high risk. The utility of using the PBQ and the EPDS together was confirmed in our study and offers an additional screening property supporting easy early assessments to be applied in clinical settings. We can conclude that mothers suffering from a severe major depressive episode in the early postpartum will surely require specific support to strengthen the interaction with their infants specially if the intensity of depressive symptoms is high and artificial feeding is to be elected.

Role of funding source

Partial funding for this study was provided by Fundació La Marató de TV3, from Catalunya, Spain. The funder had no further role in the study design; in the collection, analysis and interpretation of data; and in the writing of the report.

Acknowledgments

This study was partially funded by Fundació La Marató de TV3, from Catalunya, Spain. The first author thanks the Consejo Nacional de Ciencia y Tecnología (CONACyT) from Mexico for the scholarship granted that allowed her participation in this study. The authors also wishes to thank all the mothers that participated in the study as well as Susana Diez and Beatriz Gonzalez for their collaboration in the psychometric assessment of the mothers recruited in the present study.

Conflict of interest

The authors declare that they have no conflict of interest.

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4.3. STUDY 3:

Assessment of mother-infant bonding in mothers with mental health disorders: A comparison of the Spanish version of the PBQ with the MPAS and MIBS.

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Introduction

Mother-infant early bonding is one of the most relevant process in the postpartum and can be compromised by a perinatal mental health disorder with long-lasting effects in the infant's development (Stein et al. 2014). The use of reliable assessment strategies becomes of extreme importance for mental health professionals to allow an early identification of any bonding disturbance between a mother and her child. Some of the most validated instruments to assess this disturbances are the *Postpartum Bonding Questionnaire* (PBQ) (Brockington et al. 2001; Brockington et al. 2006b), the *Maternal Postpartum Attachment Scale* (MPAS; Condon and Corkindale 1998) and the *Mother-to-infant Bonding Scale* (MIBS; Taylor et al. 2005).

The PBQ has reported good psychometric properties to identify mother-infant bonding disturbances in the first year of postpartum both for research and screening purposes in several countries with both general population (Reck et al. 2006; Suetsugu et al. 2015 in press; van Bussel et al. 2010) as well as clinical samples (Siu et al. 2010; Wittkowski et al. 2010). The MPAS has been used in samples from several countries reporting good psychometric properties (Davies et al. 2008; Mason et al. 2011; Perrya et al. 2011; Sierau et al. 2013; van Bussel et al. 2010) and moderated psychometric properties have been reported for the MIBS (Robakis et al. 2015; van Bussel et al. 2010; Wittkowski et al. 2007; Yoshida et al. 2012). No study has ever suggested for the MPAS a cutoff to identify bonding disturbances using its total score or subscales' scores and only one study was identified to suggest a cut off point for the MIBS (Bienfait, et al. 2011). Brockington et al. (2001, 2006b) have suggested for the PBQ several cut off points but they have only been validated in one study (Siu et al. 2010) outside the United Kingdom where it was developed. Most of the studies have maintain the PBQ's

original cut-off points for the original four subscales (Haneko and Honjo, 2014; Reck et al. 2006; van Bussel et al. 2010) or for the total score (Brockington et al. 2006b) to identify the prevalence of mother-infant disturbances for research purposes mainly. (See Table 1).

Sociocultural aspects in each country can influence the maternal perception of motherhood (Razina, 2014) and should be considered in the validation and adaptation of measures to adjust to the characteristics of different populations. In Spain the PBQ has proven to have adequate psychometric properties for its use in Spanish postpartum mothers, both in general population and women with mental health disorders (García-Esteve et al. 2015, *in press*). Nevertheless the cut off points for the total score of the PBQ, the MPAS nor the MIBS have not yet been examine and validated in a Spanish sample with clinical interviews as the gold standard to identify mother-infant bonding disorders (MIBD).

Table 1. Cut off points for the PBQ and MIBS reported in previous studies

| Study | Country | Population | PBQ ≥ 26 Any type of MIBD | | PBQ ≥ 40 Severe MIBD | | |
|-----------------------------|----------------|---|--|--|------------------------------|---------------------------------|--|
| | | | Sensitivity | Specificity | Sensitivity | Specificity | |
| PBQ | | | | | | | |
| (Brockington, et al. 2001) | United Kingdom | Clinical & General Population 104 Mothers from General practice or obstetric clinics with normal bonding, babies with abnormalities and bonding disorders. | Factor 1=0.93, Factor 2=0.57, Factor 3=0.43, Factor 4=0.18, | Factor 1=0.85 Factor 2=1.0 Factor 3=0.96 Factor 4=1.0 | Not reported | Not reported | |
| (Brockington, et al. 2006b) | United Kingdom | Clinical Population 200 Mothers referred to health services. | 0.84 | 0.74 | 0.89 | Positive predictive value=0.73. | |
| (Siu et al. 2010) | China | Clinical Population 62 Mothers attending a Perinatal Specialist Out-patient Psychiatrist Clinic. | 0.74 | 1.0. | 0.83 | 0.96. | |
| MIBS | | | | | | | |
| | | | MIBS ≥ 2 | | | | |
| | | | Sensitivity | Specificity | auROC | | |
| (Bienfait et al. 2011) | France | General Population. 98 mothers in the neonatal unit of a maternity ward. | 0.9 | 0.8 | 0.93 | ---- | |

For the screening of high-risk populations such as mothers with mental health problems, the validation of the cut off points in reliable measures is a priority to strengthen its efficiency and accuracy in clinical settings, and facilitate an early intervention and follow-up in mother-baby dyads with high risk factors. To fulfill that purpose the present study had as main objectives: a) to estimate and compare the validity, reliability and most adequate cut off points for the Spanish version of the PBQ, MPAS and

MIBS to screen for mother-infant bonding disturbances using the Birmingham Interview for Maternal Mental health (5th ed. Brockington et al, 2006a) as the gold standard in mothers with mental health disorders; and b) to analyze the characteristics of the mother-infant bonding in mothers with a mental health disorder during the postpartum.

Method

Design and participants

The assessment of the mothers was developed in two times. In the first time (T1) the mother was assessed at 4-6 weeks after the childbirth and the second assessment (T2) was done after the 7 weeks of postpartum (Mean=13.6 weeks, median=12 weeks) with both the mother and her baby. A total of 71 mothers were invited and 48 (67.6%) accepted to participate. Three mothers were excluded from the study since two did not completed the measures and one mother declined to participate in the second assessment. A total of 45 (93.8%) mother-baby dyads participated in the study and signed a consent form. The study was approved by the Ethical Committee of the Hospital. The data was collected during the period of February 2014 and April 2015.

Measures and procedure

Previously to T1, the mothers had been clinically diagnosed with some mental health disorder using the Structured Clinical Interview for DSM-IV-TR, (SCID-I) applied by a trained psychiatrists or clinical psychologist. In T1, mothers filled out the Spanish version of the *Edinburgh Postnatal Depression Scale* [EPDS] (Cox et al. 1987; García-Esteve et al. 2003), a 10-item self-rated questionnaire that identifies frequency and severity of postpartum depressive symptoms with a total score range of 0 to 30. Also they responded the State Scale (STAI-S) of the validated Spanish version of the *State-Trait Anxiety Inventory*, (Spielberger et al. 1982) that assess current maternal feelings with 20 items and a total score range of 0-60. *Mental health Problems* were identified in T1 with the Spanish version of the *General Health Questionnaire* in its 12-item version [GHQ-12] (Goldberg and Williams, 1988; Navarro et al. 2007). The GHQ-12 has a range for a total score of 0-12 and a high score reports the inability to carry out normal activities while facing new and distressing experiences. At T1 the PBQ was also filled out by the mothers, a self-report of 25 items with a high total score (range 0-125) representing bonding problems. The authors (Brockington et al. 2006b) have suggested the use of cut off points for the total score of the PBQ (≥ 26 for mild bonding disturbances; ≥ 40 for severe bonding

disturbances). Garcia-Esteve et al. (2015, in press) reported a strong internal consistency ($\alpha=0.899$) and a general factor that accounted for the 61% of the total variance that support the use of the total score to identify mother-infant bonding disorders (MIBD) in Spanish postpartum mothers.

Mothers were asked to return for a second assessment after the 7 weeks of postpartum (T2) depending on their availability. At T2 mothers filled out again the EPDS, STAI-S, PBQ and additionally also the Trait-Anxiety scale (STAI-T) in its Spanish version of the *State-Trait Anxiety Inventory* (Spielberger et al. 1982) with 20 items (total range score 0-60) that assess anxiety and distress in general, as a personal characteristic of the mother. At T2 they also answered the two additional bonding self-reports, the MPAS and MIBS. The *Maternal Postpartum Attachment Scale* (MPAS; Condon and Corkindale 1998) includes 19 items and a total score of 19-95 with high scores representing a strong emotional maternal attachment towards her baby. The question have a 2, 3, 4 and 5 point-scales and are recoded to represent the lowest score of 1 a low attachment and a 5 score, a high attachment in each item. A high score of the MPAS reports a good maternal attachment towards her baby. Adequate levels of internal consistency ($\alpha= 0.78$), test-retest reliability ($r=0.86$) and construct validity have been reported (Condon and Corkindale, 1998). The total score was used for this study. The *Mother-to-infant Bonding Scale* (MIBS; Taylor et al. 2005) is an 8-item self-report scale scored from 0 to 5 with a range for the total score of 0-40. A high total score in the MIBS represents a high presence of negative feelings of the mother towards her baby. A reasonable internal consistency was reported with a Cronbach's Alpha of 0.71 and a good stability through time (Taylor et al. 2005). A validation of the MIBS in France has suggested a cut off point of ≥ 2 to identify mother-infant bonding disturbances (Bienfait et al. 2011). For this study, the MPAS and the MIBS were translated into Spanish and back-translated into English by the first author and an independent scientific translator.

At T2 mothers were interviewed with their babies to observe the dyadic interaction by the first author using section 7 on the mother-infant relationship from the Birmingham Interview for Maternal Mental health [BIMMH] (5th ed., Brockington et al. 2006.) to identify/discard a MIBD. For the present study the fifth edition of the BIMMH was translated to Spanish by the first author and a technical correction was performed by two perinatal psychiatrists (LGE & SS) with clinical and research experience in the area. The section 7 of the Birmingham Interview for Maternal Mental health includes the possibility of providing a total score (range 0-178) through the rating of each of the compulsory probes that assess the mother-infant bonding. Two independent raters (BPH & EG) assigned the scores and the mean of both scores was used as the final score. A high total score represents higher bonding with the baby difficulties in the mother.

Socio-demographic data, reproductive health information and mental health background were collected through a questionnaire designed by García-Esteve and Navarro (2005, unpublished) and data related to the newborn and childbirth was obtained from the mother and her clinical records. To explore additional information about the mother, two more measures were applied at T2. The Spanish version of the *Mother and baby scales* (MABS) (Brazelton and Nugent, 1997) was used to assess maternal perception about her infant's behavior and her self-confidence as a mother. The MABS includes 64 items and 8 subscales. For the present study only the 4 subscales that measure the maternal perception of herself as a mother and of the infant's easy temperament were used: *Easy temperament of the baby* (3 items), *Lack of self-confidence in baby's care* (13 items), *Lack of self-confidence in breastfeeding* (8 items) and *Level of maternal general self-confidence* (3 items). To identify the mother's attachment type it was used the CAMIR (Pierrehumbert et al. 1996; adapted to Spanish by Lacasa, 2008) a questionnaire of 72 items and 13 subscales that assess the attachment representations of a mother with others in the past (with their own family, mainly her parents) and the present (family, partner and friends) as well as the family dynamics.

Data Analysis

The statistical analyses were carried out using the SPSS Version 19.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics are presented in means, medians and standard deviations, absolute numbers and percentages. Statistical significance was set at $p < 0.05$ for all the analyses.

Diagnoses: The mothers were assigned to diagnostic groups using the criteria proposed by Brockington et al. (2006b) with 5 categories: *no mother-infant bonding disorder, mild bonding disorder, bonding disorder with threatened rejection, bonding disorder with established rejection and mothers with a bonding disorder in the previous weeks but not at the time of the interview.* Diagnoses of infant-focused anxiety and pathological anger (mild and severe) were also made additionally to the five main categories. Blind to the PBQ scores two raters (BPH & EG) analyzed the interview records and determined a preliminary diagnosis assigning the mothers to a category. These preliminary diagnoses were used to calculate inter-rater reliability with the Cohen's Kappa coefficient. Afterwards they met to resolve disagreements and reach a consensus diagnosis. In the cases with continuing disagreement, a third rater (AT) was brought in to make a final decision. The consensus diagnoses were used as the definitive diagnosis to create the groups of mothers with and without bonding disorders for the further data analyses.

Convergent and Divergent validity: To estimate the convergent validity, the PBQ, the MAPS and the MIBS total scores were analyzed with Spearman non parametric correlations since the distributions of the three variables were not normal. The divergent validity was identified through the correlations of the PBQ with the EPDS and STAI-S. The total scores of the measures reported in T2 were used for the non-parametric correlations. To observe differences in means of repeated measures (PBQ, EPDS, STAI-S) Wilcoxon signed ranks tests (S) were used since the responses did not presented a normal distribution.

Internal Consistency: Cronbach's alpha coefficients were calculated to estimate the internal consistency of the PBQ, the MPAS and the MIBS. Also the test-retest reliability was estimated for the PBQ with the calculation of the intraclass correlation coefficient with the total score means obtained at T1 and T2.

Optimal cut off points: To assess the optimal cut-off points for the PBQ, MPAS and MIBS we computed Receiver Operating Curve (ROC) analyses and assess the diagnostic efficiency statistics of sensitivity, specificity using the consensus diagnoses from the interviews as the gold standard. We prioritized a cut off point with the lowest percentage of false negatives (or the highest sensitivity) for the use in clinical samples where usually a high risk population is assessed and the negative consequences of not making an early assessment of a mother-infant disorders are very high for both the mother and the infant's health and development. We use the ROC analysis for the PBQ total scores in T1 and T2 to compare the best predictive assessment time. For the MPAS and MIBS the total scores reported at T2 were used for the ROC analyses.

Comparison between mothers with mental health disorders and bonding disorders (Group 1) and mothers with mental health disorders and normal bond (Group 2): Two comparisons were performed. The first comparison was made between Group 1 (**mothers with mental health disorders and normal bond**) that was created with the mothers that reported *no bonding disorder* and those *with a bonding disorder in the previous weeks but not at the time of the interview (T2)* and Group 2 (**mothers with mental health disorders and any type of a current bonding disorder**) with the mothers that fulfilled the criteria for a diagnosis of any type of bonding disorder at the moment of the interview (T2). The second comparison was made between Group 1 (**mothers with mental health disorders and normal bond**) that included the mothers that reported no bonding disorder in any time after childbirth and Group 2 (**mothers with mental health disorders and some type of bonding disorder at any time**) created with the mothers that reported *any type of bonding disorder* at T2 and those *with a bonding disorder in the previous weeks but not at the time of the interview (T2)*. To compare Group

1 against Group 2 in both analyses we used the chi-squared test and Fisher's two-sided exact p to identify the significant differences between the dichotomous and categorical variables and the U-Mann Whitney Test for quantitative variables. Spearman non parametric correlations were used to identify the significant associations between all the measures that assess mother-infant bonding (PBQ, MPAS, MIBS, MABS) and the socio-demographic, reproductive health and newborn characteristics, mental health and maternal adult attachment variables.

Results

Sample Characteristics

Previous to the first assessment (T1) mothers were clinically diagnosed with: a major depressive episode in the postpartum (N=11, 24.4%), a major depressive episode during pregnancy (N=9, 20%), agoraphobia (N=9, 20%), anxiety disorder without agoraphobia (N=4, 8.9%), generalized anxiety disorder (N=2, 4.4%), obsessive-compulsive disorder (N=4, 8.9%), adjustment disorder (N=2, 4.4%), posttraumatic stress disorder (N=2, 4.4%), personality disorder (N=1, 2.2%) and dissociative disorder (N=1, 2.2%).

The mothers had a range age of 22-46 years (M=35.3, SD=5.5) with most of them with a current partner (95.6%) and employed (77.8%). Half of the mothers had university level studies (53.3%), most of them born in Spain (84.4%) and only 13.3% of the total reported financial problems. More than half were first-time mothers (62.2%) and the rest (37.8%) reported to have 2 children. Not breastfeeding after childbirth was reported by twelve mothers (26.7%) and later at 4-6 weeks, seventeen mothers (37.8%) reported to not breastfeed anymore. Mothers reported a mean of 38.9 weeks (SD=1.9, range=35-44) of gestational age, six (13.3%) premature babies (<37 weeks) and vaginal delivery (42.2%) was the most frequent type of childbirth reported. Twenty six of the babies were boys (57.8%), eleven babies (24.4%) suffered from some medical complication that demanded observation or hospitalization at their childbirth and two (4.4%) of them had a low weight (<2500 gr.). Seven mothers (15.5%) reported to smoke during pregnancy, two (4.4%) mothers reported to consume alcohol and also two mothers (2.2%) use illegal drugs during their pregnancy. Most of the mothers (91.1%) reported a history of previous psychiatric treatment and 80% were in a psychopharmacological treatment and the moment of the first assessment (T1). Nineteen mothers (42.2%) reported family history of psychiatric disorders.

Diagnoses. A prevalence of 22.2% (N=10, 95% C.I., 9.6 - 34.9) mothers met at T2 the criteria for some kind of MIBD. If we include the mothers with a history of some kind of MIBD previously but no

longer met the criteria at the moment of the interview (T2), the prevalence increases to 33.3% (N=15, 95% C.I., 19.0 - 47.7). No mother was diagnosed with an established rejection mother-infant bonding disorder and because of the small numbers it seem appropriate to merge the total scores for the mothers with mild bonding disorders to calculate the mean for the PBQ, MPAS, MIBS and the BIMMH total score for that diagnostic group (See Table 2).

Convergent and Divergent Validity. The PBQ show a moderate positive non-parametric correlation with the MIBS and a strong negative correlation (both scores goes in an opposite direction) with the MPAS confirming the convergent validity of the three questionnaires. Non-parametric correlations were smaller between the PBQ, the MPAS and the MIBS with the STAI-S, which measures different constructs confirming divergent validity. See Table 3.

Test-retest reliability for the PBQ. The test-retest reliability was only calculated for the PBQ through the intraclass correlation coefficient between the T1 and T2 mean scores showing a strong correlation of 0.841 (95% C.I.; 0.71- 0.91) that indicated good stability through time. Changes in the repeated measures (PBQ, EPDS, STAI-S) were also calculated with the Wilcoxon Signed Ranks-Test for T1 and T2 showing significant lower means at T2 for the total scores of the EPDS and the STAI-S. No significant difference was found for the total PBQ between the two assessments.

Table 2. Diagnostic groups of mother-infant bonding in mothers with mental health problems (n=45)

| Diagnostic Group | Inter-rate reliability (Cohen's Kappa) | Number with consensus diagnostic | % | Sp-PBQ | Sp-PBQ | MPAS | MIBS | BIMMH |
|---|--|----------------------------------|------|--------|--------|-------|------|-------|
| | | | | T1 | T2 | T2 | T2 | T2 |
| | | | | mean | mean | mean | mean | mean |
| Mothers with normal bonds | 0.85 | 30 | 66.7 | 9.94 | 9.09 | 85.34 | 1.10 | 7.33 |
| Mothers with some kind of bonding disorder in the previous weeks but not at the time of the interview (T2). | 0.88 | 5 | 11.1 | 14 | 7.4 | 90.80 | 4.80 | 7.40 |
| <i>Mothers with any type of bonding disorder</i> | 0.76 | 10 | 22.2 | 28 | 25.3 | 72.49 | 4.60 | 38.40 |
| Mild disorders | 0.63 | 4 | 8.9 | | | | | |
| Mild disorders with infant-focused anxiety | 0.79 | 2 | 4.4 | 25.57 | 23.29 | 76.47 | 3.71 | 16.96 |
| Mild disorder with pathological mild anger | 1 | 1 | 2.2 | | | | | |
| Threatened Rejection | 1 | 3 | 6.7 | 33.67 | 30 | 63.20 | 6.67 | 88.42 |
| Established Rejection _a | -- | 0 | 0 | --- | ---- | --- | --- | ---- |

BIMMH= Total score of the section 7 of the Birmingham Interview for Maternal Mental health.

_aThere were no cases diagnosed with a bonding disorder with *established rejection*.

Table 3. Correlations (Spearman) between the three measures^a of the early mother-infant bonding (PBQ, MPAS, MIBS), EPDS and STAI-S at T2

| | MPAS | MIBS | EPDS | STAI-S |
|------|---------|--------|---------|--------|
| PBQ | -.724** | .443* | .431** | .374* |
| MPAS | | -.478* | -.429** | -.334* |
| MIBS | | | .318* | .272 |
| EPDS | | | | .662** |

^aTotal scores of all the instruments were used.
Correlation is significant at * $p < 0.05$; ** $p < 0.01$ (2-tailed)

Internal consistency. The internal consistencies of the bonding measures (PBQ, MPAS, MIBS) were estimated at T2 showing that the highest Cronbach's alpha was found in the PBQ (0.887) indicating a strong internal consistency. High internal consistencies were also found in the MPAS and MIBS at T2. See table 4.

Table 4. PBQ, EPDS, STAI-S means in T1 and T2, MPAS and MIBS in T2 and Cronbach's Alpha at T2

| | T1 Mean | T2 Mean | S | p | T2 Cronbach's α |
|--------|------------|------------|--------|------|---------------------------|
| EPDS | 8.79 | 6.68 | 151.00 | 0.00 | .876 |
| STAI-S | 21.63 | 16.30 | 208.50 | 0.02 | .929 |
| PBQ | 13.96 | 12.69 | 274.50 | 0.51 | .887 |
| MPAS | -- | 83.09 | -- | -- | .867 |
| MIBS | -- | 2.29 | -- | -- | .824 |

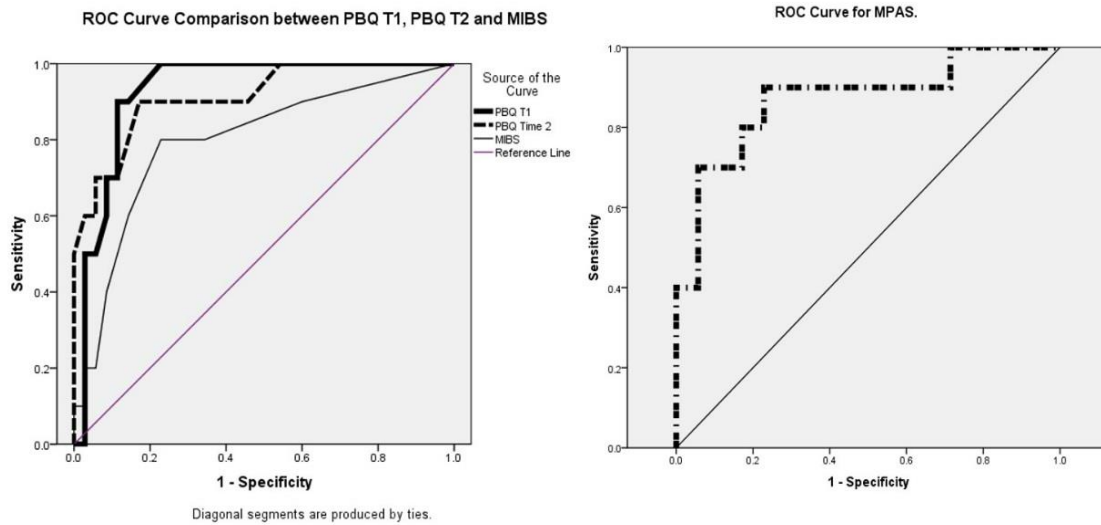
*Wilcoxon Signed Ranks-Test were used to compare the means at T1 and T2.

Sensitivity and Specificity of the cut-off points. ROC analyses were performed with the total scores PBQ at T1 and T2, and from the MPAS and MIBS at T2. The consensual diagnoses of the interview were used to compare the diagnostic efficiency statistics of sensitivity and specificity aimed to assess the optimal cut-off point to identify *any type of bonding disorder* in all the bonding questionnaires. The best screening model was reported by the PBQ scores at T1 showing the strongest screening qualities (auROC: 0.929) when compared with the rest of the questionnaires. See Table 5 and Figure 1.

Table 5. Area under de ROC Curve for the PBQ T1 and T2, and MPAS and MIBS.

| Bonding Questionnaire | Area | Std. Error | p | 95% C.I. | |
|-----------------------|------|------------|------|-------------|-------------|
| | | | | Lower Bound | Upper Bound |
| PBQ at T1 | .929 | .038 | .000 | .853 | 1.000 |
| PBQ at T2 | .914 | .052 | .000 | .812 | 1.000 |
| MPAS | .871 | .071 | .000 | .731 | 1.000 |
| MIBS | .796 | .085 | .005 | .629 | .963 |

Figure 1. ROC Curves for PBQ T1, PBQ T2, MIBS and MPAS.



The optimal choice to identify any type of mother-infant bonding disorder in the PBQ was reported at T1 with a cut-off point of ≥ 18 that reported the highest sensitivity and an adequate specificity for a clinical sample. For the MPAS, the optimal cut-off point identified was ≤ 80 and for the MIBS was ≥ 3 . The sensitivity and specificity for each cut-off point are reported in Table 6.

Table 6. Sensitivity and Specificity for Sp-PBQ, MPAS and MIBS cut off points for Any type of bonding disorder^a (ROC analyses)

| PBQ T1 | | | PBQ T2 | | | MPAS | | | MIBS | | |
|-----------------------------|------------|--------------|-----------------------------|------------|--------------|-----------------------------|------------|--------------|----------------------------|------------|--------------|
| Cut-off score | SE | SP | Cut-off score | SE | SP | Cut-off score | SE | SP | Cut-off score | SE | SP |
| ≥ 14 | 100% | 77.1% | ≥ 14 | 90% | 80% | ≤ 77 | 70% | 91.4% | ≥ 1 | 90% | 40.0% |
| ≥ 17 | 90% | 85.7% | ≥ 15 | 90% | 82.9% | ≤ 79 | 70% | 85.7% | ≥ 2 | 80% | 65.7% |
| ≥ 18 | 90% | 88.6% | ≥ 19 | 80% | 85.7% | ≤ 80 | 80% | 82.9% | ≥ 3 | 80% | 77.1% |
| ≥ 20 | 80% | 88.6% | ≥ 20 | 70% | 88.6% | ≤ 81 | 80% | 80.0% | ≥ 4 | 60% | 85.7% |
| ≥ 24 | 70% | 88.6% | ≥ 22 | 70% | 91.4% | ≤ 82 | 80% | 77.1% | ≥ 5 | 40% | 91.4% |
| ≥ 25 | 70% | 91.4% | ≥ 23 | 70% | 94.3% | ≤ 83 | 90% | 74.3% | ≥ 6 | 20% | 94.3% |
| ≥ 27 | 60% | 91.4% | ≥ 24 | 60% | 94.3% | ≤ 85 | 90% | 62.9% | ≥ 7 | 20% | 97.1% |
| ≥ 28 | 50% | 94.3% | ≥ 25 | 60% | 97.1% | ≤ 87 | 90% | 57.1% | ≥ 10 | 10% | 97.1% |
| ≥ 29 | 50% | 97.1% | ≥ 26 | 50% | 100% | ≤ 89 | 90% | 42.9% | ≥ 13 | 10% | 100% |

PBQ T1: PBQ total score at 4-6 weeks; PBQ T2: PBQ total score after the 7th week; SE= Sensitivity; SP=Specificity; +LR= Positive likelihood ratio; -LR= Negative likelihood ratio; MPAS: MPAS total score at T2 (\geq the 7th week postpartum). MIBS: MIBS total score at T2.

^aIncludes all the cases (n=10) from the diagnostic groups of mild and severe bonding disorder. Due to the small number of cases with a diagnostic of severe bonding disturbance (n=3), the ROC analysis for the severe bonding cut-off was not computed.

^bA high total score in the MPAS represents a strong positive affective maternal attachment to the baby (in an opposite direction than PBQ and MIBS), so the cut off point should be interpreted as equal to the cut off score or less.

The cut off points with the highest sensitivity and specificity are in bold.

Comparison of mothers with mental health disorders and normal bonds and mothers with mental health disorders with a bonding disorder

The socio-demographic, reproductive health and newborn characteristics, psychopathological, mental health symptomatology, the maternal type of attachment and the MABS subscales were compared between the mothers with normal bonds and those with a diagnosis of a bonding disorder. Two type of comparisons were done (see Data analysis). In the first comparison significant differences identified that mothers that fulfilled the criteria for any type of bonding disorder at T2 show higher *depressive symptoms, trait-anxiety, general mental health problems, lack of self-confidence in baby's care* and *lower levels of maternal general self-confidence* than mothers with normal bonds. In the second comparison mothers with some type of bonding disorder at any moment (at T2 or previously) only show a *lower perception of parental unavailability* in the CAMIR. See Table 7.

Mother-infant bonding and its association with other variables

In order to identify the associations of the mother-infant bonding with the rest of the variables, non-parametric correlations were used. The larger number and highest significant correlations with bonding difficulties were identified with the mental health disorders (depression, state-anxiety and trait-anxiety, general mental health problems) at T1 and T2. The highest correlations between bonding difficulties and mental health symptomatology at T1 (4-6 weeks) show that high bonding disturbances (PBQ) at T1 are associated with state-anxiety (STAI-S) at T1 ($\rho=.580$, $p<0.01$), the MABS subscale of *maternal general self-confidence* is associated to low trait-anxiety (STAI-T) at T2 ($\rho=-0.572$, $p<0.01$), the MABS subscale of *lack of self-confidence in baby's care* shows association with state-anxiety (STAI-S) at T2 ($\rho=0.571$, $p<0.01$) and a good maternal emotional attachment with her baby (MPAS) is associated with a high level of maternal general self-confidence ($\rho=0.554$, $p<0.01$).

High bonding difficulties (PBQ) at T2 are associated with all the subscales of the MABS. The only significant correlation with mother-infant relationship and socio-demographics was identified between the MABS subscale of *level of self-confidence in breastfeeding* and a *bad relationship with the partner*. Also the subscale of *maternal general self-confidence* correlated negatively with the

depressive symptoms at T1 and T2, general mental health problems at T1 and the state-anxiety and trait-anxiety at T2 (EPDS T1, GHQ-12-T1, EPDS T2, STAI-S T2, STAI-T T2) confirming a significant association of mental health disorders with *low maternal general self-confidence*.

Mental health disorders also seem to have specific associations with the subscales of the MABS; maternal description of an *easy temperament of the baby* is associated at T2 with lower state-anxiety and trait anxiety; lack of self-confidence in baby's care is associated with depressive symptoms at T1 and T2 as well as with state-anxiety and trait-anxiety at T2; and lack of self-confidence in breastfeeding is associated with depressive symptoms at T1 and T2.

Two negative associations were identified between the CAMIR and bonding disturbances. One of them reports a low maternal affective attachment to the baby and disengaged maternal attachment type (CAMIR) and the other one shows an association between low maternal self-sufficiency and high frequency of negative maternal emotions towards the baby. To not breastfeed their babies was associated with high maternal negative feelings with their baby and to be in a current psychopharmacological treatment was associated with lower bonding difficulties (PBQ) and higher maternal affective attachment with the baby (MPAS). See Table 7.

We found also significant correlations with the baby weight and bonding difficulties; all of them show that a low baby weight is associated with less bonding difficulties and good maternal affective attachment.

The level of maternal self-confidence is directly associated to having a premature baby. Also the lack of self-confidence in baby's care is associated with the absence of family history of psychiatric disorders.

See Table 8.

Table 7. Variables comparison between mothers with normal bonds and mothers with bonding disorders

| Variables | Mothers with <i>normal</i> bond | Mothers with <i>any type</i> of current bonding disorder | <i>U</i> (<i>Z</i>) ^b | <i>p</i> | Mothers with <i>normal</i> bond | Mothers with <i>any type</i> of bonding disorder at any time | <i>U</i> (<i>Z</i>) ^b | <i>p</i> |
|---|--|--|------------------------------------|----------|--|--|------------------------------------|----------|
| | N=35 | N=10 | | | N=30 | N=15 | | |
| | N (%) ^a / Median(SD) ^b | N (%) ^a / Median(SD) ^b | | | N (%) ^a / Median(SD) ^b | N (%) ^a / Median(SD) ^b | | |
| <i>Socio-demographics</i> | | | | | | | | |
| Age | 35.75(5.42) | 35.03 (5.83) | 169.0 (-.164) | 0.87 | 36.42 (5.16) | 33.35 (5.82) | 165.0 (-1.45) | 0.15 |
| Country of origin –Spain, | 31 (88.6) | 7 (70.0) | | 0.17 | 26 (90.0) | 12 (80.0) | | 0.67 |
| Level of education | | | | | | | | |
| Primary studies or less | 6 (17.7) | 1 (10.0) | | 1 | 5 (17.2) | 2 (13.3) | | 1 |
| Secondary studies | 11 (32.4) | 2 (20.0) | | 0.70 | 78(27.6) | 5 (33.3) | | 0.74 |
| University/ bachelor degree | 17 (50.0) | 7 (70.0) | | 0.3 | 16 (55.2) | 8 (53.3) | | 1 |
| Economic Problems | 4 (10.0) | 2 (20.0) | | 0.61 | 3 (10.0) | 3 (20.0) | | 0.65 |
| Unemployed | 6 (17.6) | 3 (30.0) | | 0.4 | 6 (20.7) | 3 (20.0) | | 1 |
| Relationship with partner | 120.0 (31.7) | 111.5 (37.8) | 123.0 (-1.42) | 0.19 | 116.0 (31.7) | 125.0 (37.4) | 190.0 (-.84) | 0.40 |
| Unsatisfactory relationship with partner | 7 (20.0) | 3 (30.0) | | 0.67 | 7 (20.0) | 3 (20.0) | | 1 |
| Smoking during Pregnancy | 7 (20.0) | 0 (0) | | 0.31 | 4 (10.0) | 3 (20.0) | | 0.67 |
| Alcohol consumption during Pregnancy | 1 (3.0) | 1 (11.0) | | 0.39 | 0 (0.0) | 2 (14.3) | | 0.11 |
| Drug use during Pregnancy | 1 (3.0) | 1 (11.0) | | 0.39 | 1 (3.4) | 1 (7.1) | | 1 |
| <i>Reproductive health and newborn variables</i> | | | | | | | | |
| Gestational age | 39.0(1.89) | 40.0 (1.78) | 128.5 (-1.29) | 0.20 | 39.0 (1.79) | 39.0 (2.17) | 217.5 (-.183) | 0.86 |
| Premature baby (<37 weeks) | 6 (17.1) | 0 (0) | | 0.31 | 4 (13.8) | 2 (13.3) | | 1 |
| Low baby weight (>2500 gr.) | 2 (5.7) | 0 (0) | | 1 | 0 (0) | 2 (13.3) | | 0.11 |
| Pregnancy not planned | 6 (17.2) | 3 (30.0) | | 0.39 | 6 (20.0) | 3 (20.0) | | 1 |
| Pregnancy not well received | 3 (8.6) | 1 (10.0) | | 1 | 3 (10.0) | 1 (6.6) | | 1 |
| Primiparity | 22 (62.3) | 6 (60.0) | | 1 | 18 (60.0) | 10 (66.7) | | 0.75 |
| Sex of the infant-(girl) | 15 (42.3) | 4 (40.0) | | 1 | 13 (43.3) | 6 (40.0) | | 1 |
| Not breastfeeding after childbirth | 9 (25.7) | 3 (30.0) | | 1 | 6 (20.0) | 6(40.0) | | 0.17 |
| Not breastfeeding (4-6 weeks) | 12 (34.3) | 5 (50.0) | | 0.47 | 10 (33.3) | 7 (46.7) | | 0.52 |
| Experienced elective abortion in the past | 3 (9.1) | 2 (20.0) | | 0.58 | 3 (10.7) | 2 (13.3) | | 1 |
| Experienced thoughts of ending the pregnancy | 5 (14.3) | 0 (0) | | 0.57 | 4 (13.3) | 1 (6.7) | | 0.65 |
| <i>Psychopathological variables</i> | | | | | | | | |
| History of previous psychiatric treatment | 32 (91.4) | 9 (90.0) | | 1 | 27 (90.0) | 14 (93.3) | | 1 |
| Family history of psychiatric disorders | 16 (47.1) | 3 (30.0) | | 0.47 | 13 (44.8) | 6 (40.0) | | 1 |
| Psychopharmacological treatment in postpartum | 30 (85.7) | 6 (60.0) | | 0.09 | 26 (86.6) | 10 (66.7) | | 0.13 |
| Diagnosis of a MDE in postpartum | 7 (21.2) | 4 (40.0) | | 0.25 | 6 (21.4) | 5 (33.3) | | 0.47 |
| Diagnosis of a MDE during pregnancy | 8 (24.2) | 1 (10.0) | | 0.66 | 7 (25.0) | 2 (13.3) | | 0.46 |

Table 7. Variables comparison between mothers with normal bonds and mothers with bonding disorders (Continuation..)

| Variables | Mothers with <i>normal</i> bond | Mothers with <i>any type</i> of current bonding disorder | <i>U</i> (<i>Z</i>) ^b | <i>p</i> | Mothers with <i>normal</i> bond | Mothers with <i>any</i> <i>type</i> of bonding disorder at any time | <i>U</i> (<i>Z</i>) ^b | <i>p</i> |
|---|---|---|------------------------------------|-------------|---|---|------------------------------------|-------------|
| | N=35 N (%) ^a / Median(SD) ^b | N=10 N (%) ^a / Median(SD) ^b | | | N=30 N (%) ^a / Median(SD) ^b | N=15 N (%) ^a / Median(SD) ^b | | |
| <i>Mental health symptoms</i> | | | | | | | | |
| Depressive symptoms (EPDS)-Time 1 | 6.50 (6.32) | 13.00 (6.30) | 75.5 (-1.94) | 0.052 | 7.00 (5.44) | 13.00 (7.63) | 117.0 (-1.95) | 0.051 |
| Depressive symptoms (EPDS)-Time 2 | 5.0 (4.73) | 8.5 (5.98) | 93.5 (-2.15) | 0.03 | 5.00 (4.96) | 6.00 (5.90) | 181.0 (-.90) | 0.36 |
| Spielberg Anxiety state (STAI-S)- Time 1 | 16.5 (12.94) | 34.0 (12.37) | 70.0 (-1.70) | 0.09 | 17.00 (11.47) | 28.50 (15.26) | 117.0 (-1.64) | 0.10 |
| Spielberg Anxiety state (STAI-S)- Time 2 | 14.0 (8.23) | 23.0 (6.72) | 102.5 (-1.89) | 0.06 | 14.00 (8.22) | 22.00 (7.19) | 140.0 (-10.92) | 0.054 |
| Spielberg Anxiety trait (STAI-T)- Time 2 | 15.0 (5.49) | 20.00 (4.34) | 85.0 (-2.39) | 0.02 | 15.00 (5.62) | 17.60 (18.00) | 169.5 (-1.19) | 0.23 |
| General Mental health Problems (GHQ-12)- Time 1 | 2.0 (3.58) | 7.50 (3.78) | 54.5 (-2.52) | 0.01 | 2.00 (3.37) | 7.00 (4.66) | 121.5 (-1.39) | 0.16 |
| <i>Other Scales</i> | | | | | | | | |
| <i>Adult Attachment (CAMIR)</i> | | | | | | | | |
| Secure Type | 19 (55.9) | 4 (40.0) | | 0.48 | 15 (51.7) | 8 (53.3) | | 0.92 |
| Disengaged Type | 1 (3.0) | 2 (20.0) | | 0.13 | 1 (3.4) | 2 (13.3) | | 0.26 |
| Preoccupied Type | 14 (41.2) | 4 (40.0) | | 1 | 13 (44.8) | 5 (33.3) | | 0.46 |
| <i>Adult Attachment subscales (CAMIR)</i> | | | | | | | | |
| Parental interference | 55.40 (11.04) | 57.45 (10.78) | 164.5 (-.15) | 0.87 | 56.81 (11.14) | 53.24 (10.24) | 175.0 (-1.06) | 0.29 |
| Family Interest | 54.20 (8.26) | 57.20 (15.31) | 151.5 (-.52) | 0.60 | 54.66 (8.14) | 55.86 (13.34) | 185.5 (-.79) | 0.43 |
| Complain for receiving a childish treat by their parents | 52.20 (8.55) | 48.70 (10.83) | 150.5 (-.55) | 0.58 | 51.37 (8.28) | 47.07 (9.99) | 161.5 (-1.39) | 0.16 |
| Parental Support | 54.10 (10.41) | 57.85 (10.09) | 122.0 (-1.35) | 0.18 | 50.33 (10.68) | 55.34 (9.29) | 154.5 (-1.57) | 0.12 |
| Open Communication | 50.75 (8.81) | 54.95 (12.63) | 154.0 (-.45) | 0.65 | 49.95 (8.65) | 51.90 (11.54) | 178.0 (-.98) | 0.33 |
| Support acknowledgement | 52.80 (8.28) | 52.80 (8.87) | 169.5 (-.01) | 0.99 | 50.53 (8.09) | 53.20 (8.73) | 175.0 (-1.06) | 0.29 |
| Parental unavailability | 48.50 (10.21) | 46.50(11.18) | 146.0 (-.34) | 0.73 | 51.96 (10.01) | 45.39 (9.73) | 136.5 (-2.01) | 0.04 |
| Self-sufficiency | 42.20 (6.81) | 38.40 (5.87) | 158.0 (-.34) | 0.73 | 42.47 (6.93) | 40.95 (5.84) | 183.5 (-.86) | 0.39 |
| Resentment against parents | 43.90 (11.10) | 53.90 (9.35) | 147.5 (-.63) | 0.53 | 50.47 (11.33) | 49.36 (9.53) | 199.5 (-.45) | 0.65 |
| Childhood trauma | 46.70 (13.62) | 52.25 (6.80) | 157.5 (-.35) | 0.73 | 53.31 (13.62) | 50.46 (9.88) | 194.5 (-.45) | 0.65 |
| Memory Block | 46.90 (9.57) | 45.20 (10.54) | 168.0 (-.06) | 0.96 | 45.38 (9.25) | 45.54 (10.79) | 206.0 (-.28) | 0.77 |
| Resignation of Parental responsibilities | 52.80 (9.59) | 50.10 (9.97) | 129.0 (-1.16) | 0.25 | 54.34 (10.01) | 51.74 (9.04) | 179.0 (-.96) | 0.34 |
| Appreciation for hierarchy | 48.30 (6.92) | 49.70 (9.69) | 166.5 (-.09) | 0.92 | 48.33 (5.93) | 48.69 (10.16) | 209.5 (-.96) | 0.34 |
| <i>Mother & Baby Scales (MABS)</i> | | | | | | | | |
| MABS- Easy temperament of the Baby | 5.00 (4.13) | 1.50 (3.79) | 142.0 (-.91) | 0.36 | 3.23 (4.05) | 2.80 (4.16) | 212.0 (-.32) | 0.75 |
| MABS-Lack of self confidence in baby's care | 15.00 (8.57) | 25.00 (7.18) | 65.5 (-2.68) | 0.01 | 16.46 (7.68) | 18.42 (11.43) | 172.5 (-.95) | 0.34 |
| MABS-Lack of self confidence in breastfeeding | 7.50(6.23) | 11.00 (7.59) | 127.5 (-.76) | 0.45 | 8.31 (6.46) | 9.07 (6.76) | 188.0 (-.39) | 0.7 |
| MABS-Level of maternal general self-confidence | 4.00 (2.89) | 2.00 (2.23) | 81.0 (-2.17) | 0.03 | 3.62 (2.92) | 3.29 (2.97) | 194.0 (-.24) | 0.81 |

Note: ^aDichotomus variables were analyzed with crosstabs using the Pearson chi-squared (χ^2) and the Fisher's exact test. ^bFor continuous variables, U-Mann Whitney Tests were used. The minimum statistically significance value was set at 0.05 (2-tailed). Significant values are in bold.

Table 8. Significant Non-parametric correlations with mother-infant bonding (PBQ, MPAS & MBIS)

| Bonding | Socio-demographics | Reproductive Health & New born | Mental health | Mental health Symptomatology | Mother-baby Scales (MABS) | Mother's Attachment (CAMIR) |
|---------|---|--|---|--|---|--|
| PBQ- T1 | ---- | Baby weight (.332*) | ---- | EPDS T1 (.556**) EPDS T2 (.323*) STAI-S T1 (.580**) GHQ-12 T1 (.455**) | Level of maternal general self-confidence (-.397**) | |
| PBQ T2 | ---- | Baby weight (.375*) | Current psychopharmacological treatment (-.379*) | EPDS T1 (.418**) EPDS T2 (.431**) STAI-S T1 (.363*) STAI-S T2 (.374*) GHQ-12 T1 (.349*) | Easy temperament of the baby (-.440**) Lack of self-confidence in baby's care (.442**) Lack of self-confidence in breastfeeding (.338*) Level of maternal general self-confidence (-.457**) | |
| MPAS | ---- | Baby weight (-.335*) | Current psychopharmacological treatment (.377*) | EPDS T1 (-.360*) EPDS T2 (-.429**) STAI-S T1 (-.345*) STAI-S T2 (-.334*) GHQ-12 T1 (-.395**) | Level of self-confidence in baby's care (-.481**) Level of maternal general self-confidence (.554**) | Disengaged Maternal Attachment Type (-.320*) |
| MIBS | ---- | Not breastfeeding after childbirth (.342*) | ---- | EPDS T1 (.489**) EPDS T2 (.318*) STAI-S T1 (.520**) GHQ-12 T1 (.555**) | | Self-sufficiency [CAMIR] (-.320*) |
| MABS | Lack of self-confidence in breastfeeding/bad relationship with partner (.487**) | Level of maternal general self-confidence/premature baby (.319*) | Lack of self-confidence in baby's care/Family history of psychiatric disorders (-.310*) | <u>Easy temperament of the baby and:</u> -STAI-S T2 (-.341*) - STAI-T T2 (-.402**) | Easy temperament of the baby/Level of maternal general self-confidence (.538**) | |
| | | | | <u>Lack of self-confidence in baby's care and:</u> -EPDS T1 (.363*) - EPDS T2 (.521**) - STAI-S T2 (.571**) -STAI-T T2 (.538**) | | |
| | | | | <u>Lack of self-confidence in breastfeeding and:</u> -EPDS T1 (.407**) EPDS T2 (.425**) | | |
| | | | | <u>Maternal general self-confidence and:</u> -EPDS T1 (-.332*) -GHQ-12 T1 (-.342*) -EPDS T2 (-.475**) STAI-S T2 (-.417**) STAI-T T2 (-.572**) | | |

PBQ = The Postpartum Bonding Questionnaire; MPAS= The Maternal Postpartum Attachment Scale; MIBS= The Mother-to-infant Bonding Scale; MABS= The Mother and Baby Scales; EPDS= The Edinburgh Postnatal Depression Scale; STAI-S= The State-Scale of the Anxiety State-Trait Inventory; STAI-T= The Trait Scale of the Anxiety State-Trait Inventory; GHQ-12= The General Health Questionnaire 12-item version, MABS= Mother and Baby Scales; CAMIR= Attachment Questionnaire for adults.
 T1= At 4-6 weeks of postpartum
 T2= ≥ the 7th week of postpartum
 Spearman correlations were calculated. Correlation is significant at : * p<.05 (2-tailed) ** p<.01 (2-tailed)

Discussion

Our findings show adequate validity and reliability properties in the PBQ, MPAS and MIBS. The comparison between the three of these self-reports show that the Spanish version of the PBQ is the most reliable and valid measure to assess mother-infant bonding disturbances in a sample of mothers with mental health problems in the first year of postpartum. A cut-off point of ≥ 18 in the PBQ lower than the ones suggested by other studies was identified as the optimal choice to screen for a mother-infant bonding disorder and the best timing to assess for one is at 4-6 weeks of postpartum. The optimal cut-off points identified were ≤80 for the MPAS and ≥3 for the MIBS. Our results also highlights that the mothers with mental health disorders that develop a mother-infant bonding disorder also present higher depressive, anxiety and general mental health

problems than those with normal bonds. Also, specific associations between depression and anxiety with particular bonding difficulties were identified.

Validity and reliability of the PBQ, MPAS and MIBS

The three questionnaires reported a high internal consistency with the PBQ reporting the highest of all confirming what previously was identified in a large Spanish sample of mothers from general population and with mental health disorders at 4-6 weeks of postpartum (García-Esteve et al. 2015, *in press*) as well as in samples from different countries (Haneko and Honjo, 2014; Suetsugu et al. 2015; van Bussel et al. 2010; Wittkowski et al. 2010). The strong correlations found between the PBQ and the MPAS, the two measures most similar in structure and number of items, confirmed the convergent validity as well as the more moderate correlations found with the MIBS. The fewer number and the type of items (a list of maternal feelings) of the MIBS can explain the smaller yet significant correlation with the PBQ and MPAS in line with the results identified in a previous study (van Bussel et al. 2010). The PBQ also show to have a good stability with a high the test-retest reliability for the total scores between the administration in T1 and T2.

Cut-off points to identify a mother-infant bonding disorder

The use of the Birmingham Interview for Maternal Mental health (5th ed., Brockington et al. 2006a) as the gold standard allowed to confirm the adequate screening qualities of the three questionnaires. Again, the PBQ was the questionnaire with the highest screening quality to identify mothers with bonding disturbances according to the ROC analyses. This first exploration in a small clinical sample show lower cut off points of the PBQ to identify bonding disorders, a new proposal for cut-off in the MPAS and an almost similar cut-off for the MIBS than the one reported by a previous study (Bienfait et al. 2011).

PBQ. The differences between the cut off points estimated in our sample with the ones suggested by the PBQ authors (Brockington et al. 2006b) and the only other validation study by Siu et al. in 2010 (≥ 18 vs ≥ 26 for any type of MIBD), can be explained by three main reasons. First, lower cut off points were preferred because we decided to prioritize a screening rather than a diagnostic purpose in the PBQ for its application in clinical settings decreasing the negative high costs of not making an early identification of a mother-baby dyad with a bonding disorder in settings where more detailed assessments can be realized. Approaching results for sensitivity and specificity in the PBQ cut off point to identify some kind of bonding disorder ($PBQ \geq 26$) were registered in our study at T1 with the ones reported in the Chinese sample (Siu et al. 2010). As a second reason, we identified in the interviews a tendency in the mothers to minimize the gravity of their bonding difficulties. This could probably be related with a traditional family model where the mother is still

responsible of most of the parenting tasks in the Spanish culture (Rodríguez et al. 2009) and being perceived by others as a bad mother is a cause for social reprobation. These two circumstances supported our decision for decreasing the cut off points to screen with better efficacy. The third reason for lower cut-off points identified is related with the small size of the sample and the absence of cases with established rejection diagnoses in the severe bonding diagnostic group which reduced the diversity of the total scores distribution to perform an efficient screening.

MPAS and MIBS. Neither the authors of the MPBAS nor previous studies that have use this questionnaire to assess mother-infant difficulties have suggested a specific cut-off point to identify a bonding disorder. Our results suggest a cut-off point of ≤ 80 that is optimal in our sample with a good screening capacity identified in the MPAS with a high area under the ROC curve (auROC=.871). We suggest that this should be confirmed in larger samples but we think that a cut-off point can be useful as a referential red-flag point that indicates the need of a more detailed assessment specially in mothers from clinical samples. The screening capacity of the MIBS was the lowest of the three questionnaires compared showing a moderate area under the ROC curve (auROC=.796) lower that the one reported in a previous study (auROC=.91) (Bienfait et al. 2011). The cut-off point of ≥ 3 (Sensitivity=.8, Specificity=.71) identified in the MIBS is close that the one suggested in a previous validation (≥ 2 , Sensitivity=.9, Specificity=.8) in French mothers during the first days after delivery in a Neonatal unit (Bienfait et al. 2011). The cut-off point of ≥ 2 from Bienfait et al (2011) reports a higher sensitivity which explains a lower cut-off point and also a higher specificity than ours due probably to the smaller size of our sample which could explain the small difference between both cut-off points as well as the difference in the timing of the assessment. We also have to take that the MIBS is the bonding questionnaire with the least number of items (8) of all the three self-reports compared, which can also explain the lower rates.

Best timing for assessment for an early identification of a MIBD

The two-time assessment with the PBQ shows that there could be better timings than others to screen for MIBD. The mental health measures for depression and anxiety and the PBQ show higher means of symptomatology at T1 than at T2. This reduction could be explained by the positive effect of the psychiatric treatment received by most of the mothers in the Hospital as well as a natural improvement of the parenting skills. Previous findings have shown the tendency of improvement in the mother-infant bonding with the time (van Bussel et al. 2010; Taylor et al. 2005) due to the learning parenting experience as well as the positive effect of the psychiatric treatment that improves the maternal mental health and her parenting. Both possibilities were identified in the clinical interviews and the correlational analysis. The decrease in bonding difficulties could also be contributing to the lower cut off point (≥ 15) reported by the ROC analysis with the PBQ

scores of T2 to identify any type of bonding disorder. Mothers with a normal bond with their babies at T2 that in the interviews reported a previous history of bonding disturbances described that their highest bonding difficulties occur approximately at the same time as T1, concurring that at 4-6 weeks of postpartum could be a period when bonding disturbances symptoms seem to be more evident. Therefore the best timing shown in our sample for an early identification of a mother-infant bonding disorder is in the early postpartum, at 4-6 weeks after childbirth.

Severity and specificity of mental health symptomatology and bonding disorders

A higher severity of mental health symptomatology was found in mothers with a mental health disorder and a MIBD than the mothers with a mental health disorder and normal bonds with their babies. The correlational analysis also reported significant associations between bonding difficulties and all the mental health measures at T1 and T2. These results confirm that maternal mental health disorders can compromise the early mother-infant relationship (Stein et al. 2014) proven to be one of the most important predictors for a mother-infant bonding disorder (Mäntymaa, 2006). Our study also identifies that there are specific associations between type of mental disorder and particular bonding difficulties.

Depression and bonding. The impairment effect that maternal depression has in the early bonding process between a mother and her baby in clinical samples has been previously identified (Muzik et al. 2013; Wittkowski et al. 2010). The negative effect of depression could be related with the lower sensitivity and response towards the baby (Field, 2010) and an emotional unavailability (Beck, 1995) frequent in depressed mothers. This explains the significant correlations between the maternal depressive symptoms and the bonding difficulties in all the measures (PBQ, MPAS, MIBS, MABS). Depressive symptoms were also associated with a *low maternal general self-confidence* and *lack of self-confidence in baby's care* related probably with the negative maternal cognitions frequently seen in depressed mothers (Whitton et al. 1996) with ideas of not being good enough to take care of their infants as a result of unrealistic expectations of themselves as mothers. Relevant was that the only significant associations with the maternal *lack of self-confidence in breastfeeding* were seen with *depressive symptoms* and a *bad relationship with the partner* which has been identified as a frequent risk factor for postpartum depression (Howard et al. 2014). The negative effect of postpartum depression and breastfeeding has been confirmed in several studies (Akman et al. 2008; Field, 2010; Stuebe et al. 2014) as well as not breastfeeding and bonding problems (Ystrom, 2012) where higher negative descriptions of the babies are seen in mothers that do not breastfeed (Green et al. 1991) also identified in our study through the significant correlation between *not breastfeeding* and *high maternal negative feelings towards the baby*.

Anxiety and bonding. State-Anxiety and Trait anxiety were higher in mothers with a mental health disorder and a bonding disorder in our study. This is similar to previous findings that have found an important association of anxiety and bonding disturbances (Nicol-Harper et al. 2007). Anxiety was also associated with a *low maternal general self-confidence* and *lack of self-confidence in baby's care*. These results supports the idea that mothers with a low trait-anxiety can develop good levels of *maternal general self-confidence* despite of the presence of another mental disorder during the postpartum. The high presence of anxiety could be affecting the maternal perception of the care of a baby being more frequently seen as an anxious situation and a source for concern weakening her *self-confidence in baby's care*. This combination could trigger an avoidance of anxiety-related situations associated with the baby which has been related with bonding problems previously (Tietz et al. 2014) and could explain the association between a *low affective attachment* (MPAS) and a *disengaged maternal attachment type* identified in our sample. Both depression and anxiety are frequently comorbid during the postpartum (Fava et al. 2000) specially in clinical samples (Schofield et al. 2014). This comorbidity could have an accumulative negative effect in mothers from our sample explaining the significant correlations seen between both anxiety and depression and the *general self-confidence of the mother*.

Maternal perception of inability to carry out normal activities (General mental health problems): In our sample the mothers with bonding disorder reported a higher mean in the GHQ-12 at T1 and bonding difficulties were also significantly correlated with high scores of the GHQ-12. These results could describe a psychological state of a higher inability to face distressing experiences and carry out their normal activities such as parenting in the mothers with mental health and bonding disorders. Not only the parenting demands but also the higher severity of mental health symptomatology of the mothers with bonding problems in our study could be causing that childbearing is to be experienced as a more stressful activity incrementing the postpartum stress. The relationship between psychiatric comorbidity and postpartum stress have been identified previously (Wu and Hung, 2015) being stress specially related with a perceived low ability to cope with practical and emotional maternal tasks as well as pessimistic ideas about the future directly associated with depression and anxiety after childbirth (Coo et al. 2015). The correlations found between *low maternal self-sufficiency* and high frequency of *negative maternal emotions towards the baby*, the association between receiving a *psychopharmacological treatment* and *lower bonding difficulties* and *higher maternal affective attachment with the baby*, as well as an association between *maternal description of an easy temperament of the baby* and *low anxiety levels* (state and trait), all support the idea of a significative association between severe mental health disorders and a higher inability to carry out parenting activities being these perceived as too stressfull with high probability of the development of bonding difficulties.

Limitations and strengths

The most important limitation of our study is the size of the sample and the absence of mothers diagnosed with the most severe bonding disorders cases that difficult a broader diversity in our sample and the possibility to identify cut off points for the extreme cases. For this matter the cut off points identified should be with precaution and further confirmed in a larger sample that includes cases with a more severe bonding disturbance and mothers from the general population allowing to extend the range of scores of the three measures and confirm or correct the cut-off points suggested. Nevertheless our findings can be seen as a preliminary exploration of the characteristics of the early mother-infant bonding process in women with mental health disorders and highlight the importance of the identification of the validity, reliability and screening qualities of measures used to assess MIBD in samples with cultural differences and more risk factors. The strengths in this study is the use of an interview as a gold standard, a method rarely used by the previous validations studies of the PBQ, MPAS and MIBS. Also the use of the ROC analysis technique provided enough information to select the statistically best cutoff point depending on the purpose prioritizing its use in clinical samples where the threshold should be lower because of the higher risk to present the disorder as well as better resources for a more detailed assessment (Streiner and Cairney, 2007). We support the possibility of selecting higher cut off points in the PBQ, MPAS and MIBS if they are used for research purposes in general populations samples where the risk factors for a MIBD are lower, specially with larger samples when the resources for detailed assessments are limited and not the main objective of the evaluation.

We can conclude that the PBQ, the MPAS and the MIBS are valid and reliable self-reports questionnaires to identify Spanish mothers at risk of an early bonding disturbance with their babies providing useful as screening tools in clinical settings. The PBQ was confirmed as the bonding measure with the highest screening qualities and our results emphasizes the importance of selecting lower cut off points in mothers with additional high risk factors of MIBD such as those with mental health problems in the postpartum to avoid at the most false negatives. The cut-off points suggested from our results in the MPAS and the MIBS could be used as a reference point if required. Also, an early screening at 4-6 weeks after childbirth when the symptomatology of bonding difficulties is more visible in the mother, is strongly encouraged between perinatal health professionals and could be done during the routine health check-up visits for an early identification of MIBD and adequate intervention. Our results highlight that in a high-risk sample of mothers with mental health disorders the severity of the mental health symptomatology has an important role associated with bonding difficulties and the assessment of a differentiated association of depression and anxiety in bonding difficulties is strongly suggested to guide specific interventions in these mother-baby dyads. These results supports the use of the PBQ, the MPAS and MIBS to

develop early assessments and the design of specific interventions to facilitate the early mother-infant bonding in high-risk populations such as mothers with mental health disorders.

Acknowledgments

The first author thanks the Consejo Nacional de Ciencia y Tecnología (CONACyT) from Mexico for the scholarship granted that allowed her participation in this study. The authors also wishes to thank all the mothers that participated in the study and Beatriz Gonzalez for her collaboration in the psychometric assessment of the mothers recruited in the present study.

Conflict of interest

The authors declare that they have no conflict of interest.

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5. GENERAL DISCUSSION

5.1. General discussion of the studies

Since the specific discussion of each study is detailed in **section 4** a general overall discussion of the most relevant results is presented in this section.

The main results of the doctoral thesis are the ***confirmation of the negative association of depression in the early mother-infant bonding process in women during the postpartum*** and the ***validation of a self-report questionnaire (Postpartum Bonding Questionnaire, PBQ) to screen for mother-infant bonding difficulties in Spanish mothers.***

Validation of the PBQ and other measures to assess mother-infant bonding

One of the most relevant results of the present doctoral thesis was the validation and evaluation of the strengths and weaknesses of measures that assess mother-infant early bonding in Spanish postpartum mothers. An important obstacle to research the early relationship between a mother and her baby in Spanish population was the lack of reliable and valid measures that could be used in general population as well as in clinical samples. For that reason, the validation of the PBQ was a priority to identify the prevalence of mother-infant bonding disorders and the factors associated in Spanish samples. The PBQ has been previously validated in Germany, The Netherlands, Norway, Belgium, China and Japan and used to study the mother-infant bonding in several other countries proving its utility and efficiency. The validation of the Spanish version of the PBQ was developed successfully through the confirmation of its good psychometric properties (Studies 1 and 3) and a construct validation as well (Study 3). The PBQ was confirmed as an useful and reliable measure to screen for mother-infant bonding disturbances in the two studies that assessed it (Study 1 and 3) and although the four-factor original structure was not confirmed this result was similar to previous findings (Reck et al. 2006; Wittkowski et al. 2010). A general factor was identified in the Spanish version of the PBQ that allows the use of the total score to identify bonding disturbances in the same line that previous studies have done it (Siu et al., 2010; van Bussel et al., 2010). The comparison of the PBQ with the Maternal Postnatal Attachment Scale (MPAS) and the Mother-to-Infant Bonding Scale (MIBS) allowed to confirm its convergent validity and identified the PBQ as the strongest self-report of all with the highest internal consistency, good test-retest reliability and strong screening qualities with utility in both general population and clinical samples. The use of a clinical interview in Study 3 to assess the screening qualities of the PBQ provided an additional validation process of the questionnaire that has been only used in one study before (Siu et al., 2010).

The PBQ properties reported by our studies suggest that this is a useful measure easy to apply for both clinical and research purposes that provides reliable information that could be valuable for prevention and early identification of mother-infant bonding disturbances as well as the follow-up of mothers with this type of difficulties (Klier & Muzik, 2004) and highly suggested to be used in combination with the EPDS particularly in depressed mothers (Klier, 2006). An additional value of the validation of the Spanish version of the PBQ is the possibility to estimate the prevalence of mother-infant bonding disturbances en Spanish samples and the comparison with samples from other countries that are using this questionnaire with similar criteria. This allows the identification of high-risk groups and the frequency and severity of this type of disorders in different populations.

The validation process for the PBQ allowed also the identification of adequate psychometric properties in two additional self-reports that assess mother-infant bonding: the MPAS and the MIBS in a small clinical sample. These self-reports and the Birmingham Interview for Maternal Mental health were translated and used for the first time in Spanish population and confirmed their utility to assess mothers with mental health problems. A preliminary analysis identified cut off points in the three questionnaires (PBQ, MPAS, MIBS) that could be used as a reference to identify or discard MIBD if required, until a further exploration in larger samples can be done. The section 7 that assess the mother-infant relationship from the Birmingham Interview of Maternal Mental Health (5th ed.) also confirmed its utility to assess mothers with high risk of a mother-infant bonding disorders in clinical settings. This interview also provides a quantitative total score that is compatible for both clinical and research purposes. These instruments and the information provided in the studies can be of high clinical utility to guide early screenings in Spanish mothers with risk factors as well as for research purposes.

Prevalence of Mother-infant bonding disturbances in Spanish women

The thesis allowed to identify that the 33.8% of **prevalence of mother-infant bonding disturbances** found in depressed mothers (Study 2) was the highest of all the groups of mothers studied when compared with the group from general population (Study 1: 2.9%) and in the samples of mothers with several types of mental health disorders (Study 1: 15.9%; Study 3: 22.2%). The prevalence of 14.3% of severe mother-infant bonding disturbances found in the sample of depressed mothers from Study 2 was also the highest reported in all the samples studied. This suggest that depressed postpartum mothers have the higher probabilities to develop a high-risk severe bonding disorder between a mother and her baby when compared with the one that suffer from any mental health disorder in the postpartum and the mothers from general

population (severe bonding disturbances prevalence from Study 1, mothers from general population: 0.6% vs mothers with any type of mental disorder: 6.4%).

As discussed in the studies, the prevalence rates found in the Spanish samples of the three studies are similar (range: 22.2 - 38.8%) to other European clinical samples (Brockington, Aucamp, & Fraser, 2006; Brockington, Fraser, & Wilson, 2006; Parfitt & Ayers, 2012). In contrast a smaller prevalence was reported in our general population sample in comparison with other samples in the region (range: 7.1-8.6%) estimated with the PBQ in previous studies (Edhborg, Matthiesen, Lundh, & Widström, 2005; Reck, et al., 2006; van Bussel, Spitz, & Demyttenaere, 2010). The 2.9% of prevalence of mother-infant bonding disturbances found in our sample from general population (Study 1) is closer to the prediction of 1% suggested by Brockington (2011) in general population based on the rates of mothers attended in psychiatric units in the United Kingdom. The identification of the prevalence of mother-infant bonding disturbances in Spanish general population and clinical samples provides relevant information to understand the magnitude of the problematic. This is the first estimation of prevalence rates of mother-infant bonding disturbance made in Spanish samples and highlights that the mothers with mental health problems in the postpartum should be considered more vulnerable and with higher risk to present a disorder of this type than other mothers.

Factors associated to a mother-infant bonding disturbance/disorder (MIBD)

Another important result of the present doctoral thesis was the identification of the **factors associated to a mother-infant bonding disorder** that could increase the risk for its development in the early postpartum, specifically in depressed mothers. The three studies **confirmed the negative association of depression with the early relationship between a mother and her newborn** in *mothers from general population* that usually present less risk factors associated, in *mothers with several types of mental health disorders* and in *mothers with a major depressive episode in the postpartum*. These results suggest that depressed mothers during the early postpartum show higher difficulties in their early relationship with their newborn than mothers with other mental health problems or mothers from the general population. Nevertheless, to suffer from a postpartum depression is not a guarantee to develop a mother-infant bonding disorder and there are depressed mothers that can establish a normal bonding with their babies. The studies identified specific factors that could increase the vulnerability of the depressed mothers to disturb their interaction with their babies and explain the differences between depressed mothers that develop a bonding difficulty and those who do not. The additional factors identified in the studies to be associated with bonding difficulties, were the *severity and specificity of depression, high*

frequency of mental health symptomatology (anxiety and general mental health problems), not breastfeeding, primiparity and the absence of a psychopharmacological treatment.

Severity and specificity of depression. Results from the sample of depressed mothers in Study 2 showed that although depression is one of the most significant factor that hinders the bonding process between a mother and her baby, not all the mothers that suffer from a major depressive episode in the postpartum develop a bonding disorder. The multivariate analyses in the sample of depressed mothers identified that is the **severity of the depression** the most important negative factor associated to a disturbance in the bonding process. Even though all the mothers fulfilled the criteria for a major postpartum depressive episode, the depressed mothers with a bonding disturbance reported the highest scores in the EPDS. In other words, the depressed mothers with bonding difficulties were the most severely depressed. Previous findings have reported that depressed mothers are more emotionally unavailable and have difficulties engaging in a synchronic interaction with their babies (Beck, 1995), show more disengaged and negative behaviors and lower levels of positive maternal behaviors (Lovejoy, Graczyk, O'Hare, & Neuman, 2000) and less sensitivity and responsive attitudes towards their infants (Field, 2010) associated to their mental health symptomatology. Then is logical to suppose that the most severely depressed mothers from our sample in Study 2 would have these characteristics very much increased that would have a negative impact in the maternal relationship with her infant.

Besides *severity*, results from Study 3 show that *specific depressive symptoms* are also related with the most severe bonding difficulties. The association found between maternal suicidal thoughts (EPDS item 10) and feelings of harming her baby (PBQ item 24) reports a high-risk pair of symptoms associated that should be of special clinical interest. Studies in filicide mothers have identified a frequent pair of filicide-suicide behaviors (Debowska, Boduszek, & Dhingra, 2015) that highlights the importance of considering those two symptoms (suicidal maternal thoughts and feelings of harming the baby) as a precedent for a high risk situation. Also the presence of sleeping problems (EPDS item 7) and crying due to unhappiness (EPDS item 9) were identified as the depressive symptoms most related with bonding difficulties. This group of symptoms could be consider a **signal of alarm** when seen together in a mother that should suggest to a health professional the need of an extended assessment to discard or identify a high risk bonding disorder. The EPDS and the PBQ applied together showed to provide an additional screening use to identify high-risk mothers using these items as early signs of bonding severe conflicts. These findings also highlights the importance of not only assessing for the presence of depressive symptoms but also the specificity of those in particular with depressed mothers.

High frequency of mental health symptomatology: Mothers with a bonding disorder in the studies reported higher frequency of mental health symptomatology in depression (EPDS), anxiety (STAI-S and STAI-T) and general mental health problems (GHQ-12). These results confirmed in our samples the negative association of mental health disorders in the early mother-infant bonding as already identified in previous studies (Gutiérrez-Zotes, Farnós, Vilella, & Labad, 2013; Mäntymaa, 2006; Stein, et al., 2014; van Bussel, Spitz, & Demyttenaere, 2010). Also results from Study 3 identified that there are particular associations between each mental disorder with bonding difficulties. In the clinical sample depression reported a negative association with breastfeeding the infant, confirming previous findings (Ystrom, 2012) and also with the general self-confidence as a mother also previously reported (Dennis & McQueen, 2007).

Anxiety show a negative association with the general maternal self-confidence and in baby's care as well as an association between higher anxiety and a maternal perception of a difficult temperament in their baby. The relationship of anxiety and bonding difficulties has been less studied than depression. Nevertheless recent findings has confirmed a negative impact of anxiety in the bonding process (Nicol-Harper, Harvey, & Stein, 2007).

The higher means in general mental health problems identified with the GHQ-12, also reported a higher inability to cope with stressful daily-life circumstances in the mothers with mental health problems and MIBD. The theory of a *cognitive vulnerability* related to motherhood found in depressed mothers suggested by Whitton, Appleby & Warner (1996) can help us understand how depressed mothers are more sensitive to perceive the maternal task as a very difficult challenge and as a source of high stress than non depressed mothers. These findings also support the hypothesis suggested by Condon and Corkindale (1998) about the decreased *tolerance* seen in mothers with difficult bonding with their babies. In accordance to Condon and Corkindale, mothers with mother-infant bonding disorders present a lack of tolerance for the infant behaviors that make them perceive the caretaking of the babies as a burden that could explain why mothers with high levels of anxiety described their babies as more difficult. The assessment of the maternal perception of the inability of coping with stressful experiences is strongly suggested in mothers with mental health disorders and specially in depressed mothers since it seems to be an important indicator for bonding difficulties.

Not breastfeeding. Multivariate analyses from Study 2 reported the independent negative association of *not breastfeeding* in the bonding disturbances seen in depressed mothers. The design of the study did not allowed to identify with more detail the relationship between *depression*, *not breastfeeding* and *mother-infant bonding disturbances*, but previous findings

show that they are closely interconnected (Akman, et al., 2008; Field, 2010; Stuebe, et al., 2014). Study 3 also confirmed a correlation between *depressive symptoms* and *less maternal self confidence in breastfeeding*. Nevertheless in Study 3 *not breastfeeding* did not reported a significant difference between the mothers with diverse mental health disorders with a MIBD when compared with those with a normal bond with their babies. This could make us think that the process of breastfeeding is very sensitive to maternal depression and suggest that depressed mothers will require special attention and support from the health professionals in that process. The negative association between depression and not breastfeeding have been confirmed in previous studies (Dennis and McQueen, 2007; Field, 2010; Green et al. 1991; Stuebe et al. 2014). Nevertheless the independent association of not breastfeeding with bonding difficulties has to be also taken into consideration as has been identified in other studies (Ystrom, 2012). This could make us think that if not breastfeeding is detected in depressed mothers, an accumulative negative association of both factors could affect the early relationship with the baby. Also a special attention should be given to the breastfeeding in mothers with mental health disorders if psychopharmacological treatment is to be suggested. It will require an individual assessment of the risks and benefits of breastfeeding particularly in depressed mothers. Since breastfeeding can be seen both as an strategy to facilitate the bonding or a source of higher stress, special considerations should be done to avoid exposing the mother-baby dyad to a higher risk if psychopharmacological treatment is to be included (Field, 2008).

Primiparity and Psychopharmacological treatment: *Primiparity* was associated in Study 2 to bonding disturbances in depressed mothers. To be a first-time mother is a risk factor for both depression (Howard, Molyneaux, Dennis, Rochat, & Milgrom, 2014) as well as for bonding disorder (Righetti-Veltema, Conne-Perréard, Bousquet, & Manzano, 2002) that could explain its significance only in the sample of depressed mothers but not in mothers with different type of mental health disorders (Study 3). Robson & Kumar (1980) previously identified that first-time mothers can frequently present an emotional delay towards their infants, being this a mild bonding difficulty usually improved along the time when the mother gains experience in the caretaking of the baby. Therefore first-time mothers that suffer from postpartum depression could benefit from additional support to strengthen their early relationship with their babies. These association should be further explored and the severity of the bonding disturbances should be assessed carefully in the primiparous mothers to guide successful interventions.

Also to have a *psychopharmacological treatment* was a relevant factor in Study 2 and 3. In study 2 mothers with a psychopharmacological treatment at 4-6 weeks of postpartum reported higher bonding difficulties than those without antidepressant treatment. In Study 3 it was associated with

lower bonding disorders in the second assessment after the 7th week of postpartum. The two assessments were done in different times and could indicate the positive effect of a psychopharmacological treatment in the bonding in an indirect way. We could suggest the hypothesis that mothers that required at 4-6 weeks of postpartum a psychopharmacological treatment were the ones that presented more severe mental health problems at the beginning of the clinical treatment and after the 7th week mothers have already been benefited with the positive effect of the treatment improving the maternal mental health. This hypothesis is supported with the lower means at the time 2 of the assessment (\geq 7th week of postpartum) in the EPDS and the STAI-S seen in mothers in Study 3 when compared with their means at the time 1 (4-6 weeks postpartum). In other words, it seems that by improving the mental health of the mother the bonding difficulties also decreased. This confirms the negative effect of mental health disorders in the mother in the early bonding with their infants that has been confirmed in several studies before (Mäntymaa, 2006; Stein, et al, 2014).

These results strongly encourage the need of early assessments in all depressed mothers to screen for bonding difficulties and specific early intervention in the mother-baby dyads designed in accordance to their individual conditions and needs. In accordance to the results seen in the three studies the bonding difficulties seem more evident in the mother at 4-6 weeks of postpartum and it would be the best timing for the assessment of mother-infant bonding disturbances to be more clearly identified. This time also coincides with the routine postpartum health check-up visits of the mothers and early assessments for mother-infant bonding difficulties could be included as part of the general assessment.

The present doctoral thesis allowed to identified the psychometric and screening properties in Spanish mothers of 3 questionnaires and the adaptation of a clinical interview designed to assess mother-infant bonding disorders. This offers an option for a specific assessment strategy for MIBD in clinical settings. From all the the measures analyzed, the PBQ reported the highest reliability and screening qualities and is strongly suggested to be used with the EPDS to identify high-risk of severe bonding disorders in depressed mothers. The section 7 of the Birmingham Interview for Maternal Mental health (5th Edition) has proven its utility to diagnose bonding disorders not only in the present moment but also in the past, and collects useful information for the design of specific interventions on the mother-baby dyad. It is suggested to interview the mother with her baby to asses also their interaction and include the observation as an element for the general bonding risk-assessment. The MPAS and the MIBS also reported adequate psychometric properties in a small clinical sample. Although both instruments need to be further analyzed in larger samples, they can be used as complement for the PBQ to identified additional information reported by the

mother that strengthen the assessment. All the measures can be used for clinical and research purposes which gives them a double utility.

Finally the results of the present doctoral thesis highlight the importance of linking research to clinical applications with an interactive and permanent feedback. Motherhood for women with mental health disorders during the postpartum will definitely be a challenging period and they are a population that frequently present a higher quantity of risk factors besides the mental health problematic and will for sure benefit from early and specific assessments. Because of the negative consequences with the babies and themselves and the specific conditions that they present these mothers can not be treated in the same way as they would be if they were in a different stage or their lives. Because of this, depressed mothers should be consider as a a high-risk group that will require specific professional support and follow-up to strengthen their relationship with their babies and their parenting tasks. The permanent link between research and clinical practice can be of high value. Early clinical assessments and the design of adequate interventions on these mother-baby dyads surely would be more effective if they are evidence-based originated from permanent research efforts.

5.2. New contributions to knowledge

Research in mental health but specially in maternal mental health, should always be of clinical utility. Because of this, one of the main purposes of this doctoral research project was to generate knowledge that could be of clinical relevance and utility for the design of specific mental health interventions in mothers with psychiatric disorders, specially depressed mothers. To fulfill this aim the study seek to obtain not only theoretical, but also methodological and clinical contributions to help the design of clinical interventions of mother-infant bonding disorders.

In particular, the present study enable to contribute in the following:

A. The adaptation and validation of reliable screening instruments to identify mother-infant bonding disturbances in the early postpartum adequated to the characteristics and needs of Spanish mothers.

The first priority of the study was to count with a valid and reliable measure to assess for mother-infant bonding feasible to use for both research and clinical purposes. This was fully obtained with the PBQ and a good aproximation was done with the MPAS and the MIBS that opens a new way for a further and more complete validation of those two questionnaires in larger samples. The present study incorporated previous efforts and advances that have already been done in the case of the PBQ with the selection of the instrument and the application in both clinical and general populations as part of previous larger studies. The main collaboration of this study allowed to conclude its validation process and explore two more self-reports with similar characteristics. The achievement of this first contribution was essential for the following stages of the study, and to have a reliable instrument helped fulfilled the objectives of the research. The success on this task contibutes to provide three reliable screening instruments that can be used in Spanish mothers to assess for MIBD with research and clinical utility.

B. The identification of the prevalence and the main risk factor associated to a mother-infant bonding disorder in depressed postpartum mothers.

This knowledge could allow to estimate the dimension of the problematic in Spanish samples and facilitate the comparison with other countries and other type of samples with socio-cultural similarities and differences. The information identified in the 3 studies expands the knowledge of the early interaction between a mother and her infant which confirms previous studies and opens new lines of research. Also the identification of the specific risk factors associated to bonding disorders in depressed mothers and mothers with several type of mental health disorders can orientate the design of specific and efficient early interventions in clinical settings.

C. The design and application of an assessment protocol for the mother-infant bonding process in mothers with mental health disorders useful in a clinical settings.

The use of an assessment protocol to research the bonding process in our sample could be also useful for clinical and methodological future tasks among health professionals. For this study a protocol was constructed with the selection and adaption of two additional bonding measures applied (MPAS and MIBS) with previously validated mental health screening instruments and the translation and adaptation to Spanish of the 5th. Edition of the Birmingham Interview for Maternal Mental health (BIMMH; Brockington et al. 2006). The strategy of interviewing the mother with her baby was very productive since it allowed to perform a direct observation of the interaction of the dyad and to collect additional information that was relevant for the final diagnosis (e.g. gestures and tone of voice, corporal language and reactions to the questions, the physical maternal touch towards her baby, the way the mother attended her baby's need of feeding, and sleeping). The use of these assessment instruments in the study could be replicated in other clinical settings to assess a mother and baby dyad. This activity also allowed the participation and exchange of experiences in an international workshop coordinated by the main author of the BIMMH and the PBQ. This additional activity enable the adjustment of the protocol and the collaboration in the design of the sixth edition of the BIMMH, now called Stafford Interview for Maternal Mental health. This represents a theoretical and methodological contribution for future clinical and research activities related to the maternal mental health and the mother-baby early relationship.

5.3. Limitations

The present doctoral thesis presents several limitations in the studies developed.

The validation process of the PBQ allowed to identify its psychometric properties in general population and clinical samples. The use of self report measures to assess mother-infant bonding in Studies 1 and 2 was the best choice due to the size of the sample being unable to use a clinical interview to estimate the prevalence of MIBD in the study 1 and 2 due to limitation of time and resources. Nevertheless this limitation was solved using an specialized interview as the gold Standard to confirm a mother-infant bonding disorder in Study 3 in a smaller clinical sample that allowed the validation of the PBQ. Because of this, the prevalence rates of the Studies 1 and 2 should be consider as rates that reflect the risk of a bonding disturbance rather than an identification of a confirmed disorder.

The small size of the samples in Studies 2 and 3 is an important limitation for the generalization of the results. Studies 2 and 3 required the confirmation of the reliability of the PBQ to include it as a a validated measure providing fewer time to collect larger samples. The two-times assessment in Study 3 required that the mothers would dedicate more time to the study and this represented a challenge for mothers with mental health disorders since their emotional state was an obstacle for such an extended assessment. These circumstances explain the reduced number of mothers that could participate in the final study lowering also the possibilities to include mothers with more severe bonding disorders in Study 3. The absence of severe bonding disorder cases reduced the chances to estimate the cut off points for severe bonding disorders in the three measures (PBQ, MPAS and MIBS) and should be further analyzed in larger samples. For this reason, the cut off points suggested in Study 3 should be consider as a reference in clinical assessments that requires future confirmation.

The use of clinical samples in Study 2 and 3 allowed to identify the factors more associated to a mother-infant bonding difficulties but the low prevalence of this type of disorders in mothers from general population (as seen in Study 1) difficulted the inclusion of mothers from general population to be examined in these studies. For this reason the confirmation of the factors identified in our studies apply only to clinical sample and further research should be done in general population mothers.

Finally, the acceptance of mother-infant bonding difficulties was identified to be a sensitive topic in the mothers interviewed due to fear of social disapproval and the presence of social desirability was identified to be very frequent among the mothers in Study 3. This surely affected their responses in the questionnaires as well as in the interviews for the final diagnosis of a MIBD. Although the inclusion of the baby during the interview provided important additional information from the dyadic interaction collected through direct observation allowing to contrast information, other strategies should be introduced to control the negative impact of social desirability on the responses (e.g. videotapes, observations in natural settings such as home).

5.4. New lines of research

The results reported in the three studies open new lines to conduct further research to expand the knowledge or explore new directions in the comprehension of the mother-infant bonding as well as to confirm several findings.

The most relevant new lines for research that this doctoral thesis identifies are the following:

- The design of longitudinal assessments including the mental health during pregnancy and its effect on early mother-infant bonding in Spanish postpartum mothers could confirm the causal relationship of mental health problems with bonding disturbances. Also the particular effect of each type of mental disorder, specially depression and anxiety which are comorbid in the postpartum could be of great interest.
- Exploration of the factors negatively associated to mother-infant bonding disorders in mothers with severe disorders could provide broader information. Since the number of severe cases was very small, it would be of great interest to explore in this group if the same factors that are associated in mothers with mild bonding disorders are confirmed to be equally associated and to assess if there are new ones with significant associations to discover.
- The role of breastfeeding in the mother-infant bonding disorders should be further explored. Both hypothesis should be tested: is not breastfeeding affecting negatively the early mother-infant bonding? Or is the presence of a bonding disorder the one that affects the decision of not breastfeed the baby in the mother?. The findings of these hypothesis could be of high clinical value when psychopharmacological treatment have to be provided. The role of depression on both processes should be included in this research.
- Study 3 reported a significant association between the disengaged attachment maternal style and bonding difficulties. This could be further explored and include the assessment of what other factors are associated with the parenting style in larger and more diverse samples.
- A further validation of the cut off points in the PBQ, MPAS, MIBS should be done in larger and more diverse samples. A sample that includes mothers with severe cases of bonding

disorders and also mothers from the general population will sure improve the diversity of the total scores for the three measures and the identification of severe cases.

- The role of partner's support and relationship with the mother are two factors that were not explored in this doctoral thesis. Previous studies have shown the relevance to include the partners participation in the maternal mental health wellbeing and in the bonding with her infant.
- A follow-up of the infant's emotional and psychosocial development of the depressed mothers could confirm the dimension of the relationship and effect of the factors associated with bonding disorders in the infant's future. This area has already been explored in other countries with significant findings.
- Finally it would be of much relevance and interest the use of the Stafford Interview (6xth Edition of the Birmingham Interview for Maternal Mental health) in further research and clinical assessments. This new Edition has included many of the most relevant and recent findings of the research in mother-infant bonding in 6 countries.

6. GENERAL CONCLUSION

The following conclusions offer a general summary and highlight the main results presented in this doctoral thesis:

- Mothers with postpartum depression are in a higher risk of developing a difficult mother-infant bonding. The prevalence of 33.8% of depressed mothers with a mother-infant bonding disturbance show the higher prevalence between all the Spanish mothers studied, when compared with mothers of general populations and mothers with diverse mental health disorders. The prevalence of risk of MIBD in Spanish samples is similar than the rates reported in other European samples by previous studies. This confirms the negative association of maternal depression in the postpartum with bonding disturbances. Nevertheless to suffer from a postpartum depression is not a guarantee to develop a MIBD and there are depressed mothers that can establish a normal bond with their babies. Additional risk factors in depressed mothers should be explored.
- The **severity of the depression** is negatively associated to mother-infant bonding disturbances in mothers with a major depressive episode. Mothers with bonding disturbances reported higher depressive symptomatology than depressed mothers without bonding disturbances.
- **Specific depressive symptoms** are associated with specific bonding difficulties. Depressive symptoms of sleeping problems (EPDS item 7) and crying because of unhappiness (EPDS item 9) are the most related with bonding difficulties and suicidal maternal thoughts (EPDS item 10) is associated to feelings of harming the baby (PBQ item 24). The identification of these items when they appear together as positive in a mother could serve as a *sign of alarm* to identify a high-risk bonding disorder and develop a more detailed assessment in the mother and baby dyad interaction. The presence of suicidal thoughts and feelings of harming the baby in depressed mothers should be consider a high-risk alarm signal for severe problems in the bonding process.
- Mothers with mental health disorders and bonding disturbances with their babies reported higher mental health symptomatology (anxiety and general mental health problems). Mothers with mental health disorders, specially depressed mothers, report a higher inability to cope with stressful daily experiences (GHQ-12) , such as parenting tasks. Also anxiety was associated with less self-confidence in the baby's care and general maternal self-confidence that could affect the early relationship with her baby.

- Not breastfeeding is a factor associated independently to a mother-infant bonding disturbance. Also less self-confidence of breastfeeding is associated with maternal depression. The joint association of severe depression and not breastfeeding could have an accumulative negative effect in the mother-infant bonding process.
- Primiparity is associated with bonding disturbances in depressed mothers. Depressed primiparous mothers would require a special attention and identification of the risk for a bonding disturbance.
- The **Postpartum Bonding Questionnaire (PBQ)** is a reliable and valid questionnaire with high screening qualities to identify the risk of a mother-infant bonding disturbance in Spanish postpartum mothers from general population and clinical samples. It is strongly encouraged to be used with the EPDS to provide an additional specific screening of high-risk mothers.
- The **Maternal Postnatal Attachment Scale (MPAS)** and the **Mother-to-infant Bonding Scale (MIBS)** are questionnaires with adequate internal consistency and construct validity to assess mother-infant bonding in Spanish mothers. Their psychometric properties should be further explored in larger samples.

All the results seen in the three studies developed in the present doctoral thesis highlights that a permanent link and feedback between research and clinical practice can be of high value and is strongly suggested in the early mother-infant relationship. Results suggest the importance of **early assessments** of the mother-infant bonding process in mothers with mental health disorders at **4-6 weeks** of postpartum. Due to the highest prevalence of bonding disturbances found in this group screening actions should be encouraged in all depressed mothers. Specific interventions in mothers with mental health disorders in the postpartum should be designed guided by detailed assessments with reliable measures in Spanish samples. The severe depressed mothers are a particular high-risk group that will require special professional support to strengthen their early relationship with their babies.

7.REFERENCES

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8. APPENDICES

APPENDIX 1. Spanish version of the Postpartum Bonding Questionnaire

TEST DEL VÍNCULO EN EL POSPARTO

(*Postpartum Bonding Questionnaire, Brockington et al.2001*).

Traducido y Adaptado por LI. García Esteve, P. Navarro, S.
 Díez. Programa de Psiquiatría Perinatal Barcelona-CLINIC

**Por favor indique con qué frecuencia le ocurre lo que se detalla a continuación.
 No hay respuestas “buenas” o “malas”. Escoja la respuesta más adecuada a su
 experiencia reciente.**

| ¿Cómo se siente respecto a su bebé? | | Siempre | Muy a menudo | Bastante a menudo | A veces | Raramente | Nunca |
|-------------------------------------|--|---------|--------------|-------------------|---------|-----------|-------|
| 1. | Me siento cercana. | | | | | | |
| 2. | Desearía que volvieran los días en que no lo tenía. | | | | | | |
| 3. | Me siento distante. | | | | | | |
| 4. | Me encanta abrazarlo. | | | | | | |
| 5. | Lamento haberlo tenido. | | | | | | |
| 6. | Siento como si no fuera mío. | | | | | | |
| 7. | Siento que me toma el pelo. | | | | | | |
| 8. | Lo quiero con locura. | | | | | | |
| 9. | Me siento feliz cuando ríe. | | | | | | |
| 10. | Me irrita. | | | | | | |
| 11. | Disfruto jugando con él. | | | | | | |
| 12. | Llora demasiado. | | | | | | |
| 13. | Me siento atrapada como madre. | | | | | | |
| 14. | Me siento enfadada con mi bebé. | | | | | | |
| 15. | Siento resentimiento hacia él. | | | | | | |
| 16. | Es el más guapo del mundo. | | | | | | |
| 17. | Desearía que de alguna manera desapareciera. | | | | | | |
| 18. | He hecho cosas que son perjudiciales para él. | | | | | | |
| 19. | Me pone nerviosa. | | | | | | |
| 20. | Me asusta. | | | | | | |
| 21. | Me fastidia. | | | | | | |
| 22. | Me siento segura cuando lo estoy cuidando. | | | | | | |
| 23. | Siento que la única solución es que otra persona lo cuide. | | | | | | |
| 24. | Tengo ganas de hacerle daño. | | | | | | |
| 25. | Se consuela fácilmente. | | | | | | |

APPENDIX 2. Spanish version of the Maternal Postpartum Attachment Scale (MPAS)

Escala de Apego Materno en el Posparto

(*Maternal Postpartum Attachment Scale*, MPAS; Condon & Corkindale, 1998).

Traducción de Bruma Palacios-Hernández (2013).

A continuación le presentamos una lista de preguntas sobre sus sentimientos relacionados con la interacción con su bebé. Por favor, marque la opción que describa de mejor manera cómo se ha sentido durante las últimas semanas.

1. Cuando estoy cuidando a mi bebé, tengo sentimientos de molestia o irritación.

- Muy frecuentemente
- Frecuentemente
- Ocasionalmente
- Raramente
- Nunca

2. Cuando estoy cuidando a mi bebé, siento que el bebé está siendo deliberadamente difícil o tratando de molestarme:

- Muy frecuentemente
- Frecuentemente
- Ocasionalmente
- Raramente
- Nunca

3. Durante las últimas dos semanas describiría mis sentimientos hacia el bebé como:

- Desagrado
- No siento emociones fuertes hacia el bebé
- Leve afecto
- Afecto moderado
- Afecto intenso

4. Sobre mi nivel general de interacción con el bebé, **Yo**:

- Me siento muy culpable de no estar más involucrada
- Me siento moderadamente culpable de no estar más involucrada
- Me siento ligeramente culpable de no estar más involucrada
- No tengo ningún sentimiento de culpa sobre mi nivel de interacción

5. Cuando interactúo con el bebé, me siento:

- Muy incompetente y sin ninguna confianza
- Moderadamente incompetente y sin confianza
- Moderadamente competente y confiada
- Muy competente y confiada

6. Cuando estoy con el bebé me siento tensa y ansiosa:

- Muy frecuentemente
- Frecuentemente
- Ocasionalmente

Casi Nunca

7. Cuando estoy con el bebé y hay otras personas presentes, me siento orgullosa de mi bebé:

- Muy frecuentemente
- Frecuentemente
- Ocasionalmente
- Casi Nunca

8. He tratado de involucrarme al máximo de lo que he podido en **JUGAR** con el bebé:

- Esto es cierto
- Esto es falso

9. Cuando tengo que dejar al bebé:

- Usualmente me siento triste (o se me hace difícil irme)
- Frecuentemente me siento triste (o se me hace difícil irme)
- Tengo sentimientos mezclados de tristeza y alivio
- Frecuentemente me siento algo aliviada (y me es fácil irme)
- Usualmente me siento aliviada (y me es fácil irme)

10. Cuando estoy con el bebé:

- Siempre obtengo mucho disfrute /satisfacción
- Frecuentemente obtengo mucho disfrute/satisfacción
- Ocasionalmente obtengo mucho disfrute/satisfacción
- Muy pocas veces obtengo mucho disfrute/satisfacción

11. Cuando no estoy con el bebé, me encuentro pensando en el bebé:

- Casi todo el tiempo
- Muy frecuentemente
- Frecuentemente
- Ocasionalmente
- Nunca

12. Cuando estoy con el bebé:

- Usualmente trato de prolongar el tiempo que paso con él/ella
- Usualmente trato de acortar el tiempo que paso con él/ella

13. Cuando he estado lejos del bebé por un tiempo y estoy a punto de reencontrarme con él/ella, usualmente siento:

- Placer intenso ante la idea
- Placer moderado ante la idea
- Placer leve ante la idea
- No siento nada ante la idea
- Tengo emociones negativas ante la idea

14. Ahora, sobre el bebé pienso:

- Como muy propio.
- Como algo propio.
- Como si no fuera mi propio bebé.

15. Sobre las cosas a las que hemos tenido que renunciar debido al bebé:

- Pienso que lo resiento mucho
- Pienso que lo resiento de forma moderada
- Pienso que lo resiento un poco
- No lo resiento en absoluto

16. Durante los últimos 3 meses, he sentido que no tengo tiempo suficiente para mi o mis intereses:

- Casi todo el tiempo
- Muy frecuentemente
- Ocasionalmente
- Nunca

17. Cuidar a este bebé es una pesada carga de responsabilidad. Creo que para mí esto es:

- Muy cierto
- De alguna forma cierto
- Ligeramente cierto
- Nada cierto

18. Confío en mi propio juicio al decidir lo que el bebé necesita:

- Casi nunca
- Ocasionalmente
- La mayor parte del tiempo
- Casi todo el tiempo

19. Usualmente cuando estoy con el bebé:

- Soy muy impaciente
- Soy un poco impaciente
- Soy moderadamente paciente
- Soy extremadamente paciente

| | |
|-----------|--|
| 1 | |
| 2 | |
| 3 | |
| PT | |

APPENDIX 3. Spanish version of the Mother-to-infant Bonding Scale (MIBS)

Escala del Vínculo Madre-infante

Mother-to-infant Bonding Scale. (MIBS; Taylor, A., Atkins, R., Kumar, R., Adams, A. y Glover, V., 2005). Traducción por Bruma Palacios-Hernández (2013).

Estas preguntas son sobre sus sentimientos hacia su bebé en estas **primeras semanas de vida**. Algunos adjetivos se detallan a continuación, los cuales describen algunos de los sentimientos que las madres tienen hacia su bebé durante las **PRIMERAS SEMANAS** después del nacimiento. Por favor marque con una **X** la casilla que ubique la opción que mejor describa cómo se sintió durante las **PRIMERAS SEMANAS**.

| | Con mucha frecuencia | Con frecuencia | Un poco | Nunca |
|----------------------------------|----------------------|----------------|---------|-------|
| Amorosa | | | | |
| Resentida | | | | |
| Indiferente o no he sentido nada | | | | |
| Alegre | | | | |
| Con desagrado | | | | |
| Protectora | | | | |
| Decepcionada | | | | |
| Agresiva | | | | |

PT

APPENDIX 4. Spanish version of Section 7: *Mother-infant relationship* of the Birmingham Interview for Maternal Mental health, 5th. Ed.

**Entrevista para evaluar relación madre-infant en el puerperio
(Birmingham Interview for Maternal Mental health; 5ta Ed.).**

Referencia: Brockington et al, 2006. Birmingham Interview for Maternal Mental health. Bredbury: Ery Press.

Objetivo Sección 7: explorar el curso social, psicológico y psiquiátrico de la relación madre-infante en el puerperio.

| | |
|-----------------------------|--------------------------------------|
| Fecha de entrevista: | Fecha de nacimiento de Madre: |
| Nombre de la madre: | Sexo del bebé: |
| Nombre del bebé: | Edad del bebé: |
| Fecha de parto: | |
| No. de Hijos. | |
| Entrevistador: | |

Temas obligatorios a explorar:

- *Por favor dígame cómo es su bebé (nombre del bebé).*
- *Está decepcionada sobre algo de su bebé? (algo no era lo que usted esperaba?)*
- *¿Cómo está (nombre del bebé) desarrollándose?*
- *¿Él/la le reconoce y le responde a usted?*
- *¿Cuando él/la sonrió o rió por primera vez?*
- *¿Quién se hace cargo primordialmente de su cuidado?*
- *¿Qué disfruta hacer con su bebé?*
- *¿Qué hace para hacer reír o sonreír a su bebé?*
- *¿Cómo se desarrollaron sus sentimientos hacia (nombre del bebé) después del parto?*

-Si son negativos. Hace cuanto se siente así?-

- *¿Cuando experimentó por primera vez sentimientos positivos hacia él/lla?*
- *¿Se ha sentido decepcionada por los sentimientos que tiene hacia (nombre del bebé)?*

- *¿Cómo se siente cuando está alejada de (nombre del bebé)?*
- *¿Cómo se siente cuando su bebé llora o se despierta por la noche?*
- *¿Su bebé la hace sentir enojada?*
- *¿Alguna vez ha perdido el control cuando se ha sentido enojada con su bebé?*
- *¿Ha tenido algún impulso por hacerle daño al bebé?*
 - *Si sí- ¿Cuál ha sido la peor cosa que ha sentido el impulso de hacer?*

B- *Si la madre ha perdido el control sobre su ira, debe preguntarse lo siguiente:*

- *¿Qué ha sido lo peor que ha hecho?*
- *(Si existe alguna señal de enfermedades facticias), ¿Alguna vez pretendió que su hijo estaba enfermo o se sintió tentada a enfermarle?*
- *(En casos de abuso), ¿Ha tenido el impulso de matar al bebé?*
 - *¿Cuál ha sido el efecto de todo esto en su hijo?*

C- *Si existe evidencia de la presencia de emociones maternas anormales, entonces deben preguntarse lo siguiente:*

- *¿Se arrepiente de haber tenido a este bebé?*
- *¿Se siente atrapada como madre?*
- *¿Ha sentido el impulso de querer huir?*
 - *-----Si Sí, ¿temporalmente o permanentemente?*
 - *¿Alguna vez lo ha hecho?*
- *¿Alguna vez ha sentido que sería mejor que alguien más cuidara/se hiciera cargo del bebé?*
 - *(Si, sí) ¿temporalmente o permanentemente?*
 - *¿Ha considerado alguna vez la adopción o la acogida?*
- *¿Ha deseado alguna vez que algo le pasara a su bebé?*
- *¿Cuánto tiempo tiene sintiéndose así?*
 - *¿Ha buscado ayuda profesional?*
 - *¿Desea otro bebé?*

**** Ítems adicionales de las restantes secciones de la Entrevista Birmingham de Salud Mental Materna (5ta ed.) que se sugiere INCLUIR EN LA ENTREVISTA. Estos ítems no son incluidos en la puntuación general pero sí pueden ser incorporados para la evaluación sobre la existencia de la presencia/ausencia de un desorden del vínculo madre-infante.

A. Hábleme un poco de su embarazo, ¿cómo fue? ¿cómo se sintió?

Explorar estos temas si no son descritos libremente por la madre.

11. Sacrificios de la madre por este embarazo

- 0= No ha significado ningún sacrificio
- 1= La madre ha tenido que hacer algunos sacrificios en su carrera, vida social o actividades de placer.
- 2= Ha hecho grandes sacrificios.

24. Preocupación sobre el bebé no-nacido

- 0=La condición del bebé no es un problema
- 1= Ha habido averiguaciones sobre sus preocupaciones durante el embarazo
- 2= El bebé se sabe que será anormal
- 3= La madre está preocupada porque ha experimentado una pérdida fetal previa

25. Interacción con el feto ('vínculo prenatal')

- 0= Madre muy involucrada e incluye a otros miembros de la familia en la interacción
- 1= Habla, lee y le canta al bebé
- 2= Interacción mínima
- 3= El feto es completamente ignorado
- 4= Reacción negativa al feto (p.e. molestia ante los movimientos del feto)

26. Preparación para el recién nacido/a

- 0= Madre intensamente ocupada en la preparación y fantasea sobre el cuidado de su recién nacido/a
- 1= Madre consciente del cambio de vida próximo y está mental y prácticamente preparada
- 2= Las preparaciones mentales y prácticas son inadecuadas o retrasadas
- 3= No existen preparaciones prácticas o mentales hechas

27. Abuso Fetal

- 0= Ausencia de abuso fetal
- 1= Madre falla en tomar precauciones normales para proteger al feto dentro de ella
- 2= La madre tiene impulsos por lastimar al feto
- 3= Ha ocurrido abuso fetal

61 Deseo de parto prematuro

- 0= No hay deseo para tener un parto prematuro
- 1= La madre anhela que el embarazo termine
- 2= La madre presiona para que haya un parto prematuro

B. ¿Cuál fue su reacción cuando supo el sexo de su bebé? ¿Deseaba algún sexo en particular? ¿Cuál fue la reacción de su pareja?

C. Hábleme un poco de su parto. ¿Cómo fue? ¿Cómo se sintió?

D. Hábleme de sus primeras semanas después del parto. ¿Cómo se sintió?

Explorar estos temas si es que no son descritos por la madre libremente.

82 Tristeza maternal (“blues”)

- Esto significa llanto inesperado y transitorio.
- Debe ser diferenciado de episodios duraderos de infelicidad o depresión.
- 0= No hay evidencia de disforia transitoria durante los primeros 10 después del parto
- 1=Evidencia ambigua
- 2= Evidencia definitiva
- 3= Disforia en el posparto parece parte de un estado más crónico de infelicidad que ha continuado desde el embarazo hasta el puerperio.

114. Miedo a Muerte Súbita

Refiere a ansiedad prolongada por la muerte súbita del infante, asociada a un frecuente monitoreo nocturno de la respiración del bebé.

115 Excitación general asociada al cuidado infantil

Hipervigilancia exhaustiva asociada con una preocupación excesiva sobre la salud y seguridad del bebé. Miedos hipocondriacos relacionados con el infante deben ser calificados (2).

124 Ideas de no merecimiento materno

- 0=Ninguna
 - 1= Madre ha tenido pensamientos de que ella no está calificada para ser madre del bebé
 - 2= Estas ideas son preocupantes y fuertemente mantenidas
- Estos puntajes solo deben hacerse si una madre deprimida tiene una relación *normal* con el bebé. Si existe una madre que rechaza al bebé y busca transferir su cuidado a alguien más, la calificación más apropiada es: “ideas de transferencia de cuidado infantil”.

128 Estado de ideas anormales sobre el infante

- 0=Ninguna
- 1=Presentes
- 2=Delirantes

150 Deficiencia del rol materno

Esto aplica para *cualquier* trastorno psiquiátrico-ansiedad, depresión, psicosis o cualquier otro trastorno.

0= No hay deficiencia

1= Algún tipo de negligencia en el cuidado infantil

2= Clara deficiencia para asumir el rol materno, a tal grado que la pareja o la familia debe hacerse cargo

3=La deficiencia para asumir el rol materno es una causa de preocupación o queja

SECCIÓN 7: PUNTAJES DE LA RELACIÓN MADRE-INFANTE.

***PUNTUACIÓN DE ACUERDO A:** Brockington, I. *et al.* Entrevista Birmingham de Salud Mental Materna. 5ta edición.

153. TEMPERAMENTO DEL BEBÉ

153 Temperamento del bebé

0= Plácido, bebé fácil de atender

1=Algunas dificultades, p.e. se despierta por las noches (Inquieta)

2= Bebé calmado que se resiste a ser abrazado

3= Bebé muy difícil, que grita y llora mucho y es difícil de apaciguar

154. OTROS PROBLEMAS con el/la BEBÉ

154 Otros problemas con el bebé

0= No hay otros problemas

1= Problema menor

2= Problemas graves, p.e. anormalidad física, salud delicada, discapacidad mental

155. DESARROLLO INFANTIL

155 Desarrollo del infante

0= Avanzado

1= Normal

2= Algún retraso

3= Retraso marcado

156. IMPLICACIÓN DE LA MADRE en el CUIDADO INFANTIL

156 Involucramiento materno en el cuidado infantil práctico

Esto aplica al cuidado diario- alimentación, cambio de pañales, baño y vestido del infante.

- 0= Sobre-involucramiento patológico (renuente a compartir la responsabilidad del cuidado o dejar al infante con otros adultos competentes)
- 1= Involucramiento materno normal.
- 2= Madre *despojada* de su responsabilidad completa en el cuidado infantil
- 3= Madre *renuente* o *incapaz* de asumir su responsabilidad en el cuidado infantil

¿Qué disfruta hacer con su bebé?

¿Qué hace para hacer sonreír o reír a su bebé?

Registre el relato de la madre sobre la implicación afectiva con su bebé.

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157. IMPLICACIÓN AFECTIVA CON EL INFANTE

157 Involucramiento afectivo con el infante

- 0= La madre disfruta abrazar y arrullar al bebé y está totalmente involucrada en la interacción con el infante
- 1=Existe un involucramiento menor al esperado y/o falta de arrullo hacia el bebé
- 2= Existe una clara deficiencia de involucramiento afectivo-
- 3= Existe una completa falta de involucramiento afectivo

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158. INICIO DE EMOCIONES POSITIVAS por el/la BEBÉ en SEMANAS

158 Aparición de emociones positivas hacia el bebé

Auto explicativo. **Nota:**

Un puntaje de '0' significa que se desarrollaron fuertes emociones positivas antes del parto.

'99' significa que aún no se han desarrollado emociones positivas.

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159. SENSACIÓN DE DISTANCIAMIENTO hacia el/la BEBÉ

159 Sentimiento de extrañeza

- 0=Ninguno
- 1= La madre se queja de que el bebé no pareciera pertenecerle
- 2= Este sentimiento es fuerte y es una de sus principales quejas

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160. NATURALEZA E INTENSIDAD de EMOCIONES hacia el/la BEBÉ.

160 Naturaleza e intensidad de los sentimientos hacia el infante

Este puntaje aplica para los sentimientos maternos.

'Involucramiento afectivo' (puntaje **157** en página 60) aplica al comportamiento.

El evaluador debe indicar a qué época estas puntuaciones aplican – lo más lejano o son sentimientos presentes en el momento de la evaluación. **E= Preocupación actual**

- 0=Muy fuertes-preocupación completa por el bebé
- 1=Fuertes.
- 2= Equívoca o ambivalente.
- 3= Decepción o inquietante ausencia de sentimientos positivos hacia el bebé

- 4=Desagrado u hostilidad hacia el bebé
- 5= Odio o rechazo hacia el infante

**161. PÉRDIDA SECUNDARIA de EMOCIONES
MATERNALES**

161 Pérdida secundaria de sentimientos maternos por el infante

- 0= No hay pérdida de sentimientos
- 1= La respuesta materna fue normal pero una depresión subsecuente u otros eventos condujeron a un impedimento de las emociones maternas.
- 2=Pérdida secundaria completa de emociones
- 3= Rechazo secundario hacia el infante

**162. IDEAS DE TRANSFERIR EL CUIDADO o ESCAPAR de
los DEBERES MATERNOS**

Especificar si hay fantasías o planes para escapar.

162 Ideas de transferencia del cuidado o escape de los deberes maternos

- 0=No hay deseo de escapar del cuidado infantil
- 1= La madre ha mantenido pensamientos fugaces privados de no cuidar a su bebé
- 2= La madre ha considerado *temporalmente* desertar de su responsabilidad o transferir el cuidado del bebé a alguien más
- 3=Esto ha sido discutido con su pareja, familia o servicios sociales
- 4=Abandono temporal o la transferencia del cuidado ya ha sucedido
- 5=La madre está buscando una acogida o adopción *a largo plazo*
- 6=El infante ha sido ubicado en adopción o servicio de acogida *a largo plazo*

163. IDEAS DE PÉRDIDA FETAL

Especificar la naturaleza de las fantasías.

163 Fantasías de pérdida fetal

- 0= No hay ideas
- 1=La madre ha manifestado deseos de forma privada de que el infante fuera robado o Muriera.
- 2=Esta idea ha sido expresada a otros.

164. OBSESIONES DE ABUSO INFANTIL

164 Ideas Obsesivas o impulsos relacionados con abuso infantil

- Una madre cariñosa y devota experimenta impulsos preocupantes y bizarros de lastimar o matar a su hijo/a.
- 0=Ninguna
 - 1=Presente
 - 2=Una queja importante

165. RESPUESTA DE ENOJO HACIA EL INFANTE

165 Respuesta agresiva hacia el infante

- 0=No hay enojo hacia el infante
- 1= Madre se ha sentido enojada con su bebé

- 2=Ella ha experimentado fuertes emociones de enojo, pero ha sido capaz de controlarles Fácilmente.
 3=Ella se ha mantenido en control, pero con dificultad (p.e. dejando la habitación)
 4= Ella ha perdido el control, conduciendo a un ataque verbal-gritos o maldiciones hacia el bebé
 5=Pérdida de control que ha derivado en abuso físico

166. TRATO RUDO

166-170 Abuso Infantil

- Para todo estos comportamientos,
 0= Esto no ha sucedido
 1=La madre ha tenido el impulso, pero no lo ha actuado
 2=Este comportamiento ha ocurrido
 3= Ha ocurrido más de una vez
 4= Ha ocurrido más de 3 veces

167.SACUDIDA DEL BEBÉ

168. BLOQUEO DE LA RESPIRACIÓN DEL BEBÉ

169. GOLPES, MORDEDURAS, QUEMADURA CON AGUA U OTRAS QUEMADURAS al/a BEBÉ

170. IDEAS FILICIDAS o IMPULSOS

171. AMBIENTE de ABUSO INFANTIL O FILICIDA.

171 Impulsos y actividades filicidas

- No calificar impulsos obsesivos aquí (hacerlo en el puntaje **164** previo).
 0=No hay ideas de matar al/a niño/a
 1=Estas ideas o impulsos se han experimentado de forma fugaz
 2= Ideas preocupantes de matar al/a niño/a
 3= Intento filicida

172. ABUSO INFANTIL O FILICIDIO

172 Contexto de abuso infantil o filicidio

- Especificar si una(s) enfermedad(es) mental(es) está(n) jugando un rol importante en este punto.*
 0=Ausencia de abuso o impulsos filicidas
 1= Esto ha ocurrido en un contexto donde hay una relación materno-infantil patológica
 2=El abuso de sustancias ha sido un factor
 3=Depresión ha sido un factor
 4= Psicosis ha sido un factor
 5= Otras enfermedades mentales han sido un factor

173. SEVERIDAD GENERAL de HERIDAS NO-ACCIDENTALES

173 Abuso emocional o privación

- 0= Ausencia de abuso emocional
 1= Existe alguna indicación de que el niño ha sido víctima de negligencia o ira materna

2=Evidencia definitiva de abuso emocional o privación

174 Severidad general de lesiones no accidentales

- 0= No hay abuso infantil
- 1= No se ha lastimado al infante
- 2= Lesión menor
- 3= Lesión severa
- 4= Lesión permanente

175 Deseo de otro bebé

- 0=Deseo fuerte por otro bebé en el futuro
- 1= Algo de deseo por otro bebé en el futuro
- 2= Indiferencia o ambivalencia
- 3= No hay deseo de otro bebé en el futuro
- 4= Clara determinación de no tener más bebés
- 5= La madre tuvo que ser esterilizada

Puntaje Total: /178

EVALUACIÓN GENERAL DEL ENTREVISTADOR

Diagnóstico de Alteración del vínculo materno-infantil (basarse en criterios de Brockington et al. 2006*):

Observaciones:

Entrevistador 2 que evalúa el reporte:

***Criterios para identificar Desorden en la relación madre-hijo**

Alteración/desorden del vínculo materno-infantil

Fuente: Brockington, I. F., Aucamp, H. M. & Fraser, C. (2006) *Severe disorders of the mother–infant relationship: definitions and frequency*. Archives of Womens Mental health. 9: 243–251. DOI 10.1007/s00737-006-0133-0

Criterios

1. Desorden Moderado- Madres que experimentan retraso, **ambivalencia**, o pérdida de la respuesta emocional hacia el niño.

****A hasta D son necesarios.**

- A- La madre expresa su decepción sobre sus emociones maternas o se siente extraña o distante de su bebé.
- B- No cumple criterios para el rubro de amenaza o rechazo establecido.
- C – El desorden ha durado al menos 1 semana.
- D – Estas emociones son perturbadoras y han ocasionado la búsqueda de ayuda profesional o familiar.

Ansiedad enfocada en el niño

- **Ansiedad moderada** -La madre reporta sentirse ansiosa, particularmente cuando está sola con su hijo.
- **Ansiedad severa:** la ansiedad reduce el contacto.

Odio Patológico-3 niveles– leve, moderado y severo.

Odio leve

- * La madre le grita al niño, ya sea fuerte o lanzando groserías en al menos 2 ocasiones.
- * Ha expresado su odio solamente de forma verbal.

Odio moderado

- Además de la pérdida de control,
- * Ya sea que la madre experimente impulsos de dañar al niño (sofocarlos, tirarlo, sacudirlo),
- * O ha habido un episodio menos de abuso, como sacudir el coche del niño.

Odio severo

Además de la pérdida de control verbal e impulsos de lastimar al niño, debe haber por lo menos 1 episodio de claro abuso hacia el niño.

2. Amenaza de Rechazo

- Las madres carecen de respuesta emocional positiva hacia el bebé además de haber evidenciado un deseo de deshacerse de su hijo.
- *La principal diferencia entre la amenaza y el rechazo establecido es que se mantiene el no deseo hacia el bebé para transferirlo temporalmente para su cuidado.*

3. Rechazo establecido

- A, B y C son necesarias.
- A- La madre expresa disgusto, resentimiento u odio hacia su bebé. A veces se expresa en términos de: “me gustaría que no hubiera nacido” o “Ha arruinado mi vida”.
- B- Ella ha expresado el deseo de deshacerse permanentemente del cuidado del bebé.
- C- Ella ha tenido el deseo de que el bebé desaparezca– ser robado, o morir a causa del síndrome de muerte súbita.

APPENDIX 5. Research Ethics Committee approval



DICTAMEN DEL COMITÉ ÉTICO DE INVESTIGACIÓN CLÍNICA

NEUS RIBA GARCIA, Secretaria del Comité Ético de Investigación Clínica del Hospital Clínic de Barcelona

Certifica:

Que este Comité ha evaluado la propuesta del promotor, para que se realice el estudio:

TÍTULO: Estudio comparativo de los factores implicados en el vínculo materno-filial en mujeres con y sin depresión en el postparto.

INVESTIGADOR PRINCIPAL: LLUISA GARCIA-ESTEVE

y considera que, teniendo en cuenta la respuesta a las aclaraciones solicitadas (si las hubiera), y que:

- Se cumplen los requisitos necesarios de idoneidad del protocolo en relación con los objetivos del estudio y están justificados los riesgos y molestias previsibles para el sujeto, teniendo en cuenta los beneficios esperados.
- La capacidad del investigador y los medios disponibles son apropiados para llevar a cabo el estudio.
- Que se han evaluado la compensaciones económicas previstas (cuando las haya) y su posible interferencia con el respeto a los postulados éticos y se consideran adecuadas.
- Que se cumplen los preceptos éticos formulados en la Orden SAS 3470/2009 y la Declaración de Helsinki de la Asociación Médica mundial sobre principios éticos para las investigaciones médicas en seres humanos y en sus posteriores revisiones, así como aquellos exigidos por la normativa aplicable en función de las características del estudio.
- Que dicho estudio se incluye en una de las líneas de investigación biomédica acreditadas en este centro, cumpliendo los requisitos necesarios, y que es viable en todos sus términos.

Este CEIC acepta que dicho estudio sea realizado, debiendo ser debiendo ser comunicado a dicho Comité Ético todo cambio en el protocolo o acontecimiento adverso grave.

y hace constar que

1º En la reunión celebrada el día 23/01/2014, acta 2/2014 se decidió emitir el informe correspondiente al estudio de referencia.

2º El CEIC del Hospital Clínic i Provincial, tanto en su composición como en sus PNTs, cumple con las normas de BPC (CPMP/ICH/135/95)

3º Listado de miembros:

Presidente:

- FRANCISCO JAVIER CARNE CLADELLAS (Médico Farmacólogo Clínico, HCB)

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- BEGOÑA GOMEZ PEREZ (Farmacèutica Hospitalaria, HCB)

Secretario:

- NEUS RIBA GARCIA (Médico Farmacólogo Clínico, HCB)

Vocales:

- ITZIAR DE LECUONA (Jurista, Observatorio de Bioética y Derecho, UB)
- MONTSERRAT GONZALEZ CREUS (Trabajadora Social, Servicio de Atención al Usuario, HCB)
- MIRIAM MENDEZ GARCÍA (Abogada, HCB)
- MONTSERRAT NUÑEZ JUÁREZ (Enfermera, HCB)
- JOSE RIOS GUILLERMO (Estadístico, Farmacología Clínica, USEM, UASP, HCB)
- JOSE MIGUEL SOTODA (Farmacéutico Atención Primaria, CAP Les Corts)
- ANTONI TRILLA GARCIA (Médico Epidemiólogo, HCB - Director UAPS)
- OCTAVI SANCHEZ LOPEZ (Representante de los pacientes)
- MARIA JESÚS BERTRAN LUENGO (Médico Epidemiólogo, HCB)
- MARTA AYMERICH GREGORIO (Médico Hematólogo, HCB)

CIF - G-08431173

En el caso de que se evalúe algún proyecto del que un miembro sea investigador/colaborador, este se ausentará de la reunión durante la discusión del proyecto.

Para que conste donde proceda, y a petición del promotor,

Barcelona, a 27 de enero de 2015



Reg. HCB/2014/0014

Mod_D3 (V1 de 11/10/2013)

EPA

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