Perinatal Bonding Disorders

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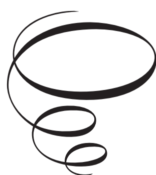
Causes and Consequences

Edited by

Toshinori Kitamura and Yukiko Ohashi

Cambridge Scholars Publishing



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CONCEPTS

CHAPTER ONE

INTRODUCTION

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Parental emotional involvement with a baby in the perinatal period—"bonding"—is one of the interests of perinatal health professionals. Although most parents maintain positive attitudes towards their infant, there are other parents who experience negative affection towards their neonate. These circumstances are unfortunate for both the children and the parents and may lead to a variety of undesirable consequences. Now, difficulties in perinatal bonding are one of the most important worldwide issues in the perinatal mental health field. For example, our two studies from different databases suggested that bonding disorder, and not depression, is a causal factor of abusive parenting to neonates (Kitamura, Takauma, & Tada, 2014; Ohashi, Sakanashi, Tanaka, & Kitamura, 2016). Brockington, Butterworth, and Glangeaud-Freudenthal (2017) insisted that the assessment of the mother's relationship with the foetus as well as the infant was a vital and specific part of the clinical investigation. They also suggested that identifying parents and infants at risk during pregnancy and the postpartum period would offer opportunities for the primary and secondary prevention of parental mental illness and its

adverse consequences on the development of children, resulting in long-term cost savings in the health, education, and welfare systems. Nevertheless, the myth that "every parent loves their own child" still prevails and prevents parents from seeking professional help.

Perinatal bonding disorders came to be known in the 1990's due to the research of Kumar (1997) and Brockington (1996). In those days, little was known about the causes and consequences of perinatal bonding and bonding disorders. It was believed that bonding disorders had no relation to the child's characteristics and that there were no predictable factors during the pregnancy. Recent years have, however, seen progress in research about perinatal bonding and bonding disorders. This book is a compilation of papers by Japanese clinical researchers. These papers describe the latest knowledge based on unique empirical investigations. Each author introduces his or her own original work in addition to ample references from previous studies.

This book begins with Dr. Yamashita's conceptual analysis of perinatal bonding disorders. This chapter provides an overview of multiple aspects of the concepts of bonding and bonding disorders which will be followed by integration of different definitions and proposal of a new one.

Causes of perinatal bonding disorders may be multifaceted. They are like pieces of a jigsaw puzzle. They include perceived rearing in childhood and present adult attachment (Dr. Kitamura, et al.), negative life events and coping styles (Dr. Kokubu, et al.), postnatal traumatic stress (Dr. Takegata, et al.), and antenatal bonding (Ms. Usui, et al.). It is of note that there are many other possible causes of perinatal bonding disorders such as poor social support（Ohara, Okada, Aleksic., et al., 2017), and infant colic (Yalçin et al., 2010). Although some pieces of the puzzle have been found, it has not been easy for us to infer the whole picture from a few pieces. One reason is that there may be confounders in the association between these predictable factors and the bonding. They may be just another symptom and may not be the cause of bonding impairment. In order to find the primary cause, we should be very cautious in comparing these pieces. Unfortunately, however, the limited number of findings on this topic are scattered and it is difficult to collectively observe this significant impairment.

Postnatal bonding disorders may have adverse consequences including child maltreatment (D. Baba, et al.) and a lack of desire to have another baby (D. Kitamura, et al.). These are just two examples. Another important consequence is poor parent-infant interactions (Hornstein,

Trautmann-Villalba, Hohm, Rave, & Schwarz, 2006; Noorlander, Bergink, & van den Berg, 2008). We should exercise caution here again about what mediates the effects of bonding disorders on these consequences.

Finally, this book concludes with chapters on interventions to the disorders: nursing care (Mrs. Shigematsu, et al.), a Baby Friendly Hospital system (Dr. Nanishi, et al.), and psychotherapy (Dr. Tamaki, et al.). They suggest the possibility of the effectiveness of different types of psychological approaches. We must also add that pregnant women's experience with nursing care affects postnatal bonding (Ohashi, Kitamura, Kita, Haruna, Sakanashi, & Tanaka, 2014). There are no effective medications for bonding impairment. Hence, a psychosocial approach should be given first priority. We think that early preventive intervention following comprehensive risk assessments is of greatest necessity for expectant mothers who do not have the resources or support for their vulnerability.

This book aims to inspire the interests of the experts in the field, and, of course, to help parents with bonding problems to seek and receive appropriate support without feeling ashamed. We are pleased to introduce this book to an international audience. We would like to express our appreciation to Cambridge Scholars Publishing for publishing our book. It would be our great pleasure if this book contributes to the knowledge of health professionals who are facing this challenging issue and helps suffering parents, their children, and families around the world.

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CHAPTER TWO

PERINATAL BONDING: CONCEPT AND ASSESSMENTS

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Abstract

Objectives: To provide a principle-based analysis of the concept of perinatal bonding and bonding disorders.

Methods: Principle-based method of concept analysis for which the data set included 72 articles published in the last few decades from PubMed, CINAHL, and PyschINFO/PsychARTICLES.

Measurement and findings: After a review of the history of perinatal bonding studies, a principle-based concept analysis was conducted to examine the state of the science with regard to this concept. The concept was critically examined according to the epistemological, pragmatic, linguistic and logical principles. Analysis of the concept revealed the following: 1) Perinatal bonding describes maternal feelings and emotions toward a foetus or infant during the perinatal period. Evidence that the concept encompasses "bonding disorder," defined as pathological multidimensional phenomena, has been accumulating in recent years; 2) Perinatal bonding is clearly operational definition in the affective domain for postnatal bonding; however, the concept of prenatal bonding includes behavioural and cognitive definitions; 3) The current status of assessment tools for perinatal bonding started to be established after the accumulation of validation studies across diverse cultural backgrounds; and 4) The

boundaries between the concepts of bonding and attachment are clearly delineated; therefore, although maternal–infant bonding is linguistically differentiated from attachment, prenatal bonding remains linguistically confused with attachment.

Key conclusion: The concept of bonding has been operationalized and standardized based on the sharp increase of validation studies with theoretically integrated research procedures (e.g. utilizing data sources in large-scale cohort studies), especially in the postnatal period. On the other hand, the concept of maternal bonding in the prenatal period is sometimes confused with related concepts. Therefore, maternal child health practitioners should use the theoretical definition of perinatal bonding and bonding disorders as a preliminary guide for identifying and gaining a better understanding of the concept in multidisciplinary practice.

Key words: Maternal–infant bonding, bonding disorder, perinatal period, concept analysis

Background

The development of an emotional bond with a newborn is the key biopsychosocial process in the perinatal period. The concept of bonding was introduced in the 1960s with the work of Rubin (1967) in the *Nursing Research Journal*. Bonding was defined as the process of attainment in the maternal role. In the 1970s, the concept was popularised and theorized by American paediatricians Klaus and Kennell (1976). They focused on the positive effect of bonding on the behavioural aspects of mother–infant interaction, such as parenting behaviours or neurocognitive development. Since that time, the formation of the maternal–infant bond has been a central focus of obstetric, neonatal and paediatric nursing care. One of the most significant tenets of their bonding theory was the ‘sensitive period,’ in which, parents need to have close contact with their newborn in the immediate postpartum period in order to promote optimal developmental outcomes for the infant. Their work led to substantial changes in the care of postpartum women in the hospital, including a widely instituted rooming-in policy. Nevertheless, many maternal–infant health professionals believed that families who were unable to have close physical contact with their newborns immediately after birth because of medical complications may be causing psychological harm (Crouch, 2002). Kennell and Klaus (1998) later revised their original idea that close contact was necessary, stating that

although it could promote bonding, ‘early separation did not prevent the formation of a close, intimate bond.’ Even after this controversy, the relative frequency of inconsistencies in the use of the concept remains a major concern among researchers who aim to develop the science surrounding maternal–infant bonding. For example, the concept of maternal ‘bonding’ appears frequently in psychiatric, paediatric and social work discussions of childhood psychopathology and child abuse. In this case, bonding is used as a diagnostic concept, and one which has to bear the weight of important explanatory, descriptive and predictive statements. However, the use of the term in that manner is often problematic because of the tendency to oversimplify attachment phenomena (Herbert, Sluckin, & Sluckin, 1982). Paradoxically, very little is known about the emotions parents generally have toward their newborn, or about how bonding typically emerges and develops through this process. Brockington, Fraser and Wilson (2006) pointed out that little has been written about the detection of maternal–infant bonding disorders, and thus developed self-report questionnaires and conducted clinical interviews for the screening and diagnosis of maternal–infant bonding failure (Brockington et al., 2001, 2007). In addition, the term ‘bonding’ is used in different ways to refer to maternal–foetal bonding, maternal–infant bonding, parental bonding and nursing bonding. Although in lay discourse, the terms bonding and attachment are often used interchangeably (Brockington et al., 2006), inconsistencies in the research literature are numerous and require clarification to advance the concept. Advancing the concept will allow both researchers and practitioners to measurement it appropriately, possibly leading to the development of psychosocial interventions that can improve perinatal bonding and bonding disorders, thereby improving maternal and child outcomes.

Aim of analysis

The purpose of this analysis is to clarify the meaning, and thereby provide a better understanding, of perinatal bonding and bonding disorders by differentiating it from other related concepts such as attachment using the evolutionary and principle-based concept analysis method described by Walker and Avant (2005) and Pernod and Hupcey (2005). The goal of the analysis is to provide a clearer definition of bonding for use in the creation of operational definitions. The aim of this concept analysis is to determine the meaning of perinatal bonding and bonding disorders in the context of perinatal mental health.

Method

To describe the current state of the concept of maternal–child bonding in the perinatal period, a principle-based method of concept analysis using a data sample of articles published in the past few decades was completed. The sample of scientific literature selected for the concept analysis was thoroughly reviewed, and the data were recorded using a review matrix as described by Garrard (2007). In accordance with the method of principle-based concept analysis, the data were then critically analysed according to the following four principles of analysis: epistemology, pragmatism, linguistics and logic (Penrod & Hupcey, 2005). In this analysis, the concept was critically examined according to the clarity of the definition (epistemology), the applicability of the concept (pragmatics), consistency in use and meaning (linguistics) and differentiation of the concept from related concepts (logic). Following the analysis, assessments were integrated into a theoretical definition that provides a higher level of understanding of the concept. The concept of perinatal bonding and bonding disorders are described as currently portrayed in the extant literature, and persistent gaps and inconsistencies are identified so that subsequent research may enhance scientific precision and improve utility, leading to the advancement of both the concept and perinatal mental health.

Managing data

The databases PsychINFO, PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) were searched using the search term 'maternal–infant bonding' OR 'bonding disorder' OR 'prenatal bonding disorder' OR 'postpartum bonding disorder' OR 'perinatal bonding disorder.' The inclusion criteria were English language, articles published in peer-reviewed journal articles and commentary on published work and human populations. The search yielded 320 articles after eliminating duplicates (Fig. 1). Each abstract was reviewed, and 198 articles were eliminated because of a lack of relevance to the present study. Studies that examined a population other than mothers and foetuses/infants (e.g. adults' bonding with children or their parents), that only introduced the concept of bonding to support the study design or that had a study topic that was conceptually unrelated to the current analysis were excluded. This yielded a sample size of 122 articles, which were subsequently obtained in full text. A full text review resulted in the elimination of 82 articles owing to a lack

of relevance in accordance with the above criteria. An additional 32 articles meeting the inclusion criteria were obtained through secondary methods. The recognition of references for inclusion at the secondary level occurred when sources were cited frequently by other authors but had not been identified in the original search results.

The past decade has seen a surge in the number of publications on the topic of perinatal bonding and bonding disorders. The majority of recent research has been published in interdisciplinary journals encompassing multidisciplinary approaches, mainly in the mental health field, and this has precluded the comparison of disciplinary perspectives as suggested by Rodgers and Knafl (2000).

Results

Clarity of definition (epistemological principle)

The epistemological principle involves the examination of how clearly the concept has been both explicitly and implicitly defined within the scientific literature. Perinatal bonding most often refers to a tie from the mother to the foetus or infant, not from infant to mother in the postnatal period, which is usually referred to as attachment. A few authors have described maternal–infant bonding as a reciprocal process (Crouch, 2002) (Matthey & Speyer, 2008). Most explicit definitions of maternal–infant bonding referred to the original work of Klaus and Kennell (1976). Normal bonding was defined by Sluckin, Herbert, & Sluckin (1983) as: “no ordinary relationship. When all goes well an attachment is being cemented between a mother and her baby, a relationship implying unconditional love, self-sacrifice and nurturing attitudes which, for the mother’s part, will last a lifetime”.

As for the prenatal period, Cranley (1981) defined maternal–foetal bonding as “the extent to which women engage in behaviours that represent an affiliation and interaction with their unborn child”, and developed the Maternal–Fetal Attachment Scale (MFAS) to measure the construct. In describing prenatal bonding, Condon (1985) noted that “the term ‘attachment’ is used to refer to the emotional tie or bond which normally develops between the pregnant woman and her unborn infant”, and subsequently developed the 19-item self-report Maternal Antenatal Attachment Questionnaire. It seems likely that maternal-foetal attachment may be a predictor of future maternal-infant attachment (Condon & Dunn,

1988). Muller and Mercer (1993) criticized the MFAS because they felt that it emphasized behaviour rather than affiliation, and studies that applied it reported inconsistent findings. Thus, they defined prenatal attachment as the "the unique, affectionate relationship that develops between a women and foetus", and proposed the attachment model for the process of relationship development and developed the Prenatal Attachment Inventory (Muller & Mercer, 1993). The same authors subsequently developed postnatal bonding measures equivalent to prenatal measures, e.g. the Maternal Postnatal Attachment Scale (Condon & Corkindale, 1998) and the Maternal Attachment Inventory (Müller, 1994). Most of these studies were published in nursing and psychology journals, where adaptive aspects of bonding were focused on and defined as a foundation of attachment formation that results in positive outcomes in terms of the mother–infant relationship and infant development. Condon (1986), and subsequently, Kent, Laidlaw, & Brockington (1997), examined impairments in maternal-foetal bonding and had provided detailed descriptions of clinical cases as 'Fetal Abuse'. The term 'fetal abuse spectrum' is a diagnostic concept and equivalent to 'bonding disorder' or 'established emotional rejection' as described by Brockington (2016).

The psychometric properties of these perinatal bonding measures based on the attachment model are summarized in Table 1.

On the other hand, many authors have described maternal–infant bonding as being limited to the affective domain (Bienfait et al., 2011; Brockington et al., 2001, Brockington et al., 2006; Taylor, Atkins, Kumar, Adams, & Glover, 2005; van Bussel, Spitz, & Demyttenaere, 2010), such as the mother's feelings and emotions toward her infant, and as not consisting of observable behaviours such as cuddling. Most of these studies were published in psychiatric journals, where impairment or failure of bonding were focused on and defined as a clinical psychological disorder resulting in negative outcomes for the mother-infant relationship and infant development, and even child abuse in severe cases. Two postnatal bonding measures were developed for the detection of bonding disorder in clinical settings during the perinatal period. These main bonding measures will be mentioned later.

There were, however, those who defined maternal–infant bonding as encompassing the affective, behavioural and biological domains (Feldman, Weller, Zagoory-Sharon, & Levine, 2007). Feldman and Eidelman (2007) found that maternal oxytocin levels were related to two measures of maternal–infant bonding: observed maternal–infant behaviour and the assessment of the mothers' cognitive representations regarding her infant.

Table 1 Perinatal Bonding Assessment measure (models based on attachment theory)

Measure	Study	Psychometric Properties		
		Factor Structure	Reliability	Validity
Maternal–Fetal Attachment Scale / Paternal–Fetal Attachment Scale	Cranley (1981)	24 items, 6 subscales[1)] 5-point scale	IC; Cronbach's α coefficient Total score = .85 Subscale = .52~.73	External criterion validity Broussard Neonatal Perception Inventory (r = .01, p = .435)
Maternal Antenatal Attachment Scale	Condon (1993)	19 items, 2-factor solution after factor analysis Quality/intensity 39% of the variance explained four styles by 2-factor solution[2)]	IC; Cronbach's α coefficient Total score = .818 Subscale = .52~.73	–
Prenatal Attachment Inventory	Muller (1993)	27 items, 1-factor solution after factor analysis 1st factor included 4 themes[3)] 4-point Likert scale	IC; Cronbach's α coefficient= .81	Construct validity MFAS (r = .72) MAMA (r = –.25) KMSS (r = .05)
Maternal Attachment Inventory	Muller (1994) Nakajima (2001)	26 items, 4-point Likert scale Factor analysis not performed Global score only	IC; Cronbach's α coefficient= .85 IC; Cronbach's α coefficient= .91	Construct validity HIFBN (r = .45) MSAS (r = –.46) PPMAMA (r = .30)

Maternal Postnatal Attachment Scale	Condon (1998)	19 items, 5-point Likert scale 3-factor solution[4)]	IC; Cronbach's α coefficient= .78 ICC; = .70	Construct validity Significantly correlated in infant temperament, ZDS, POMS, HADS, IBM, SSQ

IC: internal consistency; ICC: intraclass correlation test-retest reliability; MAMA: Marital Adjustment and Maternal Attitude Scale; KMSS: Kansas Marital Satisfaction Scale; HIFBN: How I Feel About the Baby Now; MAI: Maternal Attachment Inventory; MSAS: Maternal Separation Anxiety Scale; PPMAMA: Postnatal version of the Maternal Attitudes and Maternal Adjustment Scale; POMS: Profile of Mood States; HADS: Hospital Anxiety and Depression; IBM: Intimate Bond Measures; SSQ: Social Support Questionnaire.

1) Six subscales: DIFFSLF: Differentiation of self from the foetus / INTERACT: Interaction with the foetus / ATTRIBUT: Attributing characteristics and intentions to the foetus / GIVINGSLF: giving of self / ROLETAK: role taking / NESTING: nesting.
2) Two-dimension model: Strong Healthy / Positive quality but low preoccupation because of distraction or avoidance / Uninvolved or ambivalently involved with low preoccupation / Anxious, ambivalent or affectless preoccupation.
3) Four themes: Preparedness, Fantasizing, Affection and Interaction.
4) Three factors at each time point (4 weeks): Factor 1: Pleasure in proximity; Factor 2: Acceptance and tolerance; Factor 3: Competence as parent.

Maternal–infant bonding was also defined in terms of a relationship between a mother and infant without specifying behavioural, biological or affective components (Altaweli & Roberts, 2010) (Crouch, 2002). For example, the definition provided by Altaweli and Roberts (2010) was ‘the special, close relationship between the mother and her child’.

The timing of perinatal bonding is also a significant epistemological consideration. Most authors have also implicitly or explicitly stated that the maternal bonding process occurs over an extended period of time, but is for the most part constrained from pregnancy to the first year of the child’s life. When asked when they first felt love for their babies, 41% of mothers reported this to be whilst pregnant, 24% at birth and 27% during the first week of their child’s life; 8% reported feeling affection for their newborn after the first week (MacFarlane et al., 1978). Robson and Kumar (1980) also noted that some mothers feel indifference when holding their infant for the first time; this is more common in primiparous (40%) than in multiparous (25%) cases, and especially when the delivery was very difficult or painful. Bonding may not always be established at the time of first contact with a newborn, and can be a more gradual and constructive process that intensifies over time. Many studies have examined bonding in the first year postpartum (Feldman et al., 2007; Gunning, Waugh, Robertson, & Holmes, 2011; Taylor et al., 2005; van Bussel et al., 2010), and some of those studies had a longitudinal design (Moehler, Brunner, Wiebel, Reck, & Resch, 2006; van Bussel et al., 2010; Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012). Follow-up studies from pregnancy through the postnatal period have increased in recent years (Dubber, Reck, Müller, & Gawlik, 2015; Kita, Haruna, Matsuzaki, & Kamibeppu, 2016; Ohara et al., 2016, 2017; Ohoka et al., 2014; Persico et al., 2017; Petri et al., 2017; Rossen et al., 2016; Seng et al., 2013). A few have extended the definition to include childhood years or adolescent mothers (Kitamura et al., 2015) (Macdonald et al., 2017) (Matthey & Speyer, 2008).

In summary, the concept of perinatal bonding is frequently but not consistently defined across studies, especially during pregnancy. The majority of authors seem to agree that perinatal bonding is a continual process that includes an emotional tie of a mother with her foetus or infant and occurs in the perinatal period (during pregnancy and the first year of an infant’s life). Maternal–infant bonding may also be observed through behavioural manifestations, although the exact behaviours have not been clearly identified.

Applicability of the concept (principle of pragmatics)

The pragmatic principle involves analysing whether the concept explains a phenomenon encountered within the perinatal mental health practice disciplines and whether it has been operationalized. An examination of the literature revealed that maternal–infant bonding is easily recognizable in clinical practice, either through observation of maternal behaviour or self-report of emotions by the mother. Several clinical case reports of maternal–foetal or maternal–infant bonding were found in the medical or psychology literature (Brockington & Brierley, 1984) (Sluckin, 1993) (Kumar, 1997) (Yoshida, 2007). For example, Kumar (1997) published a study of 44 women contacted through the Association for Postnatal Illness who described problems in the early relationship with their infants. Similarly, Yoshida (2007) reported a case series of bonding disorder with or without perinatal depression in which the presence of maternal–infant bonding disorder was clearly recognizable. Notably, treatment was aimed at maternal cognitive and emotional representations, suggesting that maternal–infant bonding disorders can be improved by long-term intervention toward distorted maternal attachment representation as an important factor of maternal–infant relationship disorder (Sluckin, 1998).

In addition to the recognition of the concept in clinical practice, maternal–infant bonding has also been operationalized for use in research and practice as mentioned above. Operationalized criteria for postnatal bonding failure were proposed by Brockington et al. (2006) based on the results of factor analysis of self-administered questionnaires and clinical interviews. Kumar (1997) developed a nine-item self-report screening scale based on the mother's narrative accounts called the Mother–Infant Bonding Questionnaire (MIBQ).

In recent years, these two measures have been extensively studied in regard to their psychometric properties. The results of these studies, which mainly used relatively large community samples, demonstrated a stable factor structure with a reasonable goodness of fit and adequate test-retest reliability and construct validity.

The most frequently cited questionnaire was the Postpartum Bonding Questionnaire (PBQ) developed by Brockington et al. (2001). The PBQ is composed of 25 items that address the mother's feelings toward her infant, such as 'I feel close to my baby' and 'I resent my baby.' English, French, German, Japanese, Spanish and Swedish versions of the PBQ are available. Among these validation studies, factor analysis yielded one-factor (Reck et al., 2006) (Kaneko & Honjo, 2014), three-factor (Wittkowski, Williams, &

Wieck, 2010) (Ohashi, Kitamura, Sakanashi, & Tanaka, 2016) and four-factor models, respectively (Brockington et al., 2001) (Brockington et al., 2006) (Garcia-Esteve et al., 2016) (Suetsugu, Honjo, Ikeda, & Kamibeppu, 2015). The psychometric properties of the PBQ for perinatal bonding disorders are summarized in Table 2.

Based on the MIBQ developed by Kumar (1997) as mentioned above, Taylor et al. (2005) developed the Mother-to-Infant Bonding Scale (MIBS) to measure bonding and bonding disorders and assess the emotional response of a mother to her infant. The MIBS contains eight one-word items, including ‘joyful’, ‘dislike’ and ‘loving’. Each of these scales specifically addresses the mother’s emotions and feelings toward her infant, rather than her behaviour or parenting confidence. The MIBS has been translated into Spanish, French and Japanese, and each version includes different items developed during the translation and standardization processes (Table 3). Factor analysis revealed two-factor (Taylor et al., 2005) (Yoshida et al., 2012) and three-factor models, respectively (Figueiredo, Costa, Pacheco, & Pais, 2007). The psychometric properties of the MIBS for perinatal bonding disorders are summarized in Table 4.

As summarized in Tables 2 and 4, the results of factor analysis show that perinatal bonding disorder can be operationally defined as involving multidimensional phenomena. In addition, cluster analysis of MIBS total scores revealed a group of mothers with high MIBS scores discretely different from those with low MIBS scores, suggesting that perinatal bonding disorder might be a categorically-defined clinical syndrome (Matsunaga, Takauma, Tada, & Kitamura, 2017). Taken together, the findings of recent studies support the validity of the diagnostic criteria proposed by Brockington et al. (2006), and suggest that these two bonding measures may be useful tools for identifying mothers with severe bonding disorders that require clinical intervention. Maternal–infant bonding disorder has also been measured using clinical interviews. The Stafford Interview (Brockington et al., 2017) is an interview designed for use in all mental health fields providing maternal–infant health care during the perinatal period.

In summary, it is evident that the concept of maternal–infant bonding is relevant to and recognizable in clinical practice. Instruments used to measure the concept vary, but for the most part, are consistent in terms of how individual authors define and measure the concept of maternal–infant bonding. The development of feasible assessment tools has facilitated the awareness of bonding impairment and promoted early interventions by clinical staff providing maternal–infant health. In addition, treatment modalities that demonstrate success have been developed.

Table 2 Perinatal Bonding Assessment Measure (models based on diagnostic criteria in perinatal psychiatry ①)

Measure	Study	Psychometric Properties		
		Factor Structure	Reliability	Validity
Postpartum Bonding Questionnaire	Brockington (2001; 2006)	25 items, 6-point Likert scale 5-factor solution by PCA[1)]	Test-retest; 4 subscales; r = .95, .95, .93, .77	Predictive validity External criteria; diagnosis by Birmingham Interview for Maternal Mental Health[2)] Original cut-off (2001)[3)] Revised cut-off (2006)[4)]
	Reck (2006)	25 to 16 iems, 6-point Likert scale, 1-factor solution by PCA	IC; Cronbach's α coefficient = .85	Construct validity EPDS (r = .43, .41)
	Wittkowski (2010)	25 items, 6-point Likert scale EFA yielded a 3-factor solution by CFA	IC; Cronbach's α coefficient subscales 1, 2 and 3 = .79, .63 and .63, respectively. Total PBQ scale = .77	Convergent and concurrent validity BDI Total and factors 1, 2 and 3 (r = .71, .68, .63, and .61, respectively)
	Van Bussel (2010)	25 items, PCA not performed	IC; Cronbach's α coefficient subscales 1, 2, 3 and 4 = .77, .75, 58 and .36, respectively. Total PBQ scale = .87	Convergent and concurrent validity PBQ, MIBS, MPAS and EPDS were moderately correlated

	Kaneko (2014)	16 items, 1-factor solution by PCA	IC; Cronbach's α coefficient = .85	Concurrent validity EPDS (r = .46)
	Sutsugu (2015)	14 items, 4-factor solution[5)] by weighed least squares and promax rotation	IC; Cronbach's α coefficient = Total and factors 1, 2, 3 and 4 = .806, ,819, .658, .499, and .583, respectively	Convergent and concurrent validity Total score MIBS (r = .675) MAI (r = –.531) EPDS (r = .500)
	Garcia-Esteve (2016)	25 items, 4-factor with general factor solution by EFA and CFA General factor, impaired bonding, anxiety about care, lack of enjoyment and rejection and risk of abuse	IC; Cronbach's α coefficient = Total and factors 1, 2, 3 and 4 =.90, ,85, .83, .75, and .56, respectively	Convergent and concurrent validity Bonding disorder 2.9% and severe bonding disorder 0.6% EPDS (r = .53)
	Ohashi (2016)	25 items, 3-factor solution by EFA by CFA; Factor 1: Anger and Restrictedness; Factor 2: Lack of Affection; Factor 3: Rejection and Fear CFA model comparison was performed	IC; Cronbach's α coefficient = Factors 1, 2 and 3 = .81, .82 and .64, respectively Test-retest reliability ICC = Factors 1, 2 and 3 = .83, .82 and .76, respectively	Construct Validity EPDS (r = .49, .21, .32) CTS Psychological abuse (r = .45, .29, .31) Physical abuse (n.s.)

PCA: principal component analysis; EFA: exploratory factor analysis; CFA: confirmatory factor analysis; EPDS: Edinburgh Postnatal Depression Scale; MIBS: Mother-to-Infant Bonding Scale; MAI: Maternal Attachment Inventory; CTS: Conflict Tactics Scale; PBQ: Postpartum Bonding Questionnaire; MPAS: Maternal Postnatal Attachment Scale; BDI: Beck Depression Inventory; Se: sensitivity; Sp: specificity; PPV: positive predictive value.

1) Five factors: Factor 1: Impaired Bonding; Factor 2: Rejection and Anger; Factor 3: Positive Perception Factor; 4: Anxiety about Care of the Baby; Factor 5: risk of abuse. Four scales: Factor 1, Factor 2, Factor 4 and Factor 5.
2) Diagnostic categories: Delay in or loss of maternal emotional response; Pathological anger toward infant; and Rejection of infant, mild bonding disorder or severe bonding disorder (rejection)
3) Original cut-off (2001): Se : Sp = Factor 1 (.93 : .85), Factor 2 (.57 : 1.0), Factor 3 (.43 : .96), Factor 4 (.18 : 1.0)
4) Revised cut-off (2006): Any disorder, Factor 1: cut-off : Se : Sp : PPV = (11/12 : .82 : .68 : .76); Any rejection, Factor 1: cut-off : Se : PPV = (11/12 : .92 : .46); Any rejection, Factor 2 : cut-off : Se: PPV = (12/13 : .86 : .73); Severe anger, Factor 1: cut-off : Se : PPV = (11/12 : .93 : .19); Severe anger, Factor 2: cut-off : Se : PPV = (16/17 : .67 : .30); Severe anger, Factor 4: cut-off : Se : PPV = (2/3 : .47 : .39)
5) Four factors: Factor 1: Impaired Bonding; Factor 2: Rejection and Anger; Factor 3: Anxiety about Care; Factor 4: Lack of Affection.

Table 3 Summary of items on the Mother-to-Infant Bonding Questionnaire (MIBQ) and Mother-to-Infant Bonding Scale (MIBS)

Item number	Kumar (1997) MIBQ	Taylor (2005) MIBS (Based on MIBQ)	Marks (p.c.) MIBQ revised (by sentence)	Figueiredo (2005) MIBS (Based on MIBQ)	Yoshida (2012) MIBS (Based on MIBQ revised)
Loving	○1	○1	○1	○1	○1
Resentful	○2	○2	○3	○7	○3
Neutral or felt nothing	○3	○3	Deleted 4	○12 Not clear	Deleted 4
Joyful	○4	○4	○ (Enjoy) 6	○3	○ (Enjoy) 6
Dislike	○5	○5	○ (Did not have baby) 9	○8	○ (Did not have baby) 9
Protective	○6	○6	Deleted 8	○2	○8
Disappointed	○7	○7	○ (Baby was different) 7	○9	○ (Baby was different) 7
Aggressive	○8	○8	○ (Angry) 5	○5	○ (Angry) 5
Possessive	○9	Deleted 9		○11 Not clear	
Close	○10		○ (Feel close) 10		○ (Feel close) 10
Scared or panicky			○2		○2
Mad				○4	
Sad				○6	
Fearful				○10 Not clear	

Table 4 Perinatal Bonding Assessment Measure (models based on diagnostic criteria in perinatal psychiatry ②)

Measure	Study	Psychometric Properties		
		Factor Structure	Reliability	Validity
Mother-to-Infant Bonding Scale	Taylor (2005)	8 items, 4-point Likert scale 2-factor solution	IC; Cronbach's α coefficient = .78	Construct validity EPDS (r= –31) Blues (n.s), High (n.s)
	Figueiredo (2007; 2009)	12 items, 4-point Likert scale 3-factor solution[1)]	IC; Cronbach's α coefficient = .53; test-retest = .49	Construct validity Mothers with EPDS >9
	Bienfat (2011)	8 items, 4-point Likert scale	Not described	Construct validity ROC curve, EPDS, AAQ, MABI
	Yoshida (2012)	8 items, 4-point Likert scale 2-factor solution by PCA[2)]	IC; Cronbach's α coefficient = .71 (LA), .51 (AR); test-retest = .46 (LA), .45 (AR)	Construct validity EPDS r = .22 (LA), .51 (AR)

IC: internal consistency; ICC: intraclass correlation; PCA: principal component analysis; ROC curve: receiver operating characteristic curve; EPDS: Edinburgh Postnatal Depression Scale; Blues: Maternity Blues; High: Maternity High; AAQ: Adult Attachment Questionnaire; MABI: Mother's Assessment of the Behaviour of her Infant.

1) Three factors at each time point: Positive, Negative and Unclear.

2) Two factors at each time point: Factor 1: Lack of Affection (LA); Factor 2: Anger and Rejection.

Consistency of the concept (principle of linguistics)

The linguistic principle involves analysing whether consistency in use and meaning are maintained. For the concept of maternal–infant bonding, inconsistencies in linguistic use were frequent, as the term maternal–infant bonding was still often used interchangeably with the terms maternal–foetal attachment, maternal–infant attachment and maternal attachment (Chambers, 2009; Cranley, 1981; Condon, & Corkindale, 1998; Crouch, 2002; Matthey, & Speyer, 2008; Muller, & Mercer, 1993; Müller, 1994), especially by authors who specifically defined bonding during the prenatal period. Brockington (2004) frequently uses the term 'mother–infant relationship', and in discussing linguistic utilisation, states that bonding is a linguistic synonym for attachment and notes the difficulties that can arise from using the two terms interchangeably. Several authors also use the terms mother–infant bonding and mother–infant relationship interchangeably (Bienfait et al., 2011; Brockington, 2004).

In summary, although internal linguistic consistency was found within the majority of articles, some authors still used the terms maternal–foetus/infant bonding and maternal–foetus/infant attachment or mother–infant relationship interchangeably, creating discrepancies in linguistic practice.

Boundaries of the concept (principle of logics)

The logical principle involves analysing whether the concept holds its boundaries when integrated with other related concepts. Concepts related to maternal–infant bonding may include the mother's general mental health or feelings of well-being, caring for the infant or parenting competence, attachment, risk of abuse or maltreatment and the mother–infant relationship. The literature clearly defined the boundaries between maternal–infant bonding and the mother's mental health by measuring depression and/or anxiety and bonding in the same sample. Studies consistently differentiated depression and anxiety from maternal–infant bonding (Brockington et al., 2001). The findings showed that although maternal mental health may affect maternal–infant bonding, it is the mother's emotions and feelings toward the infant that specifically denote bonding. Kitamura< Ohashi, Kita, Haruna, & Kubo, 2013) studied the causal relationship between maternal–infant bonding, perinatal depression and risk of abuse. Their findings showed a disentangled interrelationship between these clinically significant phenomena