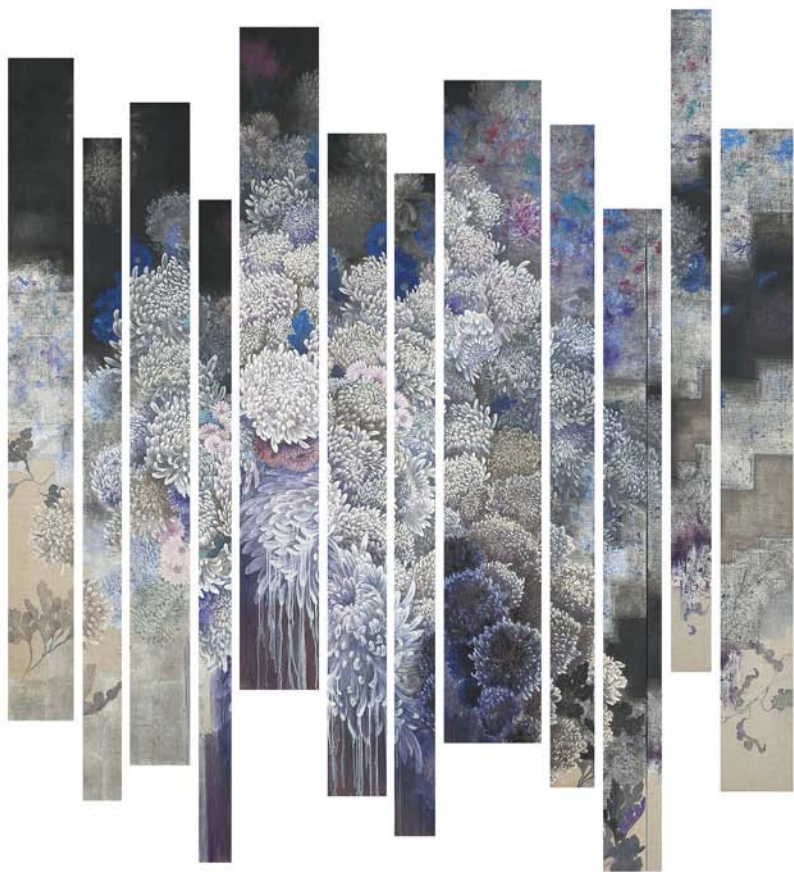


Perinatal Bonding Disorders

Causes and Consequences



Edited by

**Toshinori Kitamura
and Yukiko Ohashi**

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**Cambridge
Scholars
Publishing**



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This book first published 2019

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

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ISBN (10): 1-5275-2778-6

ISBN (13): 978-1-5275-2778-2

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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 (Hashi, Kitamura, Kita, Haruma, 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 PsycINFO/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 measure 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 woman 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
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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; Guming, 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, & Karnibeppu, 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 items, 6-point Likert scale, 1-factor solution by PCA	IC; Cronbach's α coefficient = .85	Construct validity EPDS ($r = .43, .41$)
	Witkowski (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 ($r = .71, .68, .63, \text{ and } .61$, 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 & Hashi, 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

using a non-recursive structural equation modelling method.

The authors that defined maternal–infant bonding as a behavioural component lacked logical boundaries with the concept of care for the infant or parenting competence. Therefore, these scales may have failed to differentiate between maternal–infant bonding and quality of care or parenting behaviour. Regarding the discrepancies between maternal–infant interaction as observed by nurses and maternal–infant bonding as reported by mothers, it may be important to differentiate between the concept of maternal–infant bonding and parenting competence. Although attachment is often linguistically confused with bonding, the logical boundaries between the concepts are clear. The present data sample contained studies that clearly and consistently defined the independence between attachment and bonding (Brockington et al., 2006; Ohashi, Sakanashi, Tanaka, & Kitamura, 2016; Rossen et al., 2016; Taylor et al., 2005). However confusion between bonding and attachment is still found, especially in studies related to maternal attachment to the foetus during pregnancy, most of which applied prenatal bonding measures that were based on attachment theory because they have an equivalent postnatal measure (Persico et al., 2017; Petri et al., 2017).

The term ‘mother–infant relationship’ is often used in the psychology literature, specifically in those studies that cite the work of Brockington. It seemed clear from his discussion that maternal–infant bonding and the mother–infant relationship were considered the same concept. This was not consistent across all the extant literature, as many studies differentiated the two concepts. For example, Bienfait et al. (2011) stated that ‘the mother–infant bond refers to the affective dimension in the mother–infant relationship’. In summary, the conceptual boundaries of maternal–infant bonding are clearly defined with some related concepts (maternal mental health, attachment) and completely blurred with others (care and parenting competence, mother–infant relationship).

Conceptual components

In order to determine the best estimate of the probable facts and evidence described in the current literature, the conceptual components of maternal–infant bonding were also examined, as were the context in which bonding is promoted or bonding disorders are prevented, those in which bonding is hindered or bonding disorders are precipitated and the outcomes of maternal–infant bonding.

Promotion of maternal–infant bonding

Both van Bussel et al. (2010) and Rossen et al. (2017) asserted that high levels of bonding to the foetus during pregnancy will promote high levels of maternal–infant bonding after childbirth. Based on the results of longitudinal research, Dubber et al. (2015) proposed that the early identification of bonding impairment during pregnancy and postpartum depression in mothers plays an important role in the prevention of potential bonding impairment in the early postpartum period. Support of women in labour, either by a doula or a nurse, was implicated in the promotion of maternal–infant bonding (Altaweli & Roberts, 2010). In the current literature, the most frequently reported context in which maternal–infant bonding can be promoted required a physical proximity between mother and infant after birth. For example, holding the infant was described as promoting bonding, as was breast-feeding (Song et al., 2017) and rooming-in during the immediate postpartum period (Altaweli & Roberts, 2010). Figueiredo et al. (2007) also asserted that maternal–infant bonding is stimulated by infant crying, smiling, and visual following. Maternal emotional components are also believed to promote bonding.

An examination of the literature also revealed that to promote maternal–infant bonding, health care providers should attempt to promote not only physical proximity between mother and newborn, but also a positive emotional state for the mother at birth. Mothers singing lullabies may improve maternal–infant bonding, and could also have a positive effect on neonatal behaviour and maternal stress (Persico et al., 2017). Ohara et al. (2017) suggested that psychosocial interventions that focus on two aspects of social support (number and satisfaction) during pregnancy are effective in preventing bonding failure and depression in the postpartum period.

Hindrance of maternal–infant bonding

Authors that treat maternal–infant bonding disorders most often cited physical and/or emotional separation of the mother from the infant around the time of birth as the primary cause of bonding disorders. Chambers (2009) reported that the physical separation of mother and infant, such as after a premature birth or as a result of maternal incarceration, may impair bonding. A non-vaginal or traumatic childbirth can also make bonding between mother and infant difficult (Song et al., 2017), and this has been linked to decreased maternal exposure to oxytocin during the birth process

(Feldman et al., 2007). Difficulties during pregnancy, particularly obstetric complications, may cause higher anxiety and stress in pregnant mothers, leading to difficulty in stable bonding with the foetus and subsequently more negative bonding with neonates; however, few studies have found a relation between maternal physical complications and bonding disorders (Song et al., 2017).

Emotional separation of the mother and newborn also has the potential to impair maternal–infant bonding. This may occur for a variety of reasons, for example, an unwanted pregnancy or finding out that the infant is not the desired gender (Brockington, 2004). Negative attitudes toward pregnancy also predict bonding failure (Kokubu, Okano, & Sugiyama, 2012). The effects of negative attitudes toward pregnancy on postnatal depression may be mediated by bonding failure. Traumatic events around the time of childbirth are also associated with bonding impairments (Kinsey, 2014). A history of pregnancy loss was found to be associated with disturbances in the group of maternal–foetal attachment behaviours related to “differentiation of self from *fetus*” in a subsequent pregnancy (Mehran, Simbar, Sharns, Rarnezani-Tehrani, & Nasiri, 2013). Interpersonal violence during pregnancy is associated with mother-to-infant bonding failure at 1 month (Kita et al., 2016), 6 weeks (Seng et al., 2013) or 6 months (Muzik et al., 2013). Women with childhood trauma experience greater depressive symptoms through 6 months postpartum, which predicts negative maternal–infant bonding and child outcomes at 1 year (Choi et al., 2017).

Maternal mental health may also be a hindrance to the development of maternal–infant bonding. Depression is correlated with poor maternal–foetal bonding during pregnancy (Condon, & Corkindale, 1997; McFarland et al., 2011; Ohara et al., 2016) and with bonding postpartum (Ohara et al., 2016; Higgins, Roberts, Glover, & Taylor, 2013; Ohoka et al., 2014; Moehler et al., 2006). On the other hand, there is scarce prospective research that considers stress, anxiety and personality traits across the antenatal and postnatal period and their relationship to bonding. Kitamura et al. (2015) demonstrated that parental anger and rejection was predicted by parental anger traits. Finally, infant characteristics, such as being unhealthy and having a difficult temperament or sleep problems, can also make bonding more difficult (Brockington, 2004; Figueiredo et al., 2007; Figueiredo et al., 2009; Hairston et al., 2011; Hairston, Solnik-Menib, Deviri, & Haudelzalts, 2016; Nolvi et al., 2016).

Outcomes of maternal–infant bonding

The importance of maternal–infant bonding lies in the outcomes. Maternal–infant bonding facilitates improvement in the mother’s parenting skills (Altaweli, & Roberts, 2010; Figueiredo et al., 2009), is helpful for the survival and development of the infant and may form the foundation for the infant’s later attachments and sense of self. However, van Bussel et al. (2010) caution that good maternal–infant bonding is neither a guarantee of a future healthy mother–infant relationship, nor a promise of healthy child development. Furthermore, many authors have described the outcomes of impaired bonding in vague terms and/or referenced the work of Brockington et al. (2001). According to Brockington et al. (2001, p. 133), impairments in bonding have ‘potentially serious effects on the long-term mother–child relationship, and on child development. It occasionally leads to child abuse or neglect’.

Birth cohort studies found prospective linkages between maternal perinatal depression and compromised child psychological development, even after adjusting for later maternal depression (Murray et al., 2011; Verkuil et al., 2014; Waters, Hay, Simmonds, & van Goozen, 2014). However, few studies have brought together a full model encompassing maternal perinatal bonding, postpartum depression and subsequent child outcomes. Hairston et al. (2011) found that impaired maternal–infant bonding at 4 months postnatal was related to problems with externalising behaviours of children at 18 months of age. Among women with an experience of childhood trauma in South Africa, the mediating effects of postpartum depression were significant and persisted for maternal–infant bonding and the child’s emotional/behavioural development at 1 year after controlling for covariates and antenatal distress (Choi et al., 2017).

Discussion

The purpose of this concept analysis was to describe the current state of the science with regard to the concept of maternal perinatal bonding and bonding disorders. Several key issues were revealed in the development of the concept of perinatal bonding and bonding disorders. First, maternal bonding was most often described in terms of the maternal feelings and emotions toward the foetus or infant. This definition was supported by operationalisations of maternal bonding that measured only the affective components of the dyadic relationship, which were from the mother’s

perspective. Those authors who defined maternal–infant bonding in terms of behavioural components in the context of attachment theory were more likely to suffer from unclear operationalisation or ill-defined boundaries between bonding and other similar concepts. Behavioural components of maternal–infant bonding that were unique to the concept were not found in this data sample.

Second, an examination of the literature revealed that confusion between the terms attachment and bonding is most concerning because attachment describes a body of literature that is well-known and highly utilised, but has a meaning that is not consistent with the definitions provided for perinatal bonding; therefore, attachment is not an acceptable surrogate term for bonding. An examination of the current literature also revealed that the concept of maternal–infant bonding has evolved since the early work of Klaus and Kennell (1976). Little evidence was found in support of the original assertion that close contact between the mother and infant in the first hour after birth is essential to successful bonding. Additionally, Klaus and Kennell (1976) described bonding in terms of both the affective and behavioural domains; this continues in the literature today. However, this multifaceted definition of bonding has led to inconsistencies between and within studies, as pointed out by Condon (1993) in relation to the definition of prenatal attachment by Cranley (1981). The results of this analysis reveal that two major theoretical foundations for the concept of maternal bonding have been formed in recent accumulated research findings. In the studies published in nursing and psychology journals, adaptive aspects of bonding were focused on and defined as a foundation of attachment formation that resulted in positive outcomes in the mother–infant relationship. Although conceptual ambiguity was found in those studies, they offer advantages in terms of the longitudinal consistency of assessment measures from pregnancy through the postpartum period. On the other hand, in the perinatal psychiatry literature, the evolution of the science of perinatal bonding disorder has added positively to our knowledge of the processes of and clinical implications for perinatal mental health.

Conclusions and clinical implications

The concept of maternal–infant bonding is found in multidisciplinary scientific journals, such as the psychology, sociology, nursing, public health and medical literature. A surge of studies in psychiatry journals has been observed in the past decade. The concept has now been operationalized, and

evidence based on rigorous statistical methods has been accumulated; however, it remains partly vulnerable to confusion with the concepts of attachment, the mother–infant relationship and parenting competence. Further clarification of the concept is necessary to promote this translational research across multidisciplinary practice. Specifically, including different theoretical and practical backgrounds in the concept and assessment of bonding may be essential to disseminate current knowledge and understanding of the concept to multidisciplinary teams helping the mother and foetus/infant dyad from pregnancy through the postpartum period. For example, the negative outcomes of impaired maternal–infant bonding for women and children should also be examined further by clinical intervention and multi-generational cohort studies that address specific outcomes. As such, it may be important to directly examine the relationship between maternal–infant bonding and infant attachment and the affective and behavioural domains.

The results of this concept analysis may have implications for practice disciplines such as midwifery, obstetrics, psychiatry and community health. It may also be important for midwives and obstetricians to consider that the feelings and emotions of a mother toward her infant are multidimensional and may not necessarily be fully reflected in her specific outward behaviour. Furthermore, multidisciplinary maternal infant health teams should be aware that impairments in maternal–infant bonding may not be limited to women with mental health disorders or those who have experienced difficult or traumatic births. Along with clinical judgment, the use of the **PBQ** or **MBS** is now validated and appropriate for helping multidisciplinary teams identify women at risk for impaired bonding during perinatal period. Therefore, the results of this concept analysis should be utilised for the clinical recognition of perinatal bonding disorders and for promoting the advancement of the concept through further research.

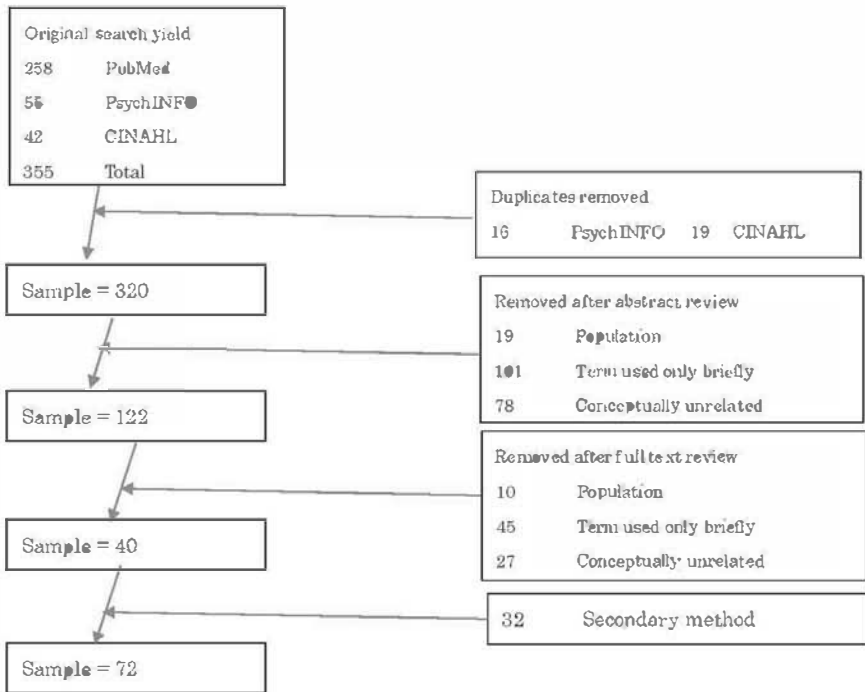


Figure 1 Flowchart of the literature search (secondary method: recognition of references for inclusion at the secondary level occurred when sources were cited frequently by other authors but had not been identified in the original search results)

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CHAPTER THREE

THE PSYCHOMETRIC PROPERTIES OF THE MATERNAL ANTENATAL ATTACHMENT SCALE AND THE IDENTIFICATION OF A CLUSTER OF PATHOLOGICAL MATERNAL-FETAL BONDING: A STUDY IN JAPANESE NON-CLINICAL MOTHERS

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Abstract

Objectives: The Maternal Antenatal Attachment Scale (MAAS) is widely used to measure parental bonding towards a fetus. The aim of this study was to identify the factor structure of the MAAS and examine whether there was a qualitatively distinctive cluster in terms of maternal-fetal bonding among healthy pregnant Japanese women.

Methods: A longitudinal observational study was conducted at 18 clinics in Kumamoto prefecture in Japan. The MAAS was translated into Japanese and a set of questionnaires was distributed to pregnant women of at least 28 weeks' gestation who attended one of these antenatal clinics in November 2011.

Results: The results of this study revealed that the Japanese version of the MAAS had a two-factor structure: Image of Fetus and Affect Towards Fetus. A confirmatory factor analysis demonstrated its cross-validity. A two-step cluster analysis revealed two clusters, one of which (44%) was interpreted as a pathological group. This cluster was characterized by a greater number of children, a worse personal response to the current pregnancy, and lower Reward Dependence, Persistence, Self-directedness, Co-operativeness, and Self-transcendence. A receiver operating characteristic curve analysis showed an area under the curve of .984, which identified Cluster 2. Recommended cut-off points of the total MAAS scores were 67/68.

Conclusion: The results of this study indicate that the Japanese version of the MAAS is a valid and reliable measure of maternal bonding towards a fetus in Japanese non-clinical mothers. Using the MAAS, we identified a cluster of maternal-fetal bonding disorders and this cluster was characterized by multiparas, negative attitudes towards the current pregnancy, and low Reward Dependence, Persistence, Self-directedness, Co-operativeness, and Self-transcendence.

Key words Attachment, Fetus, Mother, Psychometric properties

Introduction

The process through which women develop emotional ties towards a fetus begins during pregnancy. This tie, referred to as maternal-fetal bonding, has been conceptualized since the 1980s (Cranley, 1981; Condon, 1993; Müller, 1993). Mecca Cranley defined maternal-fetal bonding as “the extent to which women engage in behaviors that represent an affiliation and

interaction with their unborn child” (Cranley, 1981). It is also defined as “the emotional tie or bond which normally develops between the pregnant woman and her unborn infant” by John Condon (Condon & Corkindale, 1997). Consensus regarding the terminology and the definition of maternal-fetal bonding has yet to be reached. Many such studies used the term ‘attachment’ as the caregiver’s tie to the child (fetus). However, the term attachment does not accurately describe feelings towards a fetus (Walsh, 2010). Therefore, the term ‘bonding’ is used to refer to the caregiver’s tie to the fetus in this paper.

Maternal bonding may be consistent throughout the perinatal period starting from the time when women become aware of their pregnancy to the postnatal period. Maternal-fetal bonding is significantly correlated with postnatal bonding (van Bussel, Spitz, & Demyttenaere, 2010; Alhusen, Hayat, & Gross, 2013). Good antenatal bonding is related to maternal mental health as well as the postnatal mother-infant relationship. A good relationship between a mother and an early infant is one of the crucial components in the future physical and psychological development of a child. A community cohort study suggested that a negative perception of one’s fetus predicted postpartum depression (Weisman et al., 2010). Another cohort study indicated that maternal-fetal bonding disorders predicted maternal depression in late pregnancy, but not *vice versa* (Ohara et al., 2017). Ohara et al.’s (2017) study demonstrated the need to evaluate maternal-fetal bonding to prevent depression during pregnancy. Hence, it is of research and clinical importance to assess maternal-fetal bonding precisely for the development of the infant and mother-infant bonding.

Many instruments to assess parental bonding towards a fetus have been developed. For example, Cranley (1981) developed a 24-item self-report questionnaire, the Maternal-Fetal Attachment Scale (MFAS). This consists of five subscales to assess behaviors of pregnant women towards the fetus. However, subsequent studies have pointed out problems with this questionnaire. One of the limitations of the MFAS is that it can only be answered after quickening is felt (van den Bergh & Simons, 2009). In addition, the psychometric properties of the MFAS are problematic: development of the subscales of this original scale was not based on statistical analyses. Müller (1993) developed the Prenatal Attachment Inventory (PAI), which is a 21-item self-report inventory used to assess thoughts and feelings of pregnant women towards the fetus. As with the problems of the MFAS, this scale cannot be answered from the start of gestation. Another instrument is the Maternal Antenatal Attachment Scale (MAAS) (Condon, 1993). This is a 19-item self-report instrument, used to

assess feelings, behaviors, and attitudes towards the fetus, rated with a five-point Likert-type scale. Condon (1993) constructed the MAAS with unstructured interviews based on his proposed adult attachment model. The original MAAS consists of two subscales: “quality of attachment” and “time spent in attachment mode.” The first factor represents the quality of “emotional experiences” which emerge with thoughts of the fetus. The second factor refers to the “amount of time” devoted to thinking about, talking to, dreaming about, or feeling the fetus.

Despite its use worldwide, few studies have reported the psychometric properties of the MAAS. The previous studies confirmed the validity and reliability of the MAAS (van Bussel et al., 2010; Mako & Deak, 2014; Golbasi, Ucar, & Tugut, 2015), but they did not show the available psychometric data. A few studies assessing the factor structure found that the MAAS showed a two-factor structure, but item grouping was inconsistent (Busonera, Cataudella, Lampis, Tommasi, & Zavattini, 2016; Navarro-Aresti, Iraurgi, Iriarte, & Martínez-Pampliega, 2016). Busonera et al. (2016) reported that the Italian version of the MAAS consists of 18 items with an “intensity of preoccupation” subscale (11 items) and a “quality of attachment” subscale (seven items). Navarro-Aresti et al. (2016) proposed the brief Spanish version of the MAAS which consisted of 12 items with two subscales: “intensity of preoccupation” (six items) and “quality of attachment” (six items). The studies of the factor structure of the MAAS are not yet sufficient to evaluate the psychometric properties of the MAAS. Thus, the first goal of this study is to examine the psychometric properties of the MAAS among Japanese non-clinical mothers.

A second research question of this study is whether disordered bonding towards a fetus is a dimension or category. A recent study on maternal bonding disorders measured both at five days and at one month after childbirth in a non-clinical population showed that a two-step cluster analysis yielded two clusters, one of which was interpreted as a group of pathological bonding disorders (Matsunaga, Takauma, Tada, & Kitamura, 2017). Similarly, expectant women may be categorized according to a cluster analysis into several groups. As such, it may give us an insight that there are qualitative rather than or in addition to quantitative differences between such women in terms of bonding and bonding disorders towards a fetus.

Participants and Methods

Participants and Procedure

Of the 55 obstetric clinics in Kumamoto Prefecture, 18 (33%) responded to our request to cooperate with this questionnaire survey. We then solicited the participation of all pregnant women of at least 28 weeks' gestation who attended one of these antenatal clinics during the entire month of November 2011. These women were distributed a set of questionnaires during their visit and again at five days (while in the hospital) and at one month (while attending the one-month health check-up) postnatally. At the three time points participating women were asked to complete the questionnaire at home and to return it to the researcher using a stamped envelope. Of 1,442 eligible women, 633 (44%) returned the questionnaire during the third trimester. We received responses from 445 (31%) and 392 (27%) women at five days and at one month postnatally, respectively. In total, 257 (17%) women completed the questionnaire at all three time points. A total of 628 pregnant women returned the MAAS and of these women, 622 answered more than half of the items of the MAAS. Therefore, we subsequently analyzed data from these 622 women. The mean (SD) age of the participants was 29.8 (3.3) years. The mean gestational age was 34.2 (5.0) weeks and 47.4% of participants were nulliparous. The majority of participants were married (97.3%), and the mean age of partners was 31.9 (5.0) years. It is of note that only those women without any missing values for the MAAS items ($n = 595$) were subjected to factor analyses.

Measures

Maternal bonding towards fetus: We used the MAAS as a measure of maternal bonding towards a fetus. This is a 19-item questionnaire, rated on a five-point scale (1 to 5), used to assess maternal antenatal bonding towards a fetus. The original MAAS has a two-factor structure consisting of the quality of attachment and preoccupation (or time in attachment mode). High scores indicate a positive quality of attachment and a high intensity of preoccupation with the fetus, respectively.

Depression: As a measure of depression we used the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987). The EPDS is a 10-item questionnaire, rated on a four-point scale (0 to 3), used

to assess antenatal depression and postnatal depression. Its psychometric properties have proven excellent (Cox et al., 1987). Higher scores indicate a greater severity of depressive symptoms. The Japanese version of the EPDS is available and the reliability and validity have been verified (Okano et al., 1996). This version has been used in many previous studies by researchers as well as by maternal health service providers and clinical professionals in community settings in Japan. The factor structure of the Japanese version of the EPDS has also been elucidated (Kubota et al., 2014). Kubota et al. (2014) suggested a three-factor model consisting of Anxiety (three items), Anhedonia (two items) and Depression (three items). Although the EPDS was originally developed as a measure of postnatal depression, it has also been used as a measure of antenatal depression (Jomeen & Martin, 2007; Matthey, Souter, Mortimer, Stephens, & Sheridan-Magro, 2016; Usuda, Nishi, Okazaki, Makino, & Sano, 2017; Wickberg, Tjus, & Hwang, 2005). All participants were administered the EPDS at the three time points.

Neonatal abuse: We used the Conflict Tactics Scale (CTS) as a measure of neonatal abuse. The CTS is a self-report questionnaire that measures the frequency of various abusive parenting behaviors that have occurred since the most recent childbirth. The CTS Child Form R (Parent-Child CTS: PCCTS) focuses specifically on parental psychological and physical aggression towards the child. It consists of 19 items rated on a seven-point scale (0: “never,” 1: “one time,” 2: “two times,” 4: “three to five times,” 8: “six to 10 times,” 15: “11–20 times,” 25: “more than 20 times”). The first three items (e.g., “discussed an issue calmly”) comprise the negotiation scale. The others include seven psychological abuse items and nine physical abuse items. In this study, the time frame of the PCCTS was changed from the original of “last year” to “the time period since childbirth.” The PCCTS was translated by one of us (T.K.) after obtaining permission from the original author. The factor structure of the Japanese version of the CTS was reported, suggesting a two-factor model consisting of reasoning (three items) and psychological aggression (seven items) (Baba et al., 2017). This study excluded nine physical abuse items that showed extremely low prevalence before conducting the exploratory factor analysis. In the present study, seven psychological aggression items were used at one month postnatally.

Personality: As a measure of temperament and character of the participants, we used the Japanese version (Kijima et al., 1996) of the Temperament and Character Inventory (TCI: Cloninger, Przybeck, Svrakic, & Wetzel, 1994). The TCI measures temperament and character dimensions. Temperament has four dimensions: Novelty Seeking (NS), Harm Avoidance

(HA), Reward Dependence (RD), and Persistence (PS). Character has three dimensions: Self-directedness (SD), Co-operativeness (CO), and Self-transcendence (ST). In this Japanese version, Kijima, Tanaka, Suzuki, Higuchi and Kitamura (2000) suggested the addition of five more PS items to increase the internal reliability of the scale because of the relative small number of PS items on the 125-item inventory. Dichotomous (true or false) scales adopted in the original TCI was modified by Kijima et al. (1996) into a four-point scale (0 to 3) to obtain better internal consistency of subscales. The psychometric properties including reliability and factor validity of the Japanese version of the TCI were reported by several authors (Kijima et al., 2000; Takeuchi et al., 2011). In the present study, we administered the TCI during the pregnancy period together with the MAAS.

Demographic information: We examined antenatal institutions, the woman's age, marriage status, and birth parity (primiparity vs. multiparity). The participant's response towards the current pregnancy was assessed by an item regarding how much she was pleased with this current pregnancy (five-point scale; 1: very pleased, 5: very displeased).

Statistical Analyses

We randomly divided the women into two groups. An exploratory factor analysis (EFA) was performed for the first group ($n = 280$). The number of factors was determined by scree plot. An oblique rotation with the Promax method was performed. The factor structure derived from the EFA was cross-validated by performing a confirmatory factor analysis (CFA) using the second half of the sample ($n = 315$). The fit of each model with the data was evaluated in terms of chi-squared (CMIN), comparative fit index (CFI), and root mean square error of approximation (RMSEA). According to conventional criteria, $CMIN/df < 3$, $CFI > .95$, and $RMSEA < .08$ represented an acceptable fit, while $CMIN/df < 2$, $CFI > .97$, and $RMSEA < .05$ signified a good fit. When we compared different models of the MAAS factor structure, the Akaike Information Criterion (AIC) was used to compare models in terms of goodness of fit. The model with the lower score was considered better. Subscales of the MAAS were calculated by adding scores of items belonging to each factor. A Cronbach's α coefficient was examined to analyze the internal consistency of the subscales of the MAAS. A Cronbach's α coefficient greater than .70 was regarded as sufficient (Nunnally & Bernstein, 1994).

Pearson's correlation coefficients were used to evaluate the convergent validity of the MAAS subscales. The scores for each MAAS subscale were examined for correlations with the EPDS subscales during late pregnancy and at five days and one month after childbirth, and the subscale of the CTS at one month postnatally in addition to personality traits. We set the significance level (α) at $p < .001$ because of multiple comparisons. Multiple imputation was conducted for missing data in the correlation analysis.

We then conducted a two-step cluster analysis to classify the participants depending on the scores of the 19 MAAS item scores. To examine the validation of the clustering antenatal bonding disorders, the MAAS subscale scores and the scores of the other variables of each cluster were compared by T tests. A receiver operating characteristic (ROC) curve was used to estimate the area under curve (AUC). The optimal MAAS cut-off point was determined using the Youden index.

All statistical analyses were conducted using SPSS version 23.0 and Amos 20.0.

Ethical Considerations

The present study was approved by the Ethical Committee of Kumamoto University Graduate School of Life Sciences or department directors of the hospitals involved in the study.

Results

Missing values

Little's MCAR test showed $\chi^2 = 28194.1, p < .05$, thus rejecting possible missing cases completely at random. Hence, we imputed missing cases by the means of multiple imputation in correlation analysis. Pairwise deletion was adopted for factor analyses.

Factor Structure of the MAAS Items

The means of the MAAS item scores were in the middle of the score range, and most of the items had a skew below 2.0 (Table 1). The scree plot in an EFA suggested a two-factor model. The MAAS items with a high

(> .3) factor loading in the first factor included items such as item 1 (“I have thought about, or been preoccupied with the baby inside me”), 5 (“I have been trying to picture in my mind what the developing baby actually looks like in my womb”), and 2 (“When I have spoken about, or thought about the baby inside me I got emotional feelings which were very strong”). These items indicated that the women had a vivid image of a fetus in their womb. We named this factor Image of Fetus. The MAAS items with a high factor loading on the second factor included items such as items 19 (“If the pregnancy was lost at this time (due to miscarriage or other accidental event) without any pain or injury to myself, I expect I would feel very sad”), 11 (“When I think about the baby inside me I get feelings which are very happy”), and 12 (“Some pregnant women sometimes get so irritated by the baby inside them that they feel like they want to hurt it or punish it: I couldn’t imagine I would ever feel like this”). These items indicated strong emotional tones regarding the fetus. We named this factor Affect Towards Fetus. There were only two items (items 6 and 16) which had no high factor loading on either of the factors. However, the factor loading of these items were comparatively greater on the first and second factors, respectively, and therefore were categorized as belonging to the first and second factors.

In the second group of participants, several models were compared in terms of goodness-of-fit indices (Table 2). The first model was a two-factor structure using all 19 MAAS items (see Table 1). As compared to this original model, a model in which item 16 (“When my baby is born I would like to hold the baby immediately”) was deleted showed better AIC (from 362.3 to 326.5). Another MAAS item with insufficient factor loading on both factors (item 6: “I think of the developing baby mostly as a real little person with special characteristics”) was deleted to yield even better AIC (from 326.5 to 278.8). However, this model was not yet acceptable: chi-squared/*df* = 1.88, CFI = .904, and RMSEA = .050. We then added correlations between error variables of some indicators, such as between items 8 and 17 and between items 7 and 14 after taking into consideration zero-order correlations. The final model (Fig. 1) showed much lower AIC indicating that the fourth CFA model was the best. In the fourth CFA model, CFI did not reach the acceptable fit while CMIN/*df* and RMSEA showed good fit (CFI = .948, CMIN/*df* = 1.43, RMSEA = .037). The two latent factors were significantly correlated with each other ($r = .63$).

Table 1. Exploratory factor analysis of the MAAS items in a split-half sample ($n = 280$)

Item number	MAAS items	Mean (SD)	Skewness	Communality	Factor	
					I	II
1	I have thought about, or been preoccupied with the baby inside me	3.9 (1.1)	-0.63	.57	.82	-.15
5	I have been trying to picture in my mind what the developing baby actually looks like in my womb	3.6 (1.2)	-0.16	.58	.79	-.02
2	When I have spoken about or thought about the baby inside me, I got emotional feelings which were very strong	3.7 (0.7)	0.15	.53	.71	.07
8	I have found myself talking to my baby when I am alone	3.0 (1.2)	0.24	.22	.68	-.17
4	I have had the desire to read about or get information about the developing baby	3.7 (0.9)	-0.25	.37	.59	.07
7	I have felt that the baby inside me is dependent on me for its well-being	4.2 (0.9)	-0.75	.17	.51	.03
18	I have found myself feeling, or rubbing with my hand, the outside of my stomach where the baby is a lot of times each day	4.9 (0.4)	-3.29	.09	.32	.12

14	I have taken care with what I eat to make sure the baby gets a good diet	3.4 (1.0)	-0.30	.11	.32	.11
10	The picture in my mind of what the baby at this stage actually looks like inside the womb is very clear	3.7 (0.7)	-0.98	.13	.31	.18
17	I have had dreams about the pregnancy or baby	1.9 (0.9)	1.06	.10	.31	.11
6	I think of the developing baby mostly as a real little person with special characteristics	4.5 (0.9)	-1.71	.10	.29	.15
19	If the pregnancy was lost at this time (due to miscarriage or other accidental event) without any pain or injury to myself, I expect I would feel very sad	4.9 (0.5)	-6.80	.14	-.14	.71
11	When I think about the baby inside me I get feelings which are very happy	4.7 (0.7)	-2.63	.44	.07	.71
12	Some pregnant women sometimes get so irritated by the baby inside them that they feel like they want to hurt it or punish it: I couldn't imagine I would ever feel like this	4.6 (0.6)	-1.89	.23	-.22	.70

9	When I think about (or talk to) my baby inside me, my thoughts are always tender and loving	4.5 (0.6)	-0.94	.37	.15	.64
3	My feelings about the baby inside me have been very positive	4.2 (0.8)	-0.82	.24	.08	.58
15	When I first see my baby after the birth I expect I will feel intense affection	4.6 (0.5)	-0.69	.28	.18	.55
13	I have felt very close emotionally to my baby	4.2 (0.9)	-1.41	.21	.25	.41
16	When my baby is born I would like to hold the baby immediately	4.9 (0.5)	-4.46	.04	.06	.14

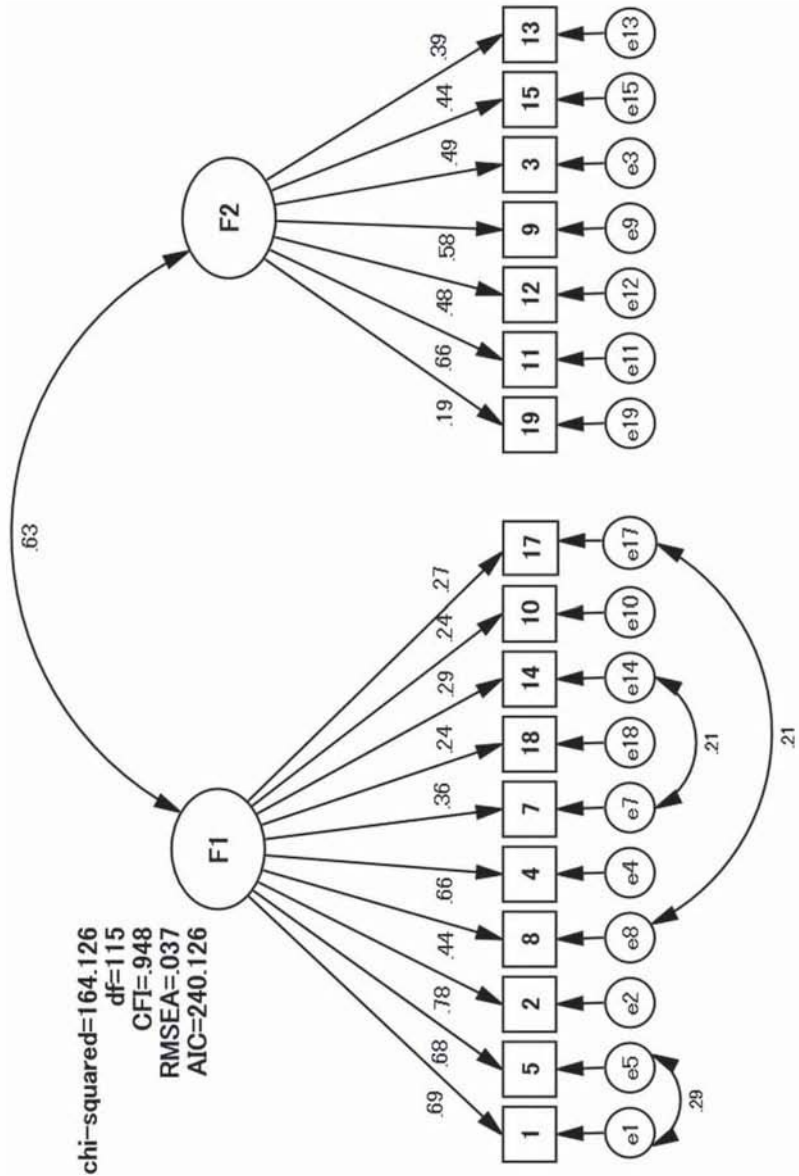
Factor loading > .30 are in bold.

Table 2. Comparison of four models of the MAAS factor structure ($n = 315$)

Model	Chi-squared/df	CFI	RMSEA	AIC
Original (11 items + 8 items)	284.263/151 = 1.88	.867	.053	362.3
Revised (11 items + 7 items)	252.464/134 = 1.88	.879	.053	326.5
Revised (10 items + 7 items)	208.808/118 = 1.77	.904	.050	278.8
Revised (10 items + 7 items) with error covariances	164.126/115 = 1.43	.948	.037	240.1

The lowest AIC is in bold. CFI, comparative Fit Index; RMSEA, root mean square of error approximation; AIC, Akaike Information Criteria. The lowest AIC is in bold.

Fig. 1. Confirmatory factor analysis of the MAAS in the second group of mothers



Convergent validity

The Image of Fetus scores had a weak negative correlation with the number of children and own response to the current pregnancy (Table 3). On the other hand, Affect Towards Fetus scores had weak to moderate negative correlations with own response to the current pregnancy and Anhedonia and Depression during pregnancy. Furthermore, both Image of Fetus and Affect Towards Fetus were correlated with RD and C. Image of Fetus was correlated with PS and ST while Affect Towards Fetus was correlated with SD and low HA.

Table 3. Correlates of the MAAS subscales and different psychological variables (N = 622)

	Mean (SD)	Cronbach's alpha	Image of Fetus	Affect Towards Fetus
Image of Fetus	36.1 (5.1)	.76	---	.46**
Affect Towards Fetus	31.6 (2.7)	.70	.46**	---
Age	29.8 (3.3)	---	-.04	-.05
Gestation (week)	34.1 (3.6)	---	.02	-.06
Number of children	0.7 (0.6)	---	-.22***	-.08
Own response	1.28 (0.61)	---	-.25***	-.35***
<i>During Pregnancy</i>				
Anhedonia	0.1 (0.4)	.74	-.03	-.26***
Anxiety	3.7 (2.1)	.67	.07	-.10
Depression	1.4 (1.6)	.79	-.11*	-.33***
<i>Five Days after Childbirth</i>				
Anhedonia	0.1 (0.7)	.77	-.06	-.09
Anxiety	2.4 (2.3)	.55	-.01	-.08
Depression	0.9 (1.4)	.78	-.04	-.16
<i>One Month after Childbirth</i>				
Anhedonia	0.0 (.3)	.65	-.04	-.06
Anxiety	1.7 (2.0)	.80	-.02	-.05
Depression	0.7 (1.3)	.74	-.07	-.19

Psychological aggression	1.9 (9.8)	.93	-.03	-.02
Personality				
NS	25.6 (6.0)	.75	.02	-.11**
HA	33.0 (7.2)	.84	-.05	-.15***
RD	29.0 (4.6)	.67	.17***	.17***
PS	16.3 (3.1)	.61	.24***	.13**
SD	43.8 (8.0)	.83	.09*	.31***
C●	49.6 (6.4)	.79	.18***	.22***
ST	17.4 (5.8)	.81	.26***	.06

* $p < .05$; ** $p < .01$; *** $p < .001$. ● own response, a woman’s response to the present pregnancy (from very pleased: 1 to very displeased: 5); NS, novelty-seeking; HA, harm avoidance; RD, reward dependence; PS, persistence; SD, self-directedness; C●, co-operativeness; ST, self-transcendence.

Internal consistency

The Cronbach’s α coefficients of the subscales of the MAAS were excellent: Image of Fetus subscale = .76, and Affect Towards Fetus = .70.

Cluster analysis.

A two-step cluster analysis was conducted in the whole sample (N = 595) using all 19 MAAS items. It yielded two clusters. The first cluster consisted of 323 (54%) whereas the second cluster consisted of 253 (43%). Nineteen outliers appeared that were removed from the subsequent analyses. As compared to Cluster 1, those women belonging to Cluster 2 scored significantly lower in both Image of Fetus and Affect Towards Fetus (Table 4). Thus Cluster 2 may represent a pathological cluster. This cluster was characterized by a *greater* number of children, a worse personal response to the current pregnancy, and lower RD, PS, SD, C●, and ST.

Total MAAS scores were calculated by adding the scores of all 19 items. In a receiver operating characteristic (ROC) curve analysis, this score showed an excellent area under curve (AUC), .984, in order to identify Cluster 2 membership. The cut-off point was 67/68 which indicated .90 for sensitivity and .96 for specificity. The cut-off of point of 68/69 indicated .85 and .99 for sensitivity and specificity, respectively. The Youden index was maximal for the cut-off point of 67/68.

Table 4. Comparison of the MAAS subscales and different psychological variables between Cluster 1 and Cluster 2 (N = 576)

	Cluster 1 (n = 323) SE in brackets	Cluster 2 (n = 253)
Image of fetus ***	39.6 (0.2)	32.1 (0.1)
Affect Towards Fetus ***	33.0 (0.1)	30.2 (0.1)
Age	29.7 (0.3)	30.4 (0.3)
Gestation (week)	34.3 (.02)	34.0 (0.2)
Number of children ***	0.57 (0.05)	0.88 (0.06)
Own response ***	1.15 (0.02)	1.38 (0.04)
<i>During Pregnancy</i> (n= 195, 171)		
Anhedonia	0.0 (0.0)	0.0 (0.0)
Anxiety	3.7 (0.1)	3.7(0.2)
Depression *	1.2 (0.1)	1.6 (0.1)
<i>Five Days after Childbirth</i> (n= 195, 171)		
Anhedonia	0.0 (0.1)	0.2 (.01)
Anxiety	2.4 (0.3)	2.3 (0.3)
Depression	1.0 (0.2)	1.1 (0.2)
<i>One Month after Childbirth</i> (n = 195, 171)		
Anhedonia	0.0 (0.1)	0.0 (0.0)
Anxiety	1.7 (0.3)	1.8 (0.4)
Depression	0.6 (0.2)	0.9 (0.3)
<i>Psychological aggression</i> (n = 149, 120)		
	2.1 (13.0)	1.6 (4.0)
<i>Personality</i> (n = 322, 252)		
NS	25.6 (0.4)	25.7 (0.4)
HA	32.4 (0.4)	33.5 (0.4)
RD ***	29.9 (0.3)	27.9 (0.3)
PS ***	16.8 (0.2)	15.8 (0.2)
SD **	44.7 (0.4)	42.4 (0.5)
CO ***	50.7 (0.4)	48.3 (0.4)
ST ***	18.2 (0.3)	16.5 (0.4)

* $p < .05$; ** $p < .01$; *** $p < .001$. Own response, a woman's response to the present pregnancy (from very pleased: 1 to very displeased: 5); NS, novelty-seeking; HA, harm avoidance; RD, reward dependence; PS, persistence; SD, self-directedness; CO, co-operativeness; ST, self-transcendence.

Discussion

This study assessed the factorial validity, convergent validity, and reliability of the Japanese version of the MAAS in non-clinical pregnant women. The results of this study revealed that the Japanese version of the MAAS has a two-factor structure—Image of Fetus and Affect Towards Fetus—as determined in previous studies (Golbasi et al., 2015; Busonera et al., 2016). Our model, derived from the results of the EFA, was entirely consistent with that reported by Busonera et al. (2016), who studied pregnant Italian women.

The convergent validity of the MAAS subscales was also identified. We showed in this study that pregnant women with more positive attitudes towards the present pregnancy and with higher RD and C were likely to have positive bonding towards the fetus. This indicates that women who are tender-hearted, loving and warm (high RD), as well as those who are empathic, compassionate, and supportive (high C) are well prepared to be a future mother. The two MAAS subscales showed differential correlations with TCI subscales. Thus, Image of Fetus was correlated with ST while Affect Towards Fetus with low HA and high SD. Those women high in ST are creative, selfless, and spiritual. They are more likely to be involved in a creative occupation. Hence, such women are easily able to imagine the fetus in their womb. On the other hand, expectant women high in Affect Towards Fetus may be more likely to be relaxed and optimistic (low HA) as well as mature, self-sufficient, and goal-oriented (high SD). In our study, we found that Image of Fetus was negatively correlated with the number of children. This is consistent with previous studies (van Bussel et al., 2010; Mako & Deak, 2014). The Japanese version of the MAAS showed good internal consistency. The Cronbach's α for each subscale exceeded those of Busonera et al. (2016).

Contrary to expectations, only Affect Towards Fetus was associated with two EPDS subscales—Anhedonia and Depression. Thus, Affect Towards Fetus represents an emotional aspect of bonding while Image of Fetus may represent other aspects such as cognition of fetal bonding. Causality between fetal bonding and depression awaits further investigation.

Of interest was the negative correlation of the number of children with Image of Fetus but not with Affect Towards Fetus. This means that, as compared to nulliparas, multiparas are less likely to have a vivid image of the fetus. This is in line with Condon and Corkindale (1997) who reported a negative correlation between the number of children and attachment

intensity (similar to our Image of Fetus). In women with more children, the fetus may be less likely to occupy a central place in the woman's psychological life. On the other hand, the first-time expectant mothers may be more preoccupied with the forthcoming baby. And yet the women's affectionate tie to the fetus is not influenced by the number of children. We found no correlation between the gestation week and the MAAS subscale scores but this may be because of a narrow range of gestation weeks ($SD = 3.6$ weeks).

Findings of more than one cluster regarding fetal bonding indicate the possible existence of a qualitatively distinctive group of expectant women with bonding difficulties. It may be alarming that more than 40% of the women were categorized as belonging to a "pathological" group. We should exercise caution when interpreting the results. Women's bonding towards a fetus varies depending on the stage of pregnancy (Mikulincer & Florian, 1999). Hence, these women may "catch up" as the pregnancy progresses. An alternative explanation may come from the difference of the measurements used in this study. As noted, there are a variety of measures of prenatal bonding and different findings may be obtained if we use different measures. Also possible is a subdivision of the women who belonged to Cluster 2 in this study. They may include women with bonding difficulty that may wear off as time goes on and women with bonding disorder that may transfer to postnatal bonding disorders. A detailed longitudinal study may cast more light onto this research question.

The expectant women categorised as pathological group were likely to be multiparous and their pregnancy was unwelcome. Their personality was described as low in maturity (low SD, C, and ST) and poor in affection and persistence. Women low in personality maturation may be less ready for fertility and child bearing. This point awaits further studies.

Clinical applications merit consideration. Our study showed that about 40% of expectant women experience difficulty in making an affectionate bond with the fetus. They may need support from perinatal health professionals. Because they are likely to have an immature personality and negative attitudes towards the current pregnancy, perinatal health professionals may have to pay more attention to pregnant women's psychological characteristics, including personality, as well as their response to the news of their current pregnancy. This may be achieved by having an interview with a woman whose pregnancy has been confirmed that explores her attitudes to fertility and childbearing, her life's aspiration and work life balance, her coping styles and social support resources, and her personality in general. If expectant women are categorized as belonging

to an at-risk group, intensive psychological intervention may be warranted. A self-report measure such as the MAAS may be of great importance in identifying those women at risk of maternal-fetal bonding difficulty. This does not necessarily mean that cases belonging to our second cluster are “pathological” bonding disorders. Some women may show a quick catch up to better fetus bonding whereas other women may show consistent bonding difficulty throughout the perinatal period. Therefore, trajectory of bonding towards a fetus and an infant over the perinatal period is a very important research topic. For example, Mikulincer and Florian (1999) studied expectant women’s adult attachment style and the trajectory of maternal-fetal bonding during the course of pregnancy. Here, secure women were strongly attached to the fetus from the beginning of pregnancy. Avoidant women showed weak attachment to the fetus in the first and third trimesters of pregnancy, and stronger bonding the second trimester. Anxious-ambivalent women showed a gradual increase in bonding to the fetus from trimester to trimester. With a greater number of cases, women belonging to Cluster 2 may be divided into more than one group.

Several limitations of this study should be noted. Firstly, the results may not be generalizable to all pregnant women, because this study used a non-clinical population in the third trimester. Women with severe pregnancy complications may show different patterns of factor structures. Secondly, we measured maternal bonding only by the MAAS during pregnancy. Further research should also investigate the concurrent validity with other measurements. Thirdly, we collected the data only once during pregnancy. The test-retest reliability should be examined in future studies.

Taking the above shortcomings into account, the present study indicates that the Japanese version of the MAAS is considered a valid and reliable measure of maternal bonding towards a fetus among pregnant Japanese women.

Acknowledgements

We thank the following hospitals and clinics for their support:

Fukuda Hospital; Suenaga Ob/Gyn Clinic; Jikei Hospital, Kumamoto City Hospital; Kumamoto University Hospital; Kurokawa Gynecologic and Obstetric Clinic; Tashiro Gynecologic and Obstetric Clinic; Amakusa Central General Hospital; Arao Municipal Hospital; Shimokawa Gynecologic and Obstetric Clinic; Kamiarukusa General Hospital; Kataoka Ladies Clinic; Honda Ladies Clinic; Aikoh Obstetrics, Gynecology, and

Dermatology Clinic; Yamaguchi Maternity Clinic; Matsubase Ladies Clinic; Kikyoyou Ladies Clinic; and Asahino General Hospital.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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CAUSES

CHAPTER FOUR

BONDING DISORDERS, CURRENT ADULT ATTACHMENT, AND PERCEIVED REARING IN CHILDHOOD IN PARENTS OF CHILDREN AGED 10 YEARS OLD OR YOUNGER: A STRUCTURAL EQUATION MODEL APPROACH

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Abstract

Background: Bonding disorders towards a child are a serious perinatal mental health issue.

Objective: To identify the influences of parents' adult attachment styles and perceived rearing when the parents were children on the current bonding style towards a child.

Methods: A total of 396 fathers and 733 mothers of a child aged 10 or younger at 20 paediatric clinics in Japan were studied with respect to two subscales (Lack of Affection [LA] and Anger and Rejection [AR]) of their emotional attitudes towards the child (the Mother-to-Infant Bonding Scale [MIBS]; Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012), their adult attachment style (Positive Self- and other-models of the Relationship Questionnaire [RQ]; Bartholomew & Horowitz,

1991), and the perceived rearing experiences (Care and Overprotection) from their own parents when they were children (the Parental Bonding Instrument [PBI]: Parker, Tupling, & Brown, 1979).

Results: Structural equation modelling revealed that AR was predicted by a poor Self-model and parental age whereas LA was predicted by poor Other- and Self-models. The effects of perceived negative rearing (Overprotection and Low Care, i.e., affectionless control) of the parents' own *mother* on bonding towards children were direct and additionally mediated by a poor Other-model while those of the parents' own *father* were not direct but were mediated by a poor Self-model towards AR. As compared with fathers, mothers were likely to show lower LA but higher AR. Older parental age was associated with lower parental AR.

Conclusion: Bonding was predicted by parental perceived rearing and adult attachment styles (Self- and Other-models). LA and AR were predicted differentially by adult attachment styles which mediated the effects of the perceived rearing by their own fathers and mothers in childhood, respectively. Two aspects of parental bonding towards a child may be influenced differentially by parental adult attachment towards a partner and the parent's own rearing experiences during childhood.

Key words: Bonding disorders, adult attachment styles, perceived rearing

Introduction

Attachment and adult attachment

A baby's emotional tie towards his/her primary caregiver is attachment whereas the latter's emotional ties towards the former is bonding (Walsh, 2010). Infant attachment towards the primary caregiver functions to buffer the baby's anxiety and provide physical protection. According to Bowlby (1969; 1973), babies are born to seek and maintain proximity to others who are supportive (attachment figure) and are used as a 'safety base' for further exploratory behaviours. Bonding, on the other hand, is a means for the primary caregivers, usually parents, to provide the baby with proximity and a 'safe base'. Thus, the baby's attachment and the parents' bonding are reciprocal. If the protection and care the baby seeks is not fully met by the parent, the baby's attachment may become insecure. Such attachment styles are, according to Bowlby, 'imprinted' to function as a prototype for interactional styles with significant others (e.g., friends, lovers, and spouses) when they grow as adolescents and adults.

A remaining question is how parental bonding is established. From where did parents learn the way to respond to the baby's behaviour of seeking support and care? Did the parents not learn how to do so when they were recipients of their own parents' care and protection? Is there a link between the parental bonding an individual received as an infant and his or her own attachment styles as a parent of his or her own child? If such a link is identified, what mediates the effects of perceived rearing during childhood and adult attachment styles on the current bonding towards a child? This is the starting point of our investigation in this study.

Adult attachment and perinatal bonding

Despite the importance of adult attachment as a conceptual framework for understanding the process of human relations and emotion regulation (Bartholomew & Horowitz, 1991; Bartholomew & Perlman, 1994; Hazan & Shaver, 1987; Mikulincer, Shaver, & Pereg, 2003), less has been studied about the effects of current adult attachment of parents on their bonding towards their baby. For example, pregnant women with secure adult attachment, as compared with those pregnant women with insecure adult attachment, had better bonding towards their foetus throughout pregnancy (Mikulincer & Florian, 1999). Thus, those women with avoidant adult attachment had low bonding towards their baby throughout pregnancy. Women with anxious-ambivalent adult attachment showed low bonding in the first trimester but their bonding towards their fetus increased as the pregnancy progressed. However, we are unaware of any studies examining the association between current adult attachment of parents and their bonding with their child.

Perceived rearing and bonding towards a child

Recently, researchers have paid attention to the association between perinatal bonding disorders and perceived rearing during childhood. For example, van Bussel, Spitz, and Demyttenaere (2010) examined maternal bonding towards a foetus that was reported to be associated with perceived rearing during childhood. In this paper, the perceived rearing was measured by the Parental Bonding Instrument (PBI; Parker, Tupling, & Brown, 1979). The PBI has two subscales: Care and Overprotection. The perceived care of mothers and fathers was associated with better foetal bonding and perceived Overprotection of fathers was associated with poorer foetal bonding. Of interest was the finding that perceived Overprotection of mothers was not associated with the current foetal bonding. This study, however, did not examine the mothers' bonding towards an infant.

Studying mothers and fathers of full-term and preterm infants, Hall et al. (2014) reported that current parental bonding difficulties were predicted by perceived maternal low Care during childhood. This study suggested that parents' own child-rearing history would predict bonding towards their newborn infant. However, in this study, participant parents' fathers and mothers (i.e., grandparents of infants) were not analysed differently. Similarly, Williams, Taylor, and Schwannauer (2016) reported that the effects of perceived rearing during childhood upon the current bonding towards an infant would be mediated by metacognition. Here, again, such effects were not examined for parents' fathers and mothers separately.

Perceived rearing and adult attachment

Because perinatal bonding is, to some extent, associated with current adult attachment styles, and the latter is associated with the parents' own perceived rearing experiences in childhood, it may be plausible to speculate that their own rearing experiences in childhood will be associated with the current bonding styles. For example, in a study of a large sample of university students ($N = 3,912$) using the PBI and the Relationship Questionnaire (RQ; Bartholomew & Horowitz, 1991) as the measure of current adult attachment (towards a partner), a positive adult total attachment style was predicted by the scores of paternal Care and low scores on maternal Overprotection in a hierarchical regression analysis in men, whereas, in women, a positive adult total attachment style was predicted by the scores of paternal and maternal Care, and low score on maternal Overprotection (Matsuoka et al., 2006). This study used a single composite variable reflecting the secure-insecure dimension of adult attachment style. When using four clusters of people according to their attachment styles (indifferent, secure, fearful, and preoccupied) applied to the same sample (Tanaka et al., 2008), two discriminant functions were identified; the first function representing the Self-model and the second function representing the Other-model. The Self-model function had high canonical discriminant functions for father's and mother's Care on the positive end and mother's Overprotection on the negative end. The Other-model function was associated with none of the PBI subscale scores. These findings were virtually the same when analysed for men and women separately (Liu, Shono, & Kitamura, 2008).

These studies used a large sample but the sample's age range was restricted to adolescent and young adulthood and most of the participants were unmarried. Hence, it was difficult to generalize to a married population.

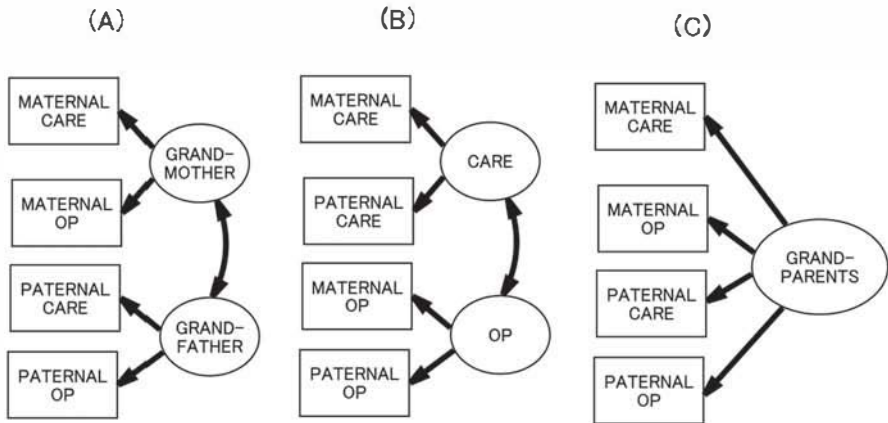
Research questions

The findings discussed thus far indicate that current bonding disorders may be predicted by current adult attachment towards a partner that may in turn be predicted by perceived rearing during childhood. In addition, if there exists an association between current bonding disorders and perceived rearing during childhood, we can prove mediation of the effects of the perceived rearing during childhood upon the current bonding disorders by the current adult attachment towards a partner (Baron & Kenney, 1986).

We further speculate that the gender of both the participant parent and their own parents may exert differential influences on their bonding patterns towards a child. Recent investigations have found that mothers and fathers exert different influences on personality development and onset of psychopathology (Kitamura, Kijima, Aihara, Tomoda, Fukuda, & Yamamoto, 1998). The main question was whether the effects of perceived parenting upon the development of personality (including adult attachment) was (a) different between the gender of parents, (b) different between types of rearing, or (c) not different and instead exert influences as single constructs. Thus, according to the first hypothesis, the quality of parental rearing is classified as maternal or paternal, each consisting of Care and Overprotection (Fig. 1A). The effects of low Care may not be different from those of Overprotection. However, the effects of perceived rearing on personality may differ between mothers and fathers. Children may be aware of the gender of a parent and react to mothers' and fathers' rearing differently (e.g., von Klitzing, Simoni, Amsler, & Bürgin, 1999). They may expect different things from the two parents. Fathers should be viewed as different from mothers in terms of family and child psychology (Cabrera, Tamis-leMonda, Baradley, Hofferth, & Lamb, 2000). The second hypothesis posits that the quality of parental rearing is classified as Care and Overprotection regardless of the gender of the parents (Fig. 1B). The effects of one domain of rearing (such as Care) upon personality may be the same between mothers and fathers but the effects of low Care may differ from those of Overprotection. Lack of Care may not be equated with Overprotection. Children may be strongly influenced, for example, by low Care but not very much so by Overprotection. Finally, the third hypothesis posits that the total atmosphere of the rearing environment as a whole exerts influences on personality development regardless of domains of rearing and the gender of the parent (Fig. 1C). Infants are born into an emotional climate that consists of the relationship between father and mother and their interactions with the infant (Barrows, 2004). Infants' attachment security is more relationship-specific than infant-specific; in other words, the wholeness is more than the sum of its parts (von Klitzing & Bürgin, 2005). Care and Overprotection scores are usually moderately correlated and mothers' and

fathers' PBI scores are also substantially correlated (Suzuki, & Kitamura, 2011; Uji, Tanaka, Shono, & Kitamura, 2006). Thus, children react to the general quality of parental rearing rather than a particular part/parts of such a rearing environment. Past investigations have adopted these three models as interchangeable but this issue needs clarification. In this study, we compared the three models by structural equation modelling (SEM) techniques in terms of fit with the data to explain the effects of perceived rearing upon the current bonding disorders via adult attachment styles (Fig. 1).

Fig. 1. Comparison of three models representing different latent variables related to perceived rearing during childhood. OP, Overprotection.



Parental bonding towards a child is not limited to infancy. Hence, it is worth examining a parent-child dyad with a wider age range of children. Examining parents of children with an age range beyond infancy should take into account the possible effects of the age of the child and parents. Traditional gender roles of parents in Japan suggest that mothers are provider of warmth, care, and protection whereas fathers are a prototype of authority, independence, and strength. A good relationship with one's mother may lead to trustworthiness of others whereas a good relationship with one's father may lead to sufficient self-esteem and self-efficacy. Reflecting relationships with one's mother and father in childhood, individuals may demonstrate affection and authoritative towards one's own child, respectively.

Methods

Participants

This questionnaire survey was performed in collaboration with the Kumamoto Paediatric Association in 2002. We solicited the members of the Association for research participation. Of the 41 clinics, 20 clinics agreed to do so. At each site, the questionnaire was distributed to the parent(s) of each child aged less than 11 years old who visited the clinic. Hence, the present sample was convenient. It is of note that all of the participating clinics provided generalized childcare and none of them was a specialized clinic for particular paediatric conditions such as developmental disorders and severe physical conditions. In Japan, such serious cases are usually referred to specialized institutions such as university hospitals. Therefore, most of the children in this study were not likely to be suffering from serious medical conditions. The parents were asked to enter this questionnaire study, and if they agreed, they were given one or two additional questionnaires so that each partner had a copy. Parents were asked to fill out the questionnaires independently of each other. A total of 759 families participated in this survey. We received responses from only 396 fathers and 733 mothers. Of these, both parents returned the completed questionnaire in 357 families. The mean (SD) ages of the fathers and mothers were 35.0 (6.5) and 33.3 (5.6) years, respectively. The fathers were slightly but significantly older than the mothers ($p < .001$). Most of the parents (94% of the fathers and 94% of the mothers) were married or cohabiting. The mean age (SD) of the children was 3.3 (2.7) years. Its range was between 0 and 10 years. The gender ratio of children was fairly even: 390 boys (51.4%) and 346 girls (45.6%). The gender was unknown for the remaining 23 children (3.0%).

Measurement

Current parental bonding towards the child: The current bonding attitudes of parents towards their child was measured by the Japanese version (Yoshida et al., 2012) of the Mother-to-Infant Bonding Scale (MIBS). This is a self-report consisting of 10-items with a four-point scale. Reliability and validity of the Japanese MIBS has already been confirmed (Kitamura et al., 2013; Yoshida et al., 2012). Derived from factor analyses, the MIBS has two subscales: Lack of Affection (LA) and Anger and Rejection (AR), each subscale with four items. Higher scores indicate worse mother-to-infant bonding.

Current adult attachment: As the measure of the current attachment to the partner, we used the Japanese version of the RQ (Bartholomew & Horowitz, 1991). This is a four-item self-report with a seven-point scale (from 1 = “Does not apply to me at all” to 7 = “Applies to me very much”). The four items represent different adult attachment styles: Secure, Fearful, Preoccupied, and Dismissing. The participant was asked to rate how each description would correspond to his/her relationship with his/her partner. After obtaining permission from the original author, one of us (TK) translated the RQ into Japanese. Because the Japanese version of the RQ has only four items and was very short, it was not retranslated into English to verify the wording. The psychometric properties have been previously reported (Griffin & Bartholomew, 1994; Scharfe & Bartholomew, 1994). According to Bartholomew and Horowitz’s (1991) following formula, we created two subscales: Positive Self- and Positive Other-models.

$$\begin{aligned} \text{Positive Self-model} &= \text{Secure} - \text{Fearful} - \text{Preoccupied} + \text{Dismissing} \\ \text{Positive Other-model} &= \text{Secure} - \text{Fearful} + \text{Preoccupied} - \text{Dismissing} \end{aligned}$$

Past perceived rearing: As a measure of the rearing that the participant mothers and fathers received during childhood (before age 16), we used the Japanese version (Kitamura & Suzuki, 1993) of the PBI (Parker, Tupling, & Brown, 1979). This is a 25-item self-report measure with a four-point scale. The PBI contains 12 Care and 13 Overprotection items. Higher scores indicate higher Care or higher Protection experiences. After obtaining permission from the original author, one of us (TK) translated the PBI into Japanese. This was retranslated into English to check that the translation corresponded with the meaning of the original instrument (Kitamura & Suzuki, 1993).

Demographic and obstetric variables: We examined the age of the parent and child and the child’s gender. We also examined other psychological variables but these will not be reported in the present study.

Procedure

Questionnaires were distributed by paediatricians to consecutive parents of children who attended the clinic and were solicited for their participation. The parent who received the questionnaire gave a copy of the questionnaire to his or her spouse. They filled in the questionnaires independently. The questionnaires were returned to one of us (TK) using a stamped addressed envelope.

Ethical approval was given by the Ethical Committee of the Kumamoto University Graduate School of Life Sciences.

Statistical analysis

We calculated means and SDs as well as skewness of all the variables used in this study. We also correlated all of them. Because of multiple comparisons, we set α values at $p < .001$.

In order to examine the ways in which parental adult attachment towards a partner may mediate the effects of the parent's own rearing experience during childhood on the current bonding towards a child, we created a series of structural equation models based on a maximum likelihood method (Cole & Maxwell, 2003; Holmbeck, 1997). We posited two latent variables of parent-to-child bonding: LA and AR both consisting of observed MBS items. Regarding the perceived rearing, we compared three models (Fig. 1). In Model A, we posited two latent variables: Grandmother and Grandfather (Fig. 1A). These represented the participant's retrospective reflection of rearing attitudes of their own mother and father, respectively. Hence, each latent variable consisted of observed Care and Overprotection. In Model B, we posited two latent variables: Care and Overprotection (Fig. 1B). These represented the participant's retrospective reflection of Care and Overprotection of their parents, respectively. Hence, Care consisted of Care subscales of grandfather and grandmother whereas Overprotection consisted of Overprotection subscales of the grandparents (Fig. 1B). Finally, in Model C, we set up only a single latent variable representing the total rearing attitudes the participant perceived retrospectively (Fig. 1C). Hence, it consists of Care and Overprotection subscales of the two grandparents as a single construct.

The fit of models with the data was examined in terms of chi-squared (CMN), comparative fit index (CFI), and root mean square error of approximation (RMSEA). According to conventional criteria, a good fit would be indicated by $CMN/df < 2$, $CFI > .97$, and $RMSEA < .05$, and an acceptable fit by $CMN/df < 3$, $CFI > .95$, and $RMSEA < .08$ (Bentler, 1990; Schermelleh-Engel, Moosbrugger, & Müller, 2003). We compared the three models (Models A, B, and C: Fig. 1) by means of the Akaike Information Criteria (AIC). A model with a lower AIC was regarded as better than other models. Once the best model was identified, it was "trimmed" by deleting the least significant path from the model and successively repeating this step as long as $\chi^2(d)$ did not reach a statistically significant level (Klein, 2005).

All statistical analyses were conducted using SPSS version 20.0 and Amos 24.0.

Results

As expected, subscales of the MBS, RQ, and PBI were significantly correlated with each other (Table 1). The two MBS subscales, LA and AR, were correlated with the Positive Self-model but only LA was correlated with the Positive Other-model. LA and AR were both correlated with low Care of grandparents but only AR was correlated with Overprotection of grandmother. Positive Self- and Other-models were correlated with grandmother's low Care and grandparents' Overprotection. Parents' and children's ages were associated with LA. AR was higher among mothers than fathers.

As compared with Models B and C, Model A showed a lower AIC, therefore, we considered this model as the most appropriate (Table 2). This model posited that mothers and fathers would exert different influences. However, the fit of this model with the data did not reach an acceptable fit. Therefore, we posited that there were correlations between the error variables of the Care and Overprotection subscales of the grandparents (Fig. 2). This increased fit with the data for CFI from .882 to .858, RMSEA from .06 to .050, and AIC from 693.108 to 498.172. In this model, affectionless control of Grandmother predicted LA both directly and through mediation by a poor Other-model (Fig. 2). Affectionless control of Grandfather predicted AR both directly and through mediation by a poor Self-model. In addition, Positive Self-model predicted low LA, though weakly. Being a mother predicted lower LA and higher AR. Older child age predicted both high LA and AR. However, the older age of parents predicted only lower AR.

Even when the SEM model was trimmed, the findings were virtually the same (Fig. 3). It was revealed that this model explained 15% and 11% of variances of LA and AR, respectively.

Table 1. Means and SDs of, as well as correlations between, the variables used in this study

	1	2	3	4	5	6	7	8	9	10	11
1 LA	—										
2 AR	.27***	—									
3 Positive Other Model	-.20***	-.07*	—								
4 Positive Self Model	-.15***	-.15***	.37***	—							
5 GM Care	-.20***	-.14***	.15***	.11***	—						
6 GM OP	.09**	.15***	-.06	-.11***	-.56***	—					
7 GF Care	-.15***	-.11***	.12***	.12***	.45***	-.30***	—				
8 GF OP	.07*	.10**	-.03	-.13***	-.33***	.56***	-.54***	—			
9 Parental Gender	-.08**	.12***	.06*	.02	.00	-.07*	.04	-.08**	—		
10 Child's Age	.18***	.10**	-.05	.04	-.03	.03	.03	-.01	.03	—	
11 Parental Age	.12***	-.06	-.07*	.03	-.04	.10**	-.04	.06	-.17***	.49***	—
Mean	1.75	2.33	3.19	2.62	26.9	11.3	22.9	11.7	1.65	3.56	34.1
SE	.006	.005	.009	.010	.02	.02	.02	.02	.001	.008	.02
Skewness	1.5	.8	-.007	-.06	-.09	.6	-.04	.5	-.06	.8	.3

LA, Lack of affection; AR, Anger and Rejection; GM, grandmother; GF, grandfather; OP, overprotection, * $p < .05$; ** $p < .01$; *** $p < .001$

Table 2. Comparison of SEM models

Model	Content	χ^2/df	CFI	RMSEA	AIC
A	Mother vs. Father	529.108/88 = 6.01	.882	.067	693.108
B	Care vs. Overprotection	563.143/88 = 6.40	.873	.069	727.143
C	Single factor	630.434/96 = 6.57	.858	.070	778.434
A'	Mother vs. Father with correlations of Care and Overprotection between Father and Mother	330.172/86 = 3.84	.935	.050	498.172

CFI: comparative fit index; RMSEA, root mean square error of approximation, RMSEA; AIC, Akaike information criteria.

Fig. 2. SEM Model A. Significant paths are in bold. Paths without significance are shown without β coefficients. MIBS, Mother-to-Infant Bonding Scale; OP, Overprotection.

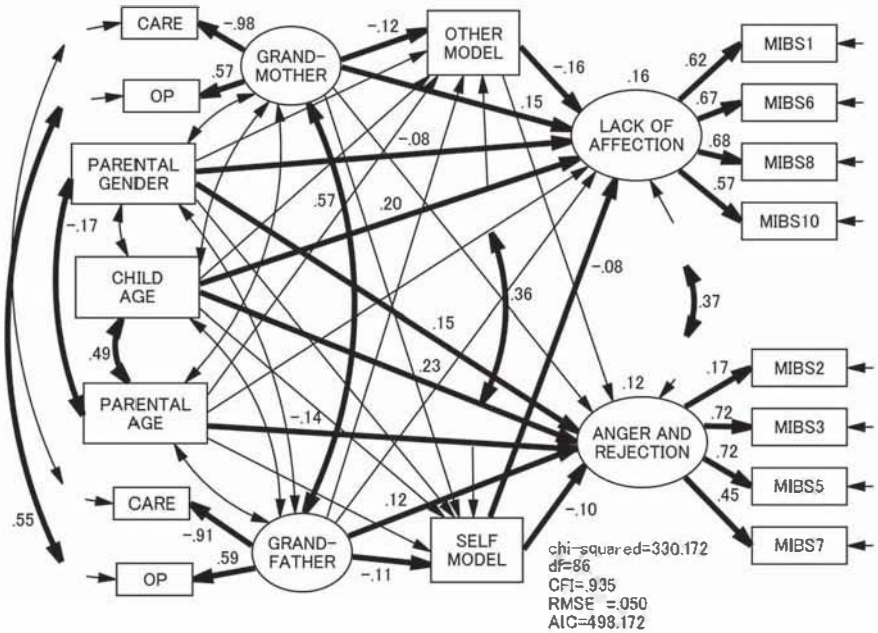
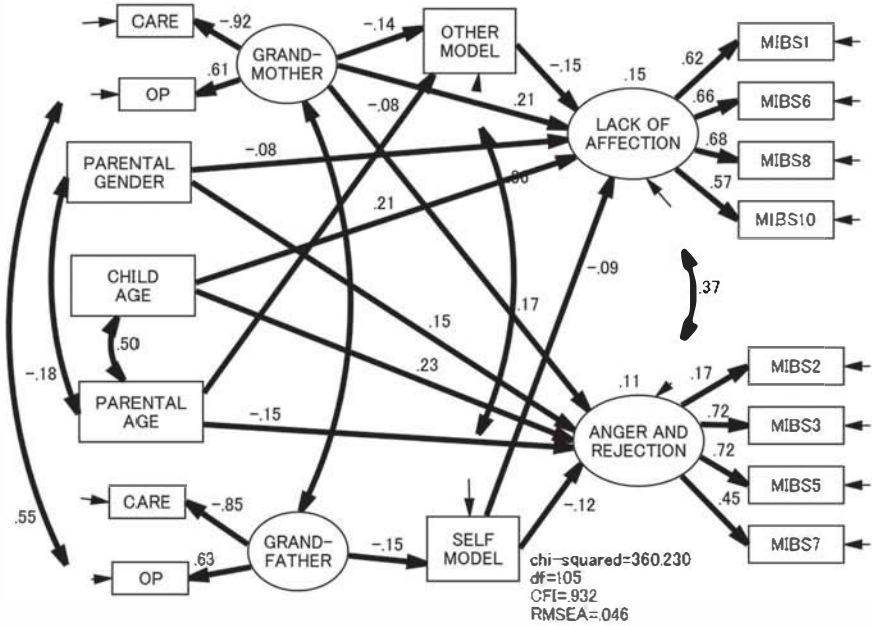


Fig. 3. SEM model after model trimming. Significant paths are in bold. Paths without significance are shown without β coefficients. MBS, Mother-to-Infant Bonding Scale; OP, Overprotection.



Discussion

This paper challenges the current paradigm of where the bonding is fostered. We revealed that bonding/bonding disorder is predicted by parental perceived rearing in childhood directly and/or indirectly, and that the current adult attachment style mediated these effects. LA was predicted by affectionless control (Overprotection and low Care) of the parents' own mother (grandmother) whereas AR was predicted by affectionless control of the parents' own father (grandfather). These were both direct effects and mediated by their poor Other- and Self-models, respectively. Poor Self-model, though to a lesser extent, predicted LA.

The results suggest at least four major considerations. The first was that perceived rearing by the grandmother predicted both LA and AR directly while perceived rearing by the grandfather predicted neither of them. The SEM showed that low Care and high Overprotection (i.e., affectionless control) received from the

grandmother was related to high LA and AR. Such a finding is consistent with previous studies (van Bussel, Spitz, & Demyttenaere, 2010; Hall et al., 2014). However, the direct relation between perceived rearing and current bonding in these studies was limited to the grandmother. One possible explanation may come from distinct gender roles of parents in the traditional Japanese family. The participants of this study were those who were brought up during the high economic growth era after World War II. In this era, fathers in Japanese families worked outside of the home whereas mothers assumed full responsibility for housekeeping and childcare at home. Although fathers took an important lead in family matters, it was rare for fathers to take part in daily child rearing. In addition, the Japanese traditional child rearing style by mothers would also contribute to the result. As described by Libra (1976; cited by Miyake, 1995), Japanese infants almost always stay with their mothers. The mothers rarely leave their babies even when there were babysitters or family members available. They would take a bath with their baby, and lie down with and piggyback their baby almost all day. Inevitably, the infant-mother relationship became very intimate and close, thus Japanese children would feel more of an emotional tie to their mothers than to their fathers. Japanese children rely on mothers because they recognize the mother is the only important safety base (Voegl et al., 1967; cited by Miyake, 1995). Considering this Japanese traditional family structure and child rearing style, it is feasible to explain that only mothers worked as direct models in learning parenting styles or attitudes as a parent.

The second consideration of interest is the contrasting finding that the perceived rearing by the grandmother influenced the Other-model in the current adult attachment while that of the grandfather influenced the Self-model. Again, this gender specificity may be explained by the Japanese parental role sharing. Using the PBI, Griffin and Bartholomew (1994) reported the attachment Self-model dimension was nearly perfectly related to the self-concept and the attachment Other-model dimension was highly related to the interpersonal orientation. In the traditional Japanese family structure (which, of course, has been ever-changing), fathers are an absolute existence at home and the symbol of authority and discipline of the family. Japanese parents define the father primarily as a breadwinner and a link between children and society (Shwalb, Kawai, & Tsunetsugu, 1997). Accordingly, paternal receptive rearing such as high Care and low Overprotection would contribute to the fulfilment of the need to belong to the family and promote self-esteem. Hence, it may result in fostering a positive self-concept. In contrast, mothers would have a different role. They were the parents who gave love and care. After the Meiji restoration and the enactment of the Meiji Civil Law, women had been, until the end of the World War II, confined to the home. A woman's main role in marriage was to raise a son in order to extend the family's lineage (Kazui, 1997). Doi (1973; cited by Nishikawa, 2009) proposed the concept of *amae* in his psychoanalytic discussion.

Amae means “to depend and presume upon another’s love or back in another’s indulgence,” and is “what an infant feels when seeking his or her mother”. This *amae*-based symbiotic harmony continues in later childhood and adulthood in interpersonal relationships among the Japanese. The affectionate rearing by mothers may contribute to developing positively proximate and securely dependent direction to others. We may presume that perceived rearing received by fathers and mothers is internalized differently.

This may differ depending on the country, age, the gender role of the parents, and the cultural context. For example, Verschueren and Marcoen (1999), in a study of 80 Belgian children with a mean age of five, examined the effects of children’s attachment to fathers and mothers on their socioeconomic competence (peer social competence, disruptive behaviour, anxious/withdrawn behaviour, and school adjustment). They reported that the child’s positiveness of self was better predicted by the quality of the child-mother attachment representation than by the quality of the child-father attachment representation whereas the child’s anxious/withdrawn behavioural problems were better predicted by the quality of the child-father attachment representation than by the quality of the child-mother attachment representation. In a study of 89 American mother-child dyads (children aged 6–13), after controlling statistically for maternal anxiety level, child-perceived competence was shown to partially mediate the relationship between maternal overcontrol and child anxiety (Affrunti & Ginsburg, 2012). In a longitudinal study of three generations in the US (Ker, Capaldi, Pears, & Owen, 2009), there appeared to be no differences in the gender of parents on the effects of parents’ positive adjustment (including academic skills, peer relations, and self-esteem) on their constructive parenting (including confident and efficacious discipline and warmth and pleasure in parenting). More research is needed to clarify the cultural issues in these areas.

Thirdly, our study indicated that poor current adult attachment mediated the effects of past perceived negative rearing (affectionless control) on current poor bonding towards a child. Each component of this mediation has been reported thus far. For example, the associations between past perceived parenting and current attachment towards intimate partners were reported by Furukawa et al. (2002), Belt and Abidin (1996), Brennan and Wamboldt (1990), Zachariah (1994a, 1994b), and Kitamura et al. (1995). Also reported were the association between adult attachment and bonding towards the child (Kitamura et al., 2013; Nonnenmacher, Noe, Ehrental, & Reck, 2016; Van Bussel, Spitz, & Demyttenaere, 2010). A question that remains is the cascading effects of perceived parenting to adult attachment and bonding disorders of the child’s attachment to the parents. For example, Fonagy, Steele, Moran, Steele, and Higgitt (1993) reported that infants of mothers whose Adult Attachment Interview (AAI) reflected insecure attachment were also insecure in their attachment towards the mother. This is in line with the psychoanalytic report

by Fraiberg, Adelson, and Shapiro (1975) that childhood conflicts reemerge at early stages of childbearing. Parenting styles may be transmitted from one generation down to another. The uniqueness of the present study was the finding of sequences from past rearing in childhood to current adult attachment, and to parental bonding towards a child. Although many researchers have been aware of the parents' working model of attachment contributing to the type of attachment relationship they develop with their peers, partners, and infants, little has been studied empirically. Our SEM model provided empirical evidence of intergenerational transmission of rearing and bonding.

The fourth consideration that we found is that two components of bonding towards a child, LA and AR, were differentially associated with predictors. AR was predicted by a poor Self-model and the parental age whereas LA was predicted by poor Other- and Self-models. This suggests that these two facets of bonding disorders had different interpersonal origins. Compared to the LA domain, AR may be more influenced by personality maturation (Takegata, Sakamashi, Tanaka, & Kitamura, 2019), economic status (Nanishi & Kitamura, 2019), or infants' behavioural problems such as propensity to cry. There have been few empirical studies on the difference of the multiple facets of bonding disorders. Further studies need to be conducted.

Our study is, of course, not free from drawbacks. We used a convenient sample. Although 20 clinics agreed to participate, all of them were private practices. They did not provide specialized paediatric care. Therefore, the parents who have a child/children suffering from severe disease would not be included. The inclusion of parents with such children would likely alter the results. Furthermore, this study included a greater proportion of mothers (65%) than fathers. Another drawback was that we studied one community in Japan. Geographical generalizations should be made cautiously based on limited information. Finally, the variables used in our SEM model were limited. Other important factors such as parent personality and parity may also influence the fostering of bonding. Self-report questionnaires may be biased depending on the parents' moods at the time of reporting, or social desirability attitudes of parents.

Even taking into account these limitations, the current study is unique, integrating child rearing in childhood by a grandmother and a grandfather, current adult attachment style, and bonding towards the current child. A transgenerational as well as interpersonal mechanism of bonding fostering were revealed. Furthermore, to the best of our knowledge, there have been few studies, which reported the difference of the multiple aspects of bonding towards a child. Use of the SEM model with AIC enabled us to compare models and select one that best fit the data. Considering these strengths, our findings can begin to shed light on the factors that affect bonding and transgenerational transmission of negative parenting. Further

studies are expected to support building positive parent-child relationships with new generations.

Conclusion

In summary, bonding was predicted by parental perceived rearing and adult attachment styles (Self- and Other-models). The two aspects of bonding (AR and LA) were predicted differentially implying that they were influenced by the rearing experiences of fathers and mothers in childhood and adult attachment towards their partner. In clinical settings, interpreting the symptoms of bonding disorders along with their roots, history, relationship with their partner, and other relevant factors are necessary for adequate patient support.

Conflict of interest statement

None declared.

Acknowledgements

We thank the pediatricians who participated in this research:

Tsuneoyoshi Egami, M.D., Hisako Fujikawa, M.D., Akiyo Furuse, M.D., Yoshiko Hattori, M.D., Yogo Haraguchi, M.D., Kaneshige Iribe, M.D., Tsunehiro Kuwahara, M.D., Toshinari Maeda, M.D., Hiroshi Mitsubuchi, M.D., Toru Miyazaki, M.D., Yuji Mizumoto, M.D., Ryozauro Seguchi, M.D., Yasushi Shimada, M.D., Shigeto Sugino, M.D., Keiichi Taku, M.D., Tekehiko Ueno, M.D., Kyoko Uramoto, M.D., and Ken Watanabe, M.D.

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CHAPTER FIVE

EFFECTS OF NEGATIVE LIFE EVENTS AND COPING STYLES ON POSTNATAL MATERNAL–INFANT BONDING AMONG JAPANESE COMMUNITY WOMEN: A LONGITUDINAL COHORT STUDY

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Abstract

Background: Postnatal bonding disorder has been an unduly neglected topic in perinatal psychiatry and obstetrics with very few studies regarding its association with negative postnatal life events and coping styles.

Objectives: To determine the degree to which negative life events and coping styles 1 month after childbirth contribute towards the development of postnatal maternal-infant bonding disorders.

Methods: A total of 105 pregnant women were followed from pregnancy to 1 month after childbirth. Three types of coping styles (Turning to Others, Problem Solving and Denial) were assessed during

pregnancy. Within the first month after childbirth, the women were assessed for the occurrence of bonding disorders (the Mother-to-Infant Bonding Scale) and four types of negative life events—(a) Physical Symptoms and Body Image, (b) Lifestyle Changes and Financial Problems, (c) Interpersonal Relationships and Out-of-Home Activities and (d) Parenting and Newborn Behaviours.

Results: Non-recursive structural equation modelling analyses showed that Parenting and Newborn Behaviours, as well as negative responses to the current pregnancy, predicted the occurrence of bonding disorders but not *vice versa*. However, such findings were confounded by the parity of the participating women. Accordingly, low antenatal self-efficacy, high Problem Solving, low Turning to Others, low Physical Symptoms and Body Image and low Interpersonal Relationships and Out-of-Home Activities predicted the occurrence of bonding disorders in both nulliparous and multiparous women. Moreover, bonding disorders influenced Parenting and Newborn Behaviours only among nulliparous women.

Conclusion: Women whose coping styles were characterised by high problem solving and low turning to others were likely to have bonding disorders. Negative life events, including Physical Symptoms and Body Image and Interpersonal Relationships and Out-of-Home Activities, unexpectedly protected against the development of postnatal bonding disorders.

Key words: postnatal bonding disorders, coping styles, negative life events, parenting, attitude to pregnancy

Introduction

The past two decades have seen a surge in the number of publications regarding perinatal bonding and disorders therein (Brockington, 2004; Kumar, 1997). Discussions on concepts and measurements of perinatal bonding disorders, as well as their correlates, appear elsewhere in this book. However, causes of perinatal bonding disorders still await detailed investigations. One possible cause of perinatal bonding disorders is negative life events (NLEs) after childbirth. This paper examines the association between postnatal maternal bonding disorders, NLEs after childbirth and perceived coping styles.

NLEs and bonding disorders

The postnatal period is characterised by life style changes and a variety of NLEs (Takegata, Ohashi, Haruna, & Kitamura, 2014). Firstly, dynamic role transitions become apparent. Although becoming a mother may be a delightful event for many women, several others may perceive it as stressful. For example, pregnancy was rated 40/100 in the Social Readjustment Rating Scale (Holms, & Rahe, 1967), which implies 'a significant change of role status experienced as a loss by the individual' (Weissman, Markowitz, & Klerman, 2000). Such transitions may include parental role changes or acquaintance, adaptation to physical changes and altered relationships with the spouse, other children, co-workers, biological relatives and in-laws (Condon, Boyce, & Corkindale, 2004; Feeney, Alexander, Noller, & Hohaus, 2003; Levy-Shiff, 1994; Lewis, & Cooper, 1988; Mercer, Nichols, & Doyle, 1988; Rhoads, Simpson, Campbell, & Grich, 2001; Hock, Schirtzinger, Lutz, & Widaman, 1995; Simpson, Rhoads, Campbell, Tran, & Wilson, 2003). Secondly, women are likely to experience a variety of bodily changes and minor symptoms, such as pain after episiotomy and increased body weight. Therefore, building new relationships and adapting to physical and social changes brought about by pregnancy, as well as their new role as a mother, are imperative. Consequently, women are likely to experience emotional conflicts and social problems. Thirdly, interpersonal relationships may change after childbirth. Spouses are a particularly important source of emotional and instrumental support during pregnancy. Studying more than 1,000 women on their first trimester of pregnancy, Kitamura, Toda, Shima, Sugawara, & Sugawara (1998a) factor analysed providers of social support during pregnancy into three: (a) husband, (b) 'premarital network' (parents and friends) and (c) 'postmarital network' (children and mother-in-law). Among the aforementioned social support providers, the husband was most frequently listed as the main support provider. The presence of support from the husband was linked to a reduction in cognitive symptoms of depression among pregnant women (Kitamura, Toda, Shima, Sugawara, & Sugawara, 1998b). Hence, conflicts with one's partner regarding childcare responsibilities, as well as those with extended family members, may be very stressful for women with children. Fourthly, women often develop feelings of isolation after childbirth. Unlike their spouses who go out to work, women usually stay at home and incessantly care for the baby throughout the day. Contacts with adults (friends and family members) are scarce. Accordingly, these 'interpersonal deficits' lead to problems in

initiating and sustaining relationships (Weissman, Markowitz, & Klerman, 2000). Therefore, the postpartum period is often stressful for women because of the increased incidence of negative (stressful) life changes (Rossen et al., 2016). We speculate a causal association between NLEs occurring after childbirth and postnatal bonding disorders. Women experiencing more NLEs after childbirth may be more likely to perceive childrearing as vexing and burdensome, consequently becoming less affectionate towards the baby.

Despite the consensus that stressful life events *generally* promote psychological maladjustment (e.g. Caspi et al., 2003; Kendler, Karkowski, & Prescott, 1999; Paykel et al., 1969; Tennant, 2002), the link between specific events and specific types of psychological symptoms at a particular life stage remains to be determined. In a two-wave study (5 days and 1 month after childbirth), Ohashi et al. (2015) examined the association between specific life event domains and depression 1 month after childbirth. After controlling for the effects of maternity blues severity 5 days after childbirth and the ages of the participants and their partners, they reported that depression severity 1 month after childbirth correlated strongly with parenting items and moderately with interpersonal items. Thus, women caring for infants are more vulnerable to NLEs related to infant care and interpersonal relationships than to those related to physical conditions. Therefore, we speculate that postnatal maternal bonding disorders could also be associated with specific life event domains. Similar to postnatal depression, we predict that postnatal bonding disorders would be associated with childrearing-related NLEs.

Coping styles and bonding disorders

Undesirable (stressful) events prompt men and women to consciously try to adapt to the situation and avoid as much adverse consequences as possible—a process known as coping (Lazarus, & Folkman, 1984; Penley Tomaka, & Wiebe, 2002). The concept of coping is multifaceted: coping styles and coping skills (Moos, & Holahan, 2003; O'Brien, & DeLongis, 1996). Coping styles characterise an individual's usual interaction pattern with a stressful environment. Coping styles are dispositional and should therefore be interpreted as part of an individual's personality (O'Brien, & DeLongis, 1996; Vollrath, Torgersen, Alnæs, 1995). On the other hand, coping skills characterise an individual's employment of management for specific stressful situations. Hence, coping skills vary from one situation to another.

Many instruments have been developed to measure coping styles (Skinner, Edge, Altman, & Sherwood, 2003), one of which is the frequently used Coping Inventory for Stressful Situations (CISS) (Endler & Parker, 1990a, 1999). Theoretically, the CISS contains three factors: Task-, emotion- and avoidance-oriented coping (Endler & Parker, 1990b; Furukawa, Suzuki, Sato, & Hamanaka, 1993). Task-oriented coping involves dealing directly with the stressful situation, emotion-oriented coping involves emotional reactions surrounding the event and avoidance-oriented coping involves escape strategies from the stressful event. Avoidance-oriented coping was later divided into distraction and social diversion (Endler & Parker, 1990a). Some researchers believe that coping styles should be divided into task-oriented and non-task-oriented styles with the latter being further grouped into subcategories. Another instrument is the Ways of Coping Checklist (WCCL) (Folkman, & Lazarus, 1985). Although task-oriented coping styles have usually been considered the most adaptive, emotion-oriented coping has been considered more maladaptive (Shikai, Shono, & Kitamura, 2009; Shikai et al., 2007). Exposure to different types of life events after childbirth promotes the use of coping styles to adjust to new life situations. In the present study, we speculate that women's dispositional coping styles, when exposed to different types of NLEs, would be associated with postnatal bonding disorders.

Other psychosocial correlates of bonding disorders

Postnatal bonding disorders and their association with NLEs after childbirth may also be linked to other psychosocial variables. One candidate variable may include negative psychological responses to news of pregnancy. Previous research has demonstrated that postnatal bonding disorders were more likely to be observed in women who were single (Figueiredo, Costa, Pacheco, & Pais, 2009), younger (Kinsey, Baptiste-Roberts, Zhu, & Kjerulf, 2014), had low education (Kinsey, Baptiste-Roberts, Zhu, & Kjerulf, 2014) and suffered from spousal violence (Kita, Haruna, Matsuzaki, & Kamibeppu, 2016) during pregnancy. Hence, women's responses to pregnancy may be more negative in such situations. Kokubu, Okano, & Sugiyama (2012) reported that negative attitudes towards pregnancy could lead to postnatal bonding disorders.

Personality may be another candidate correlate of postnatal bonding disorder. Accordingly, low self-directedness was reported to be associated

with postnatal maternal bonding disorder elsewhere in the current book. Women with low self-esteem may be likely to show fear, anger and rejection towards the newborn baby. Trait anger also correlated with both maternal and paternal bonding disorders towards the child (Kitamura et al., 2015). According to Bandura (1997, 1982), one's sense of self-efficacy leads to initiation and maintenance of coping behaviours. Self-efficacy has two levels: specific and general. Ample research has examined the relationship between self-efficacy and depression (Bandura, 1997; Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003) using context-specific measures of self-efficacy. Thus, Cutrona and Troutman (1986) examined the relationship between parenting self-efficacy and postpartum depression. Self-efficacy has been thought to regulate stress and anxiety through its impact on coping behaviours (Bandura, 1995). Therefore, high self-efficacy may lead to better maternal bonding via selection of more adaptive coping styles.

Postnatal bonding disorders have been reported to be associated with Caesarian section (Sockol, Battle, Howard, & Davis, 2014; Song, Ishii, Toda, Tomimatsu, Katsuyama, Nakai, & Shimoya, 2017), particularly emergency Caesarian section (Edhborg, Matthiesen, Lundh, & Widström, 2005), as well as newborn admission in a neonatal intensive care unit (Figueiredo, Costa, Pacheco, & Pais, 2009). Hence, bonding and bonding disorders could be speculatively associated with lesser physical contact between mother and newborn. Women who *previously* experienced holding other women's babies may also be less likely to have negative attitudes towards their own babies given that they may be more knowledgeable and confident about childrearing.

Childbirth may lead to changes in women's household accommodation considering that an increase in number of family members (addition of the new baby) requires more free space than that during pregnancy. Accordingly, women who expected a crowded accommodation were more likely to have antenatal depression (Kitamura, Shima, Sugawara, & Toda, 1993; Kitamura, Sugawara, Sugawara, Toda, & Shima, 1996). In the present study, we speculate that deterioration in women's housing conditions would lead to frustration, which would in turn promote negative emotional attitudes towards their baby.

Methodological considerations

Methodological difficulties in studying the causal impact of NLEs on psychological maladjustment have been frequently noted. Cross-sectional

correlations between NLEs and psychological maladjustment cannot lead to causation. This is because the findings, though statistically significant, may be a product of confounding. To avoid such biases, long-term follow-up studies that examine participants across multiple occasions are needed. However, such a study is costly. A possible statistical means to avoid methodological and practical shortcomings is the use of non-recursive structural equation modelling (SEM). In non-recursive SEM, researchers may posit that two variables ‘influence’ each other in a single occasion with two paths coming from and going to each other (Kline, 2005, pp. 237–262). This feedback loop model involves mutual causation among variables *measured at the same time*. Despite the presence of restrictive assumptions, such as stationarity in the relationship among variables over time and equilibrium of the possible effects among variables, this model remains attractive given its avoidance of lengthy longitudinal sample observation. The present study utilises non-recursive SEM to obtain a possible, yet non-conclusive, answer to the research question on the causality between postnatal bonding disorders and NLEs after childbirth. Such findings may encourage subsequent longitudinal cohort studies.

Another important research consideration includes possible moderation by parity. In many psychosocial studies on perinatal psychiatry, nulliparous and multiparous women have shown different patterns of path coefficients (e.g. Takegata et al., 2017). Hence, the present study performed multigroup SEM analyses with nulliparous and multiparous women as two distinctive groups.

Methods

Participants

Among women who visited one of the four antenatal clinics in Mie Prefecture, those who (a) aged 18 or above, (b) had no serious physical diseases or pregnancy-related complications, (c) had a singleton foetus, (d) had reasonable Japanese linguistic capacity, (e) planned to give birth at the clinic and (f) had no history of infant loss were recruited into the present longitudinal cohort study. Of the 108 eligible women, 107 (99%) returned their questionnaire. Participants’ age ranged between 20 and 38 with a mean (SD) age of 29.3 (4.1) years. Among these women, 61 and 46 were nulliparous and multiparous, respectively, with parity being unknown in one woman. The mean age did not differ between nulliparous and multiparous women.

Procedures

A set of questionnaires were distributed to the participants at an antenatal clinic. Solicited participants who agreed to participate in this study filled in the questionnaire and returned it in a sealed envelope to be placed in a box at the clinic. This guaranteed autonomous decision and anonymity. Questionnaires were again distributed to the same women 5 days after childbirth and 1, 3 and 4 months thereafter, returning the same to the researcher. The number of the women who returned their questionnaire was 105, 106, 90 and 76, respectively, with 70 women having questionnaires available for all four time points. The present study used data collected during pregnancy and 1 month after childbirth ($N = 105$). This study was conducted between July 2004 and December 2005 as a governmental activity of Mie Prefecture.

Ethical consideration

The present study was approved by the Internal Review Board of Mie University School of Medicine (No1235).

Measurements

Bonding disorders: Postnatal bonding disorders of mothers towards their infant were assessed using the Mother-to-Infant Bonding Scale (MIBS), the predecessor of which was the Mother-to-Infant Bonding Questionnaire (MIBQ) (Kumar et al. and revised by Marks et al., unpublished). The MIBQ was designed to elicit mothers' feelings of rejection, alienation and neutrality towards their infants. The original MIBQ showed excellent test-retest reliability and construct validity (Taylor, Atkins, Kumar, Adams, & Glover, 2005; Wittkowski, Wiek, & Mann, 2007; Figueiredo, Costa, Pacheco, & Pais, 2009). The MIBS was translated into Japanese (Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012) while modifying simple adjectival items into sentences. Research on the factor structure of the MIBS (Kitamura, Takegata, Haruna, Yoshida, Yamashita, Murakami, & Goto, 2013; Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012) showed that the Japanese MIBS had two subscales: Lack of Affection (LA) and Anger and Rejection (AR). LA includes four items, such as 'I feel protective towards my baby' (reverse item) and 'I enjoy doing things with my baby' (reverse item), while AR includes three items, such as 'I

feel resentful towards my baby' and 'I feel angry with my baby'.

NLEs: Events related to childbirth and parenting were selected based on the report of Arizmendi, & Affonso (1987). In accordance with theory, NLEs were classified into four life domains: (a) Physical Symptoms and Body Image (13 items), including 'fatigue' and 'reduced appetite'; (b) Lifestyle Changes and Financial Problems (10 items), including 'Satogaeri' and 'crowded house'; (c) Interpersonal Relationships and Out-of-Home Activities (10 items), including 'parents' reaction' and 'parents-in-law's reaction'; and (d) Parenting and Newborn Behaviours (eight items), such as 'difficult parenting' and 'difficult feeding'. The participants were asked whether they had experienced any of the aforementioned events after childbirth using a dichotomous scale (0 or 1). Thereafter, the number of life event items affirmed by the participant was summed to create subscale scores. Hence, the maximum score of each subscale was equal to the number of items therein.

Coping styles: Following Kendler, Kessler, Health, Neale, & Eaves (1991), 14 items were selected from the WCCL based on the highest loading items from each of the seven subscales. After examining the factor loadings of these WCCL items, Kendler et al. (1991) classified them into three subscales: Turning to Others (four items, e.g. 'turn to friends or relatives for advice or assistance'), Problem Solving (six items, e.g. 'confront the person who caused the problem') and Denial (three items, e.g. 'try not to think about it so much'). Such means of subcategorisation had been adopted herein.

Sociodemographic features: Participants were asked regarding (a) their age; (b) accommodational condition, particularly dissatisfaction about their current accommodation and anticipation of an overcrowded accommodation after childbirth; and (c) whether they planned to return to their biological parents' house (Satogaeri). Satogaeri is a Japanese custom wherein pregnant women return to their biological parents' house before and/or after giving birth. Here mothers and siblings who have childbearing experiences take care of both the baby and the women, possibly reducing anxiety and frustration.

Gynaecological features: Participants were asked regarding parity, age of menarche and experience of premenstrual tension symptoms.

Psychological features: Three *ad hoc* questions were used to measure women's negative attitudes towards pregnancy: 'How did you feel when you became aware that you were expecting a baby?' (three responses: pleased, 1; did not feel real, 2; perplexed, 3), 'How did your partner feel when he became aware that you were expecting a baby?' (three responses:

pleased, 1; did not feel real, 2; perplexed, 3) and 'Did you want to be pregnant?' (five responses: from did not want it, 1 to wanted it making every effort, 5). Participants were also asked regarding (a) their experience in holding other women's babies, (b) past experience of being treated for 'depression', (c) self-efficacy about life after childbirth (*ad hoc* single question), (d) marital adjustment using two items—marital satisfaction and agreement between the couple.

Statistical analyses

Little's Missing Completely at Random test suggested that data were missing completely at random ($\chi^2 = 88.4$; $df = 139$; $p > .05$). However, missing values were substituted using multiple imputation.

Firstly, we determined whether scores for LA and AR correlated with those for sociodemographic, obstetric and psychological features, as well as coping styles and NLEs after childbirth. Similarly, we determined whether scores for NLEs and coping styles after childbirth correlated with those for sociodemographic, obstetric and psychological features. Due to multiple correlations, type I error level was set at $p < .001$.

After correlational analyses, all variables that correlated with the MIBS, NLE or coping style subscale scores were subsequently used to construct a non-recursive structural equation model. The current model posits that Bonding Disorder, the latent variable, consists of two MIBS subscales, LA and AR, and that Bonding Disorder and each NLE subscale influence each other. Furthermore, we posit that Bonding Disorder and NLE would be predicted by the three coping style subscales, which, in turn, would be predicted by other predictor variables (Fig. 1).

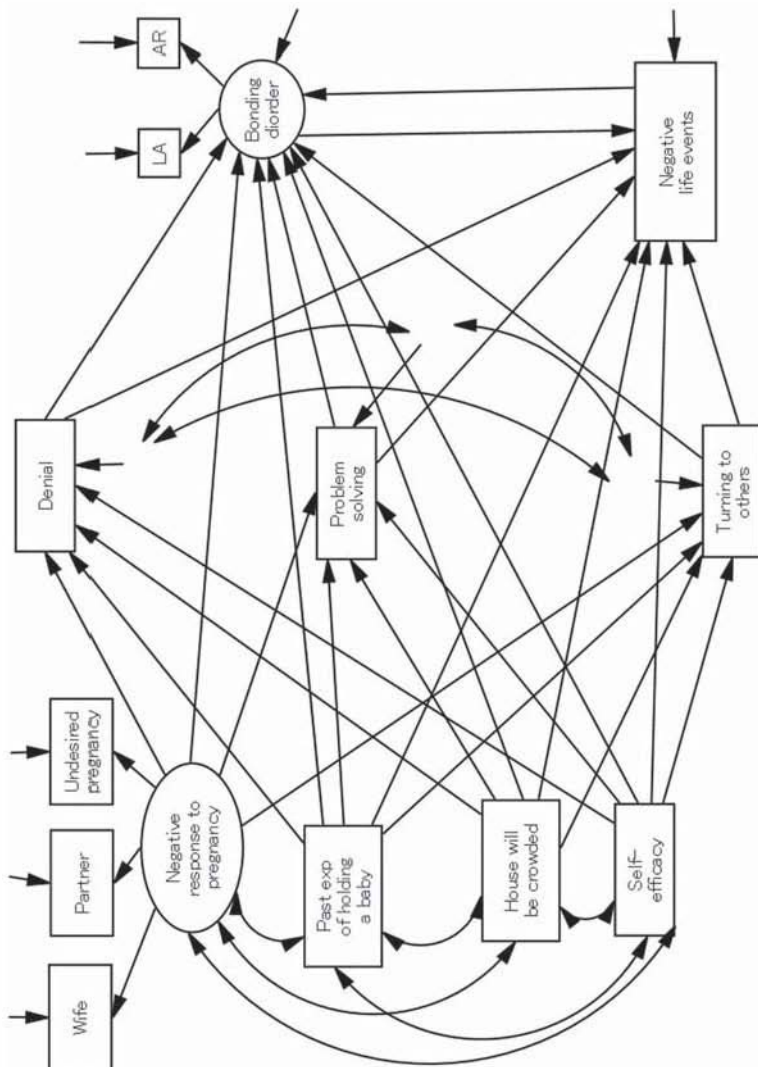
The fit to the model and the data was examined using chi-squared (CMIN), comparative fit index (CFI) and root mean square error of approximation (RMSEA). According to conventional criteria, $CMIN/df < 2$, $CFI > .97$ and $RMSEA < .05$ indicate a good fit, while $CMIN/df < 3$, $CFI > .95$ and $RMSEA < .08$ demonstrate an acceptable fit (Schemmelleh-Engel et al., 2003).

To examine the moderation by parity, a series of multigroup SEM analyses were performed using nulliparous and multiparous women as two separate groups. Here, we examined pairs of 'nested' models starting with the least restricted model. If the χ^2 of the more restricted model did not exceed that of the present model with df of difference, then the more restricted model was adopted as appropriate. This procedure was repeated until the χ^2 difference between the two models exceeded the .05 level of

significance.

All statistical analyses were conducted using the Statistical Package for the Social Sciences (version 24.0) and Amos.

Fig. 1. Original non-recursive SEM: Path model of negative attitudes toward pregnancy, perinatal dysphoric mood and bonding failure



Results

Participant characteristics

Among the 108 women, one was unmarried while one had an unknown marital status. The number of housewives, part-time workers, and full-time workers was 38 (35%), 21 (19%) and 48 (44%), respectively, with the occupational status of one woman being unknown. Regarding past episodes of depression, 7 (6.5%) women reported being treated for postnatal depression prior to the present pregnancy.

Bonding disorders, NLEs and coping styles

Both MBS subscales—LA and AR—significantly ($p < .001$) correlated with only Parenting and Newborn Behaviours (Table 1). To identify specific items that were significantly associated with the MBS subscale scores, we determined whether correlations existed between the same subscale scores and each NLE item treated as a dummy variable (0 or 1). This revealed that LA correlated with ‘difficult parenting’ ($r = .39$; $p < .001$), ‘difficult feeding’ ($r = .28$; $p < .01$), ‘night feeding’ ($r = .22$; $p < .01$) and ‘difficult falling asleep (of the baby)’ ($r = .27$; $p < .01$), whereas AR correlated with ‘difficult parenting’ ($r = .23$; $p < .05$), ‘persistent crying’ ($r = .29$; $p < .01$) and ‘difficult falling asleep (of the baby)’ ($r = .21$; $p < .05$),

Neither coping style nor any other variable, including sociodemographic, obstetric and psychological variables, correlated with LA and AR. However, low self-efficacy was slightly associated with poor LA, while dissatisfaction with housing condition was slightly associated with high AR. Negative response towards the current pregnancy was slightly associated with both LA and AR (Table 1).

A number of NLEs correlated with predictor variables (Table 2). Accordingly, Life Changes and Financial Problems tended to correlate with the perception of a crowded accommodation after childbirth, while Parenting and Newborn Behaviours negatively correlated with parity. This means that nulliparous women were more likely to report such events compared to multiparous women.

None of the coping style subscale scores correlated with predictor variables (Table 3). However, women who previously experienced holding other women’s babies were more likely to adopt Turning to Others as a means of coping.

Table 1 Correlations between the MIBS subscale scores and negative life event scores, as well as other correlates

	Lack of Affect	Anger and Rejection
<i>Negative life events after child birth</i>		
Physical Symptoms and Body Image	-.03	-.08
Lifestyle Changes and Financial Problems	.07	.09
Interpersonal Relationships and Out-of-Home Activities	-.06	-.10
Parenting and Newborn Behaviours	.42***	.30**
<i>Coping styles</i>		
Turning to Others	-.01	-.08
Problem Solving	.07	-.08
Denial	.13	.06
<i>Sociodemographic features</i>		
Age	.15	.04
Dissatisfied with house	.08	.24*
Crowded house	.05	.12
Satogaeri	.06	-.01
<i>Obstetric features</i>		
Parity	.01	-.07
Age of menarche	.02	-.04
Premenstrual tension symptoms	.00	-.01
<i>Psychological features</i>		
Own response	.21*	.22*
Partner's response	.12	.08
Undesired pregnancy	.12	.06
Past experience of holding a baby	-.14	-.00
Past treatment of "depression"	.13	.02
Self-efficacy	-.27**	-.08
Marital satisfaction	-.19	-.26**
Marital agreement	-.07	.04

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 2 Correlations between negative life event scores and other correlates

	Physical Symptoms and Body Image	Lifestyle Changes and Financial Problems	Interpersonal Relationships and Out-of-Home Activities	Parenting and Newborn Behaviours
<i>Coping styles</i>				
Turning to others	.07	.09	.05	.14
Problem Solving	.14	.10	.20*	.08
Denial	-.01	.08	.01	.15
<i>Sociodemographic features</i>				
Age	.11	.13	.14	.18
Dissatisfied with house	.03	.20*	-.01	.19
Crowded house	.07	.30**	.01	.01
Satogaeri	-.01	.19	.06	.20*
<i>Obstetric features</i>				
Parity	-.03	-.06	-.06	-.28**
Age of menarche	.06	.12	.13	.12
Premenstrual tension symptoms	.10	.02	.17	.11

<i>Psychological features</i>				
●own response	.05	.11	.01	.03
Partner's response	.08	.08	.02	-.13
Undesired pregnancy	.01	.05	.00	.04
Past experience of holding a baby	.04	-.05	.00	-.14
Past treatment of "depression"	-.11	.01	.04	-.01
Self-efficacy	.02	-.16	-.21	-.30**
Marital satisfaction	-.6	-.01	-.01	-.20*
Marital agreement	-.03	-.08	-.01	-.05

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3 Correlations between coping style subscale scores and other correlates

	Turning to Others	Problem Solving	Denial
<i>Sociodemographic features</i>			
Age	.22*	.15	.08
Dissatisfied with house	-.04	-.05	.11
Crowded house	.04	-.01	.14
Satogaeri	-.03	-.13	.32
<i>Obstetric features</i>			
Parity	.05	.09	.11
Age of menarche	.05	.09	.04
Premenstrual tension symptoms	.13	.00	.00
<i>Psychological features</i>			
Own response	.10	.07	.18
Partner's response	.06	.07	.18
Undesired pregnancy	.14	.10	.21*
Past experience of holding a baby	.26**	.08	.08
Past treatment of "depression"	.11	.11	.17
Self-efficacy	-.02	-.05	-.17
Marital satisfaction	.16	-.06	-.05
Marital agreement	.15	.11	-.03

* $p < .05$; ** $p < .01$; *** $p < .001$

Before SEM analysis, we determined whether correlations existed among scores for NLE subscales, coping style subscales and predictor variables that correlated with LA or AR at $p < .05$ in a 0-order correlation matrix (Table 4). Moreover, partner's response to current pregnancy and undesired pregnancy were added into the matrix given that they are latent variables of Negative Response to Pregnancy and undesired response to own pregnancy.

Table 4. Correlations between negative life events, coping styles and predictor variables used during structural equation modelling (N = 105)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1: Physical Symptoms and Body Image	—													
2: Lifestyle Changes and Financial Problems	.38***	—												
3: Interpersonal Relationships and Out-of-Home Activities	.18	.30**	—											
4: Parenting and Newborn Behaviours	.24*	.30**	.25*	—										
5: Turning to others	.07	.09	.05	.14	—									

6: Problem Solving	.14	.10	.20*	.08	.35***	—								
7: Denial	-.01	.08	.01	.15	.03	.00	—							
8: Own response to pregnancy	.05	.11	.01	.03	.12	.05	.18	—						
9: Partner's response to pregnancy	.08	.08	.02	-.13	.03	.07	.16	.54***	—					
10: Undesired pregnancy	.01	.05	.00	.04	.16	.08	.21*	.70***	.38***	—				
11: Self-efficacy	.02	-.16	-.21	-.30**	-.06	-.03	-.17	-.20*	-.06	-.11	—			
12: Past experience of holding a baby	.04	-.05	.00	-.14	.23*	.09	.08	.11	.17	.03	.17	—		
13: House will be crowded	.07	.30**	.01	.01	.02	-.01	.14	.05	.10	-.03	-.10	.06	—	
14 Parity	-.03	-.07	-.06	.28**	.03	.06	.11	.01	-.04	.04	.07	.07	-.02	—

Mean	4.23	3.65	1.32	1.96	10.28	9.79	5.82	0.36	0.27	1.78	1.55	2.26	0.58	0.44
SD	1.84	1.42	1.00	1.70	2.29	2.84	2.00	0.65	0.58	0.98	0.73	0.84	0.63	0.50
Skewness	— 0.08	0.07	0.45	0.43	— 0.14	0.63	0.02	1.59	2.07	0.46	— 0.11	— 0.91	0.62	0.25
Cronbach's α	.43	.30	.26	.63	.26	.51	.32	---	---	---	---	---	---	---

* $p < .05$; ** $p < .01$; *** $p < .001$

In the original model (Figs. 2, 3, 4 and 5), Negative Response to Pregnancy significantly predicted Bonding Disorder. However, none of the coping styles predicted Bonding Disorder. This remained true whichever NLE category was used during SEM analysis. Moreover, past experiences of holding other women's babies predicted Turning to Others. This model showed excellent fit with the data: CFI = 1.000; RMSEA = 0.000 in all models.

Fig. 2. Non-recursive SEM of Bonding Disorder and Physical Symptoms and Body Image

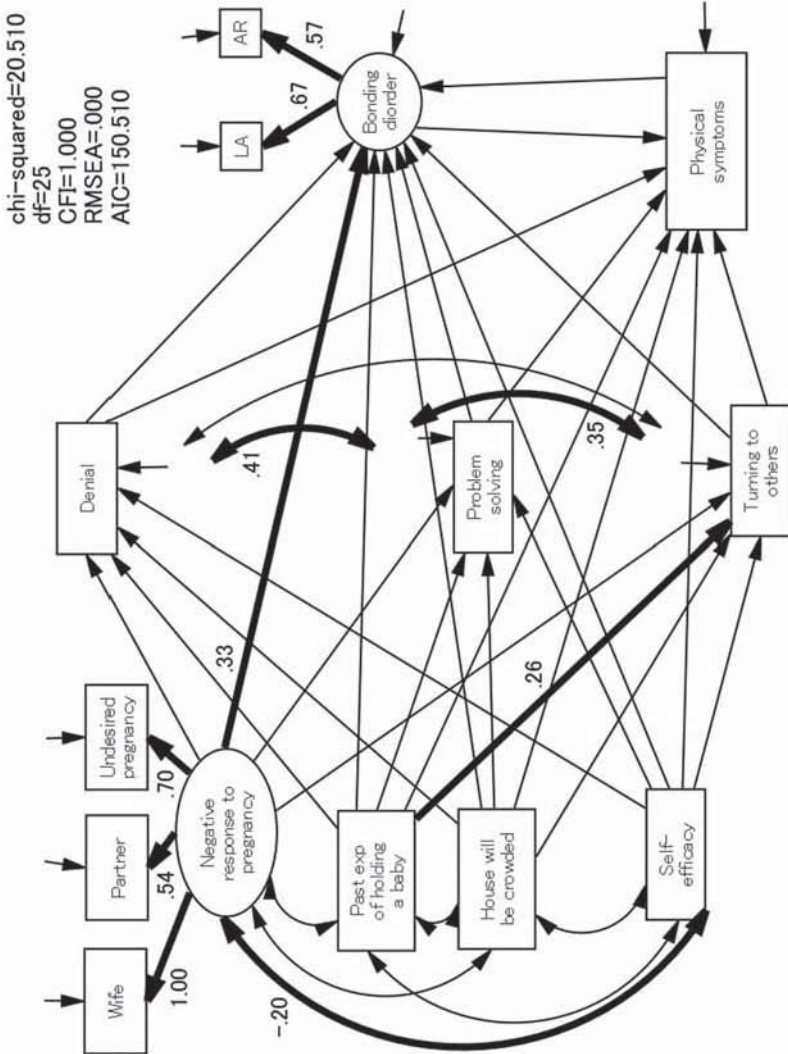


Fig. 3. Non-recursive SEM of Bonding Disorder and Lifestyle Changes and Financial Problems

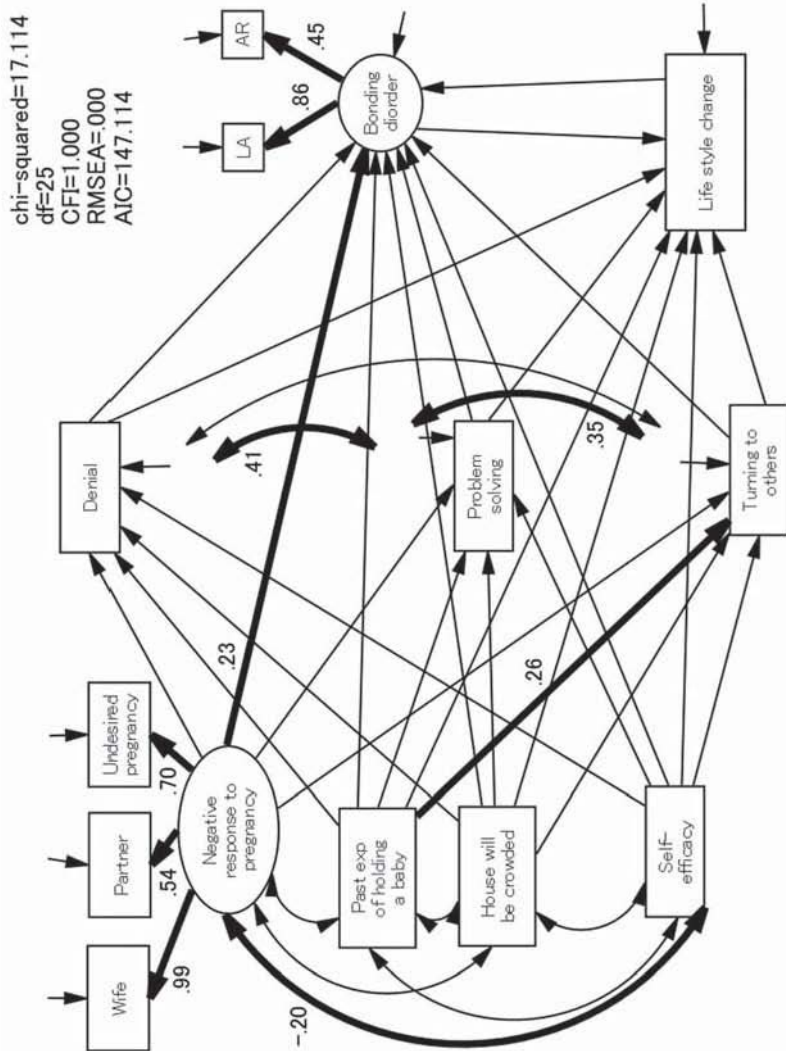


Fig. 4. Non-recursive SEM of Bonding Disorder and Interpersonal Relationships and Out-of-Home Activities

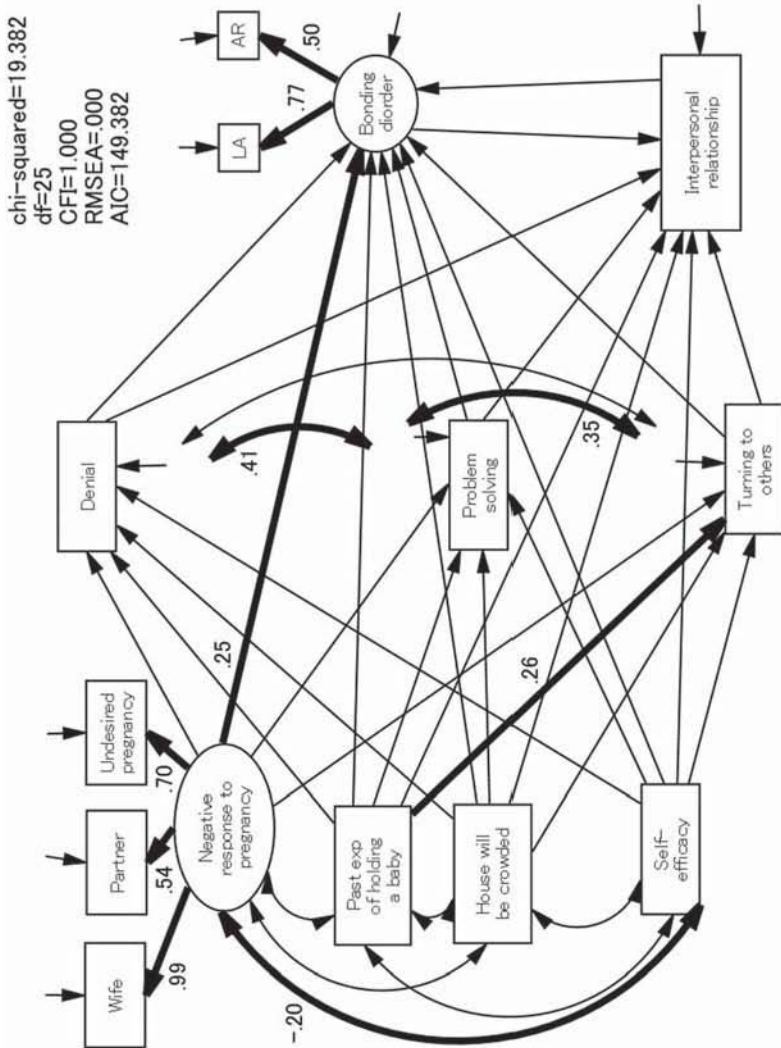
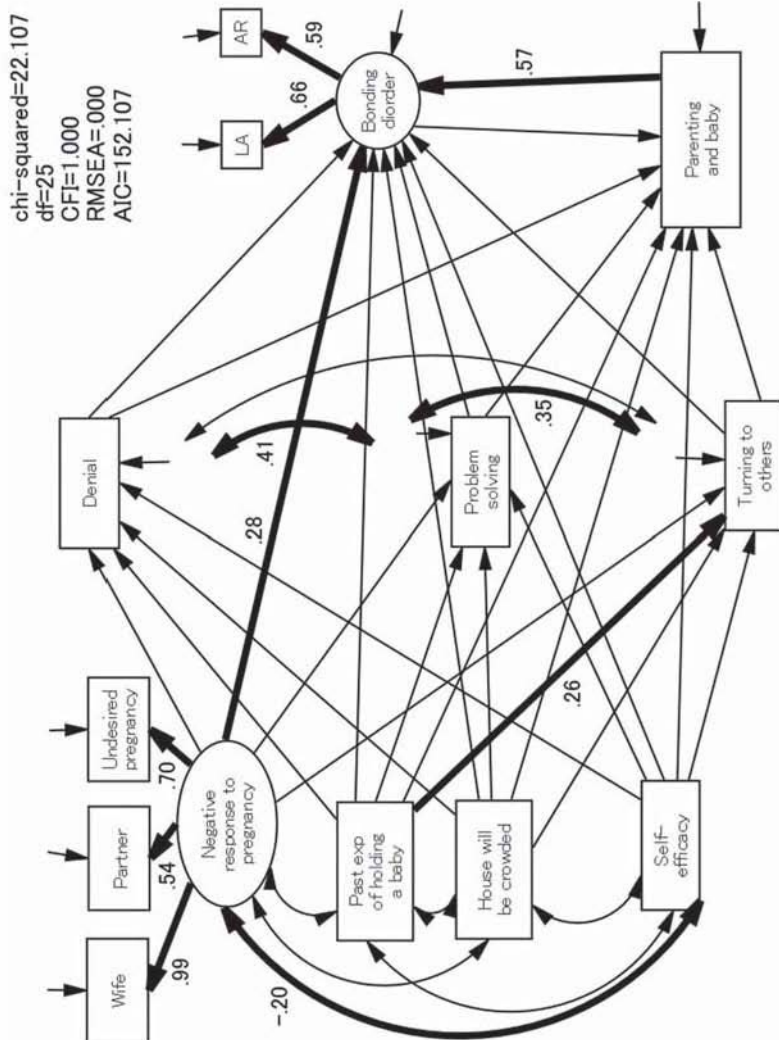


Fig. 5. Non-recursive SEM of Bonding Disorder and Parenting and Newborn Behaviours



Comparing nulliparous and multiparous women in terms of the mutual influence of Bonding Disorder and Physical Symptoms and Body Image showed that the models could be restricted without a significant increase in χ^2 (difference) up to covariances of structural models. Our results revealed no difference between nulliparous and multiparous women (Fig. 6a and 6b). Low Self-efficacy, high Problem Solving and *low* Physical Symptoms and Body Image predicted Bonding Disorder in both groups.

Fig. 6a. Non-recursive multigroup SEM of Bonding Disorder and Physical Symptoms and Body Image (nulliparous women)

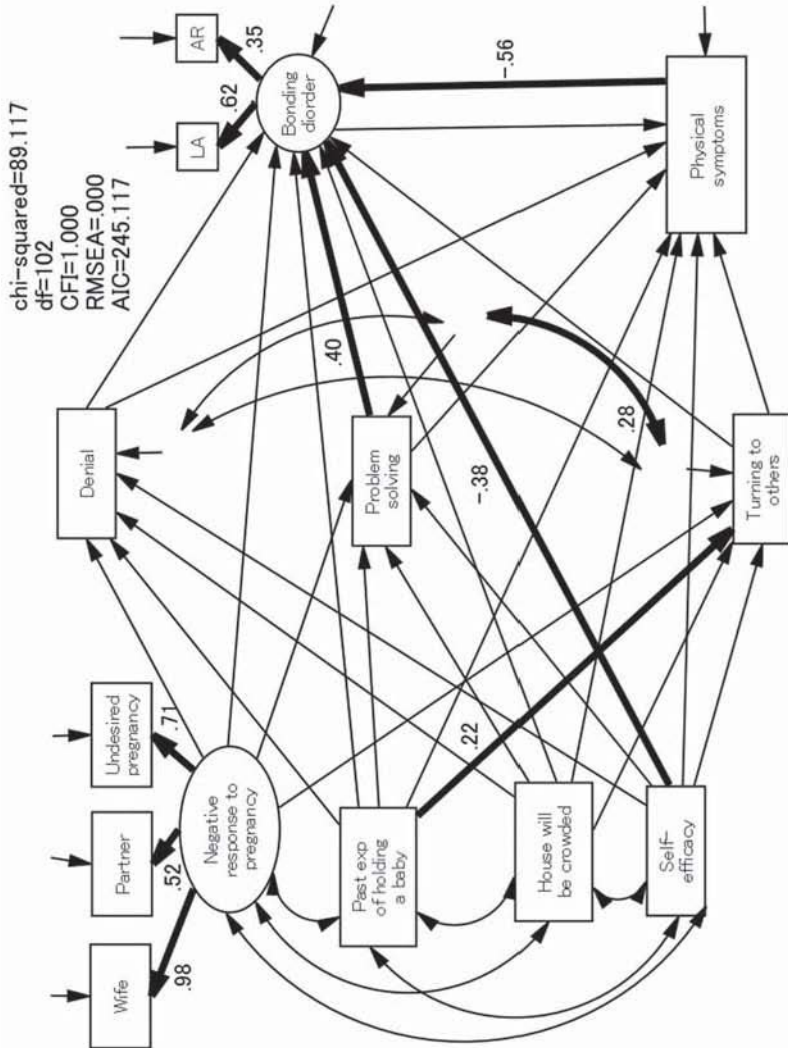
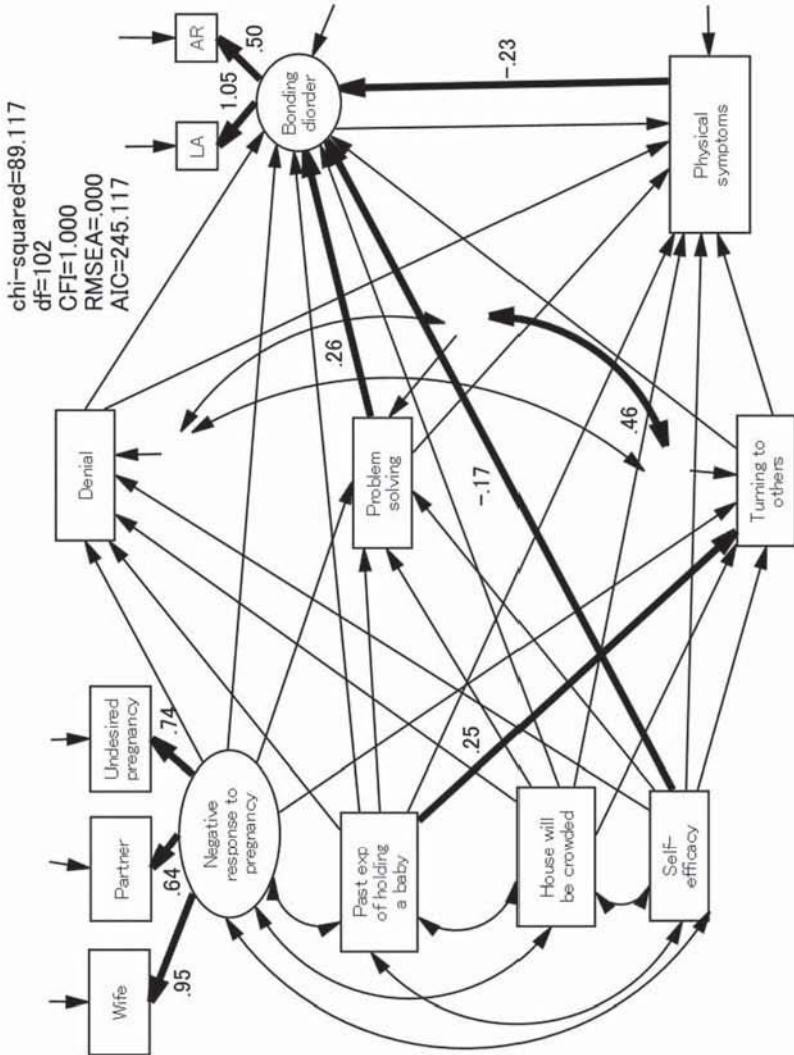


Fig. 6b. Non-recursive multigroup SEM of Bonding Disorder and Physical Symptoms and Body Image (multiparous women)



Comparing nulliparous and multiparous women in terms of the mutual influence of Bonding Disorder and Life Style Change and Financial Problems showed that models could be restricted without a significant increase in χ^2 (difference) up to residuals of structural models. No substantial difference between nulliparous and multiparous women was revealed (Fig. 7a and 7b). In both groups, past experiences of holding a baby predicted Turning to Others. None of the variables used in this analysis predicted Bonding Disorder or Life Style Change and Financial Problems.

Fig. 7a. Non-recursive multigroup SEM of Bonding Disorder and Lifestyle Changes and Financial Problems (nulliparous women)

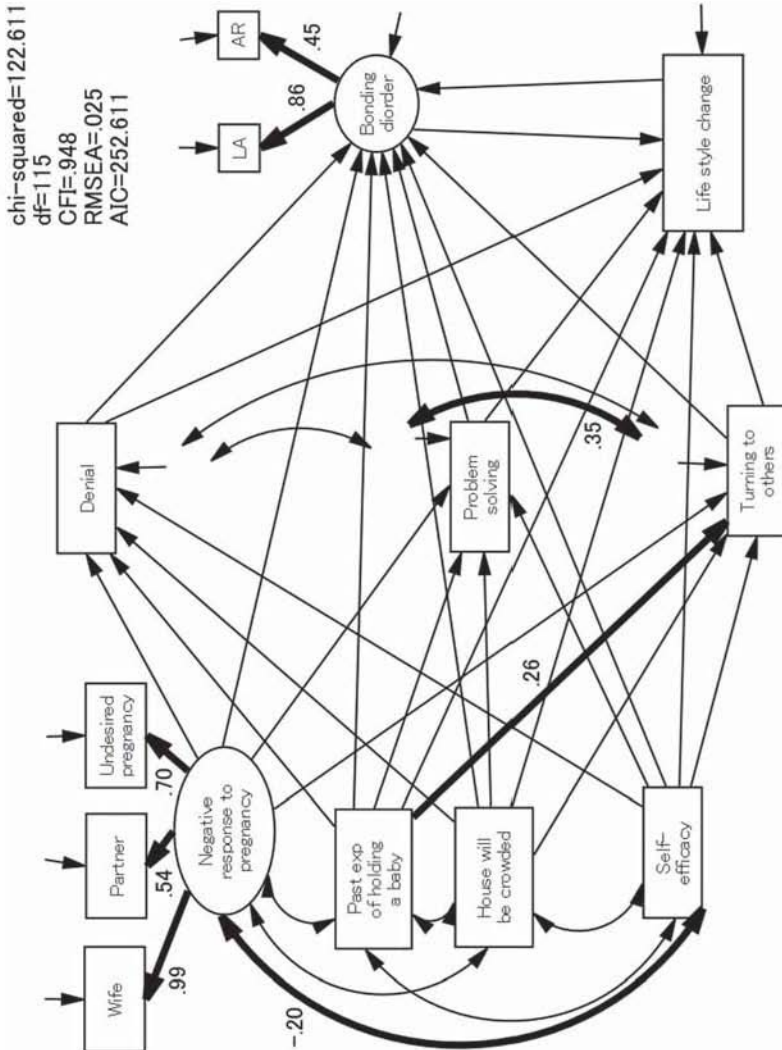
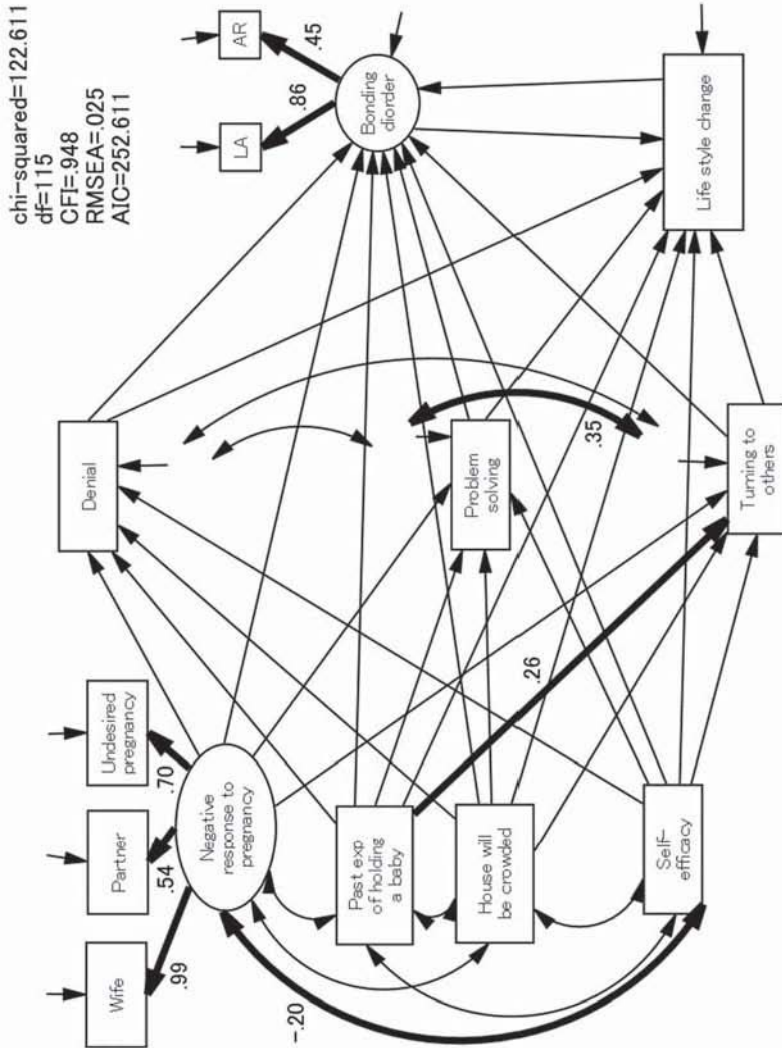


Fig. 7b. Non-recursive multigroup SEM of Bonding Disorder and Lifestyle Changes and Financial Problems (multiparous women)



Comparing nulliparous and multiparous women in terms of the mutual influence of Bonding Disorder and Interpersonal Relationships and Out-of-Home Activities showed that models could be restricted without a significant increase in χ^2 (difference) up to covariance of structural models (Fig. 8a and 8b). In both groups, low Self-efficacy, high Problem Solving, low Turning to Others and low Interpersonal Relationships and Out-of-Home Activities predicted Bonding Disorder.

Fig. 8a. Non-recursive multigroup SEM of Bonding Disorder and Interpersonal Relationships and Out-of-Home Activities (nulliparous women)

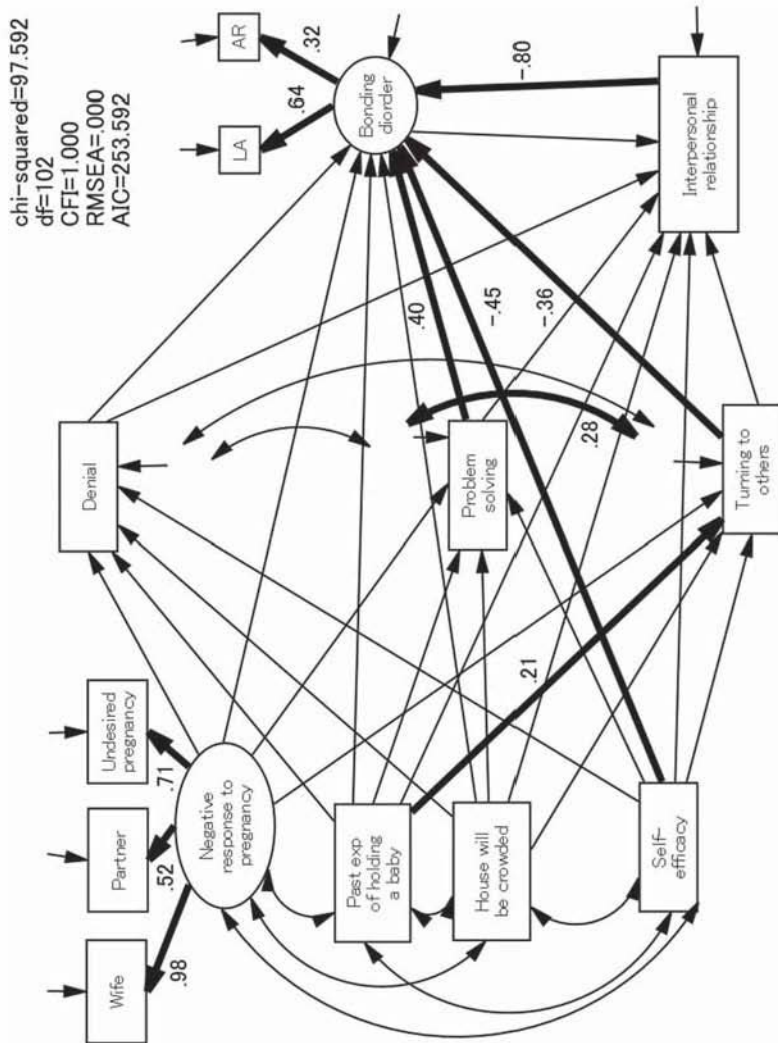
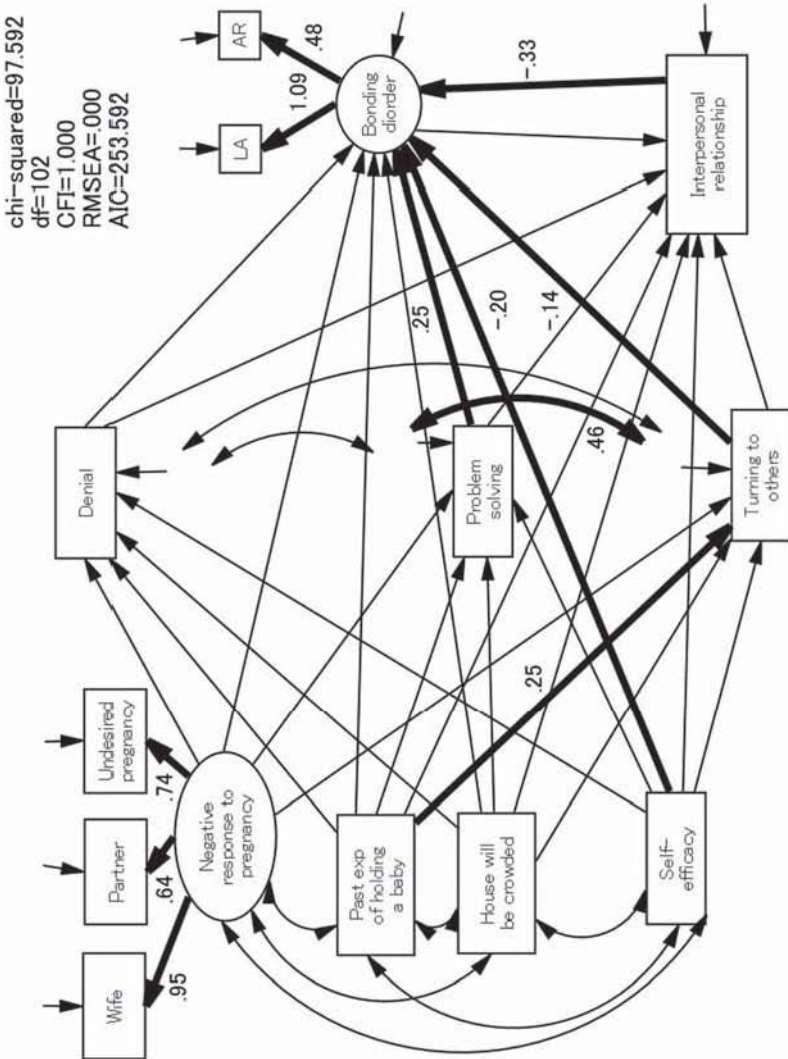


Fig. 8b. Non-recursive multigroup SEM of Bonding Disorder and Interpersonal Relationships and Out-of-Home Activities (multiparous women)



Comparing nulliparous and multiparous women in terms of the mutual influence of Bonding Disorder and Parenting and Newborn Behaviours revealed that models could be restricted until intercepts of the measurement model. In the nulliparous women (Fig. 9a), Problem Solving and low Turning to Others predicted Bonding Disorder, while Bonding Disorder influenced Parenting and Newborn Behaviours. In the multiparous women (Fig. 9b), none of the variables used in this model predicted Bonding Disorder, while low self-esteem predicted Parenting and Newborn Behaviours.

Fig. 9a. Non-recursive multigroup SEM of Bonding Disorder and Parenting and Newborn Behaviours (nulliparous women)

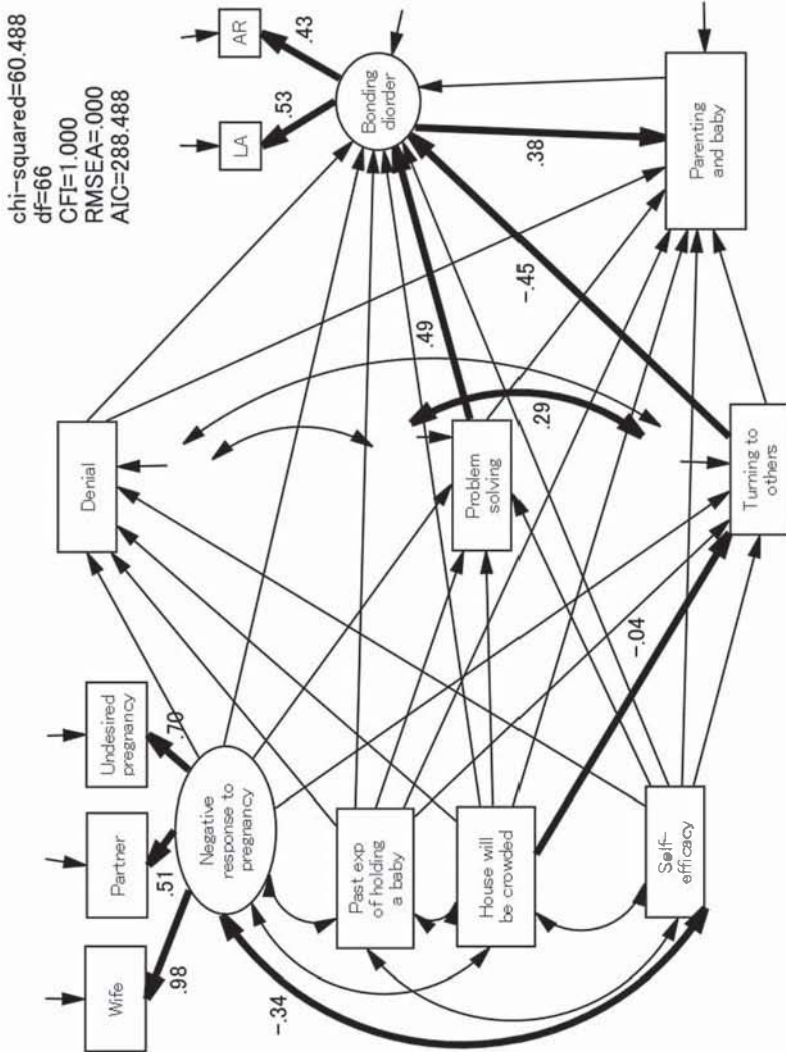
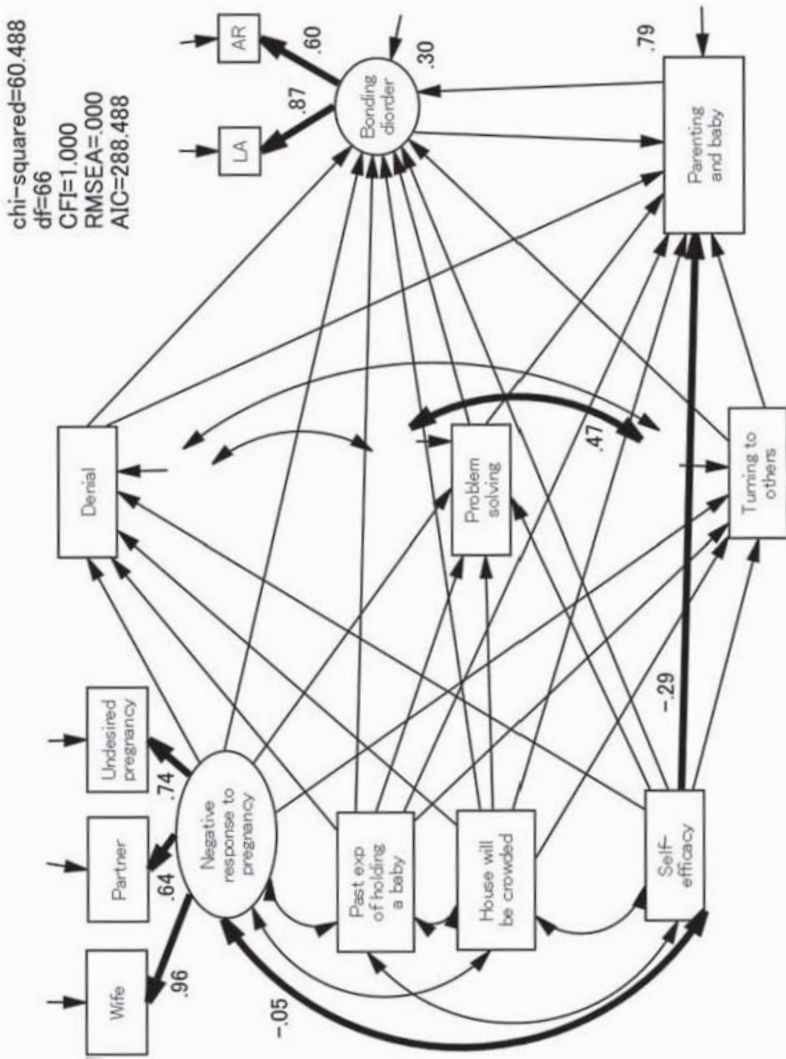


Fig. 9b. Non-recursive multigroup SEM of Bonding Disorder and Parenting and Newborn Behaviours (multiparous women)



Discussion

Our study demonstrated that in 0-order correlational analyses, both LA and AR correlated with NLEs related to Parenting and Newborn Behaviours, whereas only LA correlated with low Self-efficacy during pregnancy. This was consistent with previous investigations that linked bonding disorders with difficult temperament (Hairston, Solnik-Meilo, Deviri, & Handelzalts, 2016), crying (Yalçın et al., 2010) and sleep problems (Hairston et al., 2016) among infants. Such results were also expected given that depression after childbirth was associated with NLEs related to parenting and newborn traits (Hashi et al., 2015). However, caution should be exercised considering that bonding and NLEs were measured simultaneously. Hence, a series of non-recursive SEM analyses were conducted using bidirectional paths between the MBS and NLEs. Our results showed a causal path from Parenting and Newborn Behaviours towards Bonding Disorder but not *vice versa* (Fig. 5). We believe that mothers with a neonate might have felt stressed by parenting difficulties, such as nighttime crying, unsoothability or unstable and unpredictable newborn circadian rhythm. Moreover, no significant paths were found between Bonding Disorder and any other NLE subscale.

Consistent with previous investigations (e.g. Shikai, Shono, & Kitamura, 2009), the three coping behaviour subscales correlated with each other. However, none of them were associated with Bonding Disorder during SEM analyses (Figs. 2 to 4). Among the other predictor variables, only Negative Response to Pregnancy significantly predicted Bonding Disorder after childbirth, which was in line with previous research (e.g. Kokubu, Okano, & Sugiyama, 2012).

To examine the possible moderation effects by parity, a series of multigroup SEM analyses were performed using nulliparous and multiparous women as two separate groups, revealing different presentations. Firstly, among the coping styles, Turning to Others reduced the severity of Bonding Disorder in both nulliparous and multiparous women when considering NLEs related to Interpersonal Relationship and Out-of-Home Activities but only in nulliparous women when considering NLEs related to Parenting and Newborn Behaviours. As noted by many researchers (e.g. Takegata, Hashi, Haruna, & Kitamura, 2014), mothers with a neonate are likely to feel excessive burden due to changes and limitations to out-of-home activities and interpersonal relationships after childbirth. First-time mothers are also likely to feel frustrated by the responsibilities of infant care that are quite new to them. In such occasions, turning to

others for instrumental or informational support may function as a buffer against the adverse effects of NLEs. Compared to men, women have been more likely to use coping strategies that involve verbal expression to others and oneself (Tanres, Janicki, & Helgeson, 2002). Contrary to Turning to Others, Problem Solving was *positively* associated with Bonding Disorder in both nulliparous and multiparous women when considering NLEs related to Physical Symptoms and Body Image and Interpersonal Relationships and Out-of-Home Activities but only in nulliparous women when considering NLEs related to Parenting and Newborn Behaviours. This suggests that women with problem solving styles are more likely to develop bonding disorders. Bodily symptoms, such as fatigue and pain due to episiotomy, may be difficult to alleviate. Moreover, parenting difficulties, particularly for first-time mothers, can be hard to deal with on their own. Therefore, women who eagerly try to solve problems on their own become more stressed and less affectionate towards their baby. For example, women whose partners may not be cooperative with child care are more likely to develop good bonding towards their baby by asking other family members, friends or acquaintances for help rather than confronting and requesting their partner to take responsibility for child care (which may promote frustration).

Another interesting finding from our multigroup SEM analysis was that NLEs related to Physical Symptoms and Body Image and Interpersonal Relationships and Out-of-Home Activities reduced the severity of Bonding Disorder (but not *vice versa*) in both nulliparous and multiparous women. This Simpson paradox is difficult to explain. The Japanese expression 'a baby by hurting one's belly [onaka wo itameta ko]' signifies the cultural emphasis on vaginal delivery. Despite recent trends towards adopting elective Caesarean section and 'painless childbirth', Japanese tradition holds that women become mothers through delivery-induced pain. Some women even feel embarrassed or guilty for not undergoing vaginal delivery. However, such emotions may be offset by several types of physical symptoms after childbirth. Hence, the lack of such bodily symptoms may lead to feelings of guilt and reduced affection towards the baby. The lack of NLEs related to Interpersonal Relationships and Out-of-Home Activities may make mothers pay greater attention to their baby, as well as their own attitudes towards them. This may, in turn, lead to perceptions of increased responsibility as a parent, thereby decreasing affection towards the baby. Bonding Disorder predicted the severity of NLEs related to Parenting and Newborn Behaviours only in nulliparous women, suggesting that mothers who experience bonding

difficulty are more likely to perceive parenting as difficult. Notably, the causal path direction between Bonding Disorder and Parenting and Newborn Behaviours revealed a former-to-latter trend when analysing the group as a whole but the opposite trend when analysing both nulliparous and multiparous women separately. This paradox may exist because of the opposing effects of Bonding Disorder on Parenting and Newborn Behaviours between nulliparous and multiparous women, despite the non-significant effects among multiparous women.

Low self-efficacy directly predicted bonding disorders in both nulliparous and multiparous when considering Physical Symptoms and Body Image and Interpersonal Relationships and Out-of-Home Activities. Women who positively viewed their capacity to cope with difficulty after childbirth were less likely to suffer from Bonding Disorder. Contrary to our expectations, coping styles did not mediate this effect. Low self-efficacy may be a trait that enhances women's vulnerability towards bonding difficulty. However, caution should be exercised with such an interpretation given that self-esteem may be determined by different factors, such as experiences of abuse during childhood (Shikai, Uji, Shono, Nagata, & Kitamura, 2008) among many others. Accordingly, a correlation between postnatal maternal bonding disorders and abuse during childhood could suggest that the effects of self-esteem on postnatal bonding may be confounded by experiences of abuse during childhood.

Of the three coping styles, turning to others was predicted by women's past experiences of holding other women's babies. Such experiences may provide women with actual feelings of child care, possibly leading to insight regarding the need for social support during childrearing. This may mediate the effects past experiences of holding a baby have on LA ($r = -.14$; Table 1).

Clinical implications are multifaceted. The present study showed that turning to others for help was more adaptive while endeavouring to solve problems on their own was less adaptive for mothers with a neonate. Nursing education and guidance should pay more attention to mothers' coping styles and, if necessary, utilise behavioural approaches to improve mothers' skill of seeking help from others without feeling embarrassed or ashamed. Elimination of pregnant women's feelings of shame towards asking for help is a key component of a postnatal depression prevention programme based on interpersonal therapy (Zlotnick, Miller, Pearlstein, Howard, & Sweeney, 2006). This may be utilised for the treatment and prevention of postnatal maternal bonding disorder. Mothers with bonding disorders are likely to perceive childcare as difficult. Accordingly, nurses

and midwives should provide more childcare support to such mothers considering that typical childcare, which may not be unusually difficult for other mothers, may be excessive for such mothers. Given that antenatal self-efficacy can predict postnatal bonding disorders, encouraging self-efficacy among pregnant women may prevent the development thereof (Bandura 1997; Bandura, Adams, & Beyer, 1977; Bandura, Adams, Hardy, & Howells, 1980).

Appropriate social support may be essential for protecting mothers against bonding disorders. A recent study (Ohara et al., 2017) showed that postnatal bonding disorders was predicted by the number of individuals available for social support and not by the degree of satisfaction with the level of social support received during pregnancy. Therefore, perinatal health professionals should assess the availability of social support for pregnant women and determine possible sources of support when insufficient. These may include increasing the availability of support from the partner and other family members, as well as other social sources.

Some limitations of the present study need to be noted. A considerable shortcoming of this study is its sample size, as well as its utilisation of convenience sampling. As such, utmost care should be taken when making generalisations. Nevertheless, an extremely good fit between the model and the data was obtained. This is encouraging and may prompt further replication and expansion studies.

Secondly, although coping styles were treated as a dispositional trait, one report demonstrated that actual coping behaviours may differ from self-reported coping styles. Nonetheless, Shikai, Nagata, & Kitamura (2014) reported that the perceived coping style and actual coping response matched well for task- and emotion-oriented coping. For avoidance-oriented coping, however, perceived coping style and actual coping response were weakly correlated. Actual coping behaviours are elicited by the degree of stress individuals perceive from the event. Therefore, future studies need to consider both perceived coping styles and actual coping behaviours the participants displayed when facing adverse life experiences.

The present study showed that women who reportedly turned to others when exposed to NLEs were less likely to suffer from bonding difficulties. However, the strategy of turning to others may be effective only when social support is provided. Social support may directly or indirectly buffer the adverse effects NLEs have on the onset of psychological maladjustment (Cohen & Wills, 1985). Therefore, expectancy, as well as actual provision of social support, is another important aspect for future research. Support from a partner is what pregnant women expect the most

(Kitamura, Toda, Shima, Sugawara, & Sugawara, 1998a, 1998b). A recent longitudinal cohort study involving pregnant women showed that partners' poor understanding of and support for women's life goals predicted the severity of depression after childbirth (Shinohara et al., 2017). Hence, marital adjustment is also of clinical and research importance.

Cultural aspects may be an issue that needs careful consideration. Our results indicated that Japanese mothers can develop good maternal–infant bonding by turning to others for help and avoiding solving problems on their own. However, Turkish mothers feel less stressed using the self-confidence approach but more stressed using the helpless approach (Deniz & Ayaz, 2014). Nonetheless, such aspects need further investigation.

One flaw in the present study's methodology may be the use of the non-recursive loop model. As noted, this model is based on a few assumptions, which include (a) stationarity of the relationship between the variables over time and (b) equilibrium of the possible effects between the variables. We are uncertain whether the same relationships between bonding disorders and NLEs will be observed on subsequent occasions. We are also not confident whether effects from one to another and *vice versa* had been counterbalanced at the time of observation. Hence, future studies wherein observations are conducted over multiple points (such as weekly observations from childbirth up to 3 months) and recursive SEM can be safely used (Cole, & Maxwell, 2003) are imperative.

The present study considered coping styles as traits. Nonetheless, factors that determine an individual's coping styles remain to be studied. Such factors include, for example, situations wherein coping behaviours occur (McCrae, 1984), demographic features such as age (McCrae, 1982) and gender (Porter & Stone, 1995), social support (Guelzow, Cornett, & Dougherty, 2002), personality traits (Ghazinour, Richter, & Eisemann, 2003; Hooker, Frazier, & Monahan, 1994; Johnson, Sheahan, & Chard, 2003; McCrae, & Costa, 1986; Ruchkin, Eisemann, & Hägglöf, 1999), perceived parenting in childhood (Richter, Richter, & Eiseman, 1991) and childhood abuse experiences (Bal, Van Oost, De Bourdeaudhuij, Crombez, 2003; Himelein, & McElrath, 1996; Hyman, Paliwal, & Sinha, 2007; Leitenberg, Gibson, & Novy, 2004; Runtz & Schallow, 1997; Steel, Sama, Hammond, Whipple, & Cross, 2004; Tremblay, Hébert, & Piché, 1999). The aforementioned confounders should therefore be carefully examined in future studies.

Given our sole reliance on participants' mothers for data collection, single observer biases must also be considered. Accordingly, other informants, such as the mothers' partner, may be asked regarding NLEs.

However, reports from such informants may be less accurate considering that they may spend less time in taking care of the baby and may have less information about the mothers' out-of-home activities.

Bonding disorders may be linked to other psychological maladjustments, such as depression. Depression has been frequently observed during the postnatal period (Kitamura et al., 2005) and has been, to some extent, linked to bonding disorders (e.g. Kitamura, Yamashita, & Yoshida, 2005). Future studies should therefore consider depression as a possible confounding factor. Such a topic is discussed elsewhere in this book.

Taking into account the aforementioned methodological drawbacks, our study demonstrated that coping styles and NLEs, as well as their combination, contributed significantly to the development of postnatal maternal bonding disorders. Such results encourage clinicians to set up preventive measures that can be used before childbirth, as well as interventions when bonding disorders are identified.

Acknowledgements

We thank Dr. H. Nishiguchi and his staff, for their assistance (Mie Prefectural Government). We thank Dr. Y. Atsuta (Atsuta Pediatrics Clinic), Dr. M. Kihira (Saint Rose Obstetrics and Gynecology Clinic), Dr. N. Kihira (Tsu Nishi Obstetrics and Gynecology Clinic), Dr. H. Nomura (Nomura Obstetrics and Gynecology Clinic) and Dr. S. Yanase (Yanase Clinic Obstetrics and Gynecology) for collecting support. We also thank for all the participant women.

This study was partly supported by a Grant-in-Aid for Scientific Research (C) of the Ministry of Education, Culture, Sports, Science, and Technology (14570917).

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CHAPTER SIX

PERSONALITY, POSTNATAL TRAUMATIC SYMPTOMS, AND MATERNAL BONDING DISORDER: A PROSPECTIVE STUDY OF A JAPANESE MOTHER POPULATION

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Abstract

Background: Postnatal traumatic stress symptoms and bonding disorders of mothers are serious issues in perinatal psychiatry. However, their relationship with personality traits has not yet been fully investigated.

Objective: To identify the aetiological relationships between personality, traumatic symptoms due to childbirth, and bonding disorders of mothers.

Methods: Self-administered questionnaires, including demographic data (age, education, household income, obstetric information, and negative response to the pregnancy), the Temperament and Character Inventory (TCI) for measuring personality traits, and the Client Satisfaction Questionnaire (CSQ) for measuring satisfaction with medical staff, were distributed to participants in the third trimester of pregnancy (Wave 1). The other questionnaire included the Impact of Event Scale (IES) for assessing postnatal traumatic symptoms and the Postnatal Bonding Questionnaire (PBQ) for assessing maternal bonding disorder, were also distributed to the same women within five days postpartum (Wave 2) and one month postpartum (Wave 3).

Results: Data of 253 women were analysed using structural equation modelling. The final models revealed no aetiological association between maternal bonding disorders and postnatal traumatic symptoms. Higher self-transcendence and lower personal maturation (lower self-directedness and cooperativeness) were significantly associated with Wave 2 traumatic symptoms, whereas negative response to the pregnancy was significantly associated with maternal bonding disorders, regardless of parity. However, we identified moderation by parity. Thus, lower personal maturation was associated with bonding disorders in the primiparas only, whereas this association lost significance in the multiparas. Harm avoidance was only linked to bonding disorders in the primiparas. Additionally, less satisfaction with medical staffs was associated with traumatic symptoms in the primiparas, but with bonding disorder in the multiparas.

Conclusion: We identified that postnatal traumatic symptoms and maternal bonding disorders have different aetiology in terms of their associations to personality traits and other psychological features.

Key words: bonding disorders; Japanese; personality; postnatal women; traumatic stress

Introduction

Although perinatal health professionals have been focusing on maternity blues, perinatal depression, and postpartum psychosis, a variety of other mental disorders exist during the pregnant and postpartum periods: anxiety disorders including tokophobia (fear of childbirth), traumatic symptoms due to childbirth, and bonding disorders (Brockington, 2004; Brockington, Aucamp, & Fraser, 2006a). These mental health disorders not only cause problems during pregnancy and delivery, such as low birth weight of child, but also increased suicidal ideation of mothers, child maltreatment, and problems with child development (Grote, et al., 2010; Murray & Cooper, 1997; Ohashi, Sakanashi, Tanaka, & Kitamura., 2016; Patel & Prince, 2006). These mental disorders were often dismissed by clinical staff due to lack of awareness, knowledge, and evidence. However, an increasing interest among researchers and clinicians has been seen in postnatal traumatic stress symptoms and bonding disorders of mothers.

Postnatal traumatic symptoms, triggered by a traumatic childbirth, are mainly as follows (American Psychiatric Association, 2013): (a) re-experiencing of traumatic events (e.g., recurrent dreams and flashbacks), (b) avoidance of situations that remind one of the traumatic events, (c) negative cognitions and moods related to the traumatic experiences (e.g., self-blame or blame to others, loss of interests in activity), and (d) alterations in arousal and reactivity (e.g., aggressiveness, sleep disturbances, hyper vigilance). Because childbirth itself is uncertain and situations may change abruptly to abnormality, some women may perceive childbirth as traumatic regardless of the presence of adverse processes, such as an emergency Caesarean section (Olde, van der Hart, Kleber, & van Son., 2006; Soderquist, Wijma, Thorbert, & Wijma., 2009). Around one in three postpartum women have expressed one or more traumatic stress symptoms (Grekin & O'Hara, 2014; Olde et al., 2006) and 1–15 % of women meet the Post Traumatic Stress Disorder (PTSD) criteria (American Psychiatric Association, 2013; Grekin & O'Hara, 2014).

Maternal bonding disorders are another issue in both developing and developed countries. Bonding, the emotional connection of a mother to her newborn, is strongly important for establishing the mother–infant relationship in their lives and for the development of the infant (Brockington, Macdonald, & Wainscott., 2006b). Sadly, some mothers lack the feeling of love toward their infant, and instead feel hatred toward their baby. Brockington (1984) may have been the first to discuss the issue of “maternal bonding disorder”

in perinatal psychiatry (Brockington & Brierley, 1984; Kumar, 1997). Although the bonding tie to their baby manifests positive behaviours such as seeking, touching, talking, and smiling, mothers with bonding disorders lack affection or feel hatred, parent abusively or with anger, and may reject or neglect their infant (Brockington, MacDonald, et al., 2006). Maternal bonding disorders have been strongly associated to child maltreatment or child abuse (Ohashi, Sakanashi, et al., 2016). According to previous reports (Brockington et al., 2006b), around one in four mothers who were referred to psychiatrists due to abusive parenting had a bonding impairment. Matsunaga, Takauma, Tada, and Kitamura (2017) performed a two-step cluster analysis with 723 new mothers in Japan with the items on the Mother-to-Infant Bonding Scale and reported two discrete clusters, one of which was interpreted as a pathological bonding disorder group. The prevalence of this group was 14%.

A common misunderstanding is that a mother with “depressive symptoms due to impaired mother infant interactions” is more likely to abuse their child (Brockington et al., 2006b) from the findings that depressive symptoms and bonding disorders are correlated to each other in several cross-sectional studies (Dubber, Reck, Muller, & Gawlik., 2014; Edhborg, Nasreen, & Kabir., 2011; Edhborg, Matthiesen, Lundh, & Widström, 2005; Figueiredo, Costa, Pacheco, & Pais., 2009; Kerstis et al., 2016; Kinsey, Baptiste-Roberts, Zhu, & Kjerulf., 2014; Moehler, Brunner, Wiebel, Reck, & Resch., 2006; Muzik et al., 2013; Nonnermacher, Noe, Ehrental, & Reck., 2016; O’Higgins, Roberts, Glover, & Taylor., 2013; Ohoka et al., 2014; Sockol, Battle, Howard, & Davis., 2014; Wittkowski, Wiek, & Mann., 2007; Song et al., 2017; Sugishita, Kamibeppu, & Matsuo., 2016). However, a longitudinal study showed bonding disorders, and not depression, were a significant predictor of psychological or emotional abuse, indicating that identification of mothers with bonding impairment is of critical importance (Ohashi, Sakanashi, et al., 2016). While postnatal traumatic symptoms and maternal bonding disorders are to be given priority, insufficient evidence regarding their backgrounds and etiology exists.

The research question in this study is two-fold. The first is whether etiological relationships exist between postnatal traumatic symptoms and maternal bonding disorders. We wanted to determine if posttraumatic symptoms related to delivery cause maternal bonding disorders, or if maternal bonding disorders cause posttraumatic symptoms. Previous qualitative studies (Allen, 1998; Beck, 2004) showed that postpartum women suffering from traumatic symptoms would claim emotional intensity and detachment from their child; they would easily lose their temper and be

less patient with their child and had difficulties when dealing with the problems of others. To the best of our knowledge, however, no quantitative study has been reported for this issue. This is an issue of both research and clinical importance.

The second question was to determine how personality traits are linked to bonding disorders and traumatic symptoms related to delivery. Only a few studies examined the associations between personality traits and these mental disorders. Keogh, Ayers, and Francis (2002) found that anxiety sensitivity influenced postnatal traumatic symptoms via mediation by fear or anxiety during pregnancy. Personality traits may predict the course and treatment response. Therefore, exploring their relationship may be important to understand their aetiologies.

One of the most widely used personality measures is Temperament and Character Inventory (TCI: Cloninger, Przybeck, Svrakic, & Wetzel, 1994), developed based on a personality model including temperament and character domains. Temperament refers to “automatic emotional responses to experience that are moderately heritable and stable throughout life” consisting of four dimensions: Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD), and Persistence (PS). Character is defined as “self-concepts and individual differences in goals and values, which influence voluntary choices, intentions, and the meaning of what is experienced in life”. The character domain consists of three dimensions: Self-directedness (SD), Cooperativeness (C), and Self-transcendence (ST).

Temperament and character dimensions have been found to be associated with depression in previous reports; women with high HA and low SD and low C are more likely to have depression (Celikel et al., 2009; Furumura et al., 2012; Jylha & Isometsa, 2006; Matsudaira & Kitamura, 2006). In addition, some researchers found a significant association of ST and PS with antenatal depression (Minatani et al., 2013). Fewer studies exist about the link of personality traits and posttraumatic stress disorder (PTSD), not necessarily related to childbirth. For example, Yoon, Jun, An, Kang, and Jun (2009) studied young adults ($n = 65$) with PTSD with age- and gender-matched controls, and found that patients with PTSD showed significantly higher scores on the subscales of HA and ST, and lower scores on SD and C than the controls. Other studies examined adolescent populations. Ruchkin, Eisemann, & Hägglöf (1998) studied juvenile male rape victims and reported that those with high trauma symptoms were characterised by higher HA and RD. The same author group reported that male delinquents with some degree of PTSD were characterised by high HA and ST and low SD. Gil's (2005) study was unique in that the undergraduate students who

were studied about their personality traits were, about 2 weeks later, accidentally exposed to a terrorist explosion on a bus. Gil found that a logistic regression analysis showed that age and HA were positively associated with the risk for developing PTSD, and that NS was negatively associated with this risk. Although delivery-related trauma symptoms may differ from those in accidents and disasters in terms of their association with personality traits, high HA, RD, and ST, and low NS and SD may be associated with PTSD.

In terms of maternal bonding disorders, the association with personality traits has rarely been studied. However, pregnancy and childbirth followed by child rearing is an important and drastic life change (Feeney, Alexander, Noller, & Hohaas., 2003; Ferren, vonWyl, Burgin, Simoni, & von Klizing., 2005; Simpson, Rholes, Campbell, Tran, & Wilson, 2003; Sokol & Battle, 2015). Transition to parenthood may be stressful, particularly for those women with low personality maturation. Such women may find it difficult to perform everyday parenting jobs that require practical skills and flexible judgment. Those mothers may struggle with the continuous chores of child rearing. Therefore, these women may not be able to obtain a feeling of being a mother without difficulty.

To confirm the association between personality traits and mental disorders, attention must be paid to potentially confounding factors. For example, a negative response of the woman toward the news of the current pregnancy was reported to be linked to postnatal bonding disorders. In addition, pregnant women's satisfaction with the medical care in general would predict better bonding toward the neonate after childbirth (Hashi et al., 2014). Because these variables may function as either a confounder or a mediator, structural equation modelling (SEM) analysis would be the best method to consider such multiplicity in the model.

The purposes of this study were to identify the causal relationships between traumatic symptoms due to childbirth and bonding disorders of mothers, and to examine aetiological associations of personality traits with the above two conditions.

Methods

Participants

The data for this study were obtained from the 2011 Kumamoto community study. In this study, the local Kumamoto Prefecture government

requested participation for this research from all 55 obstetric clinics in the Prefecture. This is a follow-up on the mental health status during the perinatal period in pregnant women in the community. To this request, 18 (33%) antenatal institutes responded to the affirmative. The participant institutions included one university hospital, 12 public and private hospitals, and five private clinics. Hence, we considered this a well-balanced mixture of the different types of antenatal institutions. The inclusion criteria were women aged 20 years or over of at least 28 weeks' gestation, who attended one of these antenatal clinics during the month of November 2011. We excluded women who were illiterate in Japanese, who had a severe mental illness, or who had been hospitalised with pregnancy complications. Sets of questionnaires were distributed during the third trimester of pregnancy (Wave 1), and at five days after (Wave 2) and one month after childbirth (Wave 3). They were returned to the researcher (TK) by a stamp-added envelop. The total number of eligible women was 1538. The number of participants who sent back the questionnaires varied between the three waves. A total of 633 (41%), 445 (29%), and 392 (26%) responded during pregnancy, five days after, and one month after childbirth, respectively. A total of 257 women (17%) returned all three questionnaires. Among these women, four gave birth to twins. Therefore, these four women were excluded from the subsequent analyses. The remaining data from the 253 were used for the analyses.

Measurements

Traumatic Symptoms: We used the Japanese version (Takegata, Kitamura, Haruna, Sakanashi, & Tanaka., 2014) of the Impact of Event Scale (IES) (Horowitz, 1974). This is a well validated self-report of traumatic stress symptoms, consisting of 15 items with two dimensions (Intrusion: seven items, and Avoidance: eight items), rated on a 5-point scale (0 to 4). Higher scores indicate more severe traumatic stress symptoms. To focus exclusively on the delivery-related trauma, we added, "How was your childbirth experience?" just before the 15 IES items. The IES was distributed to participants 5 days (Wave 2) and 1 month after childbirth (Wave 3).

Postnatal Maternal Bonding Toward the Infant: We used the Japanese version (Kaneko & Honjo, 2014) of the Postnatal Bonding Questionnaire (PBQ) (Brockington et al., 2001). The PBQ is a self-rating questionnaire that assesses parents' attitudes and emotions towards their new-born infants.

It consists of 25 items rated on a 6-point scale (0 to 5). Higher scores indicate a more negative attitude toward the baby. Although investigations have reported different factor structures of this scale, Ohashi et al. (2016b) reported that the Japanese version of the PBQ had a 3-factor structure: Lack of Affection (LA), Rejection and Fear (RF), and Anger and Restrictedness (AR). LA is associated with mothers' lack of maternal affection and intimacy towards their babies. RF relates to maternal rejection and internal fear of their babies. The third subscale, AR, relates to mothers' annoyance with or anger toward their babies and their feeling that they were "trapped" by parenting. Ohashi, Kitamura et al. (2016) demonstrated sound reliability and validity of the instrument. In the present study, the PBQ was distributed to participants 5 days (Wave 2) and 1 month after childbirth (Wave 3).

Personality: We used the Japanese version (Kijima et al., 1996) of the 130-item Temperament and Character Inventory (TCI: Cloninger, Przybeck, Svrakic, & Wetzell, 1994). Because of the relative small number of PS items on the 125-item TCI, Kijima, Tanaka, Suzuki, Higuchi & Kitamura (2000) suggested the addition of five more PS items to increase the internal reliability of the scale. The TCI measures temperament and character dimensions. Temperament has four dimensions: NS, HA, RD, and PS. Character has three dimensions: SD, C, and ST. The original TCI adopted dichotomous (true or false) scales but Kijima et al. (1996) modified them into a 4-point scale (0 to 3) to obtain better internal consistency of subscales among Japanese populations. The reliability and factor validity of the Japanese version of the TCI were reported by Kijima et al. (2000) and Takeuchi et al. (2011). In the present study, we administered the TCI during the pregnancy period.

Demographic and Obstetric Variables: We recorded each woman's age, parity (primiparous/multiparous), number of children, and response to this current pregnancy (from very displeased: 1 to very pleased: 5). Regarding obstetric information, pregnancy complications, such as pregnancy hypertension, placenta previa, and anomaly of the foetus, and birth outcomes, including planned and emergency Caesarean sections, and delivery complications, were obtained from medical charts.

Women's Satisfaction with Medical Care: We asked about satisfaction with medical services the participant had received using the Japanese version (Tachimori & Ito, 1999) of the Client Satisfaction Questionnaire (CSQ) (Larsen, Attkisson, Hargreaves, & Nguyen, 1979). The CSQ is a self-report assessing clients' satisfaction with all types of medical services in general. It consists of eight items rated on a 4-point scale (1 to 4). Higher scores indicate the greater satisfaction of the client. Good reliability and

validity of the Japanese version has been reported (Tachimori & Ito, 1999).

Data Analyses

Little's test for missing completely at random (MCAR) showed that MCAR could not be rejected ($\chi^2 = 33882.495$, $df = 41717$, $p = 1.00$). Nevertheless, we imputed missing values using the means of multiple imputation method.

The Pearson product-moment correlation coefficient (r) was designated as weak ($0.10-0.29$), moderate ($0.30-0.49$), or high (≥ 0.50), depending on the value of r (Cohen, 1988). We correlated the scores of the IES subscales with those of the PBQ subscales. We then correlated the scores of the IES and PBQ subscales with the other possible predictor variables. For correlational analyses of the variables used in this study, we set the significance level at $p < 0.001$ because of the multiple comparisons.

Structural equation modeling (SEM) was used to reveal the aetiological relationships. When building the path models, we set latent variables of Trauma as well as Bonding Disorders at both Waves 2 and 3. Each latent variable consisted of the subscales of the IES and PBQ instruments. As exogenous variables of the model, we used predictor variables that were significantly correlated with either of the IES or PBQ subscale scores. Considering possible moderation effects caused by the parity of the participants, we performed a multi-group SEM for the primiparous and multiparous women as two separate groups.

All the statistical analyses were conducted using SPSS version 20.0 and Amos 24.0.

Procedure

Participants were asked to complete the questionnaire at home and to return it to one of the researchers (T.K.) using a stamp-added envelope. The present study was approved by the Ethical Committee of Kumamoto University Graduate School of Life Sciences.

Results

Characteristics of the Sample Women

Of 1442 eligible women, 633 (44%), 445 (31%), and 392 (27%) returned the questionnaires during Waves 1, 2, and 3, respectively. A total of 257 women (17%) returned all the questionnaires from each of the three time-points. We excluded four cases from the subsequent analyses because of twin babies. Therefore, the remaining 253 cases were subjected to further analyses.

The majority of women delivered at public hospitals ($n = 212$, 83.8%) (Table 1). More than 90% of the participants were married. The mean (SD) of their age was 30.2 (4.7). The mean (SD) of their partner's age was 32.3 (6.1). Forty-seven percent of women ($n = 119$) were primiparas. Only 9.5% had an emergency Caesarean section. The sex of the new-born was even between boys and girls.

Table 1. Characteristics of the analysed women.

	N (Mean)	SD (%)	Range
<i>Antenatal Institution</i>			
University hospital	8	(3.2)	
Public clinics	212	(83.8)	
Private clinics	24	(9.5)	
unknown	9	(3.5)	
<i>Marital Status</i>			
Married	245	(96.8)	
Single	4	(1.6)	
Unknown	4	(1.6)	
Own age	30.2	4.7	20–42
Partner's age	32.3	6.1	20–63
<i>Number of Children</i>			
0	119	(47.0)	
1	84	(33.2)	
2	37	(14.6)	
3	1	(0.4)	
4	2	(0.8)	
5	1	(0.4)	
Unknown	9	(3.6)	

<i>Number of Lost Children</i>		
0	238	(94.1)
1	5	(2.0)
2	1	(0.4)
Unknown	9	(3.5)
<i>Pregnancy Complications</i>		
Yes	115	(45.6)
No	128	(50.6)
Unknown	10	(3.8)
Threatened abortion	13	(5.1)
Early rupture	1	(0.3)
Placenta previa	0	(0.0)
Cervical incompetency	0	(0.0)
Pregnancy hypertension	0	(0.0)
Foetal abnormality	0	(0.0)
<i>Delivery Complications</i>		
Yes	70	(27.7)
No	172	(68.0)
Unknown	11	(4.3)
<i>Mode of Delivery</i>		
Vaginal	194	(76.7)
Planned Caesarean	22	(8.7)
Emergency Caesarean	24	(9.5)
Unknown	13	(5.1)
<i>Sex of the Neonate</i>		
Boy	121	(47.8)
Girl	121	(47.8)
Unknown	11	(4.4)

Delivery-Related Trauma Symptoms and Postnatal Bonding Disorders

The IES subscales and the PBQ subscales were correlated with each other on the same time-occasions (Table 2). Particularly, IES Avoidance was significantly correlated with RF and AR subscales at both Waves 2 and 3. The IES subscale scores on day 5 predicted the PBQ subscale scores 1 month postnatally and vice versa. Thus, W2 Avoidance predicted W3 RF ($r = 0.31, p < 0.001$) and AR ($r = 0.23, p < 0.001$) scores, whereas W2 RF predicted W3 Avoidance ($r = 0.29, p < 0.001$).

Table 2. Means and SDs of the Impact Event Scale (IES) and Postnatal Bonding Questionnaire (PBQ) subscales and their correlations.

	Mean (SE)	5 days after childbirth		1 month after childbirth	
		Intrusion	Avoidance	Intrusion	Avoidance
W2	1.91	0.09	0.15*	0.08	0.14*
LA	(0.22)				
W2	0.50	0.18**	0.31***	0.10	0.29***
RF	(0.09)				
W2	9.00	0.18**	0.25***	0.15*	0.21**
AR	(0.42)				
W3	1.82	0.08	0.16*	0.10	0.15*
LA	(0.22)				
W3	0.48	0.17**	0.31***	0.13*	0.30***
RF	(0.09)				
W3	9.94	0.20**	0.23***	0.15*	0.23***
AR	(4.47)				
Mean		5.71	1.16 (1.46)	4.00	0.73 (0.10)
(SE)		(0.27)		(0.24)	

* $p < .05$; ** $p < .01$; *** $p < .001$ W2, 5 days after childbirth; W3, 1 month after childbirth; LA, lack of affection; RF, rejection and fear; AR, anger and restrictedness.

IES and PBQ Subscales and Demographic and Other Variables

Both parity (primiparas: 0, multiparas: 1) and the number of children were negatively correlated with W3 AR ($r = -0.25$ and -0.25 , both $p < 0.001$) (Table 3). The women’s negative response to the current pregnancy was significantly associated with W2 LA and RF scores ($r = 0.35$ and 0.31 , both $p < 0.001$). The W1 CSQ data were significantly correlated with W2 and W3 AR ($r = -0.29$ and -0.28 , both $p < 0.001$). The W2 CSQ data were significantly correlated with W2 and W3 LA and AR ($r = -0.24$, -0.34 , -0.23 , and -0.26 , respectively, $p < 0.001$). In addition, W2 CSQ was significantly correlated with W2 RF ($r = -0.29$, $p < 0.001$). The women’s and their partner’s age, pregnancy, and delivery complications were not associated with any of the PBQ and IES subscale scores.

Table 3. Correlations between the PBQ and IES subscales and demographic, obstetric, and other variables.

	M (SE)	5 days after childbirth					1 month after childbirth				
		LA	RF	AR	INT	AVD	LA	RF	AR	INT	AVD
Age	30.1 (0.3)	.12	-.06	-.03	-.06	-.11	.08	-.01	-.01	-.08	-.14*
Husband's age	32.3 (0.4)	.07	-.10	-.15*	-.10	-.14*	.10	-.02	-.08	-.11	-.08
N of children	0.70 (0.05)	.04	-.09	-.15*	-.15*	-.12	-.04	-.14*	-.25***	-.13	-.13*
Parity (nullipara = 0; Multipara = 1)	0.52 (0.03)	.05	-.10	-.16*	-.13*	-.12	.01	-.14*	-.25***	-.08	-.10
Negative response to the pregnancy	1.29 (0.04)	.35***	.31***	.22**	.05	.07	.30**	.30**	.18**	-.01	.02
Pregnancy complications	0.28 (0.04)	-.02	-.06	-.04	-.04	-.02	-.07	-.09	-.03	.01	-.04
Delivery complications	1.71 (0.46)	.03	.03	-.04	.01	-.06	.08	-.04	-.02	.02	-.09
W1 CSQ	17.7 (0.2)	-.12	-.12	-.29***	-.09	-.15*	-.11	-.10	-.28***	-.05	-.09
W2 CSQ	19.5 (0.2)	-.24***	-.29***	-.34***	-.03	-.14*	-.23***	-.16*	-.26***	-.03	-.05
W3 CSQ	19.1 (0.3)	-.18**	-.14*	-.23***	-.08	-.11	-.18**	-.06	-.17*	-.02	-.02

* $p < .05$; ** $p < .01$; *** $p < .001$; W1, late pregnancy; W2, 5 days after childbirth; W3 1 month after childbirth; LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness; INT, Intrusion; AVD, Avoidance; CSQ, Client Satisfaction Questionnaire.

Only the W3 RF subscale scores differed between the three modes of delivery; it was higher in the emergency Caesarean section group (Mean = 1.00, SE = 0.50) than in the vaginal delivery group (Mean = 0.36, SE = 0.07, $F = 3.6$, $p < 0.05$) (Table 4). The significance was, however, at $p < 0.05$.

Among the personality traits, HA was associated with W2 and W3 IES Avoidance and W3 PBQ AR ($r = 0.24$ and 0.24 , respectively; $p < 0.001$) (Table 5). Negative correlations were seen between SD and C and the W2 and W3 PBQ AR (SD: $r = -0.27$, -0.38 ; C: $r = -0.31$, -0.32 , all $p < 0.001$). In addition, low SD was associated with W2 Intrusion and Avoidance and W3 RF and Avoidance ($r = -0.29$, -0.33 , -0.27 , and -0.27 , all $p < 0.001$). ST was associated with W2 and W3 Intrusion ($r = 0.35$ and 0.27 , respectively; $p < 0.001$).

Table 4. Associations of the PBQ and IES subscales with the mode of delivery.

Model of delivery (n)	5 days after childbirth					1 month after childbirth				
	LA	RF	AR	INT	AVD	LA	RF	AR	INT	AVD
Vaginal (198)	1.61 (0.21)	0.44 (0.08)	8.95 (0.48)	5.58 (0.30)	1.08 (0.15)	1.51 (0.21)	0.36 (0.07)	9.60 (0.51)	3.87 (0.27)	0.64 (0.10)
Caesar (22)	3.27 (1.37)	0.50 (0.29)	8.86 (1.18)	8.05 (0.95)	2.19 (0.75)	3.05 (1.21)	0.45 (0.22)	11.27 (1.20)	5.64 (0.99)	1.50 (0.64)
Emergency Caesar (25)	3.32 (0.84)	1.00 (0.49)	10.33 (1.45)	4.88 (0.72)	0.92 (0.43)	2.88 (0.82)	1.00 (0.50)	11.63 (1.58)	3.48 (0.56)	0.88 (0.36)
F	4.4*	1.9	0.5	3.9	2.5	3.5*	3.6*	1.3	2.4	2.8
Post hoc comparison	None	—	—	—	—	None	V < EC	—	—	—

() indicates standard error. * $p < .05$; LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness; INT, Intrusion; AVD, Avoidance

Table 5. Correlations between the PBQ and IES subscales and personality traits.

	M (SE)	5 days after childbirth					1 month after childbirth				
		LA	RF	AR	INT	AVD	LA	RF	AR	INT	AVD
NS	24.8 (0.4)	-.02	.11	.19**	.22**	.14*	.02	.11	.20**	.078	.11
HA	33.4 (0.5)	.17**	.18**	.20**	.13*	.24***	.11	.10	.24***	.18**	.23***
RD	29.1 (0.3)	-.09	-.02	-.16*	.06	-.05	-.12	-.13*	-.16*	.05	-.08
P	16.4 (0.2)	-.15*	-.09	-.09	.09	.03	-.11	.06	.02	.11	.06
SD	44.0 (0.6)	-.10	-.21**	-.26***	-.29***	-.33***	-.20**	-.27***	-.38***	-.20**	-.27***
CO	49.6 (0.4)	-.06	-.20**	-.31***	-.17*	-.26***	-.11	-.19**	-.32***	-.11	-.18**
ST	17.6 (0.4)	-.05	-.05	-.08	.35***	.21**	-.01	.06	-.03	.27***	.13

* $p < .05$; ** $p < .01$; *** $p < .001$. LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness; INT, Intrusion; AVD, Avoidance; NS, Novelty Seeking; HA, Harm Avoidance; RD, Reward Dependence; P, Persistence, SD, Self-directedness, CO, Co-operativeness; ST, Self-transcendence

Structural Equation Modelling

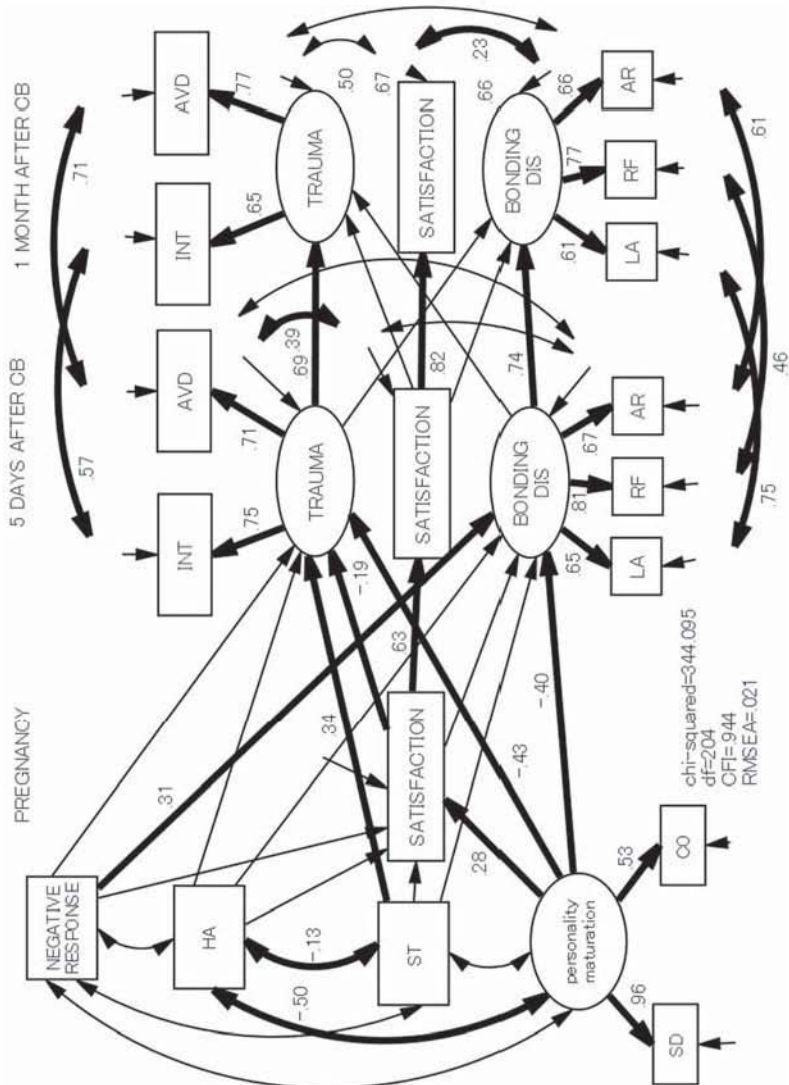
We formed SEM models based on the results of bivariate correlations. In addition to the construction of two latent variables, Trauma and Bonding Disorders, determined from the subscale scores of the IES and PBQ, we constructed another latent variable of personality maturation consisting of SD and CQ as observational variables. This is because these two dimensions have been strongly correlated in many studies (Kijima et al., 2000). Considering birth parity as a moderator variable, multi-group SEM models were separately constructed for the primiparas and multiparas (Figures 1 and 2). This model revealed acceptable fit ($CMIN/\chi^2 = 1.68$, $CFI = 0.944$, $RMSEA = 0.021$).

As expected, the W2 Trauma and Bonding Disorders predicted their counterparts at W3 (Trauma, $\beta = 0.69$ and 0.71 , $p < 0.001$; Bonding Disorders, $\beta = 0.77$ and 0.82 , $p < 0.001$). However, the W2 Bonding Disorders were not a predictor of W3 Trauma nor was the W2 Trauma a predictor of W3 Bonding Disorders, regardless of parity. Therefore, we rejected the hypothesis of causal relationship between delivery-related traumatic symptoms and postnatal bonding disorders. Similarly, the CSQ scores at one time-point significantly predicted the CSQ scores at the next time-point for both primiparas and multiparas.

In both primiparas and multiparas, a negative response toward the current pregnancy significantly predicted W2 Bonding Disorders ($\beta = 0.31$ and 0.22 , $p < 0.001$) but not W2 Trauma.

Primiparas and multiparas differed in terms of the association of CSQ and TCI subscales with Trauma and Bonding Disorders. In primiparas, W2 Trauma was predicted by ST ($\beta = 0.34$, $p < 0.001$), Personality Maturation ($\beta = -0.43$, $p < 0.001$) and the CSQ ($\beta = -0.19$, $p < 0.05$), whereas W2 Bonding Disorders were predicted by Personality Maturation ($\beta = -0.40$, $p < 0.001$). However, in the multiparas group, W2 Trauma was predicted by ST ($\beta = 0.28$, $p < 0.05$) and Personality Maturation ($\beta = -0.50$, $p < 0.001$) but not by the CSQ, whereas W2 Bonding Disorders were predicted by HA ($\beta = 0.20$, $p < 0.05$) and W1 CSQ ($\beta = -0.29$, $p < 0.001$) but not by Personality Maturation. Both W1 and W2 CSQ, in the primiparas and multiparas, were predicted by Personality Maturation ($\beta = 0.28$, $p < 0.001$ and $\beta = 0.22$, $p < 0.05$, respectively). Only among the multiparas, was the W2 CSQ predicted by the women's negative response to the current pregnancy.

Figure 1. Primiparous women. Statistically significant paths are in bold with standardized path coefficients. Fine lines are paths without statistical significance. INT, Intrusion; AVD, Avoidance; LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness; HA, Harm Avoidance; SD, Self-directedness; CO, Cooperativeness; ST, Self-transcendence.



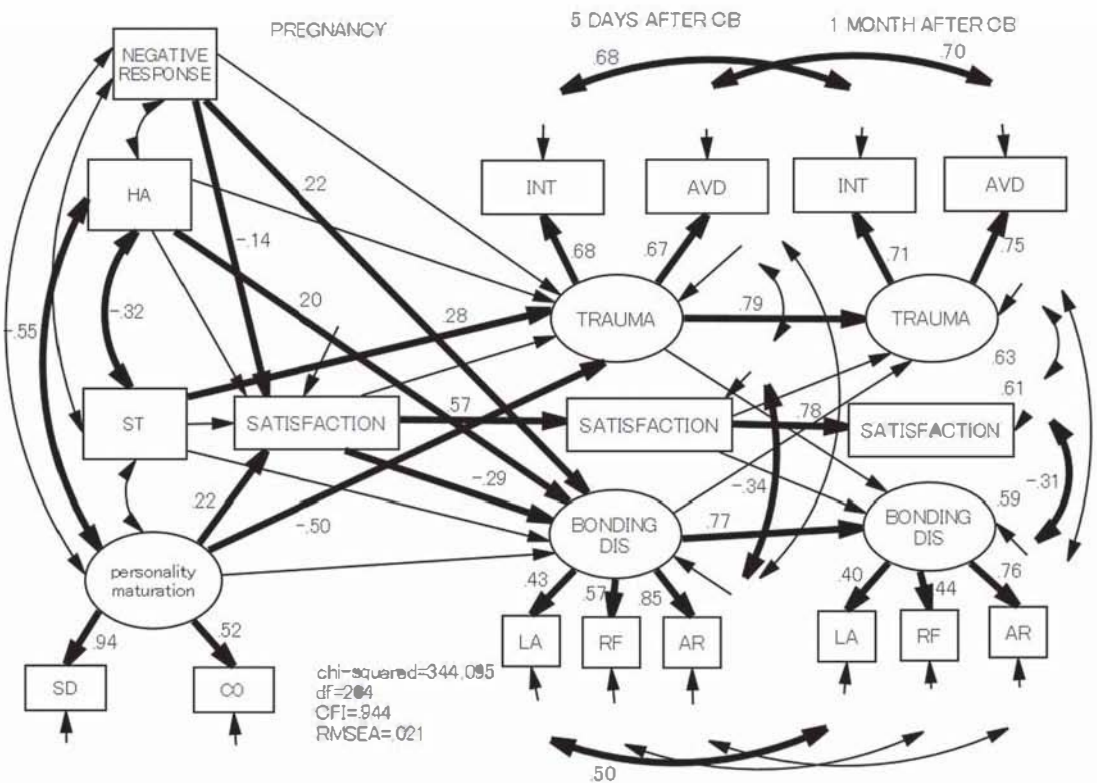


Figure 2. Multiparous women. Statistically significant paths are in bold with standardized path coefficients. Fine lines are paths without statistical significance. INT, Intuition; AVD, Avoidance; LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictiveness; HA, Harm Avoidance; SD, Self-directedness; CO, Co-operativeness; ST, Self-transcendence.

Discussion

Major Findings

This study investigated the aetiological relationships between personality traits, traumatic symptoms due to childbirth, and bonding disorders of mothers after childbirth. Major findings included (1) there was no aetiological association between maternal bonding disorders and postnatal traumatic symptoms, (2) different personality traits were associated with the delivery-related traumatic symptoms and postnatal bonding disorders in primiparas and multiparas, and (3) parity showed mediating effects on the association of personality traits with the delivery-related traumatic symptoms and postnatal bonding disorders. Delivery-related traumatic symptoms and postnatal bonding disorders shared some predictor variables, regardless of parity. Thus, both in the primiparas and multiparas, higher ST and lower personal maturation, including low SD and C●, were significantly associated with W2 Trauma, whereas a negative response toward the present pregnancy was a predictor of W2 Bonding Disorders. However, the groups differed in other areas. The primiparas were characterised by prediction of W2 Bonding Disorders by personality maturation, whereas the multiparas were characterised by prediction of W2 Bonding Disorders by high HA.

Aetiological Relationship Between Postnatal Traumatic Symptoms and Maternal Bonding Disorder

We hypothesized that delivery-related traumatic symptoms would influence the onset of maternal bonding disorders. We speculated that women who had experienced traumatic deliveries would be less likely to have an affectionate bond toward their baby. Although cross sectional correlations between the IES scores and the PB● scores were identified, the longitudinal results of our recursive SEM revealed no significant aetiological relationships. These findings indicate that mothers suffering from traumatic symptoms may have detachment from their baby as a comorbid symptom. However, this comorbidity may not be a causal relationship but may be a confounding third variable. They may include low SD and C● identified in this study, and those that were not included in our study.

Correlations of Postnatal Traumatic Symptoms

Having reviewed the literature, we hypothesised that high HA, RD, and ST, as well as low NS and SD, would be associated with PTSD. Correlational analyses revealed that the IES subscale scores were associated with high HA and ST, and low SD. Contrary to our expectation, NS was positively associated with trauma symptom scores. RD was associated with neither of the two IES subscale scores.

Notably, in our SEM model, lower Personality Maturation and higher ST significantly predicted the onset of traumatic symptoms early postpartum in both the primiparous and multiparous groups. Low SD and C● are a hallmark of an individual's vulnerability to a stressful situation. People with low SD are likely to have personality disorders and those who are low in C● see the world and others as hostile and alien to them (Cloninger, Svrakic, & Przybeck., 1993). Hence, low SD and C● may also be underlying causes of the onset of traumatic symptoms after childbirth.

According to Cloninger et al. (1994), a person with high ST is often described as “unpretentious, fulfilled, patient, creative, selfless and spiritual”, and has adaptive advantages in crises such as when confronting illness, death, and aging. Usually, higher ST is not been reported as being linked with personality disorders or psychosis, but some other investigations reported that high ST may be linked to bipolar disorders (Cloninger, Svrakic, & Przybeck., 2006; Farmer & Seeley, 2009; Harley, Wells, Frampton, & Joyce., 2011; Minatani et al., 2013). Individuals with high ST are often “criticized for being naive, magical thinking, and subjective idealism”; they may regard their childbirth not only as a physical event but also as a spiritual or holistic event, thus feel their childbirth more sensitively with their body and mind. Therefore, they may be more vulnerable to the event and expressing traumatic symptoms than others.

Personality maturation, consisting of C● and SD, may play a role as a buffer complementing other vulnerable temperament and/or characteristics such as high ST, high HA, and high NS (Cloninger et al., 1994). People with higher ST may be vulnerable to the childbirth event but personality maturation may prevent women from the onset of a variety types of psychopathology.

In general, lower satisfaction with medical services was related to the onset of traumatic symptoms only among the primiparas. The perceived availability of social support reduces the risk of the development of postnatal traumatic symptoms (Ford & Ayers, 2011). For pregnant women,

support from perinatal health professionals, such as nurses, midwives, and obstetricians, may be instrumental as well as emotional in nature. Therefore, the women's satisfaction with the medical services may function as an important source of social support. However, the failure of medical staff to establish rapport with mothers during pregnancy may cause a more stressful situation during childbirth, leading to trauma symptoms. Such influences may be stronger among the primiparas because expecting the first baby may be more stressful for them compared to the multiparas.

Correlations of Maternal Bonding Disorders

A negative response to the pregnancy predicted postnatal bonding disorders regardless of parity. Lower personal maturation was identified as factors in the primiparous groups, whereas high HA and lower satisfaction with medical services were related in multiparous group.

The finding that a woman's negative response toward the current pregnancy was related to maternal bonding disorders is consistent with previous studies (Kokubu, Okano, & Sugiyama, 2012). In modern society, both men and women pursue their working career, and an unexpected or unplanned pregnancy sometimes throw both the woman and their partner into crisis because they are forced to transform their relationship and handling their own working environment. In addition, an unexpected pregnancy when younger is a more serious issue to the woman, husband, and their family. The reason why the current pregnancy was unexpected or undesired should also be investigated. This may be linked to poor communication between spouses and possibly poor marital adjustment or adult attachment. Another important issue is that although the current pregnancy was not welcomed by the woman, they had decided to continue the pregnancy rather than choosing selective abortion. This ambiguity of feeling should be the focus of research and clinical practice. Therefore, perinatal health professionals should be even more aware of such situations and be attentive to a woman's attitude toward pregnancy. This is important from the earliest stage of pregnancy.

Our study was unique in that the moderation of parity was seen on the effects of personality traits upon bonding disorders. Thus, high HA was related to maternal bonding disorder only in multiparous women whereas low personality maturation was associated with bonding disorders only in primiparous women. SD and C are linked to increasing age. Primiparas are usually younger and may be more vulnerable to the underdevelopment

of personality when establishing affectionate ties with the baby. However, multiparas are usually older and more mature. In this population, the HA trait may be a vulnerability factor because those high in HA are easily fatigued and are characterised by anticipatory worry rather than optimism (Cloninger et al., 1993). Such women may struggle herself between the emotion of affection and feeling of guilt. Hence, they may find it more difficult to establish an affectionate tie with the second or third baby while looking after older children.

Strength and Limitation of this Study

The strength of this study is that this is a community based longitudinal study investigated in multiple settings in one prefecture in Japan. The participating institutes were a well-balanced blend of different types of antenatal clinics. We observed both traumatic symptoms and bonding disorders simultaneously during the perinatal period. Personality traits and women's responses toward the current pregnancy were measured before the childbirth so that they would not be biased by psychological variables after childbirth.

However, some limitations should be stated. The response rate, at 17%, was low in this study. Therefore, the characteristics of the participants such as age and parity may not be representative of the total population. In this study, obstetric outcomes were not included in the final SEM models due to insufficient number. Considering differences of the W3 IES scores between different styles of delivery (Table 4), further study, including more emergency CS cases would be necessary to confirm if the mode of delivery is a predictor of traumatic symptoms. Self-report questionnaires such as the TCI, PBQ, and the IES may reflect the individual's moods at the time of reporting. In addition, distinguishing traumatic symptoms and psychological diagnosis, such as PTSD by means of the IES, has its limitations.

Conclusion

To conclude, this study revealed that postnatal traumatic symptoms following childbirth and maternal bonding disorders are, though coexisting to a substantial extent, different in their causality. Both symptoms were differentially predicted by personality traits as well as psychological variables, such as negative response to the current pregnancy, and satisfaction with medical services.

Conflict of Interest

The authors have no conflict of interest to declare.

Acknowledgements

We are grateful for Dr. H. Kaneko for generously providing the Japanese version of the PBQ. We thank the support given by the following hospitals and clinics: Fukuda Hospital, Suenaga Ob/Gyn Clinic, Jikei Hospital, Kumamoto City Hospital, Kumamoto University Hospital, Kurokawa Gynecologic and Obstetric Clinic, Tashiro Gynecologic and Obstetric Clinic, Amakusa Central General Hospital, Arao Municipal Hospital, Shimokawa Gynecologic and Obstetric Clinic, Kamiamakusa General Hospital, Kataoka Ladies Clinic, Honda Ladies Clinic, Aikoh Obstetrics, Gynecology, and Dermatology Clinic, Yamaguchi Maternity Clinic, Matsubase Ladies Clinic, Kikuyou Ladies Clinic, and Asahino General Hospital.

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CONSEQUENCES

CHAPTER SEVEN

A DISCRETE CATEGORY OF JAPANESE PARENTS AS NEONATAL ABUSERS WITH PERINATAL BONDING DISORDERS: A THREE-MONTH POSTNATAL LONGITUDINAL STUDY

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Abstract

Background: Perinatal bonding disorders and neonatal abuse are major issues in perinatal mental health. Nevertheless, little has been reported about associations between parents' abusive behaviour towards an infant and bonding disorders of mothers as well as fathers.

Objectives: To identify the existence of discrete category/categories of parents-to-infant bonding difficulties and abusive parenting of mothers and fathers by performing a two-step cluster analysis.

Methods: In a longitudinal questionnaire study, data were collected in three waves or time points after childbirth at: five days (Wave 1), one month (Wave 2), and three months (Wave 3). Two-step cluster analysis

was conducted using the Mother-to-Infant Bonding Scale (MIBS) (parents to infants bonding), Conflict Tactics Scale 1 (psychological aggression), and Parent-Child Conflict Tactics Scale (CTSPC) (neglect) subscale scores with 306 couples. *Results:* Two-step cluster analysis yielded two clusters, “normal” (76%) and “pathological bonding failure and abusive parenting” (24%). Both fathers and mothers of the latter cluster had poorer mental health and more sleeplessness than the normal cluster. The commencing time of the mental health difficulties among fathers was a few months later than the mothers.

Conclusion: There were two discrete categories that included both parents, one of which was characterized by bonding disorders combined with abusive rearing styles. This categorization will be helpful for perinatal health professionals who support families with infants in both clinical and community settings.

Key words: parents, infant, child abuse, neglect, bonding disorder, cluster analysis

Introduction

Child abuse and neglect have been a major research area as well as a clinical issue in perinatal mental health. Neonatal abuse, in particular, has recently come to light among researchers (Baba et al., 2017; Baba, 2016; Matsunaga, Takauma, Tada, & Kitamura, 2017; Ohashi, Sakanashi, Tanaka, & Kitamura, 2016). Over 50% of children killed by their parents were under one-years old (Ministry of Health, Labour and Welfare, 2016). There are cohort or case-control studies with large samples (mainly data about participants under one years old) with reported variables associated with child abuse (Dixon, Browne, & Hamilton-Giachritsis, 2005; Gessner, Moore, Hamilton, & Muth, 2004; Wu et al., 2004). Possible risk factors of neonatal or infant abuse were usually socio-demographics (e.g., age, marital status, and poverty) of parents and in particular mothers (Dixon et al., 2005; Gessner et al., 2004; Wu et al., 2004), and perinatal abnormality of infants (Benedict, White, & Cornely, 1985; Wu, et al., 2004). These factors may not be a direct influence but rather confounding factors of variables not yet studied. Psychological variables need more attention in research on neonate and infant abuse. For example, Dixon et al. (2005) reported that parents’ history of depression or other mental illnesses was one of the factors associated with child abuse. Another set of factors

unduly neglected thus far are those related to fathers of the neonates and infant victims because fathers and mothers are almost equally at risk for perpetrating child abuse (Kitamura, Kaibori, et al., 2000; Kitamura et al., 1995, 1999; Kitamura, Sakamoto, et al., 2000; Yamamoto et al., 1999).

Recently, maternal bonding disorders, defined as dislike, resentment or hatred towards the child, desire for permanent relinquishment and hopes that the child disappears (Brockington, 2011), were reported in a cross-sectional study as significantly associated with abusive parenting (Kitamura, Hashi, Kita, Haruna, & Kubo, 2013). Although postnatal bonding disorders and depression are both prevalent in the puerperium period and are correlated with each other in cross-sectional studies (Kokubu, Okano, & Sugiyama, 2012), cohort studies of mothers (not fathers) indicated that bonding disorders but not depression predicted neonatal emotional abuse one month after childbirth (Baba, 2016; Hashi et al., 2016). Hence, the association reported between abusive parenting and postnatal depression may be confounded by bonding failure rather than by a real association. Therefore, identification of parents with severe bonding disorders as well as abusive parenting is an important issue in perinatal care.

Having observed a link between postnatal bonding disorder and infant abuse, we consider that it is of clinical importance to examine whether there is a discrete group of parents qualitatively different from “healthy” parents in terms of postnatal bonding disorders and infant abuse. Matsunaga, Takauma, Tada, & Kitamura (2017) performed a two-step cluster analysis on parents-to-infant bonding difficulties of mothers measured by the Mother-to-Infant Bonding Scale and reported the existence of two discrete categories: “pathological maternal bonding” and “normal”.

Because abusive rearing styles are significantly correlated between fathers and mothers (Kitamura et al., 1999), we may presume a couple has an abusive rearing “culture”. Therefore, the pattern of clustering of postnatal bonding disorders and infant abuse may be more common within a couple and couples (families) rather than individual parents. If discrete groups of couples with severe bonding difficulties and abusive parenting can be identified, then it may give insights into better interventions of child abuse in perinatal and community care.

The aim of this study was to determine if there were discrete category/categories in terms of parents-to-infant bonding difficulties and abusive couple parenting using a two-step cluster analysis. Expanding on Matsunaga et al.’s (2017) study, the research question of the present study

was: is there a distinctive group of parents in terms of bonding disorders as well as infant abuse?

Methods

Study Procedures

We conducted this longitudinal questionnaire study in one perinatal medical centre, three general hospitals, two antenatal clinics, and one midwifery-managed birth centre in the highly populated urban centre of Tokyo, and in the surrounding suburbs. We recruited each couple (mother and father) a few days after childbirth. Inclusion criteria were women who (a) could speak Japanese, (b) were living in the Japan, (c) had no serious physical diseases or pregnancy-related complications, and (d) had a singleton foetus. Those meeting the eligibility requirements received written information, and those agreeing to participate signed informed consent forms. They were assured they could leave the study at any time without penalty and that all data would be treated with confidentiality and anonymity.

The survey was conducted from December 2015 to June 2016. Data were collected in three waves: five days (Wave 1), one month (Wave 2), and three months (Wave 3) after childbirth. We handed (Wave 1) or posted (Wave 2, and 3) questionnaires to the parents who had agreed to participate in the research. We distributed the questionnaires by hand or mail at each Wave. We asked them to return the completed questionnaires via postal service. The mothers and fathers were asked to fill out and post the questionnaire independently.

At Wave 1, we asked about parent-infant bonding, parents' health status (health related quality of life, and sleepless situation), socio-demographics (age, educational background, employment status, marital status, household income, and their number of children), delivery-related status (the number of births, type of delivery, health checkup history for pregnancy, birth weight of the present baby, and baby's gender, baby's Apgar score, baby's gestational age, if baby entered the neonatal intensive care unit (NICU), and feelings at the time of pregnancy). At Waves 2 and 3, we asked about parent-infant bonding, parents' health status (health related quality of life, and sleepless situation), neonatal abuse, and if mothers return to mothers' biological parents' home after childbirth. This was a reanalysis of the data from Baba's (2016)

longitudinal research.

Measurements

Parent-to-Infant Bonding Disorders: The Japanese version of the Mother-to-Infant Bonding Scale (MIBS-J) (Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012) was used. The original English MIBS (Marks et al., unpublished) is a self-descriptive instrument to assess parent-infant bonding, and consists of 10 items with a four-point Likert scale ranging from 0 (*not at all*) to 3 (*very much*). Some are reverse items. The total score ranges between 0 and 30. Higher scores indicate worse parent-to-infant bonding. Reliability and validity of MIBS-J was previously confirmed (Kitamura, Takegata, et al., 2013; Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012). The two-factor structure of the MIBS-J for postpartum mothers (Yoshida et al., 2012) and parents who have a child under 10 years of age (Kitamura et al., 2013) was: Anger and Rejection and Lack of Affection. Each subscale consists of four items. The Cronbach's alphas of the mothers' MIBS-J subscales in this study for Anger and Rejection were 0.33 (Wave 1), 0.438 (Wave 2), and 0.64 (Wave 3) and for Lack of Affection were 0.74 (Wave 1), 0.77 (Wave 2), 0.71 (Wave 3). The Cronbach's alphas of the fathers' subscales in this study for Anger and Rejection were 0.21 (Wave 1), 0.40 (Wave 2), and 0.31 (Wave 3) and for Lack of Affection were 0.71 (Wave 1), 0.75 (Wave 2), 0.72 (Wave 3).

Neonatal abuse: Conflict Tactics Scale 1 (CTS 1: Straus & Hamby, 1997) and Parent-Child Conflict Tactics Scale (CTSPC: Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) are self-reports that measures the frequency of different types of abusive parenting behaviours occurring since the present child's birth. Reliability and validity of the CTS 1 and CTSPC were previously confirmed (Baba et al., 2017; Straus, Hamby, & Warren, 2003).

The CTS 1 and the CTSPC consists of 19 and 35 items, respectively. Items on both instruments have a seven-point scale regarding the frequency of abuse since the child's birth: 0 (*never*); 1 (*once*); 2 (*twice*); 4 (*3 to 5 times*); 8 (*6 to 10 times*); 15 (*11 to 20 times*); 25 (*over 20 times*). (see the CTS Handbook: Straus et al., 2003). Higher scores indicate more abusive parenting behaviour towards the child. After obtaining permission from the original author, one of us (TK), a psychiatrist with extensive training in the U.K., translated the CTS 1 into Japanese. Upon permission from the Western Psychological Services, KB, an RN, PhD translated the

CTSPC and the phraseology was validated by back-translation from Japanese to English by a bilingual Japanese-English nurse and confirmed by a native English speaker.

We used seven items of the Psychological Aggression subscale of the CTS 1 (Baba, Takauma, Tada, Tanaka, Sakanashi, Kataoka, & Kitamura, 2017) and five items of the Neglect subscale of the CTSPC (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998; Straus, Hamby, & Warren, 2003) for this study. This was because a previous study of Japanese mothers of infants showed that the prevalence of physical abuse items was virtually nil (Baba et al., 2017).

The Cronbach's alphas of the mothers' subscale of CTS1 and CTSPC in this study were 0.68 (W2), 0.73 (W3) for Psychological Aggression, and 0.37 (Wave 2), 0.38 (Wave 3) for Neglect. The Cronbach's alphas of the fathers' subscale in this study were 0.30 (Wave 2), 0.72 (Wave 3) for Psychological Aggression, and 0.32 (Wave 2), 0.31 (Wave 3) for Neglect.

Parents' health status: Parents' health status was assessed in terms of health-related quality of life measured by the Japanese version (Fukuhara & Suzukamo, 2004, 2005) of the SF-8 Health Survey from the SF-8™ (Ware, Kosinski, Dewey, & Gandek, 2001), and sleep difficult measured by the Japanese version of the Athens Insomnia Scale (AIS-J: Okajima, Nakajima, Kobayashi, & Inoue, 2013) originally developed by Soldatos, Dikeos, and Paparrigopoulos (2000).

SF-8™ Japanese version is a self-report measurement consisting of eight items with 5- or 6-point scales from 1 (*no problem at all*), to 5 or 6 (*extremely problematic*). Lower scores indicate a negative state of health after converting during calculations. An eight-factor structure of the SF-8™ includes: "physical functioning", "role limitations due to physical health", "bodily pain", "general health perceptions", "vitality", "social functioning", "role limitations due to emotional problems", and "mental health". There are two summary scores: Physical Component Summary (PCS) and Mental Component Summary (MCS). Each score uses weighted coefficients (Fukuhara & Suzukamo, 2004).

The original Athens Insomnia Scale (AIS) is a self-report measure consisting eight items with a 4-point scale: 0 (*no problem at all*), 1 (*slightly problematic*), 2 (*markedly problematic*), and 3 (*extremely problematic*) (Soldatos et al., 2000). Higher scores indicate negative quality of sleep with 6 as the cut-off indicating insomnia. Okajima et al. (2013) confirmed the reliability and validity of AIS-J and found a two-factor structure: Nocturnal Sleep Problem (five items) and Daytime Dysfunction (three items). The Cronbach's alphas of the mothers' subscale

of AIS-J in this study were 0.82 (Wave 1), 0.80 (Wave 2), 0.81 (Wave 3) for Nocturnal Sleep Problem, and 0.72 (Wave 1), 0.78 (Wave 2), 0.70 (Wave 3) for Daytime Dysfunction. The Cronbach's alphas of the fathers' subscale in this study were 0.81 (Wave 1), 0.77 (Wave 2), 0.71 (Wave 3) for Nocturnal Sleep Problem, and 0.76 (Wave 1), 0.78 (Wave 2), 0.76 (Wave 3) for Daytime Dysfunction.

Statistical Analyses

All statistical analyses were conducted using the SPSS version 24.0. In order to identify a qualitatively discrete cluster of participant mothers and fathers, we used a two-step cluster analysis. Variables entered into two-step cluster analysis were the scores of the two MBS subscales (Anger and Rejection and Lack of Affection) at five days, one month, and three months after childbirth, and one CTS1 subscale (Psychological Aggression), and one CTSPC subscale (Neglect) at one month and three months after childbirth among mothers and fathers. The skewness of the two MBS subscales was 0.7-9.6 and 0.8-4.9. That of the CTS1 and CTSPC was 4.3-22.4 and 6.0-23.3, respectively. Thus, these scores were log-transformed.

To examine the validity of emerging clusters, we compared between the clusters in terms of all the MBS, CTS1, CTSPC subscale scores as well as external validators including SF-8, and AIS-J subscale scores at the three Waves, socio-demographic variables, and delivery-related status.

In order to find the best cut-off points of the total MBS scores at each Wave to predict the "pathological" cluster, we conducted the receiver operating curve (ROC) analysis. The area under curve (AUC) was the indicator of the validity of the MBS total score as a predictor of the "pathological" cluster and we used Youden index to identify the most appropriate cut-off point at each Wave.

Ethical Considerations

The Ethics Committee of St. Luke's International University approved this research project (15-074). In order to empower mothers and fathers and maintain the child's safety, information about child-rearing support services and a hotline number were provided with the questionnaire. In addition, we prepared support and counselling in the health care settings if they need help. If we found child abuse through the questionnaire, we

were in accordance with the mandated reporting law.

Results

The total number of mothers and fathers who participated in the survey was 749 and 471, respectively. Among them, 543 mothers and 350 fathers returned, and there were 343 couples (mother and father couple) that return questionnaires in all waves. These data were missing completely at random (MCAR) based on Little's MCAR test ($\chi^2 = 7793.2$, $df = 12807$, $p > .05$). After excluding participants' questionnaires with missing values in the MBS, CTS 1, and CTSPC even if it was one item, 306 cases (89%) were included in the statistical analysis. The mean (*SD*) age of the fathers and mothers was 34.6 (5.1) and 32.8 (4.6) years, respectively (Table 1). Gender of the babies was almost equal: there were 164 boys (48.7%) and 173 girls (51.3%). The babies' mean (*SD*) birthweight was 3038 (359) grams. Regarding type of delivery, 226 (67.3%) mothers gave spontaneous delivery, 61 (18.2%) required Caesarean section, 29 (8.6%) by instrumental labor (Vacuum/Forceps), and 20 (6.0%) by painless delivery.

Table 1 Baseline demographic characteristics of study population

Demographic characteristics	Fathers <i>n</i> = 306		Mothers <i>n</i> = 306	
	<i>n</i>	%	<i>n</i>	%
Age (<i>M</i> , <i>SD</i>)	34.5	(5.2)	32.8	(4.7)
Educational background				
Graduated from junior high school	7	2.3	3	1.0
Graduated from high school	48	15.9	47	15.4
Graduated from junior college / professional school	43	14.2	85	27.9
Graduated from college / university	204	66.7	170	55.7
Employment status				
None	4	1.3	133	43.6
Part-time	4	1.3	20	6.6
Full-time	294	97.4	152	49.8

Marital status				
Married		297	99.7	
Unmarried		1	0.3	
Household income (<i>M, SD</i>)		809.7	(360.3)	
Number of child (<i>M, SD</i>)		0.5	0.7	
Number of births				
Primipara		177	58.2	
Multipara		127	41.8	
Type of delivery				
Spontaneous delivery		207	67.9	
Caesarean section		52	17.0	
Instrumental labor (Vacuum / Forceps)		27	8.9	
Painless delivery (Epidural anesthesia)		19	6.2	
Health checkup history for pregnancy				
Regularly		305	99.7	
Almost regularly		0	0	
Not regularly		1	0.3	
Feeling at the time of pregnancy				
Very happy	273	90.7	259	84.6
Slightly happy	18	6.0	32	10.5
Can not say happy or unhappy	9	3.0	12	3.9
Not so happy	1	0.3	3	1.0
Returned to parent's home				
none		175	57.4	
1 month		103	34.4	
3 months		10	3.3	
<hr/>				
Birth weight of the present baby (<i>M, SD</i>)		3046.8	(365.1)	
< 2,500g		20	6.5	
≥ 2,500g		286	93.5	
Baby's gender				
Boy		147	48.0	
Girl		159	52.0	

Baby's Apgar score (1minutes / 5 minutes) (<i>M, SD</i>)	8.7/9.5	(0.6/0.5)
Baby's gestational age		
< 36 weeks	6	2.0
37 weeks ≤	298	97.4
42 weeks ≤	2	0.7
Admitted to neonatal intensive care unit (NICU)		
Yes	6	2.0
No	305	98.0

Two-step cluster analysis yielded two clusters: 233 (76%) cases were classified into the first cluster (Cluster 1), and the other 73 cases (24%) into the second (Cluster 2). Cluster precision-accuracy was around 0.3, which is considered moderately good. Almost all the subscale scores of the MBS (Lack of Affection/Anger and Rejection), CTS 1 (Psychological Aggression), and CTSPC (Neglect) were significantly higher ($p < .001$) among Cluster 2 couples than among Cluster 1 couples at each of the three Waves (Table 2).

The distributions of SF-8™ Japanese version subscale scores (PCS/MCS) and AIS-J subscale scores (Nocturnal Sleep Problem/Daytime Dysfunction) at three Waves by clusters differed between the two clusters in most of the subscales (Table 3). Although there were no differences between the two clusters in the PCS subscale scores of mothers and fathers for the three Waves, the MCS subscale scores of mothers were significantly lower among Cluster 2 at all three Waves ($p < .01$) whereas the MCS subscale scores of fathers were significantly lower among Cluster 2 at Waves 2 and 3 ($p < .001$). Nocturnal Sleep Problem scores of mothers were significantly higher in Cluster 2 at all three Waves ($p < .05$) whereas in fathers Nocturnal Sleep Problem scores were significantly higher in Cluster 2 at only Wave 3 ($p < .001$). Daytime Dysfunction scores of mothers were significantly higher in Cluster 2 at all three Waves ($p < .01$) whereas fathers' Daytime Dysfunction scores were significant higher in Cluster 2 at only Wave 2 and 3.

Table 2 Analysis of scores of MIBS subscales, CTS 1 subscale, CTSPC subscale of parents at three waves by clusters

	Total		Cluster 1 <i>n</i> = 233 pairs (76%)				Cluster 2 <i>n</i> = 73 pairs (24%)				Difference between Clusters			
	Mother		Father		Mother		Father		Mother		Father		t	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
MIBS subscale														
Lack of Affection Wave 1	0.9	1.1	0.9	1.1	0.7	0.9	0.8	1.0	1.5	1.4	1.3	1.2	4.7***	3.0***
Lack of Affection Wave 2	0.8	1.1	1.0	1.2	0.6	0.8	0.9	1.2	1.5	1.4	1.4	1.2	5.2***	3.4***
Lack of Affection Wave 3	0.5	0.8	0.8	1.0	0.3	0.6	0.6	0.9	0.9	1.2	1.2	1.2	4.2***	4.0***
Anger and Rejection Wave 1	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	1.0	0.8	0.7	0.5	4.8***	1.2
Anger and Rejection Wave 2	0.5	0.6	0.6	0.7	0.3	0.5	0.5	0.6	1.0	0.8	1.0	0.9	6.9***	5.0***
Anger and Rejection Wave 3	0.4	0.7	0.5	0.6	0.2	0.4	0.4	0.5	1.0	1.1	0.9	0.7	5.9***	5.6***
CTS1 / CTSPC subscale														
Psychological aggression Wave 2	0.4	1.2	0.4	1.4	0.2	0.4	0.1	0.3	1.4	2.1	0.5	0.9	5.0***	4.3***
Psychological aggression Wave 3	0.4	1.3	0.7	3.0	0.2	0.5	0.1	0.3	1.3	2.3	0.8	1.8	4.3***	3.5***
Neglect Wave 2	0.2	0.6	0.4	1.6	0.1	0.3	0.1	0.2	0.5	1.0	0.5	0.9	3.8***	3.8***
Neglect Wave 3	0.2	0.6	0.6	2.9	0.1	0.3	0.1	0.6	0.5	1.0	0.6	1.1	4.0***	4.2***

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3 SF-8™ subscales and AIS-J subscale scores for three waves by clusters

	Total				Cluster 1 <i>n</i> = 233 pairs (76%)				Cluster 2 <i>n</i> = 73 pairs (24%)				Difference between clusters	
	Mother		Father		Mother		Father		Mother		Father		t	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
SF-8™														
PCS (Wave 1)	38.5	9.3	52.6	4.6	39.1	9.2	52.2	4.9	36.6	9.2	53.6	3.5	2.0	-2.1*
PCS (Wave 2)	43.3	8.0	51.4	5.0	43.8	7.7	51.5	4.7	42.0	8.7	51.2	5.7	1.7	0.4
PCS (Wave 3)	49.0	6.0	50.7	6.3	49.0	5.8	51.0	6.3	48.9	6.6	49.7	6.6	0.1	1.5
MCS (Wave 1)	49.5	8.2	50.5	5.6	50.5	7.8	50.6	5.5	46.8	8.8	50.0	5.8	3.3**	0.8
MCS (Wave 2)	46.2	7.0	48.4	6.3	47.3	6.4	49.1	5.9	42.5	7.5	46.0	6.9	5.3***	3.6***
MCS (Wave 3)	49.3	6.4	49.2	6.5	50.3	5.4	50.2	5.6	46.0	7.9	46.0	7.9	4.3***	4.1***
AIS-J														
NSP (Wave 1)	5.8	3.2	2.1	2.2	5.5	3.1	2.0	2.3	6.8	3.3	2.2	2.2	-3.1**	-0.5
NSP (Wave 2)	3.9	2.5	2.5	2.3	3.7	2.3	2.4	2.3	4.5	3.0	2.8	2.1	-2.1*	-1.5
NSP (Wave 3)	2.6	2.2	2.2	2.0	2.3	2.0	2.0	2.0	3.6	2.7	2.9	2.1	-3.8***	-3.1**
DTD (Wave 1)	3.4	1.7	1.4	1.4	3.2	1.7	1.3	1.4	4.0	1.6	1.6	1.4	-3.6***	-1.0
DTD (Wave 2)	3.3	1.7	1.7	1.5	3.1	1.6	1.6	1.4	4.2	1.9	2.0	1.5	-5.2***	-2.2*
DTD (Wave 3)	2.1	1.3	1.6	1.5	1.9	1.3	1.4	1.3	2.5	1.4	2.2	1.7	-3.4**	-3.8***

* PCS, Physical Component Summary; MCS, Mental Component Summary; NSP, Nocturnal Sleeps Problems; DTD, Daytime Dysfunction; $p < .05$; ** $p < .01$; *** $p < .001$

There were no differences between the two clusters in parents' age, educational background, employment status, marital status, or household income. Nor were there differences among women for type of delivery, and health checkup history during pregnancy. The infants were similar in birth weight, gender distribution, Apgar score, gestational age, and admittance to the NICU. However, the parents of Cluster 2 had significantly fewer children, ($p < .001$), and mothers of Cluster 2 had significantly more negative feeling towards the current pregnancy when informed of it ($p < .05$) (Table 4).

In order to examine whether the MIBS could be used in clinical situations as a predictor of parents belonging to Cluster 2, we conducted the ROC analyses for mothers and fathers, separately, at each Wave. Here we used the addition of the raw (not log-transformed) scores of the 10 MIBS scores as the predictor variable because of clinical utility. The AUC was over .60 in each case and was over .70 for the mothers at each wave (Table 5).

Youden indices indicated that the best cut-off points at Wave 1 were 2/3 and 1/2 for mothers and fathers, respectively (Table 6). The best cut-off points at Wave 2 were 2/3 and 3/4 for mothers and fathers, respectively (Table 7). The best cut-off points at Wave 3 were 1/2 and 3/4 for mothers and fathers, respectively (Table 8).

Table 4 Demographics at three waves by clusters

	Total		Cluster 1 <i>n</i> = 233 pairs (76%)				Cluster 2 <i>n</i> = 73 pairs (24%)				Difference between clusters			
	Mother		Father		Mother		Father		Mother		Father			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	
The number of children	0.7	0.7	0.5	0.7	0.6	0.7	0.6	0.7	0.3	0.5	0.3	0.5	4.6***	4.6***
Feeling at the time of pregnancy	0.7	0.5	1.1	0.4	1.2	0.5	1.1	0.4	1.4	0.6	1.2	0.5	-2.4*	-1.3

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 5 ROC analyses of the MIBS total scores as a predictor of Cluster 2 for mothers and fathers at three waves

Waves	AUC	
	Mothers	Fathers
1	.732	.627
2	.759	.675
3	.733	.695

Table 6 Sensitivity, specificity, and Youden index of the MIBS total scores as a predictor of Cluster 2 for mothers and mothers at Wave 1

MIBS scores	Mothers				Fathers			
	n (%)	Sensitivity	Specificity	Youden index	n (%)	Sensitivity	Specificity	Youden index
0	77 (25.2)	1.00	0.00	0.000	65 (21.3)	1.000	0.000	0.000
1	56 (18.3)	0.89	0.296	0.186	69 (22.6)	0.877	0.244	0.118
2	46 (15.7)	0.781	0.502	0.283	45 (14.8)	0.699	0.483	0.182
3	47 (15.4)	0.685	0.678	0.363	46 (15.1)	0.548	0.629	0.177
4	24 (7.8)	0.507	0.824	0.331	24 (7.9)	0.384	0.776	0.160
5	19 (6.2)	0.452	0.910	0.362	21 (6.9)	0.301	0.853	0.154
6	9 (2.9)	0.301	0.944	0.245	14 (4.6)	0.205	0.914	0.119
7	12 (3.9)	0.233	0.961	0.194	7 (2.3)	0.123	0.948	0.071
8	4 (1.3)	0.137	0.983	0.120	8 (2.6)	0.110	0.974	0.084
9	3 (1.0)	0.110	0.991	0.101	1 (0.3)	0.027	0.983	0.010

Youden in bold is the highest.

Table 7 Sensitivity, specificity, and Youden index of the MIBS total scores as a predictor of Cluster 2 for mothers and mothers at Wave 2

MIBS scores	Mothers				Fathers			
	n (%)	Sensitivity	Specificity	Youden index	n (%)	Sensitivity	Specificity	Youden index
0	101 (33.0)	1.000	0.000	0.000	57 (18.6)	1.000	0.000	0.000
1	69 (22.5)	0.863	0.391	0.254	66 (21.6)	0.945	0.228	0.173
2	45 (14.7)	0.712	0.639	0.351	46 (15.0)	0.753	0.448	0.201
3	20 (6.5)	0.616	0.803	0.419	43 (14.1)	0.616	0.603	0.219
4	30 (9.8)	0.521	0.858	0.379	33 (10.8)	0.493	0.750	0.243
5	11 (3.6)	0.411	0.953	0.364	21 (6.9)	0.37	0.853	0.223
6	8 (2.6)	0.356	0.983	0.339	11 (3.6)	0.274	0.914	0.188
7	9 (2.9)	0.260	0.987	0.247	8 (2.6)	0.232	0.948	0.181
8	5 (1.6)	0.164	0.996	0.160	7 (2.3)	0.164	0.961	0.126
9	2 (0.7)	0.110	1.000	0.110	8 (2.0)	0.110	0.974	0.084

Youden in bold is the highest.

Table 8 Sensitivity, specificity, and Youden index of the MIBS total scores as a predictor of Cluster 2 for mothers and mothers at Wave 3

MIBS scores	Mothers				Fathers			
	n (%)	Sensitivity	Specificity	Youden index	n (%)	Sensitivity	Specificity	Youden index
0	146 (47.7)	1.000	0.000	0.000	85 (27.3)	1.000	0.000	0.000
1	68 (22.2)	0.726	0.541	0.267	68 (22.2)	0.904	0.332	0.236
2	36 (11.8)	0.603	0.794	0.397	43 (14.1)	0.685	0.556	0.241
3	21 (6.9)	0.479	0.910	0.389	41 (13.4)	0.548	0.698	0.246
4	8 (2.8)	0.384	0.970	0.354	24 (7.9)	0.438	0.841	0.279
5	8 (2.6)	0.342	0.991	0.333	19 (6.2)	0.329	0.909	0.238
6	7 (2.3)	0.233	0.991	0.224	11 (3.6)	0.192	0.848	0.140
7	2 (0.7)	0.164	1.000	0.164	8 (2.6)	0.123	0.974	0.097
8	3 (1.0)	0.137	1.000	0.137	3 (1.0)	0.068	0.991	0.059
9	2 (0.7)	0.096	1.000	0.096	1 (0.3)	0.055	1.000	0.055

Youden in bold is the highest.

Discussion

Our study demonstrated that the participants could be classified into two clusters using a two-step cluster analysis based on the parents' bonding and abuse scores rated at the three Waves. There were significant differences ($p < .001$) between clusters in almost all of the subscale scores of the MBS, CTS 1, and CTSPC over the course of the three waves. These results suggest the existence of two discrete categories in terms of parents-to-infant bonding difficulties and abusive parenting of mothers and fathers. Cluster 2 may be interpreted as pathological. This pathology was found in about a quarter of parents with a newborn baby. Cluster 2 showed significantly higher scores of the MBS, CTS 1, and CTSPC of both mothers and fathers, which meant that both parents of Cluster 2 had not only severe bonding difficulties but also severe abusive parenting style. These results also mean that if mothers have severe bonding difficulties and severe abusive parenting, fathers are more likely to have the same tendency. Hence, bonding difficulties and abusive parenting styles are individual mental health issue as well as emerge as the couple's pathology.

Using MBS data at five days and one month after childbirth, Matsunaga, Takauma, Tada, & Kitamura (2017) reported two clusters of mothers with a neonate, one of which indicated a pathological bonding disorder. Our study extended the observation period to three months after childbirth, included both the mother and the father and confirmed a cluster with a bonding disorder. While the MBS subscale scores tended to decrease from Wave 1 to Wave 3 among Cluster 1 mothers and fathers, the subscale scores of the Cluster 2 parents remained high throughout the three-month postpartum period. Furthermore, our study included abusive rearing styles into a cluster analysis and identified the pathological cluster that was characterised by mothers' and fathers' bonding difficulties as well as abusive rearing styles. Bonding difficulties and abusive rearing styles may be, thus, two facets of a single phenomenon contributing to a traumatic rearing environment.

The group of parents with severe bonding disorders and abusive parenting (Cluster 2) were also characterized by poorer quality of sleep and mental health. There were, however, some gender differences. Thus, MCS scores of fathers did not differ between the two clusters at five days after childbirth whereas those of mothers were continuously low (indicating poor mental health) at three months after childbirth. Secondly, AIS-J subscale scores among fathers did not differ between the two clusters at five days and one month after childbirth whereas mothers

indicated continuously poor quality of sleep at three months after childbirth. Therefore, both mothers and fathers belonging to Cluster 2 had poorer mental health and sleeplessness but the commencing time of these conditions among fathers may be a few months later than mothers. This may be due to the fact that almost all mothers were in a hospital during Wave 1 and 34% of mothers went back to their biological parents' home immediately after discharge, so that many fathers not only were able to have more uninterrupted sleep, they also started engaging with their baby at a much later date than their spouses.

Another point of interest is the finding that mothers of Cluster 2 had more negative feelings towards the current pregnancy although there was no difference between the two clusters about fathers' feeling towards the current pregnancy. Kokubu, Okano, & Sugiyama (2012) reported that negative attitudes towards the pregnancy at early gestation (both mothers' and partners' negative attitudes towards the current pregnancy and unplanned pregnancy) predicted maternal postnatal bonding disorders. Our finding is in line with this report. However, Kokubu et al. (2012) created a single composite variable consisting of mothers' and partners' negative attitudes towards the current pregnancy and unplanned pregnancy whereas in our study the influence of negative attitudes towards the current pregnancy upon bonding disorders were examined separately for women and their partners. Our results suggest that fathers' negative feeling towards the current pregnancy at early gestation may be unrelated to paternal postnatal bonding failure.

Parents belonging to Cluster 2 were likely to have fewer children. This suggests that the more children they have the less likely mothers and fathers suffer from bonding disorders and are less abusive towards the baby. Experiences with previous children may make mothers and fathers ready to adapt to the role of taking care of a neonate. Alternatively, parents with more severe bonding disorders for the first baby are less likely to wish to have another child. This issue awaits further investigations.

What are the messages, from our results, for clinical practices? Firstly, our study indicated that "pathological" bonding disorders that started immediately after delivery would continue longer than one month after childbirth as previously reported (e.g., Matsunaga, et al., 2017; Ohashi, et al., 2016) and up to three months after childbirth. Therefore, perinatal health professionals should pay careful attention to the mothers' attitudes towards their neonate for the first few days after childbirth. During this period, women are usually in a medical institute and responsible health professionals are midwives and nurses and, possibly, obstetricians.

Traditionally, their health responsibility has been regarded as physical assessment and care (e.g., puerperal involution of the uterus, bleeding, and breast care). In addition to these, they should assess the mental status of mothers and particularly emotional attitudes towards the baby. If bonding difficulties are identified by health professionals or complained about by mothers themselves, therapeutic intervention should be initiated immediately. This may be provided by midwives, nurses, or obstetricians, or referred to clinical psychologists or psychiatrists. Because the women identified as suffering from bonding disorders are more likely to be involved in abusive rearing, preventive measures for child abuse should be started at the same time. If depression coexists with bonding disorders, they should start treatment for depression as quickly as possible because depression may make abuse prevention more difficult.

Secondly, the fact that bonding disorders and abusive rearing styles are “shared” by a couple indicates necessity of health professionals to assess and, if necessary, provide therapeutic care for women’s partners. Partners have often been ignored in the perinatal health care system. Our study strongly indicates that health professional should regard their care not as care for individuals but for couples as a unit. Involving partners in the women’s care should be an important issue.

As with the previous studies, our study confirmed that the women’s first reaction to the news of the present pregnancy was a significant predictor of postnatal bonding disorders and abusive rearing styles. Therefore, prevention of postnatal bonding disorders and abusive rearing styles should be commenced in the early stages of pregnancy rather than postnatal period. Perinatal health professionals may have psychologically oriented sessions after the news of the pregnancy, identifying the woman’s hopes, perplexity, and fears so that appropriate psychological intervention and prevention may be started.

Finally, when using the MBS in clinical settings, it is practical to make use of the simple total score of the MBS. Matsunaga, Takauma, Tada, & Kitamura (2017) identified two clusters among mothers of neonates and calculated 3/4 and 4/5 as the best cut-off points for mothers of bonding disorders at five days and one month after childbirth, respectively. The AUCs were slightly better in Matsunaga et al.’s (2017) study than ours. The best cut-off points were also slightly different between these two studies. This may be because whereas Matsunaga et al. (2017) aimed to identify mothers with bonding disorders, our study aimed to identify parents with both bonding disorders and abusive parenting. Hence, the use of the cut-off points we suggested may be more practical in

identifying mothers and fathers who are clinically more serious cases.

Questioning directly about neonatal abuse may be difficult in clinical settings and parents may avoid giving affirmative answers. However, questioning about attitudes towards the baby such as in the MBS may be less likely to be influenced by socially desirable response styles (Crowne, & Marlow, 1960). Our study indicated a clinically serious cluster with bonding disorders as well as neonatal abuse that, however, could be identified by asking only about attitudes towards the baby. This is a unique and important aspect of a tool to screen parents at risk of neonatal abuse.

Limitations of this study should be noted before concluding. Firstly, we recruited pairs of parents. Therefore, single parents were excluded. We may need further studies focusing on this population. Secondly, the sample size became smaller because we included only mothers/fathers who responded. Although the data were MCAR, we should exercise caution in interpreting the results. Thirdly, some of the main variables and CTS 1 and CTSPC in particular were with low internal consistency. This may be due to a small number of items of these instruments (7 for CTS 1 and 5 for CTSPC) because the Cronbach's α is usually lower for scales of smaller number of indicators. Alternatively, it may be due to positive skewness of the instruments. In this study, we used cluster analysis for categorization of the couples in terms of bonding difficulties and abusive rearing styles. However, there are some other methods that can enable categorization such as latent class analysis and taxometrics. Further studies should utilize these methods too. In the present study we were unable to perform the statistics to identify the complexity of causal pathways towards the bonding disorders and abusive rearing. More research may be needed to identify possible mediators and confounding variables. Even taking into account these shortcomings, to the best of our knowledge, this is the first study to find discrete categories involving both parents in terms of bonding difficulties and abusive parenting up to three months after childbirth.

Conclusion

There were two discrete categories that included both parents: "normal" (76%) and "pathological bonding failure combined with abusive parenting" (24%). Both parents of the "pathological" cluster were characterized by a poorer mental health condition and sleeplessness, but the commencing time of these symptoms among fathers were a few

months later than mothers. This will be helpful for perinatal health professionals who support families with infants in both clinical and community settings.

Acknowledgements

We wish to thank all the participants and the staff of the study hospital who assisted with this study, which was supported by MEXT KAKENHI Grant Number 25293458, and supported by a grants-in-aid of the YAMAJI FUMIKO NURSING RESEARCH FUND.

Conflict of interest

We have no conflict of interest.

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CHAPTER EIGHT

PERSONALITY CORRELATES OF PERINATAL DEPRESSION AND BONDING DISORDERS: A STUDY IN KUMAMOTO

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Abstract

Objectives: Several studies have noted the association between postnatal depression and poor bonding after childbirth. However, the causal relationships between these and the determinants of postnatal

depression and poor bonding remain unclear. The aims of this study were (a) to prospectively examine the causal relationship between maternal depression and bonding disorders at five days and one month after childbirth and (b) to examine possible determinants (such as personality traits, parity, emergency Caesarean section or perception of difficult childbirth) of postnatal depression and poor bonding.

Methods: A total of 253 women completed the Postnatal Bonding Questionnaire and the Edinburgh Postnatal Depression Scale at 5 days (Time 2) and 1 month (Time 3) after childbirth. As a measure of personality traits, we used the Temperament and Character Inventory administered in late pregnancy (Time 1).

Results: Depression at 5 days after childbirth predicted bonding disorders at 1 month after childbirth. Postnatal depression and bonding disorders were differentially predicted by personality traits.

Conclusion: Perinatal health professionals should pay more attention to depressive mothers at 5 days after childbirth in order to prevent them from developing bonding disorders. Specific personality traits may be important risk factors of postnatal depression and bonding disorders.

Key words: perinatal depression, bonding disorders, personality traits, perceived childbirth difficulty

Introduction

Childbirth is a great event in a woman's life. However, pregnancy and puerperium are times of particular vulnerability to psychological maladjustment due to the transition to parenthood. Depression after childbirth is one such psychological maladjustment. The prevalence of postpartum depression is reported to be 13% in Western countries (O'Hara, & Swain, 1996). In Japan, Kitamura et al. (2006) performed a multicentre longitudinal study and reported incidence rates of the onset of a DSM-III-R major depressive episode during pregnancy (antenatal depression) and within 3 months after childbirth (postnatal depression) of 5.6% and 5.0%, respectively. Many studies on developmental disturbances in children of depressed mothers have given reason for considerable concern. Those children show elevated rates of behavioural, emotional, attentional and/or interpersonal disturbances outlasting the maternal depressive episode throughout childhood. Lyons-Ruth, Zoll, Connell, & Grunebaum (1986) found that increased levels of maternal depression were significantly related to poorer infant mental and motor development as assessed by the

Bayley scales. Similarly, a significant difference between infants of postnatally depressed mothers and those of well mothers has been described for several aspects of cognitive development, even though the mothers' depression had remitted by around 6 to 8 months postpartum (Murray, Fiori-Cowley, Hooper, & Cooper, 1996; Murray, 1992). Another study suggested that children were more likely to have cognitive and emotional problems throughout development (Righetti-Veltema, Bousquet, & Manzano, 2003).

Although the perinatal period is very important for the development of mother-child interaction, there are mothers who fail to develop affectionate feelings towards their foetus and infant. This is called disorder of mother-to-infant bonding, or more simply, bonding disorder (Kumar, 1997; Brockington et al., 2001). Brockington (1996) reported that 10–25% of women referred to psychiatrists after childbirth experienced bonding disorders. However, outright rejection of the child was found in only 0.5–1.0% of cases (Brockington, Fraser, & Wilson, 2006).

Several studies have noted an association between postnatal depression and poor bonding. For example, Kumar (1997) showed that women who were suffering from postnatal depression had prolonged difficulties in developing maternal feelings towards their infant as compared to women who were without depression. Taylor, Atkins, Kumar, Adams, & Glover (2005) found an association between the cases of early postnatal symptoms of depression (the Edinburgh Postnatal Depression scale: EPDS > 12 on day 3 postnatal) and poor bonding scores within the first 12 weeks postnatal. In Japan, Yoshida, Yamashita, Conroy, Marks, & Kumar (2012) have also found an association between postnatal depression and poorer maternal bonding. However, women with postnatal depression do not necessarily always experience problems with bonding whereas other women, who are not depressed, may experience poor bonding (Righetti-Veltema, Conne-Perreard, Bousquet, & Manzano, 2002; Klier, 2006).

Although the association between maternal depression and bonding failure during pregnancy and after childbirth has been investigated, the causal relationships remain unclear. There may be at least two different causal paths. Firstly, the mother's mood disorder, such as depression, is a primary phenomenon secondary to which the bonding disorder is induced. Alternatively, bonding failure is the primary phenomenon after which depression follows, via feelings of guilt regarding insufficient or improper care of her baby. In a recent Japanese study, Ohara et al. (2017) performed a non-recursive structural equation modelling analysis to elucidate the causal relationships between maternal depressive mood and bonding

failure from pregnancy to 5 days after childbirth. They reported that during late pregnancy as well as 5 days after childbirth, bonding failure predicted depressive mood significantly, but not *vice versa*. This study used sophisticated statistical analyses but did not examine the causality between depression and bonding disorders on the later stage of puerperium. In Japan, Ohashi, Sakanashi, Tanaka, & Kitamura (2016) studied depression and bonding disorders throughout the perinatal period and found that although depression and bonding disorders coexisted at the same time, both of them did not predict each other at the subsequent time point.

Among correlates of depression in general are personality traits (Akiskal, Hirschfeld, & Yerevanian, 1983; Hirschfeld, Klerman, Clayton, & Keller, 1983; Jylhä, & Isomets, 2006; Matsudaira, & Kitamura, 2006). Moreover, personality traits predict the course and treatment response of depression (Klein, Kotov, & Bufferd, 2011). Cloninger, Svrakic, & Przybeck (1993) proposed a psychobiological model that included both temperament and character domains. According to their theory, the temperament domain consists of four dimensions: harm avoidance (HA), novelty seeking (NS), reward dependence (RD), and persistence (PS). The character domain consists of three dimensions: self-directedness (SD), cooperativeness (C●), and self-transcendence (ST). As a measure of these dimensions, they developed the Temperament and Character Inventory (TCI: Cloninger, Przybeck, Svrakic, & Wetzel, 1994). Many studies have used the TCI to explore the relationship between depression on the one hand, and temperament and character dimensions on the other. Most of these studies demonstrated that individuals with a depressive disorder or symptoms of one, were more likely to have high HA and low SD and C● (Jylhä, & Isomets, 2006; Matsudaira, & Kitamura, 2006; Celikel, Kose, & Cumurcuetal, 2009; Cloninger, Svrakic, & Przybeck, 2006; Farmer, & Seeley, 2009; Furumura et al., 2012; Nery et al., 2009; Tanaka, Kijima, & Kitamura, 1997). However, unlike depression in general and postnatal depression, antenatal depression has been infrequently studied with regard to its association with personality traits. Andriola, di Trani, Grimaldi, & Donfrancesco (2011) found that antenatal depression was significantly related to high HA and low SD, but this study enrolled only 65 pregnant women. Minatani et al., (2013) examined 601 pregnant women using a questionnaire that included the EPDS and the TCI. They reported that in the regression analysis, the EPDS scores were predicted by low SD, high ST, high HA, and high PS. Much less has been studied about the association between perinatal bonding disorders and personality traits. However, it is feasible to study personality traits in terms of possible

causes of bonding disorders.

Recent years have seen an increased number of investigations focussing on the mode of childbirth and the impact of perceived childbirth difficulty on different aspects of psychological adjustment after childbirth. For example, a non-vaginal birth may make bonding between the mother and infant difficult (Grassley, & Jones, 2014). Significantly worse bonding was found in mothers who underwent an emergency Caesarean section than in those in whom it was elective. However, the latter were not different from those with vaginal delivery (Vincenzo et al., 2016). Arimoto & Shimada (2010) reported that the higher the satisfaction with childbirth was, the better the mother's bonding towards her baby. Hence, we speculated that bonding disorders would be determined by the mode of delivery.

Intense fear of childbirth also causes an impaired maternal-infant relationship. Areskog, Uddenberg, & Kjessler (1984) reported that women with an antenatal fear of childbirth (tokophobia) were found to run an increased risk of sustaining a severe emotional imbalance postnatally, with possible implications on their relationship to the child. Seng et al. (2013) also reported that pre-existing post-traumatic stress disorder (PTSD) was an elevated risk factor for impaired bonding, although this finding was not statistically significant. Forcada-Guex, Borghini, Pierrehumbert, Ansermet, & Muller-Nix (2011) found that mothers of preterm infants with high PTSD symptoms showed significantly less balanced and more distorted representations of their infants. Garthus-Niegel, von Soest, Vollrath, & Eberhard-Gran (2013) reported that perceived difficult birth experiences had a substantial association with post-traumatic stress symptoms. Therefore, we hypothesized that perceived hard and difficult birth experiences would be related to the postnatal mother-infant bond.

Our report is a secondary analysis of Ohashi and colleagues' study (Ohashi, Kitamura, Sakanashi, & Tanaka, 2016, Ohashi, Sakanashi, Tanaka, & Kitamura, 2016). Their study focussed on the effects of postnatal bonding disorders on the occurrence of emotional neonatal abuse. The aims of our study were (a) to prospectively examine the causal relationship between maternal depression and bonding disorders at five days and one month after childbirth and (b) to examine possible determinants (such as personality traits, parity, emergency Caesarean section or perception of difficulty of childbirth) of postnatal depression and poor bonding.

Methods

Participants

In 2011, the Kumamoto Prefectural Government conducted a longitudinal study on the perinatal mental health of pregnant women in the community, into the postnatal period. All 55 obstetric clinics in the prefecture were invited to participate in this follow-up survey. Eighteen (33%) antenatal institutes responded to this request. These included one university hospital, public and private hospitals ($n = 12$), and private clinics ($n = 5$). Hence, this was a mixture of different types of antenatal institutions. The entry criterion was women of at least 28 weeks gestation who had attended one of these antenatal clinics during the month of November 2011. Eligibility criteria were pregnancy and age over 20 years. We excluded those women who were illiterate in Japanese, who had severe mental illness, or who had been hospitalised with pregnancy complications. Sets of questionnaires were distributed on three occasions: (a) during the third trimester of pregnancy (Time 1), (b) five days after childbirth (Time 2), and (c) one month after childbirth (Time 3). The total number of eligible women was 1442. Of these, 633 (44%), 445 (31%), and 392 (27%) returned the questionnaires during the third trimester, five days, and 1 month after childbirth, respectively. A total of 253 (18%) returned the questionnaires for all three time points. Therefore, these 253 cases were subjected to further analyses.

The mean (SD) age of the participants was 30.2 (4.7) years old. The mean (SD) of their partner's age was 32.3 (6.1). About 80% of the participants gave birth at public hospitals ($n = 212$, 83.8%). The majority of the women were married. Forty-seven percent of the women ($n = 119$) were primiparas. Only about 10% had an emergency Caesarean section. The sex of the newborn was evenly distributed between boys and girls.

Procedure

The participants were requested to complete the questionnaire at home and return it to one of the researchers (T.K.) using a postage paid envelope. This investigation was approved by the Ethical Committee of Kumamoto University Graduate School of Life Sciences.

Measurements

Depression: We used the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987) at 5 days (Time 2) and 1 month (Time 3) after childbirth. This is a 10-item questionnaire rated on a 4-point scale (0 to 3) to assess postnatal depression and is commonly used in many perinatal settings. Higher scores indicate more severe depressive symptoms. The psychometric properties of the EPDS have been reported to be good (Cox, Holden, & Sagovsky, 1987). The EPDS was translated into Japanese (Okano, et al., 1996) and the reliability and validity were previously verified. A 3-factor structure of the EPDS was reported (Kubota et al., 2014): Anxiety (ANX), Anhedonia (ANH), and Depression (DEP).

Bonding disorder towards the newborn baby: We used the Japanese version (Kaneko, 2011) of the Postnatal Bonding Questionnaire (PBQ; Brockington, Fraser, & Wilson, 2006; Brockington et al., 2001), a self-reported measure of parents' attitudes and emotions towards their newborn baby. The PBQ consists of 25 items rated on a 6-point scale (0 to 5). Eight items are positively worded, and these are reverse scored. Higher scores indicate that the parent has a more negative attitude towards the infant and experiences a psychological burden regarding parenting. The psychometric properties in a Japanese population have been well reported (Kaneko, & Honjo, 2014; Suetsugu, Honjo, Ikeda, & Kamibeppu, 2015; Ohashi, Kitamura, Sakanashi, & Tanaka, 2016). For the present analysis, we used the 3-factor model that was reported by Ohashi, Kitamura, Sakanashi, & Tanaka (2016): Lack of Affection (LA), Rejection and Fear (RF), and Anger and Restrictedness (AR). In this study the PBQ was distributed to the participants at day 5 and 1 month after childbirth.

Personality Traits: As a measure of temperament and character, we used the TCI (Cloninger, Przybeck, Svrakic, & Wetzel, 1994). This is a self-reported questionnaire developed to assess the seven dimensions of personality described by Cloninger and colleagues (Cloninger et al., 1994) with a total of 29 subscales. They revised the biosocial model of personality and posited seven domains of personality: four domains of temperament—HA, NS, RD, and PS—and three domains of character—SD, C●, and ST. According to them, SD and C● are thought of as reflections of personality maturation. The TCI was translated into Japanese (Kijima et al., 1996). In this study, we used a 125-item short version instead of the 240-item full version during the third trimester of pregnancy (Time 1).

Perception of difficulty of childbirth: In order to evaluate the participants' perceived difficulty of labour, we created an *ad hoc* question, "How was your childbirth experience?". The question was rated on a seven-point scale ranging from "very easy (1)" to "very difficult (7)".

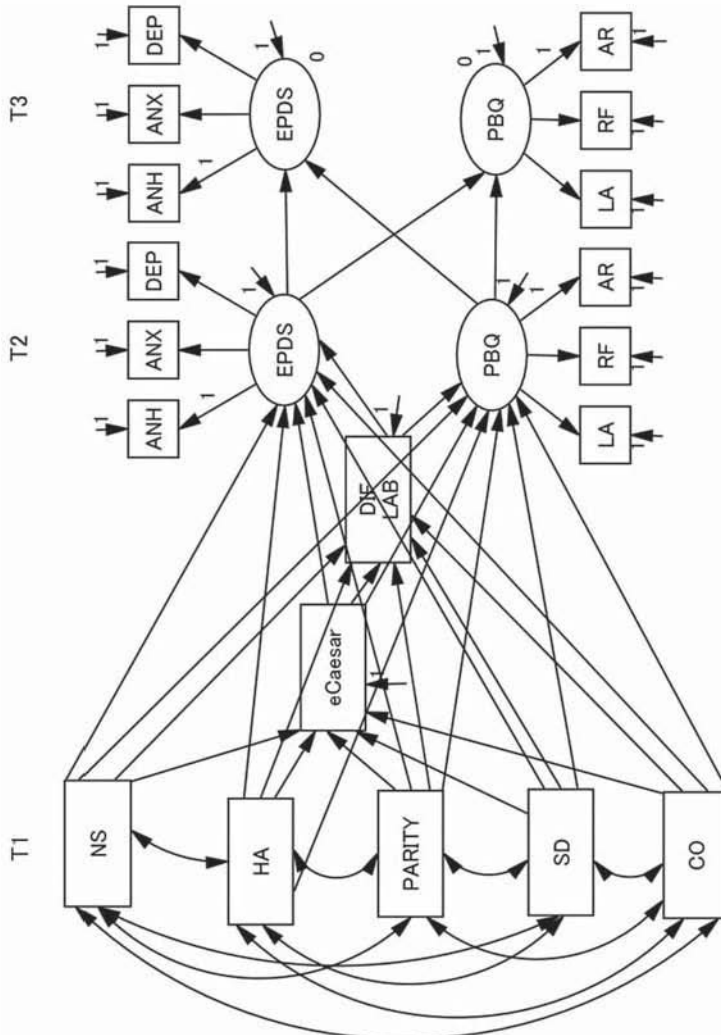
Demographic and obstetric data: Demographic data included age and parity (primiparas/multiparas). Medical records were used to identify complications of pregnancy, including threatened labour, pregnancy hypertension, placenta praevia, anomalies of the foetus, and birth outcomes that included planned Caesarean sections, emergency Caesarean sections, and childbirth complications.

Statistical analyses

We imputed missing values by means of the multiple imputation method. We first examined the means and standard errors (SEs) of all the variables used in this study and then correlated them. Subsequently, we created a structural equation model (SEM) to clarify the temporal relationships between the variables (Fig 1). Here we posited that (1) depression and bonding disorders at one time point would predict that at the next time point, (2) depression at one time point would predict bonding disorders at the next time point while bonding disorders at one time point would predict depression at the next time point, (3) depression and bonding disorders after childbirth would be predicted by personality and/or perception of difficulty of childbirth, and (4) perception of difficulty of childbirth would be predicted by personality and/or emergency Caesarean sections. We also posited that variables at the same time point would co-vary with each other. In the later analysis, the full information maximum likelihood method was used to substitute missing data (Arbuckle, & Wothke, 1995 - 1999). The fit of models with the data was examined by chi-squared (CMIN), the comparative fit index (CFI), and root mean square error of approximation (RMSEA). A good fit was defined by CMIN/df < 2, CFI > 0.97, and RMSEA < 0.05, and an acceptable fit by CMIN/df < 3, CFI > 0.95, and RMSEA < 0.08 (Schermelleh-Engel, Moosbrugger & Müller, 2003). Once the best model was identified, it was "trimmed" by deleting the least significant path from the model and successively repeating this step as long as χ^2 did not reach a statistically significant level (Klein, 2005).

Figure 1. First path model of EPDS, PBQ, emergency Caesarean, Perception of difficulty of childbirth, parity and personality.

Items specific correlations are deleted for the sake of clarity. ANH, anhedonia; ANX, anxiety; DEP, depression; LA, lack of affection; RF, rejection and fear; AR, anger and restrictedness; HA, Harm Avoidance; NS, Novelty Seeking; RD, Reward Dependence; P, Persistence; SD, Self-Directedness; CO, Cooperativeness; ST, Self-Transcendence; eCaesar, emergency Caesarean section; DIF LAB, perception of difficulty of childbirth; T1, late pregnancy; T2, 5 days after childbirth; T3, 1 month after childbirth.



All of the statistical analyses were conducted using SPSS version 24.0 and Amos 24.0 [IBM Japan].

Results

Correlations of the EPDS and PBQ subscales and the predictor variables

As expected, subscale scores of each measure were correlated significantly with each other (Table 1). Each of the EPDS and PBQ subscales were also correlated between T1 and T2. The EPDS subscales at either of the observation times were correlated with the PBQ subscale scores rated at the same time. Moreover, the EPDS subscale scores at Time 1 predicted the PBQ subscale scores at Time 2 except for a few correlations. Similarly, the PBQ subscale scores at Time 1 predicted the EPDS subscale scores at Time 2.

Among the predictor variables, NS and HA as well as low SD and C, predicted ANX and DEP at both Time 1 and 2 but not ANH at either of the observation points. These variables also predicted LA, RF, and AR at both Time 1 and 2 except for a few exceptions. Emergency Caesarean section predicted DEP at Time 1 and all of the three PBQ subscale scores at Time 1 and 2. Perceived difficult labour predicted ANX, DEP, RF, and AR at Time 1 and 2, except for RF at Time 2. Parity predicted all of the six subscale scores of EPDS and PBQ at Time 1 and 2 except for LA at Time 2.

Table 1 Correlations of all the variables used in the present study

	M (SE)	EPDS						PBQ						
		T2			T3			T2			T3			
		ANH	ANX	DEP	ANH	ANX	DEP	LA	RF	AR	LA	RF	AR	
T2 ANH	0.07 (0.51)													
T2 ANX	1.85 (2.16)	.25**												
T2 DEP	0.87 (1.46)	.43**	.64**											
T3 ANH	0.17 (0.24)	-.01	.86**	.43**										
T3 ANX	1.36 (1.84)	.12**	.56**	.64**	.09**									
T3 DEP	0.61 (1.18)	.12**	.47**	.59**	.28**	.58**								
T2 LA	1.85 (3.45)	.15**	.14**	.23**	.11	.07**	.11**							
T2 RF	0.48 (1.31)	.21**	.30**	.44**	.16**	.15**	.26**	.48**						
T2 AR	9.02 (6.36)	.26**	.49**	.54**	.09**	.32**	.30**	.42**	.57**					

T3 LA	1.70 (3.31)	.08**	.11**	.23**	.19**	.14**	.16*	.69**	.39**	.33**			
T3 RF	0.48 (1.37)	.23**	.34**	.49**	.11**	.28**	.33**	.34**	.61**	.46**	.40**		
T3 AR	10.16 (6.85)	.29**	.41**	.49**	.13**	.41**	.39**	.36**	.44**	.72**	.37**	.51**	
NS	24.9 (5.9)	.10**	.24**	.27**	.09**	.18**	.02	-.01	.12**	.21**	.03	.11**	.20**
HA	33.4 (6.9)	.13**	.32**	.20**	.04	.25**	.21**	.17**	.18**	.20**	.11**	.10**	.24**
SD	43.9 (8.4)	-.16**	-.45**	-.32**	-.12**	-.37**	-.25**	-.12**	-.22**	-.29**	-.17**	-.25**	-.38**
CO	49.5 (6.3)	-.00	-.27**	-.28**	-.13**	-.15**	-.20**	-.06*	-.20**	-.32**	-.12**	-.18**	-.32**
eCaesar	—	-.00	.07	.13**	-.02	.07	.01	.23**	.16**	.13**	.23**	.17**	.16**
DIF LAB	4.9 (1.8)	.11**	.21**	.18**	.03	.15**	.13**	.04	.14**	.21**	-.03	.12**	.24**
PARITY	—	-.09**	-.26**	-.13**	.07**	-.17**	-.09**	.06*	-.08**	-.16**	.05	-.13**	-.25**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. T2, 5 days after childbirth; T3, 1 month after childbirth.

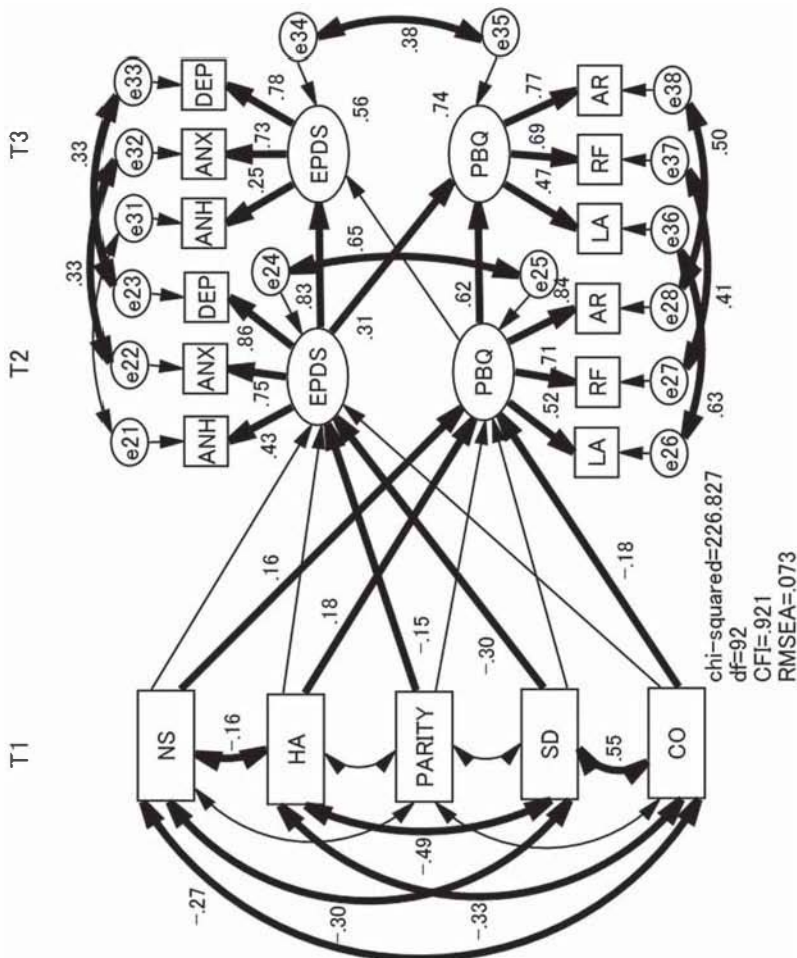
ANH, anhedonia; ANX, anxiety; DEP, depression; LA, lack of affection; RF, rejection and fear; AR, anger and restrictedness; HA, Harm Avoidance; NS, Novelty Seeking; RD, Reward Dependence; P, Persistence; SD, Self-Directedness; CO, Cooperativeness; ST, Self-Transcendence; e Caesar, emergency Caesarean section; DIF LAB, perception of difficulty of childbirth; T1, late pregnancy; T2, 5 days after childbirth; T3, 1 month after childbirth.

SEM Analysis

After model trimming, we obtained a much simpler model (Fig. 2). This model showed an acceptable fit to the data: $\chi^2/df = 2.47$, CFI = .921, and RMSEA = 0.073. This model found that: (1) both depression and bonding disorders significantly predicted corresponding variables at the next time point, (2) depression at Wave 2 significantly predicted bonding disorders at Wave 3, whereas bonding disorders at Wave 2 failed to predict depression at Wave 3, and (3) depression was predicted by parity (primiparas) and low SD, but bonding disorders were predicted by NS, HA, and low C.

Figure 2. Path model of EPDS, PBQ, parity and personality.

Path coefficients are standardised. Path coefficients without significance are calculated but not described for the sake of clarity. ANH, anhedonia; ANX, anxiety; DEP, depression; LA, lack of affection; RF, rejection and fear; AR, anger and restrictedness; HA, Harm Avoidance; NS, Novelty Seeking; SD, Self-Directedness; CO, Cooperativeness; T1, late pregnancy; T2, 5 days after childbirth; T3, 1 month after childbirth.



Discussion

To the best of our knowledge, the present study is the first to prospectively investigate the causal relationship between maternal depression and bonding disorders in connection with personality traits, 5 days and 1 month after childbirth, using SEMs. As expected, bonding disorders at 1 month after childbirth were predicted by bonding disorders at 5 days after childbirth but they were also predicted by depression at 5 days after childbirth. On the other hand, bonding disorders at 5 days after childbirth failed to predict depression at 1 month after childbirth. The results of our current analyses differed from those of Ohashi, Sakanashi, Tanaka, & Kitamura (2016) despite using the same sample population. This may be because of the difference of model specification. Ohashi, Sakanashi, Tanaka, & Kitamura (2016) paid attention mainly to the effects of bonding disorders and depression on neonatal emotional abuse whereas our focus was on the prediction of postnatal bonding disorders and depression by personality traits and parity. The path efficient from depression at Time 2 to bonding disorders at Time 3 was modest and this appeared only after controlling for the effects of personality traits and parity.

The determinant of coefficient of bonding disorders at 1 month after childbirth was 0.74. This means that 74% of the variance of bonding disorders was explainable by this model. This finding appears to merit a follow up of mothers with depression from the beginning of the postpartum period as well as possible early intervention to prevent the escalation of bonding disorders. Further, we previously showed that mothers with postnatal depression who did not seek medical support scored significantly higher in bonding disorders than those who did (Kitamura, Yamashita, & Yoshida, 2009). This suggests that perinatal health professionals should pay more attention to not only depression but also postpartum women's feelings towards their infants. Ohara, et al. (2017) reported that at 5 days after childbirth, a bonding disorder predicted depression but not *vice versa*. The discrepancies between this and our report may result from differences in scales used in the study. It may be that the PBQ, the measure we used, is more suitable for identifying patients of severe bonding disorders than the Mother-to-Infant Bonding Questionnaire (MBQ), which is the measure that Ohara et al. (2017) used. It may also come from the difference in time frame: Ohara et al. (2017) used three time points—early and late pregnancy and 5 days after childbirth—while we used a different set of three time points—late

pregnancy, 5 days, and 1 month after childbirth. Bonding disorders at 5 days and 1 month after childbirth may have different causal paths. This needs further investigation.

Our study also shed light on the possibility of heterogeneity in bonding disorders, a part of which has its origins in depression. Such bonding disorders that are secondary to depression perhaps should be treated as mood disorders whereas ‘pure’ (or primary) bonding disorders may require a unique therapeutic approach. Further studies with greater sample size may be necessary to clarify these issues.

Another important aspect of our results was that depression after childbirth was predicted by parity and low SD. Matsudaira and Kitamura (2006) examined the effects of personality (temperament and character) on specific depression and specific anxiety of 541 Japanese undergraduates. Hierarchical multiple regression analyses demonstrated that specific depression was predicted by low SD. SD refers to identification with the autonomous self and the confidence to deal with any situation in accordance with one’s goals and values. Individuals high in SD have high self-esteem, responsibility, and ability to pursue a purpose (Cloninger, Svrakic, & Przybeck, 1993). As in studies of Minatani, Kita, Ohashi, Kitamura, Haruna, Sakanashi, & Tanaka (2013) and Andriola, di Trani, Grimaldi, & Donfrancesco (2011), our study showed that postnatal depression was associated with low SD.

On the other hand, our results showed that bonding failure was predicted by high NS, high HA, and low C. This study is the first to show an association between bonding disorders and personality traits. HA is a trait that is characterized by low energy level. People high in HA are cautious, fearful, nervous, and passive (Cloninger, Przybeck, Svrakic, & Wetzel, 1994). They are shy in most social situations and easily feel tired. Hence, such a temperament is not suited for people who are required to provide adequate affectionate responses to their new babies in a variety of situations. This requires parents to cope properly in sudden and unexpected situations. Not surprisingly, HA was inversely related to bonding towards their babies. NS refers to a heritable bias in the activation and initiation of behaviour. Individuals high in NS show exhilaration in response to novel stimuli, intuitive decision making, and active avoidance of rules or orders (Cloninger, Svrakic, & Przybeck, 1993). Matsudaira and Kitamura (2006) reported that specific anxiety was predicted by high NS and high HA. Anxiety in late pregnancy predicted both depression and bonding failure at 1 month after childbirth (Kokubu, Okano, & Sugiyama, 2012). It is not surprising that anxiety arising from temperament makes a

major contribution to the development of bonding disorders. Cloninger and colleagues have shown that a combination of high NS and HA reflects a borderline personality trait (Cloninger, Svrakic, & Przybeck, 2006). In clinical settings, these people are emotionally reactive with mixed anxiety and anger, are socially alienated, and have prominent approach–avoidance conflicts (Svrakic, Whitehead, Prsybeck, & Cloninger, 1993; Cloninger, Svrakic, & Przybeck, 1993).

C● indicates the extent to which individuals view other people as a part of the self. Individuals high in C● are socially tolerant, empathetic, helpful, and compassionate (Cloninger, Svrakic, & Przybeck, 1993). Such personality traits are much of what is needed for parents taking care of their infant. Those mothers who are less empathetic or compassionate, if combined with borderline personality traits, are likely to feel anger and rejection when facing unexpected difficulties related to child-rearing.

In the current study, a primipara state predicted depression but not bonding disorders at 5 days after childbirth. Association between parity and some of the PB● subscale scores found in bivariate correlations may come from confounding data, due to the significant association between depression and bonding disorders.

Bonding disorders at 5 days after childbirth were predicted by emergency Caesarean section in our first model (fig. not shown), but this disappeared in our final model. This may be because a significant association between low SD and emergency Caesarean section confounded the situation.

Limitations of this study should be noted. Firstly, diagnosis of depression and bonding disorders relied solely on the mothers' own reports, which may be a source of bias. Furthermore, the high rate of attrition may be explained by mothers' effort complete and return the questionnaires at 5 days and 1 month after childbirth being excessive for those with moderate or severe depression. Secondly, the participants were not a random sample of pregnant women in Japan. The health professionals of participant hospitals were strongly motivated in perinatal psychological care and voluntarily participated in this study, therefore they might provide physical as well as psychological support to the sample perinatal women. Thirdly, there was no validation of some of the scales used in the study such as the perception of difficulty of childbirth.

In summary, our study indicates that depression at 5 days after childbirth predicts bonding disorders at 1 month after childbirth and that postnatal depression and bonding disorders were differentially predicted by personality traits. The findings suggest that we should pay more

attention to depressed mothers at 5 days after childbirth in order to prevent them from developing bonding disorders later. Different personality traits may be important risk factors of postnatal depression and bonding disorders. Assessment for maternal personality in early pregnancy should be routinely performed by perinatal health professionals.

Acknowledgements

We are grateful for Dr. H. Kaneko for generously providing the Japanese version of the PBQ. We thank the support given by the following hospitals and clinics: Fukuda Hospital, Suenaga Obst/Gyn Clinic, Jikei Hospital, Kumamoto City Hospital, Kumamoto University Hospital, Kurokawa Gynaecologic and Obstetric Clinic, Tashiro Gynaecologic and Obstetric Clinic, Amakusa Central General Hospital, Arao Municipal Hospital, Shimokawa Gynaecologic and Obstetric Clinic, Kamiamakusa General Hospital, Kataoka Ladies Clinic, Honda Ladies Clinic, Aikoh Obstetrics, Gynaecology, and Dermatology Clinic, Yamaguchi Maternity Clinic, Matsubase Ladies Clinic, Kikuyou Ladies Clinic, and Asahino General Hospital.

Conflict of interest statement

None declared.

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CHAPTER NINE

DO YOU WANT ANOTHER BABY? BONDING DISORDER, DYSPHORIC MOOD AND DEMOGRAPHIC DETERMINANTS OF DESIRE FOR ANOTHER BABY AMONG JAPANESE WOMEN WITH A ONE-MONTH OLD CHILD

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Abstract

Objectives: To examine the effects of bonding disorders and depression on the desire to have another baby among mothers of one-month-old infants.

Methods: Self-administered questionnaires were distributed on three occasions: during the last trimester of pregnancy (Wave 1), and five days (Wave 2) and one month (Wave 3) after childbirth. The desire to have another baby was rated at Wave 3. This was predicted by the Postnatal Bonding Questionnaire (PBQ) and the Edinburgh Postnatal Depression Scale (EPDS) at Wave 2 as well as responses to the current pregnancy and demographic features at Wave 1.

Results: The desire to have another baby at one month after childbirth was negatively predicted by bonding disorders and depression at five days after childbirth and whether the current pregnancy was undesired. This was, however, only the case among nulliparas.

Discussion: The correlates of the desire to have another baby differ between nulliparas and multiparas. Only among nulliparas was the desire to have another baby correlated negatively with bonding disorders and depression. The national policy for avoiding a reduction of the child birth rate should take into account perinatal psychological issues.

Key words: Desire to have another baby, bonding disorders, depression, parity

Introduction

In high-income countries, the age of first delivery has been increasingly delayed. This may be associated with difficulties related to pregnancy and childbirth. There may be a variety of reasons for this. For example, women have more chances to work after marriage. Married couples have more liberal views about when to decide to have children (Tydén, Svanberg, Karlström, Lohoff, & Lampic, 2006). Old value systems emphasizing women's childbearing and household responsibilities have become less common. Women may view other issues as more attractive and important than childbearing. In addition to this, Japan has seen a total fertility rate of less than 2.0 for more than two decades with a constant decrease. Couples who have one child seem not to want more children. Therefore, this has become a serious social issue. The government has considered that having more than one child is an economic burden and, therefore, financial support for couples may increase the fertility rate.

Little attention has been paid about motivations, other than financial ones, for women having already given birth to one baby to have additional children. If, for example, the latest childbirth and subsequent child rearing was unpleasant or stressful, women may be less motivated to have another baby. Postnatal maternal bonding disorders that make women feel hatred towards the baby may lead to weaker motivation to have further children. Postnatal depression may be another possible cause of avoiding additional pregnancies. If the current pregnancy was not desired or expected, then the couple may be less motivated to have another baby.

In this study, we hypothesized that among women having given birth to their first baby, their motivation to have another baby would be determined by bonding disorders, postnatal depression, and whether the current childbirth was undesired.

Methods

Participants

As a part of a cohort study on pregnant women and their relationship with their baby, all 55 obstetric clinics in Kumamoto Prefecture were solicited to participate in this follow-up survey. ● Out of 55 clinics, 18 (33%) antenatal institutes agreed. A mixture of different types of antenatal institutions participated: one university hospital, 12 public and private hospitals, and five private clinics. ● Our inclusion criteria were (a) women of at least 28 weeks' gestation attending one of these antenatal clinics during the entire month of November 2011, and (b) at least 20 years old. We excluded those women who were illiterate in Japanese, who had a severe mental illness, or who had been hospitalized with pregnancy complications. Sets of questionnaires were distributed during the third trimester of pregnancy (Wave 1), at five days (Wave 2), and one month after childbirth (Wave 3). ● Of 1,538 eligible women, 633 (41%), 445 (29%), and 392 (26%) women responded at each of the three time points (during the pregnancy, five days after childbirth, and one month after childbirth, respectively). A total of 257 (17%) women returned all three questionnaires. ● Of these women, four gave birth to twins. Excluding these women, the remaining data from 253 (16%) women were used for subsequent analyses.

Measurement

Desire to have another baby: We created an *ad hoc* item: “Do you wish to have another child in the future?” This was scored on a five-point scale from “1-Not at all: I will not give birth to any more children” to “5-Definitely: I wish to have another baby.”

Reactions to the current pregnancy: The questionnaire at Wave 1 included two *ad hoc* questions: “How did you feel when informed of the current pregnancy?” (negative response to the pregnancy) and “Did you want the pregnancy?” (pregnancy undesired). Both were rated on a five-point scale: from “1-very much pleased” to “5-very much displeased” and from “1-wanted very much” to “5-did not want pregnancy,” respectively.

Bonding disorder: We used the Japanese version (Kaneko & Honjo, 2010) of the Postnatal Bonding Questionnaire (PBQ; Brockington et al., 2001). This self-report questionnaire assessing parents’ attitudes and emotions towards their infants consists of 25 items rated on a six-point scale (0 to 5). Higher scores indicate a more negative affection towards the baby and greater psychological burden regarding parenting. We have already found that the PBQ has a three-factor structure (Ohashi, Kitamura, Sakanashi, & Tanaka, 2016): Lack of Affection (LA), Rejection and Fear (RF), and Anger and Restrictedness (AR). The PBQ was distributed to participants five days after childbirth.

Depression: Symptoms of maternal depression were assessed by the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), a screening instrument for postpartum depression. The EPDS consists of 10 items with a four-point scale. It was translated into Japanese by Okano et al. (1996) who examined its validity and reliability. The EPDS was found to have a three-factor structure: Anhedonia, Anxiety, and Depression (Kubota et al., 2014).

Demographic and obstetric data: Demographic data included the woman’s and partner’s age, number of children (other than the newborn), and the gender of the newborn. Medical records were used to identify pregnancy complications, including threatened preterm labor, hypertension during pregnancy, placenta previa, anomalies of the fetus, and birth outcomes that included planned Caesarean section (CS), emergency CS (emCS), and delivery complications.

Data analyses

We calculated means and SDs of all the variables used in this study. Then we correlated the scores of the desire to have another baby with these predictor variables. The variables found to be significantly correlated with the desire to have another baby were used in a series of structural equation modelling (SEMs) analyses. In this study, we speculated that parity would be a moderator so we performed several multigroup SEMs with nulliparas and multiparas as two groups. The basic idea of these SEMs was that the desire to have another baby would be predicted by both the Bonding Disorder and the Dysphoric State, which consisted of the subscales of the PBQ and EPDS, respectively (Fig. 1). For the sake of simplicity of the models, we added a third set of different predictor variables selected from the variables that were significantly correlated with the desire to have another baby (Table 3).

The fit of the models with the data was examined using different indices: chi-squared (CMIN), comparative fit index (CFI), and root mean square error of approximation (RMSEA). Conventional criteria suggest that a good fit would be indicated by CMIN/df < 2, CFI > .97, and RMSEA < .05, and an acceptable fit by CMIN/df < 3, CFI > .95, and RMSEA < .08 (Bentler, 1990; Schermelleh-Engel, Moosbrugger, & Müller, 2003). We compared different models by means of the Akaike Information Criteria. A model with a lower AIC was regarded as better than other models (Klein, 2005).

Procedure

Participants were asked to complete the questionnaire at home and to return it to one of the researchers (T.K.) using a stamped envelope. The present study was approved by the Ethical Committee of Kumamoto University Graduate School of Life Sciences.

Results

Little's MCAR test showed $\chi^2(43092) = 27077.0$, $p = 1.00$. Thus, the data were missing completely at random. Missing values were imputed by the means of multiple imputation.

The mean (SD) of the participant mothers was 30.1 (4.7) years. The multiparas (mean = 30.8, SE = 0.4) were slightly older than the nulliparas (mean = 29.4, SE = 0.5) ($t = 2.4$, $p < .05$). The mean (SD) age of the partners was 32.3 (6.0). The multiparas' partners (mean = 33.2, SE = 0.5) were older

than the nulliparas partners (mean = 31.2, SE = 0.6) ($t = 2.7, p < .01$). The gender of the newborn was equal between boys and girls.

The desire to have another baby expressed at Wave 3 was correlated with a younger age of the woman and partner, fewer number of children, a negative response to the current pregnancy, an undesired pregnancy, Anhedonia and Depression at Wave 1, and LA at Wave 2 (Table 1).

Table 1. Means and SDs of all the variables used in this study and correlations with desire for another baby

Variables	Correlation with desire to have another baby	Mean	SD	skewness
Age	-.33***	30.2	4.7	0.1
Husband age	-.24***	32.3	6.0	1.0
N of children	-.42***	0.70	0.80	1.0
Negative response to the pregnancy	-.26***	1.28	0.57	2.1
Pregnancy undesired	-.17**	1.62	1.00	0.3
Pregnancy complications	.06	0.28	0.61	2.6
Gender of the baby	-.03	1.50	0.50	0.0
Anhedonia day 5	-.14*	0.08	0.54	8.3
Anxiety day 5	-.01	1.85	2.21	1.1
Depression day 5	-.15*	0.86	1.45	2.2
LA day 5	-.29***	1.91	3.55	3.1
RF day 5	-.08	0.50	1.36	4.1
AR day 5	-.10	9.00	6.49	1.2

* $p < .05$; ** $p < .01$; *** $p < .001$. LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness

As predictors of the desire to have another baby, we used the age of the woman and partner, a negative response to the pregnancy, an undesired pregnancy, and the subscales of the EPDS and PBQ. As expected, the ages of the woman and partner, and a negative response to the pregnancy and an undesired pregnancy were significantly correlated with each other (Table 2). Young women were more likely to report that the current pregnancy was

not desired and higher Anxiety. Women with a young partner were more likely to report higher Anxiety, Depression, and AR. The negative response to the pregnancy was significantly correlated with Anhedonia and Depression as well as RF and AR. Finally, the subscales of the EPDS and the subscales of the PBO were correlated with each other.

With parity as a moderator, we performed multigroup SEMs (Table 3). The model using the undesired pregnancy showed the lowest AIC, thus this was regarded as the best to fit the data. The fit was nearly acceptable: chi-squared/ df = 2.48, CFI = .906, and RMSEA = .077.

In this model, there appeared to be differences between nulliparas and multiparas. In nulliparas, the desire to have another baby was predicted significantly by Bonding Disorder, Dysphoria, and an undesired pregnancy (Fig. 2). In contrast, these predictions were not significant in multiparas (Fig. 3).

Tables 2. Correlations of variables used in the SEMs

Variables	1	2	3	4	5	6	7	8	9	10
1 Desire for another baby	—									
2 Age	-.33***	—								
3 Husband age	-.24***	.62***	—							
4 Negative response to the pregnancy	-.26***	-.05	-.02	—						
5 Pregnancy undesired	-.17**	-.18**	-.12	.43***	—					
6 Anhedonia day 5	-.14*	.03	-.02	.16*	.07	—				

7 Anxiety day 5	-.01	-.16*	-.24***	.12	.13	.25***	—			
8 Depression day 5	-.15*	-.03	-.13*	.21**	.12	.47***	.66***	—		
9 LA day 5	-.29***	.12	.07	.00	-.01	.15*	.13*	.20**	—	
10 RF day 5	-.08	-.06	-.10	.31***	.03	.21**	.30***	.45***	.48***	—
11 AR day 5	-.10	-.03	-.15*	.22**	.05	.27***	.48***	.53***	.42***	.59***

* $p < .05$; ** $p < .01$; *** $p < .001$. LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness

Table 3. Comparison of models of multigroup analyses for nulliparous and multiparous women (no restriction)

Predictor variables in the model	Chi-squared/ <i>df</i>	CFI	RMSEA	AIC
Ages of the woman and the partner	100.930/44 = 2.29	.910	.072	228.930
Negative response to the pregnancy	83.134/32 = 2.60	.904	.080	195.134
Undesired pregnancy	79.239 / 32 = 2.48	.906	.077	191.239
Ages of the woman and the partner + Negative response to the pregnancy	533.570 / 55 = 9.70	.285	.186	683.570
Ages of the woman and the partner + Undesired pregnancy	509.010/55 = 9.25	.303	.181	659.010
Negative response to the pregnancy + Undesired pregnancy	114.514/41 = 2.79	.876	.085	248.514
Ages of the woman and the partner + Negative response to the pregnancy + Undesired pregnancy	592.410/73 = 8.12	.294	.168	754.410

CFI, comparative fit index; RMSEA, root mean squared of error approximation; AIC, Akaike Information Criterion.

Fig. 1. Conceptual model

LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness; ANH, Anhedonia; ANX, Anxiety; DEP, Depression

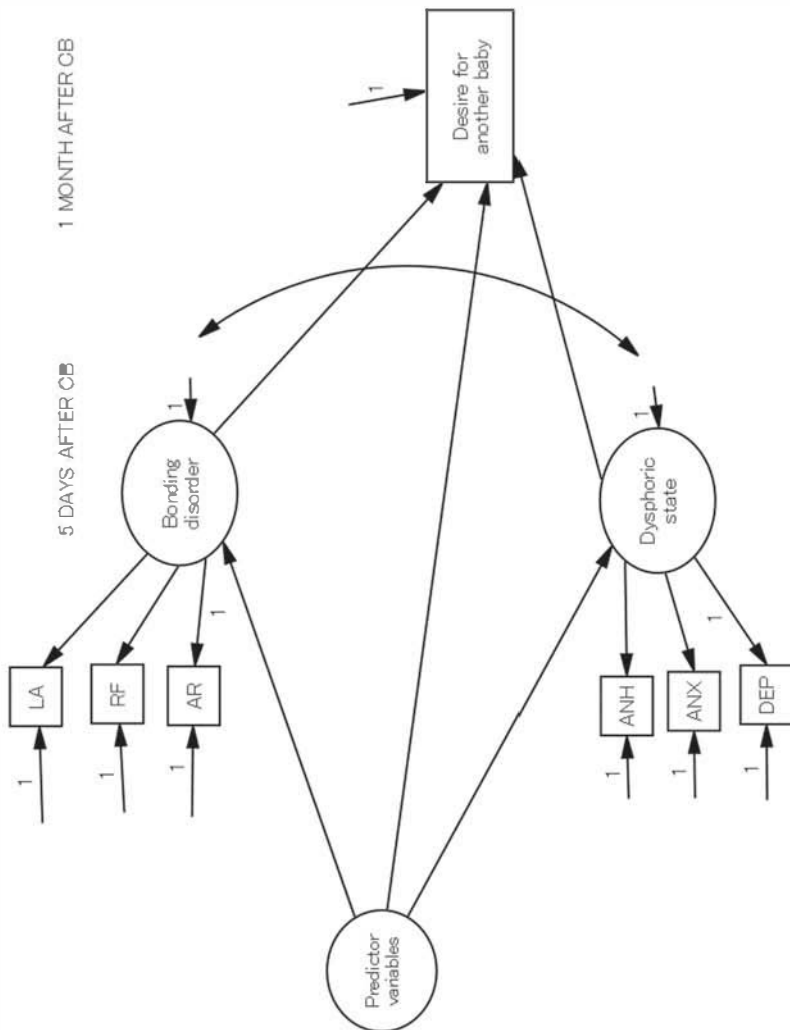


Fig. 2. Nulliparous women

Paths with significant estimates are in bold. LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness; ANH, Anhedonia; ANX, Anxiety; DEP, Depression

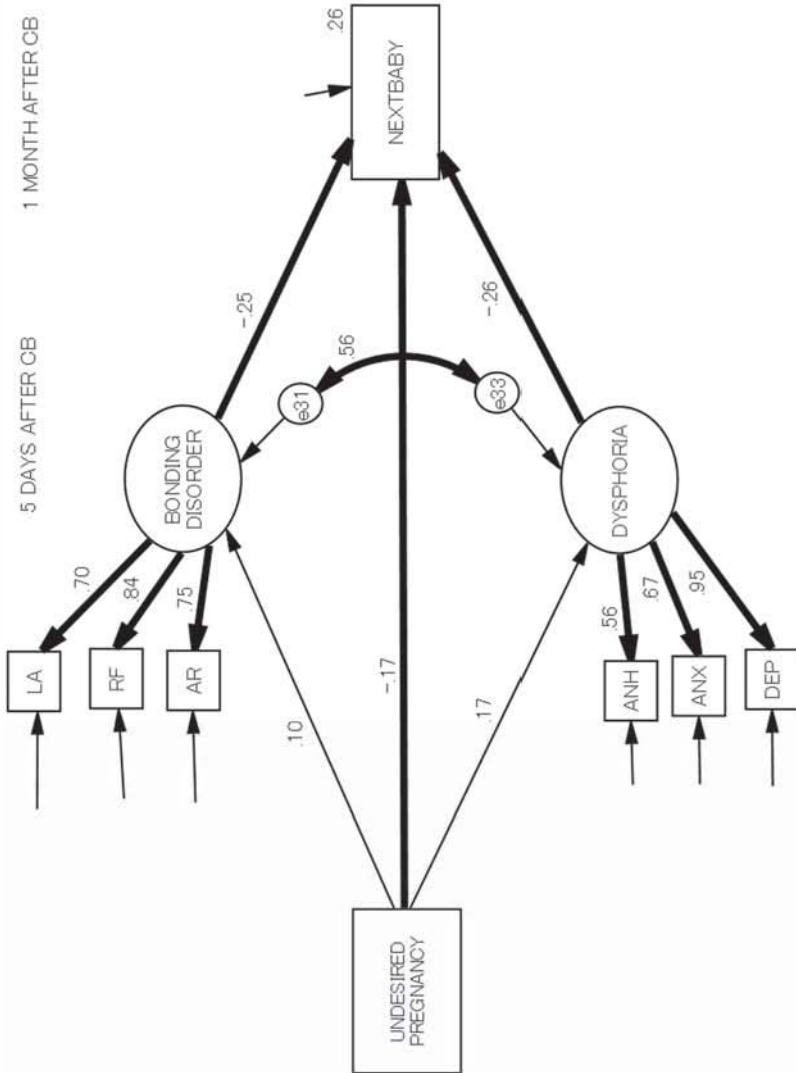
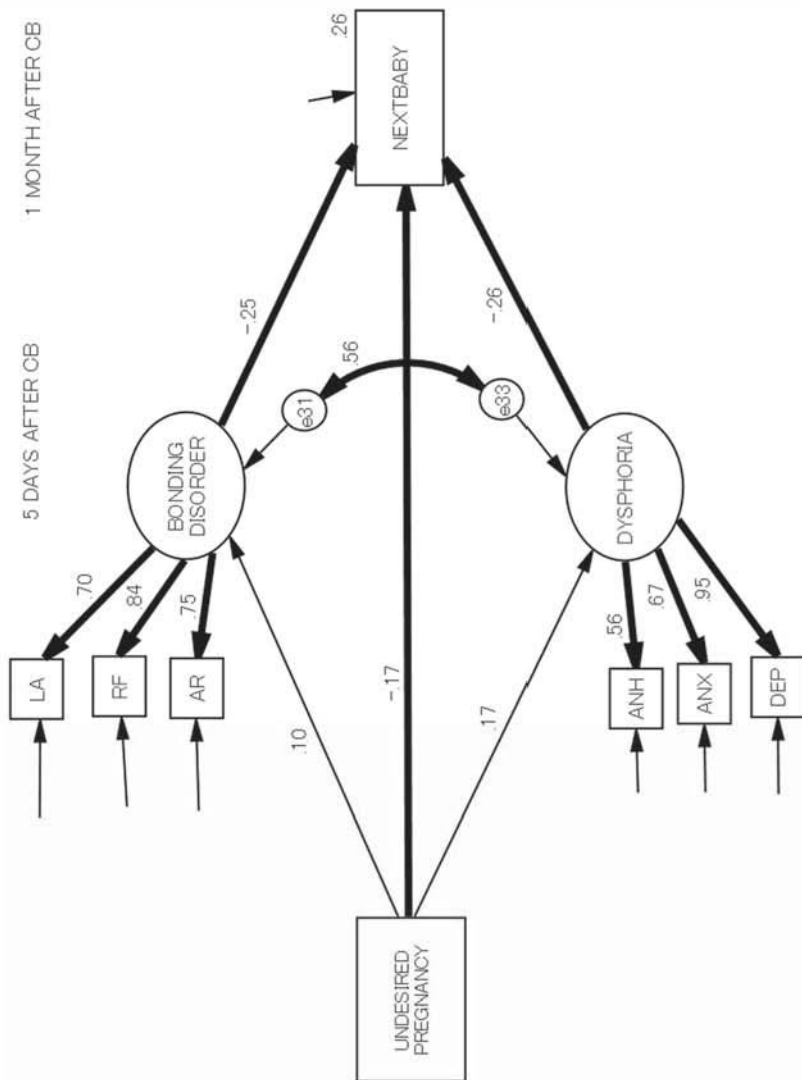


Fig. 3. Multiparous women

Paths with significant estimates are in bold. LA, Lack of Affection; RF, Rejection and Fear; AR, Anger and Restrictedness; ANH, Anhedonia; ANX, Anxiety; DEP, Depression



Discussion

Our study revealed that nulliparas and multiparas differed in terms of path results regarding the predictors on the desire to have another baby. Thus, bonding disorders and depression at five days after childbirth predicted the desire to have another baby only for nulliparous women. Among multiparous women, the desire to have another baby was not predicted by either bonding disorders or depression.

In developed countries, the value of rearing one's own offspring may have changed. In Japan, we used to have traditional values represented by the expression, *kodakara* (treasure child/children). Parents would want to do as much as possible for their children. This is still the case generally. However, the sense of having one's own children has changed. The birth of children is no longer a given, but is chosen and decided according to the will of parents. In other words, *kodakara* was changed from "blessed" to "the creation by the parents" (Kashiwagi, Sato, & Shoji, 2002). As life style and value systems become diversified, the deciding factors regarding whether to have children or not have become multifaceted and vary from one couple to another.

Our SEM model failed to show significant associations between multiparous mothers' desires to have another baby and a variety of psychological variables. It may be that for multiparas there are important practical reasons, such as family budget, support regarding childcare and housekeeping, and living space in the house, to name just a few. In order to avoid a decline in birth rate, the Japanese government established child rearing support systems in communities and provided allowances for each family having children (Ministry of Health, Labour and Welfare, 2017). Our results are in line with indications that these policies may be effective for families already having at least one child. On the other hand, the desire to have another baby among nulliparous women was predicted by a lack of bonding disorders and depression during the early postpartum period. These psychological factors may be causes for them to avoid having another baby. Our model succeeded in explaining about a quarter of the variance in nulliparous mothers' desires to have another baby. If women's psychological problems during the perinatal period are unignorablely related to the negative attitudes towards further pregnancy and childbirth, Japanese childcare support policies are not sufficiently effective for nulliparas. More light should be shed on the psychological aspects of women giving birth in terms of planning for future pregnancies. If women give birth to their first baby without depression or bonding disorders, they are more likely to want

to have another baby. Moreover, perinatal counseling should also include aspects of hope for another baby, planning about the family structure, and career planning in connection with depression and bonding disorders.

Another point of interest is that negative bonding towards the baby and the mother's depression are also important in terms of the influence on the early relationship between the mother and the baby. Moreover, parenting styles may be transmitted to the next generations (Kitamura et al., 2009). The construction of much more intensive psychological support, particularly for nulliparous mothers during the perinatal period, may be a very important key for the national policy of preventing a declining birth rate.

A drawback of our study is the attrition rate of the investigation. Although the participating institutes were a well-balanced blend of public and private clinics, our analyses included only 16% of the eligible women. It may be that women with more complications decline from participating in the study. Attrition cases may have different patterns regarding the desire to have another baby. The study failed to identify predictors of the desire to have another baby among multiparous women. More research is needed to identify possible predictors.

Taking these drawbacks into consideration, the present study provides preliminary evidence that 26% of the variance of the desire to have another baby among nulliparas was predicted by perinatal psychological factors, including undesired pregnancy, bonding disorders, and depressive symptoms. A strength of our study is that we performed several multigroup SEMs with nulliparas and multiparas as two groups. Several studies also suggested that nulliparas and multiparas could not be considered as the same group in perinatal psychological studies (Takegata, Sakanashi, Tanaka, & Kitamura, 2019; Kokubu, Okano, Sugiyama, & Kitamura, 2019). To the best of our knowledge, this paper is the first report that demonstrated that bonding disorders is a predictor of avoidance of having another baby.

In conclusion, among nulliparas, the desire to have another baby at one month after childbirth was predicted by bonding disorders and depression at five days after childbirth and whether the current pregnancy was undesired. Policies that put importance on perinatal mental health support are required.

Acknowledgements

We are grateful for Dr. H. Kaneko for generously providing the Japanese version of the PBQ. We are thankful for the support given by the following hospitals and clinics:

Fukuda Hospital, Suenaga Ob/Gyn Clinic, Jikei Hospital, Kumamoto City Hospital, Kumamoto University Hospital, Kurokawa Gynecologic and Obstetric Clinic, Tashiro Gynecologic and Obstetric Clinic, Amakusa Central General Hospital, Arao Municipal Hospital, Shimokawa Gynecologic and Obstetric Clinic, Kamiamakusa General Hospital, Kataoka Ladies Clinic, Honda Ladies Clinic, Aikoh Obstetrics, Gynecology, and Dermatology Clinic, Yamaguchi Maternity Clinic, Matsubase Ladies Clinic, Kikuyou Ladies Clinic, and Asahino General Hospital.

Conflict of interest statement

None declared.

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CHAPTER TEN

BREASTFEEDING SELF-EFFICACY IN JAPANESE MOTHERS OF AN INFANT: ASSOCIATION WITH FEEDING STYLE, MOTHER-TO-INFANT BONDING, DEPRESSION, AND PERCEIVED CARE BY MIDWIVES

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Abstract

Objectives: To clarify the associations between breastfeeding, breastfeeding self-efficacy, maternal bonding disorders, and other psychological variables as well as the effects of nursing care for

breastfeeding in a maternity ward.

Methods: Postnatal women were investigated when they were discharged from the obstetric ward (Wave 1) and one month after childbirth (Wave 2) using *ad hoc* items measuring feeding style, the Japanese version of the Breastfeeding Self-Efficacy Scale-Short Version (BSES-SF), the Mother-to-Infant Bonding Scale (MIBS), the Edinburgh Postnatal Depression Scale (EPDS), *ad hoc* items measuring the women's perception of midwives' care about breastfeeding (the Perceived Nursing Care for Breastfeeding Scale: PNCBS), and other variables.

Results: Factor analyses confirmed a single factor structure of the BSES-SF, a single factor structure of the MIBS, a three-factor structure of the EPDS, and a two-factor structure of the PNCBS. Structured equation modelling analyses showed that (a) the breastfeeding exclusivity at Wave 2 was predicted by both the BSES-SF scores and breastfeeding at Wave 1; (b) the MIBS scores at Wave 2 were predicted by both the MIBS and BSES-SF scores at Wave 1; and (c) the PNCBS predicted greater breastfeeding exclusivity and BSES-SF scores as well as lower MIBS and EPDS scores at Wave 1.

Conclusion: This study clarified the psychological mechanism of breastfeeding exclusivity in terms of breastfeeding self-efficacy, obstetric history, age, and perceived nursing care. Antenatal nursing care should focus more on the expectant women's attitudes towards the current pregnancy as well as postnatal nursing care. Better nursing care, which enhances breastfeeding self-efficacy with desired and satisfactory care, and guidance for mothers with an infant may lead to higher breastfeeding exclusivity and better mental health including depression and bonding disorders.

Key words: breastfeeding, breastfeeding self-efficacy, maternal bonding, depression, nursing support

Introduction

The World Health Organization (2003), the American Academy of Pediatrics (2005), and the American Dietetic Association (2001; 2012) have recommended exclusive breastfeeding for the first six months of life and continued breastfeeding for two years and beyond. The health outcomes of babies (and mothers) fed exclusively with breast milk were better than those with formula milk. They included less gastrointestinal diseases, otitis media, respiratory illnesses, and atopic disease as well as differences in maternal

outcomes of delayed menses and postpartum weight loss (Ip et al., 2007; American Academy of Pediatrics, 2012). Nevertheless, less than half of infants are breastfed at six months of age in high income countries (Victoria et al., 2016). Japan is no exception. Only half of infants aged two months or younger were predominantly breastfed in the latest national survey (Equal Employment, 2016).

Why do so many women stop breastfeeding exclusively in such a short time after childbirth? Research showed that low breastfeeding exclusivity was associated with (a) sociodemographic features such as lower education (Brown et al., 2013; Kohlhuber, Rebhan, Schwegler, Koletzko, & Fromme, 2008), single motherhood (Brown et al., 2013), and younger age (Forster, McLachlan, & Lumley, 2006), (b) health conditions such as obesity (Brown et al., 2013; Forster, McLachlan, & Lumley, 2006), and smoking before and throughout pregnancy (Brown et al., 2013; Forster, McLachlan, & Lumley, 2006), (c) obstetric variables such as preterm birth (Kohlhuber et al., 2008; Vieira et al., 2010), and delivery by Caesarean section (Dashti, Scott, Edwards, & Al-Sughayer, 2010; Vieira et al., 2010), (d) infant conditions such as no early breast contact by the infant (Brown et al., 2013), and the infant time spent in the Special Care Nursery (Dashti et al., 2010), (e) maternal conditions such as perceived insufficient milk supply (Chantry, Dewey, Peerson, Wagner, & Nommsen-Rivers, 2014), mother's depression (Forster et al., 2006), no intention to breastfeed (Brown et al., 2013; Forster et al., 2006; Kohlhuber et al., 2008), and not having been breastfed oneself as a baby (Forster et al., 2006), (f) social conditions such as poor paternal (Dashti et al., 2010) and spousal (Kohlhuber et al., 2008) support for breastfeeding, (g) poor information on breastfeeding before birth (Kohlhuber et al., 2008; Vieira et al., 2010), and (h) inappropriate hospital care after birth (Inoue, Binns, Otsuka, Jimba, & Matsubara, 2012).

Breastfeeding self-efficacy is a woman's perception of their ability to breastfeed (Dennis, 1999). This concept has attracted much research interest and is reported to be associated with the successful initiation and continuation of breastfeeding (Baghurst et al., 2007; Blyth et al., 2002; de Jager, Broadbent, Fuller-Tyszkiewicz, & Skouteris, 2013; Loke & Chan, 2013; McCarter-Spaulding & Gore, 2009; Wilhelm, Rodehorst, Stepan, Hertzog, & Berens, 2008; Ystrom, Niegel, Klepp, & Vollrath, 2008). Further, several intervention studies indicated that breastfeeding duration and exclusivity could be improved by enhancing breastfeeding self-efficacy during pregnancy and the early postnatal period (McQueen, Dennis, Stremler, & Norman, 2011; Nichols, Schutte, Brown, Dennis, & Price, 2009; Noel-Weiss, Rupp, Cragg, Bassett, & Woodend, 2006). One study

was reported from Japan (Otsuka et al., 2014). The first aim of our study was to identify the effects of breastfeeding self-efficacy on breastfeeding exclusivity in a longitudinal study design using a sample of Japanese mothers.

A second aim of our study was the effects of midwives' care for breastfeeding in a maternity ward. The first few days after childbirth may be crucial to initiate and continue exclusive breastfeeding. Here the nursing care by perinatal health professionals may have vital importance. In this study, we created an *ad hoc* measure of nursing support for breastfeeding and examined the effects of such care on mothers' feeding style in a naturalistic design. Then we examined whether nursing care focusing on breastfeeding during a stay in an obstetric ward would facilitate breastfeeding exclusivity. A Baby-Friendly Hospital (BFH) is of particular interest because it is a globally registered institute to promote breastfeeding.

Research has shown an association between poor breastfeeding and breastfeeding self-efficacy as well as psychological maladjustment after childbirth. Zubaran and Foresti (2013a) studied postpartum women between two and 12 weeks after childbirth in a cross-sectional research study and found that mothers who combined breastfeeding and bottle-feeding presented higher depression scores while breastfeeding self-efficacy scores were negatively correlated with depression scores. The same authors reported that breastfeeding self-efficacy scores were correlated with other psychological adjustment measures (Zubaran & Foresti, 2013b). Another study in Norway also reported an association between psychological maladjustment and mixed feeding (Ystrom, Niegel, Klepp, & Vollrath, 2008). These studies were, however, cross-sectional in their research design and therefore causality could not be discussed. It may be either that psychological maladjustment inhibits exclusive breastfeeding or that exclusive breastfeeding promotes psychological well-being. In a longitudinal study from six weeks to six months postpartum, Haga et al. (2012) reported that breastfeeding self-efficacy predicted changes in depression scores. Nevertheless, these authors failed to examine the effects of depression on breastfeeding self-efficacy scores. A goal of our study is to clarify these issues in a longitudinal study.

This study aims to investigate whether and how much breastfeeding self-efficacy and baby-led feeding increase breastfeeding exclusivity and maternal mental health one month after childbirth. We took into account the possible confounding effects of birth weight of the infant and breastfeeding frequency.

Methods

Participants and procedure

Women who gave birth at the Japanese Red Cross Medical Center, which provides perinatal maternal and child care, were recruited during the month of August 2014. We excluded women (a) who had a still birth or an abortion, (b) who were admitted to the emergency intensive care unit (EICU) or intensive care unit (ICU), (c) whose infant was admitted to the neonatal intensive care unit (NICU) or growing care unit (GCU), (d) who were human immunodeficiency virus (HIV)-positive or human T-cell leukemia virus (HTLV)-positive and hence opting to not breastfeed, and (e) who gave birth to more than one neonate on this occasion. Among 537 eligible women, 457 (85%) women agreed to participate in this questionnaire study. After completing the questionnaire survey when they were discharged from the obstetric ward (Wave 1), they were sent an envelope with a set of questionnaires to complete before attending the first month health check and asked to drop it into a mailbox set up at the outpatient department (Wave 2). A total of 216 (40%) women returned the second wave questionnaire.

Nursing care for breastfeeding

The Japanese Red Cross Medical Center is one of the Baby-Friendly Hospitals (BFHs) in Japan that is comprised of about 70 institutions. The BFH Initiative was started by the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) in 1991. This is a global effort to implement practices to protect, promote, and support breastfeeding. The Japanese Red Cross Medical Center was certified as a BFH in 2000.

In the Japanese Red Cross Medical Center, nurses pay particular attention to support mothers to be confident about breastfeeding. For example, when supporting women to master breastfeeding techniques, nurses avoid 'giving a lecture' and denying their effort but praising what they have achieved and then add, if necessary, information to improve their performance even more. Women who have given birth a few days earlier are capitalized as a model of breastfeeding so that women can feel that "If they can do it, I can do it as well." Encouragement rather than discouragement is frequently used by saying, for example, "You have done well," and "Your baby looks satisfied." A rooming-in policy makes it possible for mothers to

feed whenever they want.

The above clinical orientation further aims to encourage a baby-led approach for feeding. Breastfeeding may be led either by mothers or babies. In the former, mothers hold control over the routine of feeding with fixed scheduling. In the latter, however, mothers respond to and follow cues given by babies. Baby-led feeding is recommended by the American Academy of Pediatrics (2005). There has been no randomized controlled trials comparing baby-led vs. scheduled feedings (Fallon et al., 2014). However, in naturalistic studies, a longer duration of breastfeeding was associated with baby-led feeding (Brown & Amott, 2014; Brown, Raynor, & Lee, 2011; Cameron, Taylor, & Health, 2013).

Measures

Feeding style: A set of *ad hoc* questions were used to assess the feeding style for the preceding 24 hours at both Waves 1 and 2. On both occasions, women were asked about how many times they breastfed and formula fed in the past 24 hours. We calculated Breastfeeding Exclusivity as follows;

$$\text{Breastfeeding Exclusivity} = (\text{number of breastfeeds in the past 24 hours}) / (\text{number of breastfeeds in the past 24 hours} + \text{number of formula-feeds in the past 24 hours})$$

Hence this rate was 1.0 for women who exclusively breastfed and 0.0 for women who exclusively formula fed.

Breastfeeding self-efficacy: Breastfeeding self-efficacy was measured by the Japanese version (Otsuka, Dennis, Tatsuoka, & Jimba, 2008) of the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF; Dennis & Faux, 1999) at both Waves 1 and 2. This is a self-report of maternal perception on her ability to breastfeed her new infant (Dennis, 1999). It consists of 14 items with a five-point scale (from “1 - not at all confident” to “5 - very confident”). The total score ranges from 14 to 70: higher scores indicate higher level of breastfeeding self-efficacy. Its validity has been demonstrated (Dennis & Faux, 1999; Nanishi, Green, Taguri, & Jimba, 2015; Otsuka, Dennis, Tatsuoka, & Jimba, 2008).

Bonding disorders: We used the Mother-to-Infant Bonding Scale (MIBS) to measure the postnatal bonding disorder of mothers towards their newborn infants at both Waves 1 and 2. The predecessor of the MIBS was the Mother-to-Infant Bonding Questionnaire (MIBQ; Kumar et al. and revised by Marks et al., unpublished). The MIBQ was constructed to elicit

mothers' feelings of rejection, alienation, and neutrality towards their infants. The MBSQ was excellent in test-retest reliability and construct validity (Figueiredo, Costa, Pacheco, & Pais, 2009; Taylor, Atkins, Kumar, Adams, & Glover, 2005; Wittkowski, Wiek, & Mann, 2007). The MBSQ was translated into Japanese (Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012) with modification of items from simple adjectives to sentences.

Depression: We used the Japanese version (Okano et al., 1996) of the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987) at both Waves 1 and 2. This is a self-reported measure of postnatal depression and is commonly used in many perinatal settings. It consists of 10 items with a four-point scale (0 to 3). Higher scores indicate severe depressive symptoms. The psychometric properties of the EPDS have been reported to be excellent (Cox et al., 1987). Kubota et al. (2014) examined the factor structure of the EPDS and demonstrated a three-factor model: Anxiety (ANX), Anhedonia (ANH), and Depression (DEP) (Kubota et al., 2014).

Perceived Nursing Care: We created *ad hoc* items to measure the patient's perception of the nursing care for breastfeeding they received during the hospital stay. This self-report instrument, the Perceived Nursing Care for Breastfeeding Scale (PNCBS), consists of 10 items with a five-point scale (Table 6). Higher scores indicate a more favourable perception of nursing care. This was administered at Wave 1.

Women's intention for breastfeeding during pregnancy and after childbirth: We used two *ad hoc* questions asking about their intention to feed their baby by breast milk or formula milk during pregnancy and after childbirth with a five-point scale (0 to 4). This was asked at Wave 1.

Demographic and obstetric variables: We asked at Wave 1 about the participant's age, past experiences of feeding (no, 1; yes, 2), number of past pregnancies and deliveries, infertility treatment (yes, 1; no, 2), attitudes towards pregnancy (very pleased, 1 to not pleased at all, 5), delivery complication (yes, 1; no, 2), hours spent for delivery, delivery bleeding (CC), partner's attendance, gestational week, baby's body weight (in g), gender of the baby (boy, 1; girl, 2), educational level (junior high school, 1; high school, 2; college, 3; university, 4; Master/PhD, 5), and annual income (million yen).

Statistical analyses

Psychometric properties of instruments: We used the data obtained from 457 women when discharged from the hospital (Wave 1) for psychometric studies—the Japanese version of the BSES-SF, the MIBS, the EPDS, and the PNCBS. We divided the sample randomly into two groups. We conducted exploratory factor analyses (EFAs) and confirmatory factor analyses (CFAs) of each instrument, using the first ($n = 224$) and second ($n = 233$) halved groups, respectively. Only 101 and 115 cases were available for Wave 2 for the first and second halved samples respectively. Factorability of data for items of each instrument was determined by the Kaiser-Meyer-Olkin (KMO) index and the Bartlett Sphericity Test. We also determined the communality of each item of the instrument. Items with communality $< .2$ may be excluded from EFAs (Yong & Pearce, 2013). EFAs were conducted with the maximum likelihood method with (if more than one-factor structure) Promax rotation. The number of factors was determined by the scree test (Cattell, 1966). Subscales were calculated by adding scores of items belonging to the same factors. Internal consistency of subscales was determined by Cronbach's alpha coefficient.

As the means of validity of each instrument, we used the women's intentions for breastfeeding during pregnancy and after childbirth (measured at Wave 1.)

Determinants of feeding style: Next, we focused on breastfeeding exclusivity one month after childbirth (Wave 2). To this end, we used the data of women who returned the questionnaire ($n = 216$). After correlating the breastfeeding exclusivity at both Waves 1 and with predictor variables of which significance level was set at $p < .01$ because of multiple comparison, we set up an original SEM (Fig. 1). Here, we posited two latent variables—EPDS and Perceived Nursing Care—each consisting of three and two observed variables of the EPDS and PNCBS, respectively. We also posited that the four main variables—MIBS, Breastfeeding Exclusivity, BSES-SF, and EPDS at Wave 1 predicted their scores at Wave 2. As exogenous variables, we added Undesired Pregnancy, Number of Deliveries, Age, and Perceived Nursing Care into the SEM.

The fit of each model with the data was examined in terms of goodness-of-fit indices: chi-squared (CMIN), comparative fit index (CFI), and root mean square error of approximation (RMSEA). According to Schermelleh-Engell, Moosbrugger, and Müller (2003), a good fit was defined by $\text{CMIN}/df < 2$, $\text{CFI} > .97$, and $\text{RMSEA} < .05$, and an acceptable fit by $\text{CMIN}/df < 3$, $\text{CFI} > .95$, and $\text{RMSEA} < .08$. After calculating the goodness-

of-fit of the original SEM, we “trimmed” the model. Thus, we deleted the least significant path from the model and successively repeated this step as long as $\chi^2(df)$ did not reach a statistically significant level (Klein, 2005).

Ethical consideration

This study was approved by the ethical committees at the Japanese Red Cross College of Nursing (No.2014-32) and the Japanese Red Cross Medical Center (No.529).

Results

Factor structure and validity of the Japanese version of the BSES-SF

In the first halved sample, the data showed excellent factorability of the Japanese version of the BSES-SF: KM indices = .930 and .946 and Bartlett’s sphericity tests $\chi^2(91) = 3290.568, p < .001, \chi^2(91) = 2328.440, p < .001$, for Waves 1 and 2, respectively. In both Waves 1 and 2, communalities of the Japanese version of the BSES-SF items were more than .2 in all items and more than .6 in eight and 13 items in Waves 1 and 2, respectively (Table 1). The Japanese version of the BSES-SF showed a single-factor structure in both Waves 1 and 2. Hence, the data were not rotated orthogonally (Varimax rotation). In CFAs, chi-squared/*df* was 5.43 and 3.06, CFI = .843 and .859, and RMSEA = .138 and .094, respectively, for Waves 1 and 2.

Cronbach’s alpha was .906 and .922 for the total score of the Japanese version of the BSES-SF in Waves 1 and 2, respectively.

In the whole sample, the total BSES-SF scores at Wave 1 were significantly correlated with the participant’s intention (with a five-point scale) for breastfeeding during pregnancy ($r = .32, p < .001$) and just after the childbirth ($r = .50, p < .001$). This was also the case for the Wave 2 BSES score: $r = .23$ and $.36 (p < .001)$.

Table 1 Commuality and factor structure of the Japanese version of the Breastfeeding Self-Efficacy Scale-Short Form

Item no.	Items ^a	Wave 1 (n = 224)		Wave 2 (n = 101)	
		Commuality	Factor loading	Commuality	Factor loading
1	I can determine whether my baby is getting enough milk.	.67	.75	.63	.75
2	I can address breastfeeding as well as I have addressed other challenges in my life.	.63	.81	.70	.81
3	I can breastfeed my baby without adding formula milk.	.61	.75	.63	.75
4	I can determine whether the baby is latching onto the breast properly from start to finish.	.59	.80	.66	.80
5	I can manage breastfeeding to my satisfaction.	.69	.88	.78	.88
6	I can find a way to breastfeed even when the baby is crying.	.52	.79	.64	.79
7	I am always sure that I want to breastfeed my baby.	.60	.73	.60	.73

8	I can breastfeed comfortably when other family members, including a partner, parents, and parents-in-law, are present.	.29	.53	.35	.53
9	I am satisfied with how I am breastfeeding my baby.	.60	.86	.77	.86
10	I am prepared for the fact that breastfeeding takes time.	.58	.76	.61	.76
11	I can thoroughly breastfeed from the first breast before having to switch to the other breast.	.59	.81	.64	.81
12	I can breastfeed my baby for all feeds.	.79	.71	.73	.71
13	I can always manage to breastfeed my baby whenever he/she wants.	.78	.74	.72	.74
14	I can tell whether my baby has finished feeding.	.59	.76	.63	.76

a. This is an English translation of the Japanese version of the BSES-SF and may not be equivalent to the original English version.

Factor structure of the MBS

In the first halved sample, the data showed factorability of the MBS: KMO indices = .509 and .762 and Bartlett's sphericity tests $\chi^2(45) = 401.121$, $p < .001$, and $\chi^2(45) = 454.015$, $p < .001$, for Waves 1 and 2, respectively. Communality was less than .2 in items 2 and 3 in Wave 1 and item 4 in Wave 2. Thus, these items were not considered for EFAs. Because previous studies indicated a two-factor structure of the MBS, we set the number of factors at two in our EFAs but the factor structure we found was not consistent between Waves 1 and 2 (Table 2). The scree test also showed a single-factor structure for Wave 1 data and a two-factor structure for Wave 2 data. Therefore, we excluded items 2, 3, and 4 from the analyses and subjected the remaining seven items for EFAs with a single factor solution (Table 2). Here all the MBS items showed a factor loading greater than .3 in both Waves 1 and 2 data.

The above seven-item single factor model was examined by CFAs. In Wave 1, fitness of the model with data was poor: $\chi^2/df = 4.49$, CFI = .831, and RMSEA = .123. It was also the case in Wave 2: $\chi^2/df = 2.54$, CFI = .641, and RMSEA = .082. We compared two models: (a) our one-factor model and (b) a two-factor model by Yoshida, Yamashita, Conroy, Marks, & Kumar (2012). AIC was better for our model both in Waves 1 and 2 (Table 3). However, Cronbach's alpha was still poor, .634 and .376 in Waves 1 and 2, respectively.

Table 2. Community and factor structure of the Mother-to-Infant Bonding Scale

Item no.	Items	Wave 1 (n = 224)				Wave 2 (n = 101)			
			Two-factor structure				Two-factor structure		
		Communality	1	2	Single factor	Communality	1	2	Single factor
1	Feel love towards my baby (LA)	.23	-.07	.49	.45	.64	.36	.83	.45
2	Scared or panicky when having to do something for my baby (AR)	.14	.01	.06	.16	.24	.16	.14	.18
3	Feel resentful towards my baby (AR)	.15	.01	.19	.26	.28	.20	.35	.25
4	Feel nothing for my baby	.28	-.07	.21	.24	.18	.11	.35	.18
5	Feel angry with my baby (AR)	.29	.42	.00	.37	.62	.75	-.23	.69

6	Enjoy doing things for my baby (LA)	.34	.27	.32	.58	.59	.63	.34	.68
7	Wish my baby was different (AR)	.48	1.01	-.07	.50	.76	.90	-.31	.78
8	Feel protective towards my baby (LA)	.43	.04	.71	.53	.77	.87	.23	.91
9	Wish that I do not have my baby	.32	.44	-.02	.29	.48	.67	-.17	.63
10	Feel close to my baby (LA)	.37	-.01	.68	.52	.47	.39	.58	.46

Factor loading > .3 is in bold. AR: Anger and Rejection, LA: Lack of affection.

Table 3. Comparison of single and two-factor structures of the MIBS

	Wave 1				Wave 2			
	Chi-squared/ <i>df</i>	CFI	RMSEA	AIC	Chi-squared/ <i>df</i>	CFI	RMSEA	AIC
Present single-factor model	4.49	.831	.123	104.882	2.54	.641	.082	77.584
Two-factor model by Yoshida	3.15	.881	.096	109.818	3.04	.724	.094	107.833

CFI, comparative fit index; RMSEA, root mean square error of approximation; AIC, Akaike information criterion.

Factor structure of the EPDS

In the first halved sample, the data showed excellent factorability of the EPDS: $KM\bullet$ indices = .835 and .809 and the Bartlett's sphericity tests $\chi^2(45) = 765.000, p < .001, \chi^2(45) = 450.583, p < .001$, for Waves 1 and 2, respectively. In both Waves 1 and 2, communalities of the EPDS items were more than .2 in all items except for item 10 in Wave 1 (Table 4). Items 1 and 2 that were labelled as Anhedonia by Kubota et al. (2014) were loaded on the same factor (Factor 2). Otherwise, the factor structure of the EPDS items differed between Waves 1 and 2. Thus, items 3, 4, and 5 that were labelled Anxiety by Kubota et al. (2014) were loaded on one factor in Wave 1 (Factor 1) but item 3 was not loaded on either of the factors in Wave 2 while items 4 was loaded on Factor 3 and item 5 were loaded on both Factors 1 and 3 in Wave 2. Of items 7, 8, and 9 that were labelled Depression by Kubota et al. (2014), all three items in Wave 2 were loaded on the expected factor (factor 3 in Wave 1 and Factor 1 in Wave 2). Item 10 was loaded on the factor on which Depression items were loaded (factor 3 in Wave 1 and factor 1 in Wave 2).

Table 4. Community and factor structure of the Edinburgh Postnatal Depression Scale items

Item No.	Items	Wave 1				Wave 2			
		Community	Factors			Community	Factors		
			1	2	3		1	2	3
1	I have been able to laugh and see the funny side of things (ANH)	.52	-.16	.98	.16	.55	.07	.64	.17
2	I have looked forward with enjoyment to things (ANH)	.45	.26	.69	-.25	.48	-.10	1.03	-.17
3	I have blamed myself unnecessarily when things went wrong (ANX)	.48	.93	.04	-.22	.47	.29	.27	.24
4	I have been anxious and worried for no good reason (ANX)	.48	.55	.05	.18	.43	-.17	-.07	1.02
5	I have been scared or panicky for no good reason (ANX)	.46	.41	.05	.26	.56	.48	-.00	.40
6	Things have been getting on top of me	.39	.68	.02	-.04	.33	.24	.18	.14

7	I have been so unhappy that I have had difficulty sleeping (DEP)	.25	.28	-.09	.34	.58	.81	.01	-.06
8	I have felt sad or miserable (DEP)	.53	.55	-.05	.29	.63	.67	.07	.18
9	I have been so unhappy that I have been crying (DEP)	.47	.20	.03	.61	.64	.92	-.10	-.07
10	The thought of harming myself has occurred to me	.12	-.11	-.05	.49	.60	.91	-.03	-.20

Factor loading > .3 is in bold. ANH, Anhedonia; ANX, Anxiety; DEP, Depression.

In CFAs, we compared different models of the factor structure of the EPDS: (a) the three-factor model proposed by Kubota et al. (2014) for a Japanese population, (b) the model derived from the present EFAs with items 1 and 2 as Anhedonia, items 4 and 5 as Anxiety, and items 7, 9, and 10 as Depression, and (c) the model where items 3 and 6 were added to Anxiety. AIC was the lowest in the present model both in Waves 1 and 2 (Table 5). Therefore, we calculated the scores of the EPDS subscales in the present study—Anhedonia, Anxiety, and Depression—by adding the scores of items 1 and 2, items 4 and 5, and items 7, 9, and 10, respectively.

Table 5. Comparison of three models of factor structures of the EPDS

	Wave 1				Wave 2			
	Chi-squared/ <i>df</i>	CFI	RMSEA	AIC	Chi-squared/ <i>df</i>	CFI	RMSEA	AIC
Kubota et al.	3.01	.950	.093	105.157	1.69	.964	.054	82.710
Present model (1, 2 as Anhedonia, 4, 5 as Anxiety, and 7, 9, 10 as Depression)	3.42	.935	.102	85.574	1.21	.984	.030	61.353
Present model modified (1, 2 as Anhedonia, 3, 4, 5, 6 as Anxiety, and 7, 9, 10 as Depression)	2.57	.936	.082	121.563	1.27	.969	.034	90.574

CFI, comparative fit index; RMSEA, root mean square error of approximation; AIC, Akaike information criterion.

Cronbach's alpha was .775, .691, and .604 for Anhedonia, Anxiety, and Depression, respectively, in Wave 1. It was .636, .680, and .481 in Wave 2.

Factor structure and measurement invariance of the PNCBS

In the first halved sample, the data showed excellent factorability of the PNCBS: KM \bullet indices = .867 and the Bartlett's sphericity tests $\chi^2(45) = 2061.268$, $p < .001$ for Wave 1. Communalities of the PNCBS items were more than .2 in all items (Table 6).

Table 6. Community and factor structure of the Perceived Nursing Care for Breastfeeding Scale items

Item no.	Item	Factors		
		Communality	1	2
1	Midwife in charge of you understood your feeling about your breastfeeding	.70	-.07	.88
2	Midwife in charge gave you calm and appropriate advice and guidance	.73	-.09	.91
3	Midwife in charge attended your feeding, helped you feed your baby when needed, fed your baby on your behalf when requested	.59	.01	.75
4	Midwife in charge offended you or made you angry through rude speech or conduct	.71	.88	-.08
5	Midwife in charge offended you by talking about things you did not want to talk about	.89	1.04	-.18

6	Midwife in charge offended you by meddling with you	.88	1.01	-.14
7	Midwife in charge did not respect your feelings as much as you expected	.85	.73	.27
8	Midwife in charge did not give you calm and appropriate advice and guidance as much as you expected	.87	.74	.26
9	Midwife in charge did not attend your feeding, help you feed your baby when needed, feed your baby on your behalf when requested as much as you expected	.81	.76	.18
10	Midwife in charge gave you encouraging messages such as “you have done well,” and “that is perfect.”	.52	.09	.67

Factor loading > .3 is in bold.

Two factors emerged from the analyses. The items with a high factor loading on the first factor included items such as “Midwife in charge offended you by picking topics you did not want to talk about,” “Midwife in charge offended you by meddling with you,” and “Midwife in charge offended you or made you angry by tough speech or conduct.” These were all reverse items. Therefore, we interpreted this as Lack of Offensive Care. The items with a high factor loading included items such as “Midwife in charge gave you calm and appropriate advice and guidance,” “Midwife in charge of you understood you,” and “Midwife in charge attended your feeding, helped you feed your baby when needed, fed your baby on your behalf when requested.” We interpreted this as Supportive Care.

This factor model was examined in CFAs. The fitness of the model with

the data was moderate: $\chi^2/df = 12.51$, CFI = .869, and RMSEA = .223. Cronbach's alpha was .966 and .883 for factors 1 and 2, respectively.

Correlations of breastfeeding exclusivity with other predictors

As seen in Table 7, breastfeeding exclusivity both at Waves 1 and 2 was correlated with the BSES-SF scores and the three EPDS subscale scores at Wave 1 (Table 7). The perceived care of the midwife significantly predicted breastfeeding exclusivity at Wave 2. Among the other predictors, the woman's age was correlated with Breastfeeding Exclusivity only at Wave 2 whereas the past experience of breastfeeding was correlated with Breastfeeding Exclusivity only at Wave 1. Past experiences with infertility treatment were correlated with Wave 2 breastfeeding exclusivity.

Table 7. Correlations of Waves 1 and 2 breastfeeding exclusivities with other variables

	Mean (SD)	Skewness	Correlation with breastfeeding exclusivity	
			Wave 1	Wave 2
Wave 1				
BSES-SF	47.4 (13.5)	0.2	.36***	.35***
MIBS: Total score	0.98 (1.65)	3.2	-.10	-.13
EPDS: Anhedonia	0.21 (0.64)	3.2	-.19**	-.16*
EPDS: Anxiety	1.22 (1.43)	0.8	-.24**	-.17*
EPDS: Depression	0.40 (0.88)	2.6	-.23**	-.02
PNCBS: Lack of Offensive Care	20.6 (5.1)	-1.3	.05	.18**
PNCBS: Supportive Care	14.8 (2.0)	-3.0	.14	.20**
Wave 2				
BSES-SF	53.0 (14.5)	0.1	NA	.44***
MIBS: Total score	0.91 (1.70)	4.0	NA	-.13
EPDS: Anhedonia	0.22 (0.59)	2.8	NA	-.04
EPDS: Anxiety	1.23 (1.53)	1.1	NA	-.14*
EPDS: Depression	0.42 (1.0)	4.6	NA	-.12
Baseline				
Age	34.8 (4.4)	-0.2	-.12	-.24***
Past experiences of breastfeeding	1.40 (0.49)	0.4	.20**	.12
Number of past pregnancies	1.88 (1.06)	1.4	.14*	.04
Number of past deliveries	1.48 (0.64)	1.1	.18*	.05
Infertility treatment	1.76 (0.43)	-1.2	.20*	.19**
Undesired pregnancy	1.27 (0.54)	2.2	.10	-.03

Delivery complication	1.91 (0.29)	-2.8	.05	.08
Hours spent for delivery	10.1 (9.2)	1.6	-.12	-.04
Delivery bleeding (cc)	428.6 (295.1)	1.8	-.05	-.06
Partner's attendance	1.15 (0.36)	2.0	.06	-.03
Gestational weeks	39.3 (1.3)	-2.5	.01	-.02
Baby's body weight (g)	3106 (359)	0.6	.09	.00
Gender of the baby	1.54 (0.50)	-0.2	-.04	.05
Educational level	3.86 (0.68)	-1.2	-.05	-.09
Annual income (million yen)	10.9 (0.58)	2.3	-.01	-.07

* $p < .05$; ** $p < .01$; *** $p < .001$

Correlations of the MIBS and EPDS with the other variables

Other than the correlations with breastfeeding exclusivity described above, the Wave 1 MIBS was correlated with negative response towards the current pregnancy (Table 8). EPDS Anxiety scores at Waves 1 and 2 were both correlated negatively with past experiences of breastfeeding. EPDS Depression at Wave 1 was correlated negatively with Supportive Care.

Table 8. Correlations of Waves 1 and 2 MIBS and EPDS subscale scores with other variables

	Wave 1				Wave 2			
	MIBS	ANH	ANX	DEP	MIBS	ANH	ANX	DEP
PNCBS: Lack of Offensive Care	-.05	-.08	-.06	-.16*	.03	-.02	-.08	-.10
PNCBS: Supportive Care	-.17*	-.16*	-.15*	-.19**	-.05	-.06	-.04	-.03
Age	-.05	.04	-.04	-.08	-.07	.11	.01	-.00
Past experiences of breastfeeding	-.17*	-.16*	-.25***	-.16*	-.15*	-.11	-.27***	-.04
Number of past pregnancies	-.13	-.15*	-.16*	-.14*	-.17*	.01	-.17*	-.03
Number of past deliveries	-.16*	-.16*	-.22**	-.16*	-.17*	-.08	-.26***	-.04
Infertility treatment	-.02	-.14*	-.07	-.10	-.02	-.03	.21	.21
Undesired pregnancy	.29***	.11	-.02	.03	.13	.09	-.05	.00
Delivery complication	-.03	-.04	-.06	-.20	-.02	.04	-.10	-.01
Hours spent for delivery	.12	.04	.11	.04	.10	.00	.14*	-.01
Delivery bleeding (cc)	-.04	.05	.09	.08	.02	-.00	-.00	-.10
Partner's attendance	-.02	-.05	-.06	-.13	-.07	-.06	.03	.12
Gestational week	.08	-.04	.11	.01	.05	-.08	.09	.03
Baby's body weight	-.03	-.02	-.01	-.09	-.10	-.01	.04	.01
Gender of the baby (Boy, 1; Girl, 2)	-.06	-.13	-.08	.01	-.01	.04	.02	.06
Educational level	-.05	-.04	.04	.03	-.09	-.13	-.07	.06
Annual income (million yen)	-.10	-.17*	-.08	-.05	-.07	-.02	-.13	-.00

W1, at discharge; W2, one month after childbirth; BSES, Breastfeeding Self-Efficacy; LA, Lack of Affection; AR, Anger and Rejection; ANH, Anhedonia; ANX, Anxiety; DEP, Depression

***Relationship between breastfeeding, BSES, MIBS, EPDS,
and other variables: Structural equation model***

In order to clarify the complex relationship between breastfeeding, the BSES-SF, MIBS, EPDS, PNCBS, and other variables, we set up a series of SEMs. Here we included breastfeeding exclusivity, the BSES-SF, MIBS, and EPDS scores that were added to the PNCBS scores

The original SEM showed acceptable fit with the data: $\chi^2/df = 2.62$, CFI = .906, RMSEA = .087, and AIC = 303.249. After model “trimming” we reached a model with an acceptable fit: $\chi^2/df = 1.79$, CFI = .919, RMSEA = .061 and AIC = 318.763. As expected, the MIBS, BSES-SF, EPDS, and breastfeeding rate at Wave 1 predicted their scores at Wave 2. In addition, the BSES-SF scores at Wave 1 predicted the scores of the MIBS at Wave 2.

Fig. 1. Original model of prediction of breastfeeding
 SC, Supportive Care; LOC, Lack of Coercive Care; MIBS, Mother-to-Infant Bonding Scale; BSES, Breastfeeding Self-Efficacy Scale; EPDS, Edinburgh Postnatal Depression Scale; ANH, Anhedonia; ANX, Anxiety; DEP, Depression.

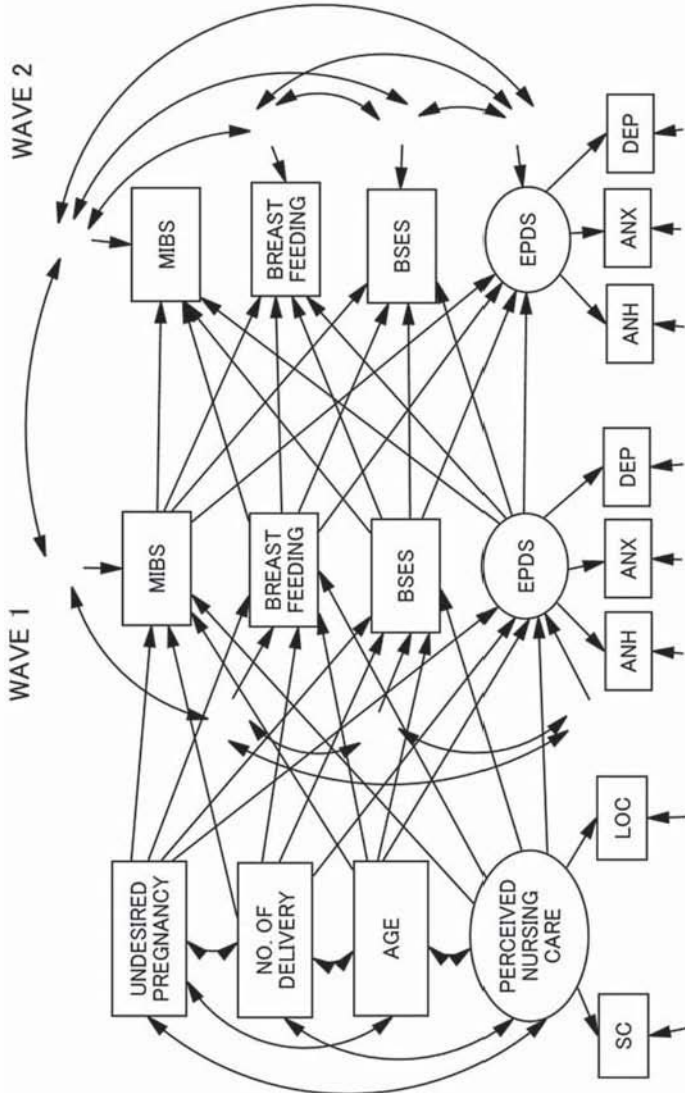
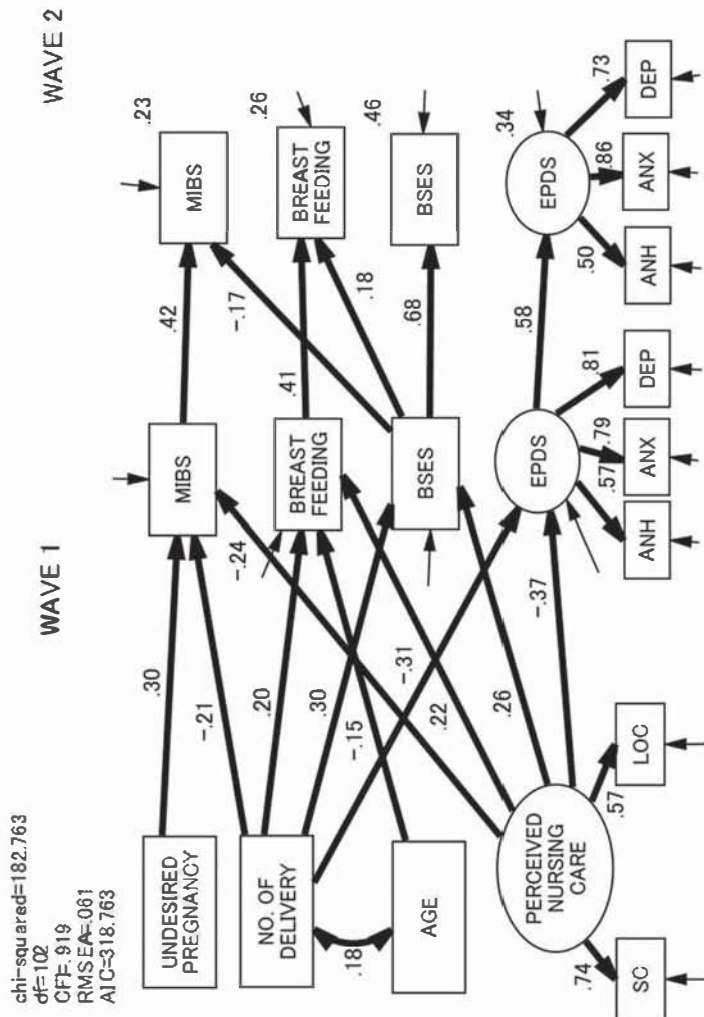


Fig. 2. Final model after trimming

Paths with significant coefficients are in bold. Correlations between error variables at one time-point, as well as item specific correlations were calculated but not shown in the figure for the sake of clarity.

SC, Supportive Care; LOC, Lack of Coercive Care; MIBS, Mother-to-Infant Bonding Scale; BSES, Breastfeeding Self-Efficacy Scale; EPDS, Edinburgh Postnatal Depression Scale; ANH, Anhedonia; ANX, Anxiety; DEP, Depression.



Discussion

Our results showed a robust single-factor structure of the Japanese version of the BSES-SF with an excellent internal consistency. This is in line with previous reports (Dennis, 2003; Otsuka et al., 2008). In both Waves 1 and 2, item 5 “I can manage breastfeeding to my satisfaction” showed the highest factor loading. This item typically represents a mother’s self-efficacy on breastfeeding.

Previously, it has been reported that the MIBS has a two-factor structure (Kitamura et al., 2013; Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012). The two factors extracted from such EFAs, however, were moderately correlated with each other. In our analyses, the single-factor model was superior to the two-factor model in terms of the AIC. Although bonding disorders have at least two facets, there may be a general factor representing the entirety of bonding difficulties. Our model may reflect such a general construct of bonding disorders. Different factor structures were reported for different instruments measuring bonding disorders (e.g., Ohara et al., 2016; Ohashi, Kitamura, Sakanashi, & Tanaka, 2016). Therefore, the dimensionality of bonding disorders awaits further studies using a greater sample with different measurements simultaneously.

There has been ample research on the factor structure of the EPDS. Recently, Kubota et al. (2014) performed an elegant statistical analysis on this issue and reported a three-factor structure. It included Anhedonia, Anxiety, and Depression. Our results were in line with this as a whole but the EPDS items belonging to each factor differed slightly. What awaits further studies are (a) measurement invariance of the EPDS over the course of the perinatal period, (b) trajectory of the three subscales of the EPDS across the perinatal period, and (c) associations with the other facets of depression that were intentionally omitted from the development of the scale (Cox, Holden, & Sagovsky, 1987): somatic and cognitive aspects of depression (see Shafer, 2006).

We were unaware of any empirical measures of women’s perception of nursing care with a special focus on the type of feeding they received as infants while staying in an obstetric ward. To the best of our knowledge, the PNCBS is the first such measure. Our analyses revealed that the instrument consisted of two facets that were clinically interpretable. One factor represented perception of (lack of) offensive care. Nurses offer (probably *bona fide*) care that was not desired or even rejected by patients. Another factor represented perception of desired and satisfactory support from nurses. Research showed that both lack of support and presence of

undermining interventions from others may lead to psychological maladjustment (Manne & Glassman, 2000; Riemsma et al., 2000; Stansfeld, Fuhrer, & Shipley, 1998; Symister & Friend, 2003). Development of our instrument may encourage further clinical studies on the effects of nursing care on breastfeeding as well as the psychological well-being of mothers of an infant.

Our primary outcome measure was breastfeeding exclusivity. As expected, breastfeeding exclusivity during both Waves 1 and 2 were predicted by higher breastfeeding self-efficacy. They were also predicted by the younger age of the woman. Though not reaching the statistically significant level of $p < .001$, the three EPDS subscale scores at Wave 1 (inversely) and past experience of feeding predicted higher breastfeeding exclusivity at Wave 1. Breastfeeding exclusivity at Wave 2 was predicted by the two PNCBS subscale scores and infertility treatments. These findings suggest that breastfeeding self-efficacy is a stronger predictor of breastfeeding than any other predictor studied in this report. Therefore, enhancement of women's breastfeeding self-efficacy may be an excellent target for the prevention of early termination of breastfeeding (Kronborg, Væth, Olsen, Iversen, & Harder, 2007; McQueen, Dennis, Stremler, & Norman, 2011; Nichols, Schutte, Brown, Dennis, & Price, 2009; Noel-Weiss, Bassett, & Cragg, 2006; Noel-Weiss, Rupp, Cragg, Bassett, & Woodend, 2006; Otsuka, Dennis, Tatsuoka, & Jimba, 2008; Otsuka et al., 2014; Perez-Blasco, Viguer, & Rodrigo, 2013; Wu, Hu, McCoy, & Efirid, 2014).

Secondary outcome variables in this study were MBS and EPDS. Bonding disorders at Wave 1 were predicted by unwanted pregnancy whereas the Anxiety subscale of the EPDS was predicted by a lack of past feeding experiences and a fewer number of past deliveries. Wave 1 Depression was predicted by a lower Support Care score of the PNCBS. Association between the undesired pregnancy and bonding disorders are in line with several studies (Kokubu, Okano, & Sugiyama, 2012; Ohashi, Sakanashi, Tanaka, & Kitamura, 2016).

The above findings were generally confirmed by SEM after model trimming (Fig. 2). In addition, we found that (a) breastfeeding exclusivity was predicted by a greater number of past deliveries, (b) MBS was predicted by a fewer number of past deliveries and lower PNCBS, (c) EPDS was predicted by a lower PNCBS, and (d) Wave 1 BSES-SF predicted Wave 2 MBS. Therefore, as compared to multiparas, nulliparas were more likely to have bonding disorders and depression as well as reluctance to breastfeeding. This means that perinatal health professionals should pay

particular attention to the mental health of first-time mothers. Secondly, perceived nursing care was a predictor of not only breastfeeding and breastfeeding self-efficacy but also better bonding towards an infant and less dysphoric moods including anhedonia, anxiety, and depression. Nursing care focusing on breastfeeding may have pervasive effects on other aspects of the mental health of mothers of a newborn. This is in line with Hashi et al.'s (2014) finding that postnatal bonding disorders were less when the expectant women perceived more satisfaction with the medical care they had received. An unexpected result of ours is the prediction of Wave 2 bonding disorders by lower breastfeeding self-efficacy at Wave 1. Because breastfeeding self-efficacy is one aspect of general self-efficacy, the latter may have predictive power for maternal bonding towards an infant.

Limitations of our study are multifaceted. Firstly, our sample came from one very unique antenatal clinic that is renowned for its maternal care. We should be very careful in extrapolating the results into other clinical situations. Secondly, we had only two observation time points. We had no chance to examine the women during pregnancy. Hence, the results may be subject to some biases. Thirdly, we relied solely on the participants' self-reports, thus being subjected to reporter bias. Information should be obtained through direct observation (e.g., breastfeeding ratio) and structured clinical interviews (e.g., depression and anxiety after childbirth). However, our study is unique in that breastfeeding exclusivity, breastfeeding self-efficacy, bonding towards an infant, and dysphoric moods were all examined simultaneously. We are unaware of such a study in the literature.

Taking into consideration these drawbacks and cautionary remarks, our study clarified the psychological mechanism of breastfeeding exclusivity in terms of breastfeeding self-efficacy, obstetric history, age, and perceived nursing care. Antenatal nursing care should focus more on the expectant women's attitudes towards the current pregnancy as well as postnatal nursing care.

Acknowledgements

We thank all participating mothers and the staff of the antenatal clinics they attended.

Conflict of interest statement

None declared.

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INTERVENTIONS

CHAPTER ELEVEN

DO POSTNATAL CARE AND BREASTFEEDING PREVENT MOTHER-TO-INFANT BONDING DISORDER?

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Abstract

Breastfeeding and breastfeeding-promoting hospital care, namely skin-to-skin contact followed by early initiation of breastfeeding and rooming-in have been suggested to play a crucial role in establishing mother-infant relationship. However, it remains unknown if breastfeeding and such postnatal care could reduce the symptoms of bonding disorder. We examined if breastfeeding and breastfeeding-promoting hospital care could reduce the symptoms of bonding disorder until 12 weeks postpartum. Data from 519 mothers collected through self-administered questionnaires were analyzed. Symptoms of bonding disorder was measured using the Japanese version of the Mother-to-Infant Bonding Scale at discharge, and 4 and 12 weeks postpartum. Infant feeding status was measured using 24-hour recall at 4 and 12 weeks postpartum in six-stage rating from full breastfeeding (no formula feeding) to formula feeding (only formula feeding). Hospital care was recalled at discharge. A structured equation model was used to analyze the effect of breastfeeding and hospital care on mother-to-infant bonding. On-demand feeding during hospitalization, which was unrestricted breastfeeding without a schedule decided by a hospital, reduced the

symptoms of mother-to-infant bonding disorder 4 weeks postpartum. Skin-to-skin contact immediately after birth followed by early initiation of breastfeeding had positive effect on breastfeeding self-efficacy 4 weeks postpartum and higher breastfeeding self-efficacy 4 weeks postpartum reduced the symptoms of mother-to-infant bonding disorder 12 weeks postpartum. Rooming-in was not related with reduced symptoms of bonding disorder. Further, breastfeeding at 4 weeks postpartum was not related with reduced symptoms of bonding disorder at 12 weeks postpartum. Skin-to-skin contact immediately after birth with early initiation of breastfeeding and on-demand feeding during hospitalization should be encouraged. There might be an early postpartum sensitive period on establishing mother-to-infant bonding that cannot be compensated with rooming-in and breastfeeding after discharge.

Key words: mother-to-infant, breastfeeding, bonding disorder, rooming-in, early skin-to-skin contact, on-demand feeding

Do Postnatal Care and Breastfeeding Prevent Mother-to-Infant Bonding Disorder?

The affective tie between mother and infant is developed through repeated mutual interactions between mother and infant; one of the key interactions is breastfeeding. Mothers who breastfed their infants often recall that their affection for their infants grew as they responded to their infants' cues for feeding (Hattori, Nunohara, Nawa, & Akiyama, 2009). In hospitals to promote breastfeeding, infant abandonment was reduced along with increased breastfeeding rate (Buranasin, 1991; Lvoff, Lvoff, & Klaus, 2000).

Why did breastfeeding promotion reduce infant abandonment? Was it a benefit of breastfeeding or a consequence of improved hospital routines? So far, evidence suggests both are possible.

One potential explanation is that breastfeeding enhances the maternal affective tie to infants and caregiving behavior through hormonal responses. Breastfeeding mothers had more positive moods, reported more positive events, and perceived less stress than bottle-feeding mothers (Groër, 2005). Some of these effects may relate to mothers' hormonal systems, which are stimulated by breastfeeding. Specifically, when the infant is suckling to the breast, oxytocin, a hormone and neurotransmitter, is released in the maternal central and peripheral system in large concentrations (Johnston & Amico,

1986). Studies in humans and animal models showed that oxytocin is involved in mood, anxiety, stress responsiveness, and maternal behavior (Galbally, Lewis, Ijzendoorn, & Permezel, 2011).

A significant amount of animal research consistently found an association between oxytocin and maternal behavior. In a study of young rats given either oxytocin or an oxytocin antagonist, the young rats who received oxytocin later provided more maternal care to their offspring (Pedersen & Boccia, 2002). Several studies showed that rats that had received good maternal care and experienced only brief separations in early infancy had higher rates of oxytocin receptor binding in specific areas of the brain while lactating, had quicker onset of maternal behavior after delivery, and were more responsive to pups than those who received poor maternal care or longer separations as infants (Champagne, Diorio, Sharma, & Meaney, 2001; Champagne & Meaney, 2001; Francis, Champagne, & Meaney, 2000).

In humans also, oxytocin functioning is recognized to be linked with the mother-infant relationship. Oxytocin is associated with mood regulation and several reproductive and affective behaviors including delivery, lactation, intercourse, and parenting (Galbally et al., 2011). The increase of oxytocin levels during pregnancy is considered to facilitate postnatal maternal behavior and the formation of an emotional bond between mother and infant in humans by reducing anxiety and ameliorating responses to external stress (Galbally et al., 2011). Mothers who have less anxiety have more capacity to pay attention to infant care (Nissen, Gustavsson, Widström, & Uvnäs-Moberg, 1998) and regulate their mood (Mezzacappa & Katlin, 2002). Although there is some inconsistency in the results, several studies suggested that oxytocin may improve sensitivity to nonverbal infant cues (Domes, Heinrichs, Michel, Berger, & Herpertz, 2007; Radke & de Bruijn, 2015). In fact, a study among 675 mother and infant dyads showed that longer duration of breastfeeding was associated with more maternal sensitive responsiveness (Tharner et al., 2012). Therefore, breastfeeding is considered to have a positive effect on maternal affective emotion and caregiving behavior to infants through repeated oxytocin release.

Returning to the idea that infant abandonment was reduced after hospitals adopted care guidelines to support breastfeeding, it was not only the increased breastfeeding rate but also perhaps the improved hospital routine that could be the reason for that unexpected positive effect. More specifically, studies suggested that breastfeeding-promoting care guidelines, especially early initiation of breastfeeding subsequent to skin-to-skin contact immediately after birth and rooming-in through day and night, might enhance the maternal emotional tie to infants and caregiving behavior.

Since the 1970s, there has been an international promotion of breastfeeding, reflecting the well-known benefits of breastfeeding on maternal and child health (Kramer et al., 2008; Kramer et al., 2001; Victora et al., 2016; Victora et al., 2015). A key of the worldwide movement is the Baby-Friendly Hospital Initiative, which calls health facilities to follow the *Ten Steps to Successful Breastfeeding* (Table 1) (World Health Organization, 1998; World Health Organization & UNICEF, 2009). Facilities that adopted the ten steps are designated as “Baby-Friendly Hospitals.” In Baby-Friendly Hospitals, medical staff facilitate close physical contact between a mother and her infant. Infants are placed skin-to-skin on the mother immediately after birth, supported for the first spontaneous suckling of the breast, and kept rooming-in with the mother, which enables on-demand feeding. Those practices are known to make breastfeeding easier for mothers and increase the breastfeeding rate (Hofvander, 2005; Kramer et al., 2001; World Health Organization, 1998).

Table 1: Summary of the *Ten Steps to Successful Breastfeeding* *

Step 1.	Have a written breastfeeding policy that is routinely communicated to all health-care staff.
Step 2.	Train all health-care staff in the skills necessary to implement this policy.
Step 3.	Inform all pregnant women about the benefits and management of breastfeeding.
Step 4.	Help mothers initiate breastfeeding within an hour of birth ^b .
Step 5.	Show mothers how to breastfeed and how to maintain lactation even if they are separated from their infants.
Step 6.	Give newborn infants no food or drink other than breast milk unless medically indicated.
Step 7.	Practice rooming-in: allow mothers and infants to stay together 24 hours a day.
Step 8.	Encourage breastfeeding on demand.
Step 9.	Give no artificial teats or pacifiers to breastfeeding infants.
Step 10.	Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

* Extracted from *Baby-Friendly Hospital Initiative-Revised, Updated and Expanded for Integrated Care* by WHO and Unicef (World Health Organization & UNICEF, 2009).

^b Originally, the guideline stated to initiate breastfeeding within a half-hour of birth but more recent studies indicated this is too hasty (M. Klaus, 1998).

Close observations of mother and infant dyads revealed that those practices have a positive effect not only on breastfeeding but also on other maternal behaviors (Winberg, 2005). When infants are placed on the mother's abdomen skin-to-skin immediately after birth, they display a stereotyped "pre-feeding behavior; they root, achieve hand-mouth contact, crawl to the breast, attach to the nipple, and eventually begin to suck after about 60 minutes" (M. Klaus, 1998). The uniformity of the behavior suggests an innate program of infants to elicit maternal caregiving behavior. Mothers who experienced skin-to-skin contact and early initiation of breastfeeding breastfed longer than mothers who were separated from the infant soon after birth or who held the infant swaddled in blankets (Moore & Anderson, 2007; Moore, Bergman, Anderson, & Medley, 2016). Further, mothers who had skin-to-skin contact with the infant during the first two hours after birth were more sensitive to the infants' cues and more affectively involved with the infants 12 months postpartum than those who did not (Bystrova et al., 2009). Therefore, it is reasonable to assume that skin-to-skin contact immediately after birth and subsequent early initiation of breastfeeding can positively affect the establishment of the mother-infant relationship.

Classical studies showed striking results suggesting that rooming-in could lead to a better mother-infant relationship. One study followed-up with mothers who had contact with their infants for an extra 16 hours in the first 3 days after birth and those who received routine hospital care, which means receiving their infants only for feeding. Mothers in the extra-contact group demonstrated more affective behavior with their infants at one month, one year, and two years later (Ringler, Kennell, Jarvella, Navojosky, & Klaus, 1975). In another study among low-income mother-infant pairs who were randomly assigned to either rooming-in or to routine postpartum contact, rooming-in correlated with fewer subsequent cases of parenting inadequacy. At a mean age of 17 months, fewer infants in the rooming-in group were hospitalized because of maltreatment, reported to Child Protective Services for child mistreatment, and in the care of adults other than their parents (Connor, Vietze, Sherrod, Sandler, & Altemeier, 1980).

A more recent study, however, suggested that the effect of rooming-in on the mother-infant relationship is inconclusive. A randomized controlled trial with 176 mother-infant dyads showed that the practice of skin-to-skin contact, early suckling, or both during the first two hours after birth positively affected mother-infant interaction, maternal sensitivity, and dyadic mutuality and reciprocity one year after birth. Meanwhile, the negative effect of two hours of separation after birth was not compensated

for byrooming-in later (Bystrova et al., 2009). These findings suggested the presence of an early “sensitive period” during which the mother and infant have an optimal chance to bond and influence each other, and which may induce a long-term positive effect on the mother-infant relationship (Bystrova et al., 2009; M. H. Klaus et al., 1972). Because well-designed trials are scanty, the impact of rooming-in has not yet been concluded (Jaafar, Ho, & Lee, 2016).

In summary, studies suggested that breastfeeding and breastfeeding-promoting care, which ensure close physical contact between mother and infant from a very early stage after birth, played a crucial role in establishing the mother-infant relationship. However, it is not known if breastfeeding and breastfeeding-promoting postnatal care prevent failure in establishing the mother-infant relationship. Therefore, the aim of this study is to examine if breastfeeding and breastfeeding-promoting postnatal care, namely, early skin-to-skin contact followed by initiation of breastfeeding and rooming-in, reduce the symptoms of bonding disorder.

Methods

Study Design and Participants

This is a part of an intervention study exploring the impact of a breastfeeding self-efficacy intervention on breastfeeding and various psychological variables, one of which was maternal bonding to infants (Otsuka et al., 2013). Participants were recruited from the antenatal wards at four obstetric hospitals in Japan, of which two were certified as Baby-Friendly Hospitals (BFH) and the other two were non-Baby Friendly Hospitals (nBFH), between August 2010 and January 2011. All the women in their third trimester were approached and included in the study when they were (a) 16 years of age or older, (b) able to read and write Japanese, and (c) expected to have a singleton birth. They were excluded from the current study if they intended to formula feed, had a pregnancy that ended in either miscarriage or stillbirth, had a medical condition that could significantly interfere with breastfeeding, or had a separation of mother and infant because of a medical condition. They were also excluded in cases in which they delivered with anesthesia, including obstetrical analgesia, and emergency and planned caesarean section, because anesthesia is reported to interfere with mother and infant interaction after birth (Ransjö-Arvidson et al., 2001).

Procedure

Details of the study procedure were published elsewhere (Otsuka et al., 2013). In brief, participants were allocated to an intervention group or a control group in each hospital. Group allocations were not at random but based on the expected date of delivery to avoid contact between the two groups, because in Japan, women generally remain in the hospital for about five days after delivery and often share a room with other women. Women in the control group had access to the conventional hospital and community breastfeeding support; women in the intervention group had access to the conventional support services and the breastfeeding self-efficacy intervention.

The intervention was to provide a breastfeeding self-efficacy workbook after a baseline survey in the third trimester. Women in the intervention group were encouraged to complete the 22-page workbook, which took about 30 minutes, before delivery. The information in the workbook is solution-oriented to facilitate positive cognitive appraisal based on the breastfeeding self-efficacy theory (Dennis, 1999; Nichols, Schutte, Brown, Dennis, & Price, 2009; Otsuka et al., 2013).

Data collection was conducted four times. The first data collection was conducted during the third trimester. The follow-up surveys were conducted three times until 12 weeks postpartum. The first follow-up was conducted before discharge, the second follow-up was conducted when the mothers were returned to the hospital for their infants' one-month health checkup, and the last follow-up was conducted through postal mail. All the surveys were conducted through self-administered questionnaire. In this study, measurement of characteristics or practice during pregnancy or hospitalization (i.e., sociodemographic and obstetric characteristics and hospital infant feeding practices) was labelled as "Time 1," measurement at discharge was labelled as "Time 2," measurement at 4 weeks postpartum was labelled as "Time 3," and the measurement at 12 weeks postpartum was labelled as "Time 4."

Measurement

Mother-to-infant bonding disorder: The symptoms of mother-to-infant bonding disorder was measured using the Japanese version of the Mother-to-Infant Bonding Scale (MIBS-J) (Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012). The MIBS-J is a self-administered questionnaire to detect a disorder in maternal feeling toward an infant. It was developed based on the original Mother-to-Infant Bonding Scale (MIBS) developed by Taylor in

the UK in 2005 (Taylor, Atkins, Kumar, Adams, & Glover, 2005). Some of the items are reversed, and all the items are anchored with a four-point Likert-type scale, where 0 = “not at all” to 3 = “very much”. The MBS-J has 8 items in total with two subscales; 4 items reflect lack of affection (LA), and the other 4 items reflect anger and rejection (AR) to infants. The total score of each subscale ranges from 0 to 12, and a higher total score indicates worse mother-to-infant bonding (Yoshida et al., 2012). The MBS-J was applied at Time 2, 3, and 4 (Table 2).

Table 2: Timing of the Administration of Each Psychometric Scale and the Measurement of Infant Feeding Status

Timing	MBS ^a	BSES-SF ^b	Infant feeding status
Third trimester (Time 1)		✓	
Before discharge (Time 2)	✓	✓	
4 weeks postpartum (Time 3)	✓	✓	✓
12 weeks postpartum (Time 4)	✓		✓

^a Mother-to-Infant Bonding Scale

^b Breastfeeding Self-Efficacy Scale Short Version

Breastfeeding self-efficacy: Breastfeeding self-efficacy is defined as the maternal perception of her ability to breastfeed her new infant (Dennis, 1999). Previous studies consistently showed that higher breastfeeding self-efficacy is associated with better breastfeeding outcomes (Dennis & Faux, 1999; Otsuka, Dennis, Tatsuoka, & Jimba, 2008).

In this study, breastfeeding self-efficacy was measured using the Japanese version of the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF) (Otsuka et al., 2008). This is a self-report instrument that contains 14 items; all the items are presented positively and anchored with a 5-point Likert scale where 1= “not at all confident” and 5 = “very confident”. The total score ranges from 14 to 70, with higher scores indicating higher levels of breastfeeding self-efficacy. The Japanese version of the BSES-SF was applied at Time 1, 2, and 3, and its Cronbach’s alpha coefficients were 0.95, 0.95, and 0.95, respectively (Table 2).

Postnatal care in the hospital: Postnatal care at the hospital was measured through maternal report at discharge. The care was measured according to the *Ten Steps to Successful Breastfeeding* (Table 1). In accordance with the research objectives of this study, we selected three steps for analysis; all relate to physical contact between a mother and the infant and breastfeeding practices.

Step 4: Help mothers initiate breastfeeding within an hour of birth.

Step 7: Practice rooming-in; allow mothers and infants to stay together 24 hours a day.

Step 8: Encourage breastfeeding on demand (this means mothers do not feed by clock, but they carefully observe their babies to respond to the cue for feeding).

To measure Step 4 (hereafter referred to as “skin-to-skin”), mothers were asked if they held their baby skin-to-skin immediately after birth and tried to initiate breastfeeding during that time. To measure Step 7 (hereafter referred to as “rooming-in”), mothers were asked if they stayed with their babies day and night from soon after delivery. To measure Step 8 (hereafter referred to as “on-demand feeding”), mothers were asked two questions. If a mother reported that she breastfed her baby whenever her baby demanded and there was no schedule for feeding decided by the hospital, it is considered that she breastfed her baby “on demand.”

Infant feeding status: This outcome was measured using 24-hour recall at 4 weeks and 12 weeks postpartum and classified into six categories based on Labbok and Coffin’s breastfeeding classification: (1) full breastfeeding (no formula feeding), (2) high partial breastfeeding (breastfeeding for more than 80% of the time), (3) medium partial breastfeeding (breastfeeding for 20–80% of the time), (4) low partial breastfeeding (breastfeeding for less than 20% of the time), (5) token breastfeeding (occasional breastfeeding, not for nutritive purposes), and (6) formula feeding (only formula feeding) (Labbok & Coffin, 1997).

Pregnancy intention: Pregnancy intention was assumed to affect mother-to-infant bonding, infant feeding status, and breastfeeding self-efficacy. It was measured by two questions: one question asked if the pregnancy was unwanted and the other asked if the pregnancy was mistimed. If a mother answered “no” to both of the questions, the pregnancy was considered an intended pregnancy; if a mother answered yes to one or both questions, the pregnancy was considered an unintended pregnancy.

Data Analysis

Among 925 mothers who met the inclusion criteria, 70 refused to participate and 177 were excluded because of intention to formula feed (n=3), a medical condition that could interfere with breastfeeding (n=71), and separation of mother and infant because of a medical condition (n= 103). Further, 159 mothers were excluded because of anesthesia during delivery. As a result, data from 519 mothers were analyzed.

After descriptive analysis of sociodemographic and obstetric characteristics, hospital postnatal care, breastfeeding self-efficacy, and infant feeding status, missing values in the data set were assessed. A Little's Missing Completely at Random test showed $\chi^2 = 12188.391$, $df = 19087$, $p = 1.000$, suggesting values missing completely at random. Missing values were substituted by the means of multiple imputation for further analysis.

Correlations with the abovementioned characteristics and the two subscales, LA and AR, were analyzed. In the correlation analysis, categorical variables were treated as dummy variables (0 or 1). Considering the results of the correlation analysis, variables to construct a structured equation model (SEM) were selected.

The fit of the model was also considered to finalize the selection of the variables to be entered in the SEM. The fitness was examined by chi-squared/degree of freedom (CMIN/DF), comparative fit index (CFI), and root mean square error of approximation (RMSEA). According to Schemelleh-Engell, Moosbrugger, & Muller (2003), a good fit was defined by CMIN/DF < 2, CFI > 0.97, and RMSEA < 0.05, and an acceptable fit was defined by CMIN/DF < 3, CFI > 0.95, and RMSEA < 0.08.

In the SEM, pregnancy intention, hospital postnatal care, and breastfeeding self-efficacy during the third trimester were posited to influence breastfeeding self-efficacy, mother-to-infant bonding, and feeding status at Time 3 (4 weeks postpartum). Further, mother-to-infant bonding, feeding status, and breastfeeding self-efficacy were posited to influence one another. Mother-to-infant bonding, feeding status, and breastfeeding self-efficacy at Time 3 were posited to influence mother-to-infant bonding and feeding status at Time 4.

Moreover, trends of the two subscales of the MIBS, LA, and AR scores were analyzed using the Friedman test.

All the analysis was conducted using SPSS version 24 and Amos version 24. A *p* value of .05 or less was considered to indicate acceptable significance.

Ethical Considerations

The current study was approved by the Research Ethics Committee of the Graduate School of Medicine at The University of Tokyo (No. 2418). Written informed consent was obtained before the baseline survey. Confidentiality of all the data was maintained.

Results

Characteristics of Participants and Postnatal Care in the Hospital

More than one-third of the mothers were primiparas ($n = 199$, 38.3%) and had a delivery in a Baby-Friendly Hospital ($n = 192$, 37.0%). The majority of the mothers had intended pregnancies and were married, well educated, and in a stable economic status (i.e., no financial concerns). Further, the majority of them intended exclusive breastfeeding (Table 3).

Regarding the postnatal care received in the hospital, the majority held their infant skin-to-skin immediately after birth and attempted the first breastfeeding ($n = 379$, 73.9%) while only 23.5% ($n = 112$) answered that they stayed with their infant day and night since soon after birth. Further, only 53.0% ($n = 275$) practiced on-demand feeding during the hospital stay (Table 3).

Table 3: Characteristics of Participants and Perinatal Care Received in Hospital and Its Correlation with Subscales of MIBS (N = 519)

Variable	Mean (SD) / Number (%)	Correlations					
		LA Time 2	LA Time 3	LA Time 4	AR Time 2	AR Time 3	AR Time 4
Age	30.5 (4.7)	< 0.001	0.033	-0.025	-0.046	-0.049	-0.094
Parity							
Primiparous	199 (38.3)						
Multiparous	301 (58.0)	-0.039	0.012	0.009	-0.177*	-0.240*	-0.189**
Intended pregnancy	370 (71.3)	-0.003	-0.018	-0.020	-0.044	0.038	-0.038
Delivery in a Baby-friendly Hospital	192 (37.0)	0.009	-0.026	-0.007	-0.077	-0.100	-0.025
Gestation week	39.6 (1.1)	0.104*	0.094	0.102*	0.030	0.050	0.023
Birth weight (g)	3142.4 (334.2)	0.027	0.029	0.056	-0.019	-0.018	-0.015
Marital status							
Married	517 (99.6)	0.034	0.032	0.028	0.029	-0.008	0.036
Educational status							
Beyond high school level	363 (69.9)	0.020	0.035	-0.010	-0.075	0.011	-0.060
Economic status							
No financial concern	453 (87.3)	-0.035	-0.074	-0.024	-0.100*	-0.020	-0.058

Intention of breastfeeding							
Exclusive breastfeeding	399 (76.9)	-0.030	-0.066	-0.067	-0.062	-0.031	-0.040
Partial breastfeeding	118 (22.7)						
Perinatal care received in hospital							
Skin-to-skin	379 (73.9)	-0.006	0.004	-0.009	-0.057	-0.031	-0.030
Rooming-in	112 (23.5)	0.055	0.020	0.026	-0.043	-0.021	0.025
On-demand feeding	275 (53.0)	-0.004	-0.032	0.005	-0.100*	-0.144	0.011
BSES-SF during third trimester (Time1)	42.2 (11.1)	-0.186*	-0.138*	-0.144*	-0.186**	-0.175**	-0.108*

* $p < 0.05$, ** $p < 0.01$

MIBS, Mother-to-Infant Bonding Scale; LA, Lack of Affection; AR, Anger and Rejection; BSES-SF, Breastfeeding Self-Efficacy Scale-Short Version

Infant Feeding Status and the Trends of the Two Subscales of the MIBS

Among all the participants analyzed, the vast majority (n = 518, 99.8%) initiated breastfeeding. Within 24 hours of the survey at 4 weeks postpartum (Time 3), 59.5% (n = 266) of the mothers had fully breastfed their infants. The rate was increased to 70.5 % (n = 303) at 12 weeks postpartum (Time 4). On the other hand, only 1.1% (n = 5) were formula feeding at 4 weeks postpartum (Time 3), and the rate was increased to 5.6 % (n = 24) at 12 weeks postpartum (Time 4) (Table 4).

Table 4: Infant Feeding Status at 4 Weeks (Time 3) and 12 Weeks Postpartum (Time 4) by 24-Hour Recall

Infant Feeding Status	4 weeks postpartum	12 weeks postpartum
	n (%)	n (%)
Full breastfeeding	266 (59.5)	303 (70.5)
High partial breastfeeding	99 (22.1)	56 (13.0)
Medium partial breastfeeding	52 (11.6)	28 (6.5)
Low partial breastfeeding	21 (4.7)	12 (2.8)
Token breastfeeding	4 (0.9)	7 (1.6)
Formula feeding	5 (1.1)	24 (5.6)

Both LA and AR scores decreased significantly as time passed. The mean LA was decreased from 0.55 (SD = 1.07) at discharge (Time 2) to 0.42 (SD = 0.99) 12 weeks postpartum (Time 4) (p = 0.013). Similarly, AR decreased from 0.97 (SD = 1.07) at discharge (Time 2) to 0.57 (SD = 0.99) 12 weeks postpartum (Time 4) (p < 0.013) (Table 5).

Table 5: Trends of the Two Subscale Scores of the MIBS

Subscales	Time 2 Mean (SD)	Time 3 Mean (SD)	Time 4 Mean (SD)	Change from Time 2 to Time 4
LA	0.55 (1.07)	0.61 (1.27)	0.42 (0.99)	$\chi^2(2) = 8.69$, $p = 0.013$
AR	0.97 (1.07)	0.84 (1.04)	0.57 (0.99)	$\chi^2(2) = 61.17$, $p < 0.001$

MIBS, Mother-to-Infant Bonding Scale; LA, Lack of Affection; AR, Anger and Rejection

Correlation of Characteristics of Participants and Postnatal Care in the Hospital with the Two Subscales of the MIBS

Table 3 further indicates the correlations of the characteristics of participants and hospital postnatal care with the two subscales of the MIBS. Multiparas mothers were more likely to have lower AR scores through Time 2 to Time 4. Gestation week was correlated with LA Time 2 and LA Time 4. Stable economic status (having no financial concerns) was correlated with a lower AR score at Time 2. BSES-SF during the third trimester was correlated with both lower AR and lower LA scores through Times 2 to 4.

Correlations of the selected variables in the SEM. We created an original SEM model including all the variables that have correlation with MIBS. From the original model, variables were selected to create a model with a good fitness (Fig 1). Table 6 summarizes the correlations between the selected variables in the SEM. Skin-to-skin was correlated with rooming-in and on-demand feeding. Rooming-in was correlated with on-demand feeding, BSES-SF Time 1, and feeding status Times 3 and 4. On-demand feeding was correlated with BSES-SF Time 1 and feeding status Times 3 and 4. BSES-SF Time 1 was correlated with BSES-SF Time 3, feeding status Times 3 and 4, LA Times 3 and 4, and AR Times 3 and 4. LA Time 3 was correlated with LA Time 4 and AR Time 4. LA Time 4 was correlated with AR Time 4.

Effect of hospital postnatal care and breastfeeding on MIBS. Figure 1 is the SEM to examine if breastfeeding and breastfeeding-promoting postnatal care in the hospital, namely, early skin-to-sin contact, rooming-in, and on-demand feeding have preventive effect on MIBS. The CMIN/DF of 2.220, the CFI of 0.970, and the RMSEA of 0.049 indicated an acceptable-to-good fit of the model.

Figure 1. SEM of pregnancy intention, in-hospital perinatal care, breastfeeding self-efficacy, feeding status and MIBS.

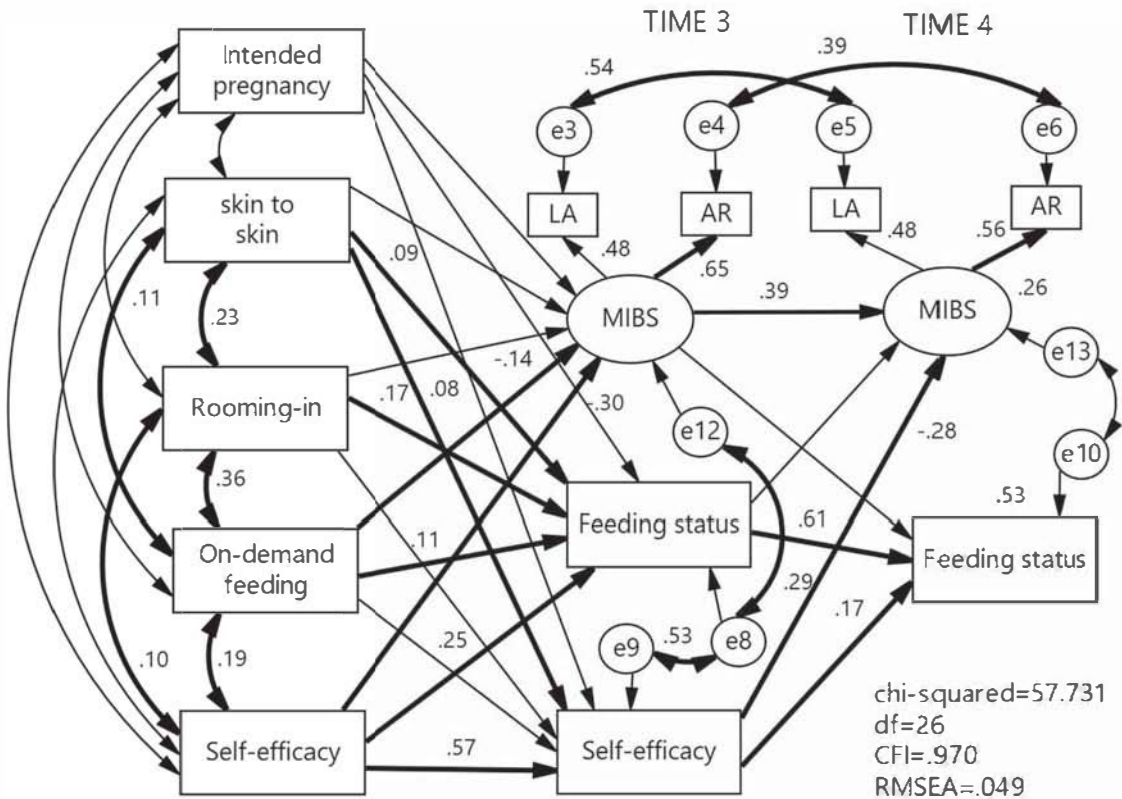


Table 6: Correlations of the Variables in the SEM

	1	2	3	4	5	6	7	8	9	10	11	12
1 Intended Pregnancy		-.021	-.067	.031	.046	.019	.013	.064	-.018	-.020	.038	-.038
2 Skin-to- skin			.208*	.113*	.010	.014	.077	.074	.004	-.009	-.031	-.080
3 Rooming- in				.343*	.110*	.072	.192*	.150*	.020	.026	-.021	.025
4 On- demand feeding					.190**	.080	.171*	.180**	-.032	.005	-.144	.011
5 BSES-SF Time 1						.349**	.251**	.201**	-.138*	-.144**	-.175**	-.108*
6 BSES-SF Time 3							.512	.225	-.012	-.064	-.402	-.097
7 Feeding status Time 3								.452	.099	.018	-.137	-.003

8	.027	-.023	-.006	.006
Feeding Status Time 4				
9		.425**	.182	.177**
LA Time 3				
10			.081	.269**
LA Time 4				
11				.252
AR Time 3				
12				
AR Time 4				

* $p < 0.05$, ** $p < 0.01$

BSES-SF, Breastfeeding Self-Efficacy Scale-Short Form; LA, Lack of Affection; AR, Anger and Rejection

Regarding breastfeeding outcomes, skin-to-skin, rooming-in, on-demand feeding, and breastfeeding self-efficacy at Time 1 positively influenced breastfeeding at Time 3. Breastfeeding and breastfeeding self-efficacy at Time 3 positively influenced breastfeeding at Time 4.

In regard to mother-to-infant bonding, on-demand feeding and better breastfeeding self-efficacy at Time 1 had preventive effects on mother-to-infant bonding disorder at Time 3. Mother-to-infant bonding at Time 3 was correlated with mother-to-infant bonding at Time 4. Skin-to-skin enhanced the breastfeeding self-efficacy at Time 3 and had a preventive effect on mother-to-infant bonding disorder at Time 4. Breastfeeding at Time 3 did not significantly influence mother-to-infant bonding at Time 4.

Discussion

This study has two major findings. First, on-demand feeding during hospitalization reduced the symptoms of mother-to-infant bonding disorder at 4 weeks postpartum. Second, skin-to-skin contact after birth followed by early initiation of breastfeeding had a positive effect on breastfeeding self-efficacy at 4 weeks postpartum, and better breastfeeding self-efficacy at 4 weeks postpartum reduced the symptoms of mother-to-infant bonding disorder at 12 weeks postpartum. These findings are in line with previous studies suggesting breastfeeding and close physical contact soon after birth have a positive effect on establishing the mother-to-infant affective relationship (Bystrova et al., 2009; Moore & Anderson, 2007; Moore et al., 2016; Winberg, 2005). Further, the current study suggests that postnatal care in hospital, which is known to promote breastfeeding, may have a preventive effect on mother-to-infant bonding disorder.

Mothers who practiced on-demand feeding during hospitalization had reduced symptoms of mother-to-infant bonding disorder at 4 weeks postpartum. In Japanese hospitals, which have a feeding schedule, typical practice is to schedule mothers feeding their infants every three to four hours (Horiuchi, Sakai, Yoda, & Nagayama, 2001). In a natural setting without a feeding schedule, the frequency of breastfeeding varies among mother-infant dyads, but many studies reported the frequency to be more than eight times a day (Riordan, 2005). For example, a descriptive study with 24 mothers with an infant aged 17 months on average (ranging from 2 to 38 months) in the United States showed that they breastfed their infants 15 times per day on average when there was no restriction for feeding (Cable & Rothenberger, 1984). Therefore, mothers who practiced on-demand feeding probably breastfed their infants more frequently than mothers who

breastfed their infants following a feeding schedule decided by a hospital. Assuming that on-demand feeding let mothers breastfed their infants frequently, frequent breastfeeding during early postpartum periods may have a preventive effect on mother-to-infant bonding disorder. On the other hand, breastfeeding at 4 weeks postpartum did not predict reduced symptoms of mother-to-infant bonding disorder at 12 weeks postpartum. This finding may suggest a sensitive period for establishment of mother-to-infant bonding that can be enhanced by breastfeeding. The suggestion is not conclusive as vast majority of the participants practiced breastfeeding to some extent at 4 weeks postpartum. A study including more mothers who do not breastfeed their infants may give a clearer picture to understand the role of breastfeeding on establishing the mother-to-infant relationship.

Skin-to-skin contact immediately after delivery followed by early initiation of breastfeeding was not directly linked with reduced symptoms of bonding disorder at 4 weeks postpartum. Instead, the practice enhanced breastfeeding self-efficacy at 4 weeks postpartum, and enhanced breastfeeding self-efficacy predicted reduced symptoms of bonding disorder at 12 weeks postpartum. In other words, mediated by breastfeeding self-efficacy, skin-to-skin contact could reduce symptoms of mother-to-infant bonding disorder. This finding is consistent with a previous study, which suggested early physical contact of mother and infant enhanced the mother-to-infant affective relationship (Bystrova et al., 2009). The current study further suggested that the positive effect of skin-to-skin contact followed by early initiation of breastfeeding on mother-to-infant bonding might be mediated by breastfeeding self-efficacy.

Rooming-in did not predict reduced symptoms of mother-to-infant bonding disorder at 4 weeks postpartum. This finding again supports the presence of the early sensitive period for establishment of mother-to-infant bonding proposed by Bystrova et al. (2009). Although rooming-in as well as skin-to-skin and on-demand feeding predicted breastfeeding at 4 weeks postpartum and therefore should be promoted, staying with the infant after the very early postnatal period in the delivery room might be too late to enhance mother-to-infant bonding. The study by Bystrova et al. suggested the sensitive period might be about two hours after birth.

Higher breastfeeding self-efficacy was related with reduced symptoms of bonding disorder. Higher breastfeeding self-efficacy in the third trimester predicted reduced symptoms of bonding disorder at 4 weeks postpartum. Similarly, higher breastfeeding self-efficacy at 4 weeks postpartum predicted reduced symptoms of bonding disorder at 12 weeks postpartum. Studies indicated that breastfeeding self-efficacy can be enhanced through

breastfeeding support that focused on the four sources of self-efficacy: (a) performance accomplishments (e.g., past successful breastfeeding experiences), (b) vicarious experiences (e.g., watching other women breastfeed, peer counselling), (c) verbal persuasion (e.g., encouragement from influential others such as friends, family, and lactation consultants), and (d) influence of one's physiological and/or affective states (e.g., release from pain, fatigue, and anxiety) (Noel-Weiss, Rupp, Cragg, Bassett, & Woodend, 2006; Otsuka et al., 2013). Such supports may reduce symptoms of bonding disorder.

Several limitations must be considered when interpreting the results of this study. First, the majority of the participants of this study had intended pregnancies and were married, well educated, and in a stable economic status. Socially disadvantaged women may be at more risk of mother-to-infant bonding disorder, and a study targeting this demographic is warranted to generalize the findings of the current study. Second, symptoms of mother-to-infant bonding disorder were measured merely by MBS, which is a self-administered questionnaire. Direct observation of mother-to-infant bonding may give further understanding of the preventive effect of breastfeeding and postnatal care on bonding disorder. Finally, there was no diagnostic testing of mother-to-infant disorder in this study. Although breastfeeding and in-hospital postnatal care were suggested to reduce the symptoms of bonding disorder, it remains unknown if those practices decrease the onset of bonding disorder.

In spite of these limitations, this study has value in suggesting clinical practices soon after birth to reduce symptoms of bonding disorder until 12 weeks postpartum. To the best of our knowledge, this is the first study that examined the effect of breastfeeding and postnatal care in the hospital on the symptoms of bonding disorder. In conclusion, on-demand feeding in the hospital was suggested to reduce the symptoms of bonding disorder. Skin-to-skin contact followed by early initiation of breastfeeding was also suggested to reduce the symptoms of bonding disorder mediated by breastfeeding self-efficacy. Implications are to encourage skin-to-skin contact immediately after birth with early initiation of breastfeeding and on-demand feeding during hospitalization. There might be an early postpartum sensitive period for establishing mother-to-infant bonding that could not be compensated for with rooming-in and breastfeeding afterwards.

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CHAPTER TWELVE

HOME VISITS BY MENTAL HEALTH NURSES FOR JAPANESE WOMEN WITH POSTPARTUM DEPRESSION: EFFECTIVENESS ON MATERNAL BONDING AND QUALITY OF LIFE

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Abstract

Several qualitative studies have revealed high distress symptoms in women with postpartum depression. Moreover, postpartum depression can negatively influence maternal bonding, mother-child interactions, children's development, and women's quality of life. Previous studies have shown the efficacy of psychosocial interventions for postpartum depression. In particular, home-based individual interventions by nurses or health visitors also reported the satisfaction and the acceptability of treatment by mothers who received the intervention. However, the efficacy of the intervention by nurses in women's quality of life has not been examined sufficiently.

This intervention study evaluated the effectiveness of home visits on depressive symptoms, maternal bonding, and quality of life by mental health nurses for Japanese women with postpartum depression. Eighteen postpartum women met the inclusion criteria and were randomly allocated into the intervention ($n = 9$) or control ($n = 9$) group at 1 to 2 months postpartum. The intervention group received four weekly home visits by a mental health nurse. Control group participants received usual care. Two women in the intervention group did not complete the study. Depressive symptoms, maternal bonding, and quality of life were measured at one and

six weeks post-intervention. In addition, participants completed an open-ended questionnaire on satisfaction and effectiveness derived from the home visits. The changes in mean scores of the WHO/QOL-26 over the study period demonstrated that the intervention group showed greater improvement in women's quality of life than the control group. Women in the intervention group had amelioration of depressive symptoms and maternal bonding over time, but there were no statistically significant differences between groups. The qualitative analysis of comments about home visitation revealed four categories related to "setting their mind at ease", "clarifying thoughts", "improving coping abilities", and "removing feelings of withdrawal from others". These results suggest that home visits by mental health nurses can contribute to positive mental health and social changes for women with postpartum depression. A larger trial is warranted to test this approach to care for women with PPD.

Key Words: postpartum depression, mental health nurse, home visits, quality of life, maternal bonding

Introduction

Postpartum depression affects approximately 10-13% of Japanese women (Okano, Sugiyama, & Nishiguchi, 2007; Yamashita, Yoshida, Nakano, & Tashiro, 2000), similar to that in Western countries (Hara & Swain, 1996). Several qualitative studies have revealed high distress symptoms in women with postpartum depression (Beck, 1992; 1993; 1996; Chan, Levy, Chungm, & Lee, 2002; Nahas, Hillege, & Amasheh, 1999; Ugarriza, 2002). Moreover, postpartum depression can negatively influence maternal bonding (Kumar, 1997; Moehler, Brunner, Wiebel, Reck, & Resch, 2006; Higgins, Roberts, Glover, & Taylor, 2013; Yoshida, Yamashita, Conroy, Marks, & Kumar, 2012), children's development (Beck, 1998; Murray, Sinclair, Cooper, Ducourneau, & Turner, 1999), and women's quality of life (Darcy et al., 2011; De Tychey et al., 2008; Moimkehr et al., 2016; Zubaran & Foresti, 2011).

Previous studies have shown the efficacy of psychosocial interventions for postpartum depression (Brockington 2004; Dennis & Hodnett, 2007; Glavin, Smith, Sorum, & Ellefsen., 2010; Kuosmanen, Vuorilehto, Kumpuniemi, & Melartin, 2010; Lumley, Austin, & Mitchell, 2004).

In particular, home-based individual interventions by midwives (MacArthur et al., 2002), pediatric nurses (Armstrong, Fraser, Dadds, & Morris, 1999/2000; Wickberg & Hwang, 1996), advanced practice nurses (Horowitz et al., 2001), public health nurses (Segre, Stasik, Hara, &

Arndt, 2010), or health visitors (Holden, Sagovsky, & Cox, 1989) reported not only efficacy in recovering from postpartum depression, but also satisfaction levels and treatment acceptability of mothers who received the intervention.

In terms of difference of the effect in psychological approaches, Morrell et al. (2009) evaluated benefits for postpartum women of two psychologically informed interventions (based on cognitive behavioral or person centered principles) by trained health visitors. They reported the psychologically informed sessions were clinically effective at six and twelve months postnatally compared with usual care, and there was no differential benefit for either psychological approach.

In terms of proficiency in psychological treatment, Cooper, Murray, Wilson, & Romaniuk (2003) showed that non-directive counseling and cognitive behavioral therapy by trained health visitors produced a rate of reduction in depression superior to that of rates produced by specialists. They proposed that health visitors produced better client outcomes because they were therapists who had previous experience of home visiting. Although this explanation does not adequately explain this outcome, the results suggested that proficiency in psychological treatment would not influence the effectiveness on reducing depressive symptoms. While Cooper et al. (2002) demonstrated there was no reliable impact on maternal mood of the intervention delivered by trained, but otherwise unqualified, community workers. Therefore a provider with a psychological approach would be needed to have a certain specialty.

Horowitz et al. (2013) indicated nurse-led home visits had a positive effect on outcomes for all depressed mothers. They tested the efficacy of the relationship-focused behavioral coaching intervention through nurse-led home visits in increasing maternal-infant relational effectiveness between depressed mothers and their infants during the first nine months postpartum. They reported there were no significant differences between the treatment and control groups for maternal-infant relational effectiveness, responsiveness to caregiver, or depressive symptom severity. Nonetheless, both groups did have significant improvement on all measures over time. As a result, they considered that home visits by the nurse for both treatment and control groups that featured the nurse's active empathic listening to mothers during data collection, focused attention paid to mothers in the video-recorded sessions, and monitoring provided by completion of depression measures and the diagnostic interview. Together they likely constituted an unexpected form of treatment for the control group mothers, and self-reflection in completing the measures may

have promoted self-monitoring by the mothers and created enough sense of attention to be an unintended intervention. This is in line with Holden et al. (1989), they indicated that women in their control group may have benefited from taking part in the study, because they could talk about their feelings during the diagnostic interview.

However, the efficacy of interventions by nurses or health visitors requires further analysis. Nursing seeks to maximize clients' strengths, assets and potential, and to contribute to their quality of life (Zhan, 1992), though the effect on mothers' quality of life from the interventions by nurses have not been clarified sufficiently.

Turner, Chew-Graham, Folkes, & Sharp (2010) explored women's experiences of health visitor's listening visits as a treatment for postpartum depression through in-depth interviews, and reported that women with postpartum depression may report listening visits as helpful but insufficient to manage their depression. These results indicated that the specialty of mental health would be needed to take care for women with postpartum depression.

Only a few studies have reported the efficacy of an intervention by mental health nurses. Austin, Dudley, Launders, Dixon, & McCartney-Bourne (1999) found that nursing assessment and early intervention (providing support, psycho-education, and advice and education on mothering) by experienced community mental health nurses produced high rates of recovery from depression, and promoted close collaboration among other health professionals (midwives, early childhood nurses, general practitioners, and psychiatrists). However, their study was limited by the lack of a control group. Beeber, Holditch-Davis, Belyea, & Funk (2004) tested a short-term, home-based intervention by mental health nurses with 16 mothers with depressive symptoms. The intervention consisted of strategies for managing depressive symptoms, improving problematic life issues, increasing access to social support, and effective parenting. The intervention showed a significant reduction in depressive symptoms, and an improvement in maternal-child interactions. All participants were retained in the study and reported high satisfaction with the intervention. However, that study targeted not only postpartum women, but also the mothers of toddlers.

The intervention by mental health nurses; including assessing women's mental states accurately, providing intervention flexibly according to the women's mental states, psycho-education, managing depressive symptoms, and advice and education on problematic life issues, access to social support, and effective parenting, could contribute to improvement of

depressive symptoms, maternal bonding, and quality of life.

This intervention study evaluated the effectiveness of home visits on depressive symptoms, maternal bonding, and quality of life by mental health nurses for Japanese women with postpartum depression.

Method

Participants

Postpartum women attending a child health appointment at one month postpartum were recruited between July 2004 and August 2006 at eight hospitals in Hyogo, Japan. Ethical approval was obtained from the Institutional Ethics Committee.

All participants were Japanese women, 18 years or older. Women were excluded if they lived outside the district, had delivered prematurely (before 36 weeks gestation), if their infant had any congenital or serious disease, if they had not had a singleton birth, or if they had received any antidepressant or other specific treatments during the study period.

Procedure

Women who agreed to participate provided informed consent and completed a screening questionnaire (Edinburgh Postnatal Depression Scale [EPDS]). Those who scored 9 or higher on the scale (indicating possible depression) were invited to enter the trial. Women were interviewed and assessed at home using a structured clinical interview to determine if they had a major or minor depressive disorder. Women who met the research criteria were allocated to the intervention or control group using computer-generated random numbers. For the ethics of keeping women with a major depressive illness, we planned as follow. If it would be considered that the woman has a need of treatment, as consulting with a psychiatrist, the intervention and the assessment would be stopped and discontinued any more. But in this study, we didn't find anyone who would meet the requirements.

The control group received routine care (e.g., a postpartum visit at home for the newborn with a midwife or a public health nurse and a 4-month postpartum check-up that conducted community-based). In addition to routine care, the intervention group received four home visits by mental health nurses between one and four months postpartum. Each home visit was at least one hour duration.

The intervention was based on the Orem-Underwood model (Orem, 2001; Underwood, 1985a; 1985b), a mental health/psychiatric nursing model based on a self-care deficit perspective. The major aim of this intervention was to reduce depressive symptoms, and improve women's quality of life and mother's feelings towards her newborn baby. The intervention consisted of active listening, providing support and acceptance of the woman, providing psycho-education on depressive symptoms, advice on coping strategies for problematic life issues, including parenting, and increasing access to social or family support. The intervention was provided flexibly according to the individual's needs and the nurse's assessment of each woman's self-care level and mental state. The validity of the intervention was confirmed by a descriptive study (Tamaki 2004).

The intervention was delivered by three experienced female mental health nurses, who had master's degrees. All nurses had trained before conducting the intervention so that they could provide the same content. Written records were kept of each intervention session. To ensure that the intervention was consistently applied, case conferences were held every week and records reviewed.

Measures

Depressive symptoms, quality of life, and maternal bonding were assessed before the intervention (Time 1), 1 week (Time 2), and 6 weeks post-intervention (Time 3) using four standardized measures. At the screening, the Edinburgh Postnatal Depression Scale (EPDS) was also used. In addition, women in the intervention group were asked to describe how they perceived the home visits at Time 2 and 3 using an open-ended questionnaire.

The Japanese version of the Edinburgh Postnatal Depression Scale (EPDS) was used (Okano et al., 1996). The EPDS is a 4-point self-reporting scale (from 0 to 3) specifically designed to screen for postpartum depression symptoms in community samples (Cox, Holden, & Sagovsky, 1987). The validity and reliability of this Japanese version of EPDS were confirmed (Okano et al., 1996). Furthermore, Kubota et al. (2014) examined the factor structure of the Japanese version of EPDS by utilizing exploratory analysis and confirmatory factor analysis, and reported it was consisting of three sub-scales: Anxiety (3 items), Depression (3 items), and Anhedonia (2 items). In this study, we measured these three sub-scale scores.

The Structured Clinical Interview for DSM-IV AXIS I Modified Version for the Trans-cultural Study of Postnatal Depression (SCID-PND) is a semi-structured interview (O'Hara 1999). Gorman et al. (2004) reported the SCID-PND was appropriate for assessing perinatal depression and other non-psychotic psychiatric illnesses. In the present study, the SCID-PND (Japanese version) was used by trained research mental health nurses (other than the nurses providing the intervention) who received 4 days of training in the use of the SCID-PND. The training included lectures, role-play, and discussions and was lead by a psychiatrist and the author. To ensure the reliability, the research nurses' assessments were supervised by a psychiatrist. The research nurses who conducted the SCID-PND were blinded to the group allocation of the women.

A short version of The World Health Organization Quality of Life Assessment Instrument (WHOQOL-26) was used (Tazaki & Nakane, 1997; World Health Organization, 1995). This 5-point self-rating instrument (from 1 to 5) has 26 items with 5 subscales: physical (physical state), psychological (cognitive and affective state), social (interpersonal relationships and social roles in life), environmental (relationships to salient features of the environment), and global (meaning of life or overarching personal beliefs). An average score is calculated from the total of the 5 subscales. A higher score indicates better QoL.

The Japanese version of the Mother-Infant Bonding Scale (MIBS) was used (Yoshida et al, 2012). It is based on Kumar's Mother Infant Bonding Questionnaire (Kumar, 1997), and is a 4-point self-rating instrument (from 0 to 3) designed to detect the problems in a mother's feelings towards her newborn baby. Yoshida et al. (2012) examined the factor structure of the Japanese version of MIBS by utilizing exploratory analysis and confirmatory factor analysis, and reported a two-factor structure out of eight items: lack of affection (LA) and anger/rejection (AR). Those Chronbach's alpha coefficients were reported 0.71 and 0.57, respectively. Higher scores indicate greater negative attitudes towards the child.

In an open-ended questionnaire, women in the intervention group were asked to describe how they perceived the home visits in terms of satisfaction and meaning, and make other comments as appropriate about the intervention.

For the first assessment, a face-to-face interview using SCID-PND was conducted in the women's homes; the other two assessments were conducted by a telephone interview. The three assessments were conducted by the same nurse for each woman. All of the self-reported questionnaires were distributed by the nurse but completed at a later time

by the woman and returned in a prepaid envelope.

Analysis

Differences between groups were tested using Chi-square or the Mann-Whitney rank test. Fisher's exact test was used to compare the number of cases of depression between the intervention group and control group at Time 2 and Time 3.

All scores of EPDS, WHQOL-26, and MBS displayed skewed statistics within an acceptable range (<2). A two-way repeated-measures ANOVA was conducted on the influence of group (intervention, control) and time. When interaction effect was present, we used the simple main effects approach to further elucidate the meaning of the significant interaction with Bonferroni's post hoc test. When interaction effect was not present, the simple main effect of time was tested with Bonferroni's post hoc test.

The level of significance was set at $p < 0.05$. The SPSS for Windows version 21.0 was used.

Data from open-ended questionnaires were analyzed using a qualitative content analysis approach. Responses were classified and organized as meaning units. To assure reliability and trustworthiness, the process of categorizing data was scrutinized by two experts.

Results

A total of 867 postpartum Japanese women were recruited and screened for postpartum depression with the EPDS; 361 (41.6%) women agreed to participate to the study. Sixty-six women (18.3%) scored above the threshold of 9 on the EPDS. Of these 66 women, 58 met the inclusion criteria and 40 (69.0%) agreed to enter the intervention trial. These women were interviewed at home by trained nurses at about 8 weeks postpartum and assessed with the SCID-PND for major or minor depression. Of these 40 women, 19 (47.5%) were found to be depressed. One woman declined to participate after the interview. Thus 18 women were randomized into an intervention ($n=9$) or a control ($n=9$) group. After the trial started, 2 women in the intervention group dropped out. They declined to continue receiving the intervention for their busyness or the condition of their baby.

Figure 1. Trial Profile

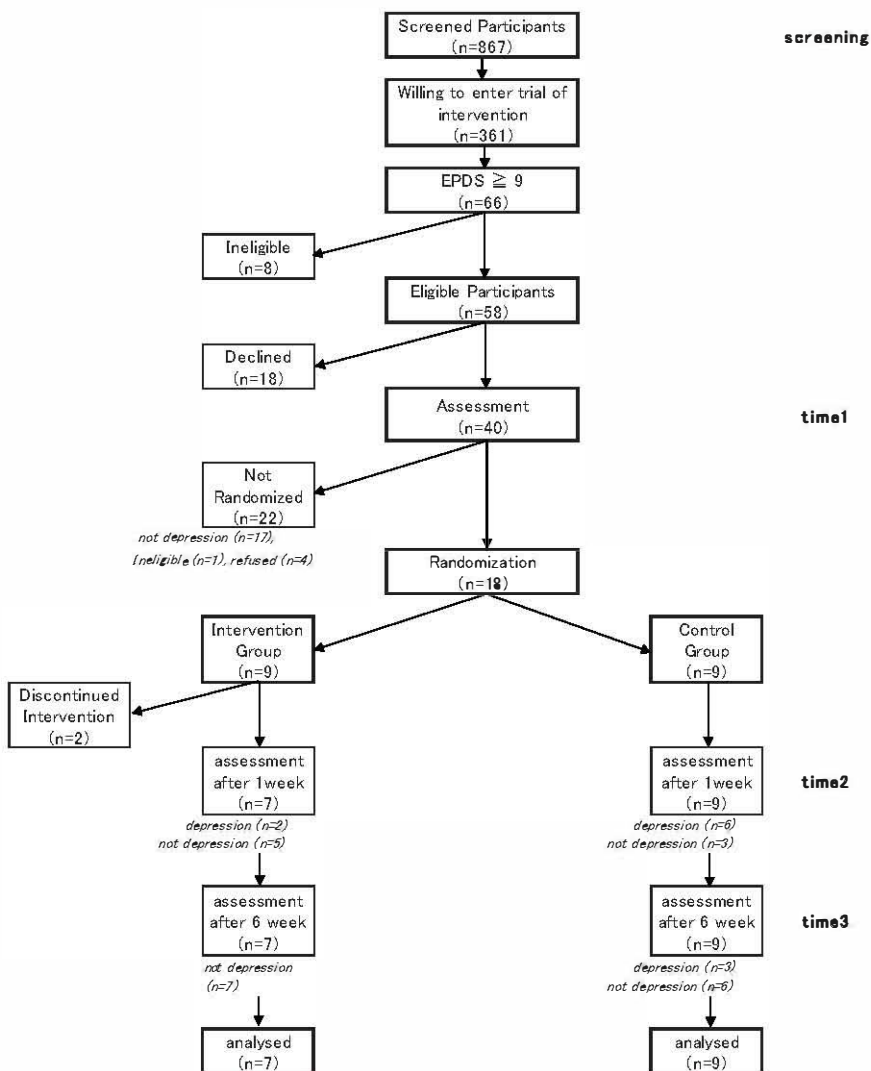


Table 1 shows details of the 16 women in the study. The mean age of the women was 33.8 years. All were married and three lived with their parents (own or in-laws). Two women delivered by caesarean section, 4 women had undergone fertility treatment, and 6 had at least one episode of

depression in the past. Chi-square or the Mann-Whitney rank analysis revealed no significant differences between the groups on any of these variables.

Table 1: Demographic characteristics of participants according to group.

Results are reported as n (%) or mean [SD].

Characteristics	Intervention (n = 7)	Control (n = 9)	Total (n = 16)
Mean age	33.86 [3.02]	33.78 [5.33]	33.81 [4.34]
Parity			
Primiparous	7 (100)	6 (66.7)	13 (81.3)
Multiparous	0	3 (33.3)	3 (18.8)
Living arrangements			
Partner	7 (100)	6 (66.7)	13 (81.3)
Parents	0	3 (33.3)	3 (18.8)
Married	7 (100)	9 (100)	16 (100)
Working status			
Employed	0	3 (33.3)	3 (18.8)
Unemployed	7 (100)	6 (66.7)	13 (81.3)
Educational level			
High school	0	4 (44.4)	4 (25.0)
Up to college	7 (100)	5 (55.6)	12 (75.0)
Type of delivery			
Spontaneous vertex	6 (85.7)	8 (88.9)	14 (87.5)
Caesarean section	1 (14.3)	1 (11.1)	2 (12.5)
Newborn's gender			
Male	2 (28.6)	6 (66.7)	8 (50.0)
Female	5 (71.4)	3 (33.3)	8 (50.0)
Newborn's birthweight	2800 [296]	3122 [473]	2981 [426]
Treatment history for sterility	1 (14.3)	3 (33.3)	4 (25.0)
Previous depression	2 (28.6)	4 (44.4)	6 (37.5)

No significant difference was found.

SD, standard deviation.

The mean (and SD) of each assessment time was as follows; Time 1 (before the intervention) was 55.7 (SD 19.6) days postpartum, Time 2 (1 week post- intervention) was 101.1 (SD 29.6) days postpartum, and Time 3 (6 weeks post- intervention) was 137.7 (SD 33.6) days postpartum.

Effect of intervention

Depressive symptoms: At Time 2, according to a structured clinical interview, 5 of 7 (71.4%) depressed women in the intervention group showed no evidence of having depression, whereas only 3 of the 9 (33.3%) women in the control group had recovered. At Time 3, no woman in the intervention group showed evidence of depression, whereas 6 of 9 (66.7%) women in the control group had recovered. There were no significant differences between the intervention group and control group at time2 (Fisher's exact $p=0.315$) and time3 (Fisher's exact $p=0.213$).

According to the two-way ANOVA for the three subscale scores of EPDS, the interactions of the variables "intervention and time" were not significant. Although the changes in mean scores over the study period demonstrated that the intervention group showed greater improvement in depressive symptoms than the control group (figure 2), the main effect of intervention was not significant. Furthermore the main effect of time for the Anxiety score ($F(1, 14) = 6.91$, $p=0.001$) and the Depression score ($F(1,14)=4.32$, $p=0.01$) were significant. According to the Bonferroni post hoc test, significant differences were shown on Anxiety scores between screening and time3 ($p=0.043$), and between time1 and time3 ($p=0.042$).

Table 2: Changes in scores over the study period & Two-way ANOVA for EPDS, WHO/QOL-26, & MIBS

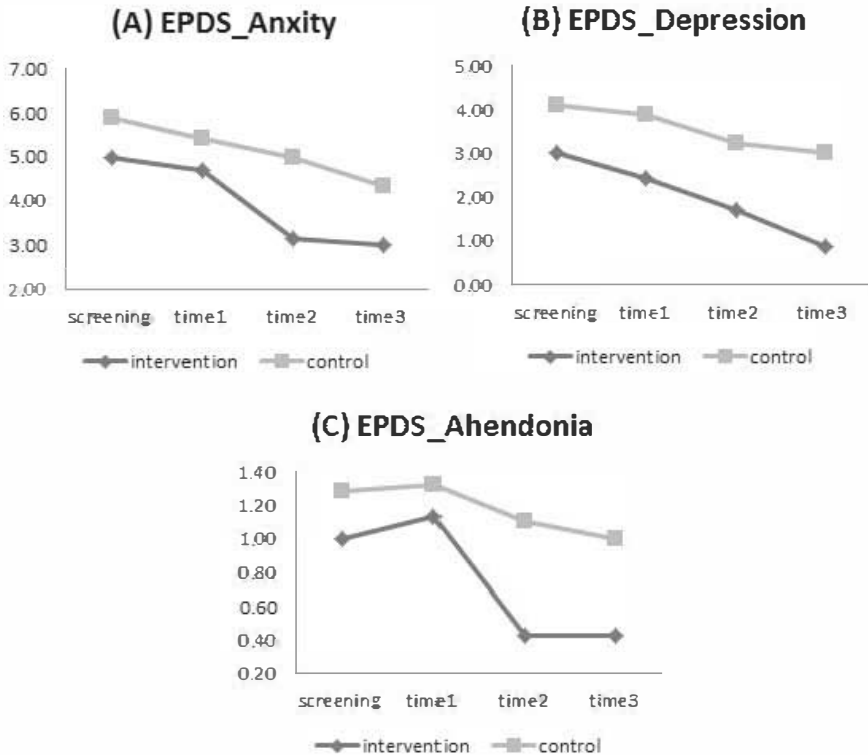
timing	screening		time1		time2		time3		main effect		
	intervention	control	intervention	control	intervention	control	intervention	control	timing	group	interaction
<i>EPDS</i>											
Anxiety	5.00 (1.16)	5.89 (0.78)	4.71 (2.06)	5.44 (1.81)	3.14 (1.68)	5.00 (2.12)	3.00 (1.16)	4.33 (2.40)	6.91**	3.04	0.63
Depression	3.00 (2.38)	4.11 (1.83)	2.43 (2.57)	3.89 (2.84)	1.71 (2.43)	3.22 (2.73)	0.86 (0.90)	3.00 (2.50)	4.32*	2.27	0.38
Ahendonnia	1.00 (1.32)	1.29 (0.49)	1.14 (0.90)	1.33 (1.00)	0.43 (0.79)	1.11 (1.36)	0.43 (0.75)	1.00 (1.50)	1.44	0.50	1.00
<i>WHO/QOL-26</i>											
Physical			17.86 (2.27)	19.67 (3.81)	24.43 (4.39)	20.33 (2.24)	24.86 (5.01)	20.22 (4.06)	8.48**	2.53	5.93**
Psychological			15.43 (2.51)	16.00 (3.28)	19.57 (4.12)	16.11 (4.08)	20.86 (4.71)	16.67 (4.18)	4.62*	2.31	3.11
Social			9.29 (1.89)	9.11 (1.76)	10.29 (2.36)	9.56 (1.13)	11.14 (1.95)	9.78 (1.39)	4.93*	1.02	1.09
Environmental			23.43 (4.50)	22.33 (3.61)	27.43 (5.97)	22.22 (4.44)	28.57 (5.71)	22.67 (3.57)	7.53**	3.52	6.40**
Global			5.14 (1.22)	5.78 (0.83)	6.57 (1.40)	5.78 (1.39)	6.86 (1.35)	5.44 (0.88)	3.37*	0.288	5.65**
Average			2.74 (0.40)	2.80 (0.32)	3.40 (0.62)	2.85 (0.41)	3.55 (0.63)	2.88 (0.44)	9.92**	3.55	7.14**
<i>MIBS</i>											
Anger & Rejection			6.14 (1.68)	8.56 (2.92)	5.29 (0.76)	7.11 (2.03)	5.43 (1.13)	8.00 (2.35)	4.13*	6.19*	0.48
Lack of Affection			6.14 (1.86)	6.78 (2.17)	5.71 (2.06)	7.00 (1.41)	5.00 (1.53)	7.44 (2.35)	0.21	2.75	3.03

Results are reported as means (SD). SD, standard deviation.

* $p < .05$ ** $p < .01$

Figure 2. Changes in mean scores over the study period for EPDS

(A) EPDS Anxiety (B) EPDS Depression (C) EPDS Ahendonia



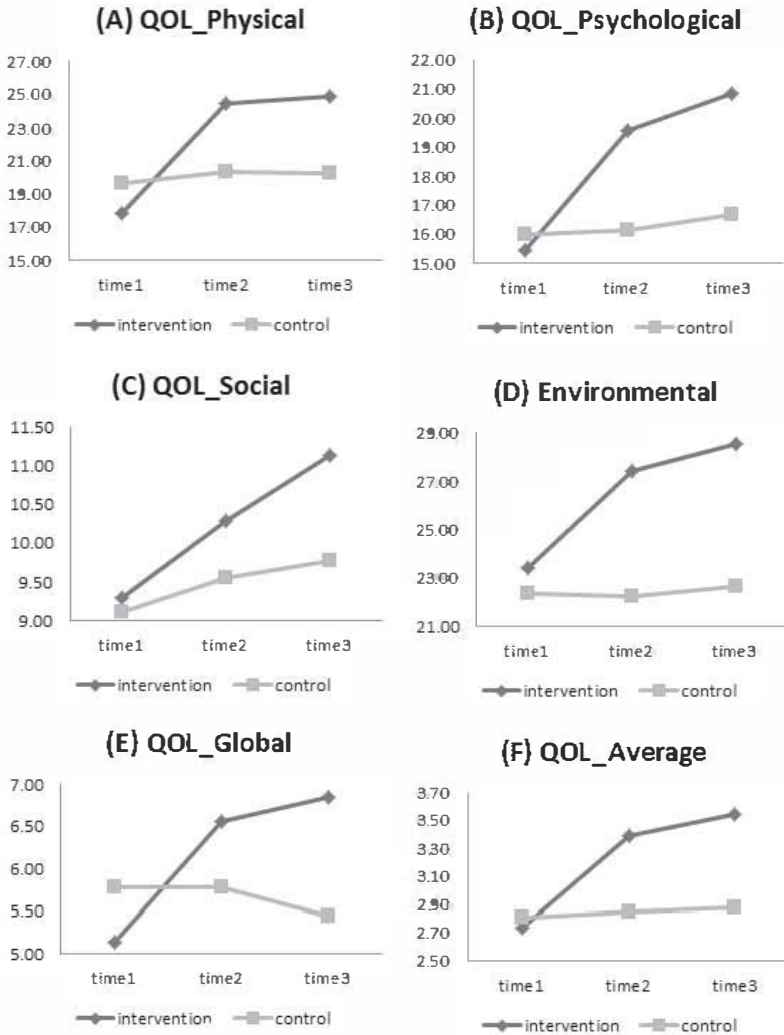
Quality of Life: According to the two-way repeated-measures ANOVA for the five subscale scores and the average score of the WHO/QOL-26, the interactions of the variables “intervention and time” were significant, except for the Psychological and Social subscale scores; the Physical score ($F(1,14) = 5.93, p = 0.001$), the Environmental score ($F(1,14) = 6.40, p = 0.005$), the Global score ($F(1,14) = 5.65, p = 0.009$), and the Average score ($F(1,14) = 7.14, p = 0.003$).

On the Physical score, the simple main effect of intervention on time2 was significant ($F(1, 14) = 5.937, p = 0.029$), and the simple main effect of time of intervention group was significant ($F(1, 14) = 12.563, p = 0.001$). According to the Bonferroni post hoc test, significant differences were shown between time1 and time2 ($p = 0.002$), and between time1 and time3

($p=0.002$). On the Psychological score, the simple main effect of time of intervention group was significant ($F(1, 14) = 8.399, p=0.005$). According to the Bonferroni post hoc test, significant differences were shown between time1 and time2 ($p=0.015$), and between time1 and time3 ($p=0.013$). On the Social score, the simple main effect of time of intervention group was significant ($F(1, 14) = 4.528, p=0.032$). According to the Bonferroni post hoc test, significant difference was shown between time1 and time3 ($p=0.027$). On the Environmental score, the simple main effect of intervention on time3 was significant ($F(1, 14) = 6.456, p=0.024$), and the simple main effect of time of intervention group was significant ($F(1, 14) = 12.213, p=0.001$). According to the Bonferroni post hoc test, significant differences were shown between time1 and time2 ($p=0.017$), and between time1 and time3 ($p<0.001$). On the Global score, the simple main effect of intervention on time3 was significant ($F(1, 14) = 6.441, p=0.024$), and the simple main effect of time of intervention group was significant ($F(1, 14) = 7.749, p=0.006$). According to the Bonferroni post hoc test, significant differences were shown between time1 and time2 ($p=0.009$), and between time1 and time3 ($p=0.014$). On the Average score, the simple main effect of intervention on time3 was significant ($F(1, 14) = 6.388, p=0.024$), and the simple main effect of time of intervention group was significant ($F(1, 14) = 15.582, p<0.001$). According to the Bonferroni post hoc test, significant differences were shown between time1 and time2 ($p=0.001$), and between time1 and time3 ($p=0.001$).

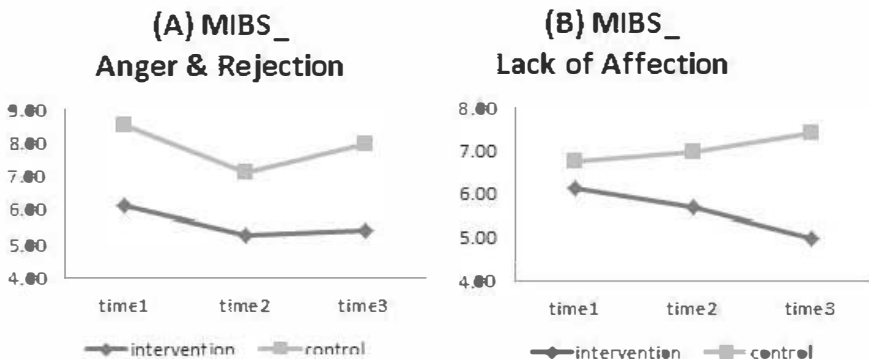
The changes in mean scores of all five subscales and the average over the study period demonstrated that the intervention group has shown greater improvement in women's quality of life than the control group (figure 3).

Figure 3. Changes in mean scores over the study period for WHO/QOL-26
 (A) QOL_Physical (B) QOL_Psychology (C) QOL_Social
 (D) QOL_Environmental (E) QOL_Global (F) QOL_Average



Maternal Bonding: According to the two-way ANOVA for the two subscale scores of MBS, the interactions of the variables “intervention and time” were not significant. However the changes in mean scores over the study period demonstrated that the intervention group has shown greater improvement in mother’s feeling for her baby than the control group (figure 4). Furthermore on the Anger & Rejection score, the main effect of time ($F(1, 14) = 6.91, p = 0.001$) and the main effect of group ($F(1, 14) = 6.19, p = 0.026$) were significant.

Figure 4. Changes in mean scores over the study period for MBS
(A) MBS Anger & Rejection (B) MBS Lack of Affection



Perceptions of the intervention: All intervention group participants reported on satisfaction and effectiveness derived from the intervention. From the qualitative data, 4 descriptive categories emerged and included “setting their mind at ease”, “clarifying their thoughts”, “improving coping abilities”, and “removing feelings of withdrawal from others”.

Setting their mind at ease

In this description category comprised the women’s perceptions of being relieved, or taking a weight off her mind. The women described as follows: ‘Your listening to my concern put me at ease’, ‘I feel more secure after you listened to my thoughts’, ‘My anxiety got better and felt more at ease’.

Clarifying their thoughts

In this description category comprised the women’s perceptions of clarifying or realizing their thoughts, or recovering her composure. The

women explained as follows: 'I realized my own thoughts and feelings while I was talking with you', 'My thoughts became clearer after your considerations and consultations', 'Telling you my concern stabilized my thoughts and feelings'.

Improving coping abilities

In this description category comprised the women's perceptions of improving to associate with her husband or her baby, understanding how to deal with her stress or to solve her problem, or gaining confidence in herself. The women clarified as follows: 'I had have confidence that you acknowledged the way of one's childcare', 'Your suggestions gave me many ideas, such as how to cope with stress, and various ways of making life creative so on', 'I learned the importance of listening through my experience of being listened to my story/concern. Now I can listen to my husband's story/concern', 'My attitude and relationship for my husband has changed since then'.

Removing feelings of withdrawal from others

In this description category comprised the women's perception of removing feelings of withdrawal from others. The women reflected as follows: 'The home visits were very much helpful to me because previously I hadn't strong will and encourage to know or to consult to someone'.

Discussion

Results of this study demonstrate that home visits by mental health nurses can improve their perceived quality of life significantly and ameliorate their depressive symptoms and a mother's feeling for her baby.

Postpartum women need a great deal of energy to undertake self-care, parenting and housework, as well as establish an effective mothering relationship with their baby. Given the complexities of these multiple roles, home visits may be more effective in helping women deal with aspects of their life than requiring new mothers to attend outpatient or community-based appointments. The intervention model in the current study focused on a self-care deficit framework, enabling the mental health nurse to identify and develop the women's self-care, focus on their daily life, share experiences, and work on problematic life issues. The skill base of mental health nurses is well suited to home-visits.

It is noteworthy that women receiving the intervention reported a positive effect on quality of life and this effect was maintained 6 weeks post-intervention. This may have been due to the emphasis on self-care and the women's strengths. The nurses helped and encouraged women to make decisions and enhance their daily performance. Based on the results of the qualitative data, women in the intervention group gained confidence and enhanced their coping skills. These experiences may have helped them improve and maintain their quality of life.

In this study, women in the intervention group had amelioration of maternal bonding over time, but there were no statistically significant differences between groups. Some researchers pointed out that in the context of maternal postpartum depression, intervention involving mother and infant may have a greater effect on the mother's feelings towards her baby than intervention involving the mother alone (Guedeney, Guedeney, Wendland, & Burtchen, 2013; Nysten, Moran, Franklin, & Hara, 2006; Poobalan, Aucott, Ross, Smith, & Helms, 2007). The intervention in our study focused on mothers not involved with infants directly, therefore the effect on maternal bonding might be insufficient.

Some studies distinguish between maternal depression and bonding disorder (Brockington, 2004; Fleming, Ruble Gordon, & Shaul, 1988; Klier 2006). Women with postpartum depression do not all experience problems with bonding, and some women, who are not depressed, do experience poor bonding (Righetti-Veltama, Conne-Perreard, Bousquet, & Manzano, 2002). Higgins et al. (2013) suggested that while these two disorders may share common triggers, they may follow different courses of development or resolution. Therefore the intervention for depressed mothers may need the assessment of depressive symptoms and maternal bonding respectively. An approach coordinating both might be ideal, focusing on mother or involving mother and infant, flexibly according to the assessment of each condition (Goodman, Guarino, & Prager, 2013).

Women in the control group showed some improvement in the level of depressive symptoms over time and those reductions in EPDS scores did not differ significantly between the intervention and the control groups. It is possible that either the women recovered from depression spontaneously or that the clinical assessment interview itself influenced their recovery. The fact that the three assessments were conducted by the same nurse for each woman in the current study could have helped women in the control group recover from their depression, because a relationship may have formed during these interviews. However, this may also be a limitation and may explain the lack of significant differences between groups in

terms of EPDS scores, similar to previous studies (Holden et al., 1989; Horowitz et al., 2013).

Results of this study demonstrate that home visits by mental health nurses can ameliorate their depressive symptoms, and the findings from the qualitative data suggest that women felt reassured by the visits, could relax more in their mothering role, clarify their thoughts, and improve their coping abilities. Austin et al. (1999) found that mental health nurses can accurately assess women's mental states. Beeber et al. (2004) found that mental health nurses helped mothers choose strategies that were appropriate to their energy levels and interests based on systematic assessments made while building a therapeutic relationship between the nurse and the mother. Walker, Barker, & Pearson (2000) reported that a community psychiatric nurse's ability to develop strong relationships with service users was very important in providing effective mental health care. In the present study, the intervention provided flexibly according to individual needs and nurses' assessments of the women's self-care level and mental state. It could be derived that these components help lead to recovery from depression.

This study has several limitations, including a small sample, the fact that postpartum women were recruited within a confined area in Japan, and that the severity of depression in participants was mild or moderate. It is likely that these results cannot be generalized to other groups of postpartum women, especially those with more severe forms of postpartum depression. Therefore, further research is needed with larger samples to evaluate the effectiveness of mental health nurse interventions for women with postpartum depression. ●f the eight hundred and sixty seven postpartum women screened with the EPDS, five hundred and six (58.4%) women didn't agree to participate to the study. When evaluating the high refusal rate, it was thought that the postpartum women might be apt to feel burden of the intervention or the research through home visits. However it cannot be denied that a bias was created by this situation. Long-term follow-up studies are also needed to determine if the improvement in depressive symptoms and quality of life are sustained over the long term. Although the research nurses who conducted the structured clinical interview were blind to the subsequent group allocation, it would be difficult to be completely unaware of group assignments because of the nature of the study.

Conclusion

These results indicate that home visits by mental health nurses for women with postpartum depression had significant positive effects on quality of life and ameliorated depressive symptoms and a mother's feeling for her baby. In postpartum services, mental health nurses could support depressive mothers effectively through care that focuses on women's daily life and self-care, accurately assessing women's mental status and energy levels, and building relationships.

Acknowledgment

This research was supported by the Grants-in-Aid for Scientific Research from the Japan Society for the Promotion of Science, and a grant from the University of Hyogo.

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