



Turun yliopisto
University of Turku



CHALLENGES FOR THE TRANSITION INTO EARLY PARENTHOOD:

Prenatal depressive symptoms, marital distress,
and the premature birth of an infant

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*To my sons, Kajus, Frans and Amos,
and to my husband, and to my parents.*

ABSTRACT

Sari Ahlqvist-Björkroth

CHALLENGES FOR THE TRANSITION INTO EARLY PARENTHOOD: Prenatal depressive symptoms, marital distress, and the premature birth of an infant

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Depression and marital distress are identified risks for parenting problems during the postnatal period, but less is known about how they impact parenting during the transition from the prenatal to postnatal period. The preterm birth of an infant has shown to be an independent risk factor for maternal postnatal depression. The aims of this thesis were 1) to explore the effects of prenatal and postnatal depressive symptoms and marital distress on both parents' parental representations and on postnatal breastfeeding (Study I and II) and 2) to develop a comprehensive intervention to support parenting after preterm birth and evaluate the effect of the intervention on maternal postnatal depressive symptoms (Study III and IV).

The results showed that prenatal maternal depressive symptoms were associated with suboptimal quality of mothers' prenatal representations of their unborn infants and their relationships with the infants. The mothers' prenatal depressive symptoms predicted postnatal depressive symptoms, which were associated with shorter durations of exclusive breastfeeding. Fathers' marital distress increased their likelihood of having suboptimal prenatal representations. A new intervention to educate neonatal staff on supporting parenting, the Close Collaboration with Parents, was developed and successfully implemented. After the intervention, the mothers of preterm infants were shown to have significantly lower level of depressive symptoms than the mothers in the cohort before the intervention.

In conclusion, the prenatal and postnatal depressive symptoms of mothers were found to be risk factors for the less optimal development of mother-infant relationship in the transition to parenthood whereas only the marital distress had a negative impact on the fathers' prenatal representations. In addition, the new intervention was effective in preventing postnatal depressive symptoms among mothers of preterm

Key words: prenatal depression, postnatal depression, marital distress, transition to parenthood, representations, initiation of infants. breastfeeding, exclusive breastfeeding, preterm birth, preterm infant, neonatal intensive care, mothers of preterm infants, parenting intervention

TIIVISTELMÄ

Sari Ahlqvist-Björkroth

VARHAISEN VANHEMMUUDEN HAASTEET:

Raskaudenaikaiset masennusoireet, parisuhdetyytymättömyys ja lapsen ennenaikainen syntymä

Psykologian ja logopedian laitos, Turun yliopisto

Vanhempien masennusoireiden ja parisuhdetyytymättömyyden tiedetään lisäävän vanhemmuudessa havaittujen ongelmien riskiä lapsen syntymän jälkeen. Huomattavasti vähemmän on tutkittu sitä, miten nämä tekijät vaikuttavat varhaiseen vanhemmuuteen siirtymävaiheessa, raskausajasta synnytyksen jälkeiseen aikaan. Toisaalta on näyttöä siitä, että lapsen ennenaikainen syntymä on itsenäinen riskitekijä äitien synnytyksenjälkeiselle masennukselle.

Tämän väitöskirjan tavoitteena oli: 1) Tutkia raskausaikaisten ja synnytyksen jälkeisten masennusoireiden ja parisuhdetyytymättömyyden vaikutusta molempien vanhempien raskaudenaikaisiin mielikuviin lapsesta ja suhteestaan lapseen sekä synnytyksen jälkeiseen täysimetykseen (tutkimukset I ja II). 2) Kehittää laaja-alainen interventio, joka tukee varhaista vanhemmuutta sairaalahoidon aikana vauvan ennenaikaisen syntymän jälkeen ja tutkia tämän intervention vaikuttavuutta äitien synnytyksen jälkeiseen masennukseen (tutkimukset III ja IV).

Tulokset osoittivat, että äitien kohonneet raskaudenaikaiset masennusoireet olivat yhteydessä heidän mielikuviansa heikompaan laatuun niin, että mielikuvat vauvasta ja omasta vanhemmuudesta olivat todennäköisemmin vääristyneitä. Äitien raskaudenaikaiset masennusoireet ennustivat heidän synnytyksen jälkeisiä masennusoireitaan ja nämä puolestaan olivat yhteydessä täysimetyksen lyhyempään kestoan. Isien raskausaikainen parisuhdetyytymättömyys lisäsi todennäköisyyttä siihen, että heillä oli heikompileatuksia mielikuvia vauvasta ja itsestä vanhempana. Tutkimuksessa kehitettiin myös uusi varhaista vanhemmuutta tukeva koulutusinterventio ”Vanhemmat Vahvasti Mukaan” vastasyntyneiden teho-hoidon henkilökunnalle. Intervention toteuttamisen jälkeen ennenaikaisesti syntyneiden vauvojen äideillä oli merkittävästi vähemmän synnytyksen jälkeisen masennuksen oireita kuin äideillä, jotka olivat olleet samalla osastolla vauvansa kanssa ennen interventiota.

Yhteenvetona voi todeta sekä raskaudenaikaiset että synnytyksen jälkeiset masennusoireet olivat riskitekijöitä kehittyvälle äiti-lapsi-suhteelle ja äitiydelle. Isä-lapsi-suhde sen sijaan näytti olevan altis parisuhdevaikeuksien negatiiviselle vaikutukselle. Lisäksi uusi interventio osoittautui tehokkaaksi ennaltaehkäisemään ennenaikaisesti syntyneiden lasten äitien synnytyksen jälkeisiä masennusoireita.

Avainsanat: raskaudenaikaiset masennusoireet, synnytyksen jälkeinen masennus, parisuhdetyytymättömyys, siirtymävaihe vanhemmuuteen, mielikuvat, imetyksen aloitus, täysimetus, ennenaikainen syntymä, vastasyntyneiden teho-hoito, ennenaikaisesti syntyneiden vauvojen äidit, vanhemmuutta tukeva interventio

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ABBREVIATIONS

CA	Corrected age
CC	Close Collaboration with Parents
COPE	Creating Opportunities for Parent Empowerment
GW	Gestational week
EBF	Exclusive breastfeeding
EPDS	Edinburgh Postnatal Depression Scale
FNI	Family Nurture Intervention
IQ	Intelligence quotient
IRMAG-R	Interview of Maternal Representations during Pregnancy
LOS	Length of stay in hospital
LPA	Latent profile analysis
MITP	Mother-Infant Transaction Program
NICU	Neonatal intensive care unit
PC	Preterm control group
PI	Preterm intervention group
PPD	Postpartum depression
RCT	Randomized controlled trial
RDAS	Revised dyadic adjustment scale
RT	Randomized trial
SGA	Small for gestational age
STEPS	Steps to the healthy development and well-being of children
TC	Term control group
VIC	Video interaction guidance
VLBW	Very low birth weight
WHO	World Health Organization
WMCI	Working Model of the Child Interview

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original publications, which are referred to in the text by the Roman numerals I-IV. The original publications have been reproduced with the permission of the copyright holders.

- I. Ahlqvist-Bjorkroth, S., Korja, R., Junttila, N., Savonlahti, E., Pajulo, M., Raiha, H., Aromaa, M. (2016). Mothers' and fathers' prenatal representations in relation to marital distress and depressive symptoms. *Infant Mental Health Journal*, 37(4), 388-400. doi:10.1002/imhj.21578
- II. Ahlqvist-Bjorkroth, S., Vaarno, J., Junttila, N., Pajulo, M., Raiha, H., Niinikoski, H., & Lagstrom, H. (2016). Initiation and exclusivity of breastfeeding: Association with mothers' and fathers' prenatal and postnatal depression and marital distress. *Acta Obstetricia Et Gynecologica Scandinavica*, 95(4), 396-404. doi:10.1111/aogs.12857
- III. Ahlqvist-Bjorkroth, S., Boukydis, Z., Axelin, A. M., & Lehtonen, L. (2017). Close collaboration with parents intervention to improve parents' psychological well-being and child development: Description of the intervention and study protocol. *Behavioural Brain Research*, 325, 303-310. doi:http://dx.doi.org/10.1016/j.bbr.2016.10.020
- IV. Ahlqvist-Bjorkroth, S., Axelin, A. M., Korja, R., & Lehtonen, L. Effect of an intervention for NICU staff to support parenting on prolonged maternal depression. (Submitted)

1 INTRODUCTION

Pregnancy and birth of an infant represent a major transition period in the life cycle of an adult. A common feature of this transitional period is the simultaneous occurrence of physical and psychological changes. Adaptation to the changes during the transition offers an opportunity for psychological growth or reorganization of self (Brodén, 2004). On the other hand, it may be a time of special psychological vulnerability and disorganization. The psychological process of the transition into parenthood has a dual focus; integrating of self-as-parent into current self-identity and developing an emotional relationship with the unborn infant (Stern, 1995). Thus, a parent-infant relationship starts to evolve in the mental representations of prospective parents during pregnancy. After the birth of an infant, the parent-infant relationship deepens through close proximity, nurturing, and interaction with the infant (Feldman, 2016).

The emotional well-being of a parent has been shown to be a meaningful organizing factor during the early onset of parenthood and parenting. Depression is one of the most prevalent mental health problems during the transition to parenthood; about 13% of mothers and 10% of fathers endorse clinically significant symptoms of depression during the transition time (Gavin et al., 2005; Paulson & Bazemore, 2010). In addition, the preterm birth of an infant has been found to be an independent risk factor for postnatal depression of parents. The prevalence of depression among parents of preterm infants varies from 6% to 48% (Helle et al., 2015; Lefkowitz, Baxt, & Evans, 2010; Pace et al., 2016; Vigod, Villegas, Dennis, & Ross, 2010). The high prevalence of postnatal depression after the preterm birth of an infant may be due to long hospitalization of the infant and, thereby, early separation between parents and infant and parents' alienation from their parenting role (Feldman, Weller, Leckman, Kuint, & Eidelman, 1999). Evidence concerning the benefits of interventions supporting parenting during the hospitalization of the infant is growing, but the challenge of implementing the effective components of the interventions into everyday neonatal care remains (Benzies, Magill-Evans, Hayden, & Ballantyne, 2013).

The marital relationship of the parents is challenged by the reorganized family relationships, roles, and responsibilities during the transition to parenthood. A good marital relationship can be a source of mutual support in the adaptation to parenthood, whereas a distressed marital relationship can be a risk factor for the developing parenthood. The quality of the postnatal marital relationship has been

shown to be robustly and positively associated with parenting in the sense that a good quality marital relationship spills over to parenting and vice versa (Erel & Burman, 1995). The parenting of fathers has been shown to be especially sensitive to marital problems (Cummings, Merrilees, & George, 2010).

Previous studies have also shown that marital distress and parental depression, as solo factors or as interrelated factors, have adverse effects on child development (Papp, Mark Cummings, & Schermerhorn, 2004). They are associated with children's non-secure attachment styles, subsequent problems in the child's development (e.g. lower IQ, delays in language development, internalizing and externalizing behavior, and general psychopathology) (Goodman et al., 2011; Grace, Evin-dar, & Stewart, 2003; Martins & Gaffan, 2000; L. Murray, 1992).

The first focus of this study was to evaluate the impact of prenatal and postnatal depressive symptoms and marital distress on mothers' and fathers' prenatal representations and on breastfeeding behavior. The second focus of the study was to develop an intervention that implements parenting support in every-day neonatal intensive care. The third and final focus was to study the effect of the developed intervention on the postnatal depression of mothers with a preterm infant.

2 REVIEW OF THE LITERATURE

2.1 Psychological transition to parenthood

Women's transition to motherhood has been found to begin at an early state of pregnancy and to be completed months after birth, when a woman feels she has regained control over her inner experience and external environment (Darvill, Skirton, & Farrand, 2010). Based on psychodynamic theory the transition has two main themes in the psychological processes of a pregnant woman: 1) the reorganization of self-identity and 2) the development of an emotional relationship with the unborn infant (Raphael-Leff, 2001; Stern, 1995). The reorganization of self-identity is especially related to the integration of a new role, motherhood, among the other roles a woman has. This process includes an exploration of one's own experiences of motherhood, most importantly with woman's own mother (Stern, 1995). In addition, it includes a reflection on the expectations of the surrounding society for the role of motherhood. During the process a woman defines her maternal identity. Mothers have reported that the change in self-identity during the transition was more like refracting the self rather than experiencing a complete change of the self (Bailey, 1999). The second theme, forming an emotional relationship with the unborn infant, is related to the woman's ability to imagine the fetus as a separate individual from herself. It is a continuum from the woman's concentration on the physical pregnancy to growing a connection to the fetus and finally to the real baby (Raphael-Leff, 2001). Most women (92%) experience the fetus as a separate individual during the third trimester of pregnancy, but some experience this already during the second (63%) or even the first (30%) trimester (Lumley, 1982). It has been suggested that as soon as a pregnant woman starts to keep the baby in her mind and prioritize the baby's needs above her own, she also sees herself as a mother (Fonagy & Target, 1996).

Recent literature has shown that for men the psychological process of transitioning to fatherhood also starts during pregnancy. Contrary to previous assumptions, the pregnancy seems to be an even more stressful transition period for men than the postpartum time (Condon, Boyce, & Corkindale, 2004). Men may undergo even more complicated reorganization of self-identity and identification with the fathering role than women due to a lack of physical evidence of existence of the unborn child and lack of a role model for today's nurturing father role. A recent review (Genesoni & Tallandini, 2009) and a metasynthesis (Chin, Hall, & Daiches, 2011) both identified three similar themes men were concerned about during pregnancy.

The first theme was emotional distance or unreality, which was related to men's inability to directly experience the embodied nature of the pregnancy, although, the feelings of detachment were combined with a desire to form an emotional bond with the infant (Genesoni & Tallandini, 2009). The second theme was forming a father identity based on men's fathering experiences and expectations from the surrounding environment. The third theme was a redefinition of the relationship men had with their partner. Men's experiences of the change in partner relationship varied from a feeling of deeper and more united intimacy to greater discrepancy of needs and expectations with the partner than before the pregnancy. Men's active mental process about the forthcoming fathering role during pregnancy has been shown to facilitate the psychological adjustment to fatherhood (Boyce, Condon, Barton, & Corkindale, 2007).

2.1.1 Prenatal representations

Representations have been defined as individuals' internal working models of attachment relationships (Main, Kaplan, & Cassidy, 1985) or schemas-of-being-with (Stern, 1995), which evolve through early subjective experiences of being in interacting with a close caregiver. Representations are also described as complementary by nature (Bowlby, 1973). When a parent, an attachment figure, has acknowledged the infant's needs for comfort and protection and simultaneously has respect for the older infant's need for independent exploration, the child is likely to develop an internal working model of self as valued and self-reliant. On the other hand, if the parent has frequently rejected the infant's cues for comfort or for exploration, the child is likely to develop an internal working model of self as unworthy or incompetent. Based on working models, the child predicts the behavior of an attachment figure and plans his/her own responses (Bretherton, 1992).

Pregnancy activates prospective parents' current representations of the care they have received from their parents (Stern, 1995). A successful transition to parenthood includes a representational and behavioral shift away from seeking comfort and protection from childhood attachment figures to providing protection, comfort and care for their own child (George & Solomon, 1996). While developing representations about their own caregiving role, the prospective parents are developing representations of the unborn child. These representational processes are closely related to one and other (Brodén, 2004) and are also complementary by nature (Ammaniti et al., 1992). For example, if a mother imagines herself as a loving and caring mother, she imagines the baby as calm and easy. The representations related to the infant are enriched by observation of the real infant in the womb and slowly separated from the representations related to the caregiving role

(Broden, 2004; Stern, 1995). Forming prenatal mental representations of the unborn infant, one's own caregiving role, and the partner's caregiving role is a central psychological preparation for upcoming parenthood.

2.1.1.1 Quality of prenatal representations

The quality of prenatal representations appears in the subjective narrative patterns when a parent describes the fetus as well as current and expected experiences of the relationship with the fetus/child (Zeanah, Larrieu, Heller, & Valliere, 2000). The most common methods for exploring prenatal and postnatal representations through narrative patterns are the Working Model of the Child Interview (WMCI) (Benoit, Parker, & Zeanah, 1997) and the Interview of Maternal Representations during Pregnancy (IRMAG-R) (Ammaniti, Tambelli, & Odorisio, 2013). The methods consist of an assessment of the qualitative features of a narrative and the classification of representations into three categories derived from attachment measurements (Benoit et al., 1997; Zeanah, Benoit, Barton, & Hirshberg, 1996). The three representation categories in the coding system of the WMCI are *balanced*, *disengaged*, and *distorted*. Comparable categories in the coding system of the IRMAG-R are *integrated/balanced*, *restricted/disinvested*, and *not integrated/ambivalent*. Both of the methods are based on the assumption that higher coherence of the narrative indicates a well-organized representation of the parent-child relationship (Hesse, 2008) in the sense that the balanced categories have high coherence while the distorted and not-integrated categories have low coherence. In addition, the level of emotional involvement with the child and the relationship with the child within parents' narration guide the classification. High positive emotional involvement is related to balanced representations, low emotional involvement is characteristic of disengaged and restricted representations, and high negative or anxious emotional involvement is related to distorted and not-integrated representations.

2.1.1.2 Mothers' prenatal representations

The patterns of mothers' prenatal representations become relatively stable by the third trimester of the pregnancy (Ammaniti et al., 2013). One review (Vreeswijk, Maas, & van Bakel, 2012) showed that the distribution of the three main categories of mothers' prenatal WMCI was 62% balanced, 17.5% disengaged, and 20.5% distorted. This distribution is typical for prenatal and postnatal low-risk samples (Tambelli, Odorisio, & Lucarelli, 2014; Vreeswijk et al., 2012). The quality of the mother's prenatal representations has been shown to be negatively shaped by 1) maternal factors: adverse attachment experiences and low education level or social

class; 2) pregnancy factors: previous abortions and somatic problems during pregnancy; and 3) contextual factors: parity, lack of social support, and domestic violence. The quality of representations has been found to be stable from pregnancy to early childhood (71-80%) (Benoit et al., 1997; Tambelli et al., 2014; Theran, Levendosky, Bogat, & Huth-Bocks, 2005). Stability was shown to be most typical for balanced maternal representations (88%) and least typical for disengaged representations (13%) (Benoit et al., 1997). Tambelli et al. (2014) found that balanced representations were more common during the postnatal period than during pregnancy. Changes from unbalanced prenatal representations to balanced postnatal representations may happen even if a mother has minor problems but the context remains stable and is supportive. A positive change may also be related to the birth of a healthy child, which functions as a positive organizer of the mother's representations. The change from balanced prenatal representations to unbalanced postnatal representations or the stability of unbalanced quality is related to a high amount of individual and contextual stressors during pregnancy (Theran et al., 2005).

The quality of a mother's prenatal representations has been shown to predict specific behavioral patterns in postnatal interaction with the child (Dayton, Levendosky, Davidson, & Bogat, 2010; Tambelli et al., 2014). Balanced representations predicted a positive and emotionally engaged interaction style, whereas the disengaged/restricted representations predicted low emotional involvement and high control, and distorted/nonintegrated representations predicted dysfunctional interactions, such as expressions of hostility and anger (Dayton et al., 2010; Tambelli et al., 2014). Mothers' prenatal representations have also been shown to predict children's attachment patterns (Benoit et al., 1997; Crawford & Benoit, 2009; Zeanah, Benoit, Hirshberg, Barton, & Regan, 1994). The maternal prenatal representations predicted infants' attachment security one year later with 74% accuracy. The infants of mothers with balanced prenatal representations were most likely (91%) to be secure at the age of 12 months (Benoit et al., 1997). However, a high amount of social-contextual stressors decreases the concordance between maternal prenatal representations and later infant attachment type (Huth-Bocks, Theran, Levendosky, & Bogat, 2011).

2.1.1.3 Fathers' prenatal representations

Fathers' prenatal representations have been studied much less than mothers. So far, only one study has presented the distribution of main representational categories for prenatal fathers. The distribution of representations was: 44% balanced, 49% disengaged, and 7% disturbed (Vreeswijk, Maas, Rijk, Braeken, & van Bakel, 2014). Remarkable is the high amount of disengaged representations compared to the distribution of mothers' prenatal representations. This result implies emotional

distance is more typical for expectant fathers than mothers. Parity is the only factor that has been shown to shape the quality of expectant fathers' representations. First-time fathers are more likely to have balanced representations than fathers with one or several previous children (Vreeswijk, Rijk, Maas, & van Bakel, 2015). While no associations between fathers' age, education, or psychological problems and their prenatal representations have been found, a strong stability between prenatal and postnatal representations has been demonstrated (Vreeswijk et al., 2015). Vreeswijk et al. (2015) found that balanced representations (84%) especially remained stable between the prenatal period (26 gestational weeks) and six months postpartum. The accordance of the disengaged representations was 41% and that of the distorted only 7%.

Thus far, there is no evidence of how fathers' prenatal representations predict their later interactive behavior with their child or their child's attachment security. One study reported findings on fathers' representations at six months postpartum and later (at 24 months) quality of father-infant interaction (Hall et al., 2014). Early postnatal representations of fathers predicted both the quality of their own interaction and the infants' interaction behavior. The fathers with balanced representations had a more sensitive and positive interaction style and their children were more social and sustained their attention better during interactions than the fathers' with unbalanced representations. The fathers with a distorted representation had the lowest quality interaction behavior. Furthermore, Hall et al. (2014) showed that there was a positive association between fathers' balanced representations and child's language development and that the association was mediated by the quality of the interaction.

2.1.2 Couple relationship

For first-time pregnant couples, the pregnancy is also a transition period for the couple's relationship. One of the most often and consistently reported changes in a couple relationship during this transition period is the decline of marital satisfaction between a couple. (Bower, Jia, Schoppe-Sullivan, Mangelsdorf, & Brown, 2013; Don & Mickelson, 2014; Dyrddal, Røysamb, Nes, & Vittersø, 2011; Lawrence, Rothman, Cobb, Rothman, & Bradbury, 2008; Twenge, Campbell, & Foster, 2003). Marital satisfaction or quality, as a concept, is often used to refer to both married couples and unmarried co-habiting couples. The decline of the self-evaluated or observed marital quality varies from small to moderate in magnitude for both mothers and fathers (Doss, Rhoades, Stanley, & Markman, 2009; Twenge et al., 2003). The decline has been reported to be most likely among mothers of infants (Bower et al., 2013; Doss et al., 2009), high socioeconomic groups, and more recent cohorts (Bower et al., 2013; Twenge et al., 2003). Generally, the declining

of marital satisfaction can be explained by the reorganization of social roles and restricted freedom (Twenge et al., 2003). Among new mothers, a decline in marital satisfaction has been shown to be related to a reduction in quality time spent with their partners and the perception of increased unfairness in housework (Dew & Wilcox, 2011). The decline of marital quality may continue, even over the next 15 years after the birth of the first child (Doss et al., 2009; Dyrdal et al., 2011; Hirschberger, Srivastava, Marsh, Cowan, & Cowan, 2009). However, the quality of the marital relationship also declines linearly for childless couples over the course of time (Doss et al., 2009). Therefore, it is not appropriate to make a causal conclusion that the birth of a child causes the decline of marital quality. However, the decline seems to be more abrupt and steeper for couples having children than for childless couples (Doss et al., 2009; Lawrence et al., 2008). In addition, the birth of a child has been shown to intensify existing problems in marital relationships rather than create them (Kluwer & Johnson, 2007), and the decline in marital satisfaction is most likely when multiple risk factors are present (Kohn et al., 2012).

However, not all couples experience a decrease in marital quality in the transition to parenthood: Some do not change at all, and some others even experience improvement in the marital relationship (Dew & Wilcox, 2011; Doss et al., 2009). There is individual variability in couples' responses to the transition. Some of the variation is due to partners' individual history and characteristics. Partners who are insecurely attached as adults or have negative representations of their own parents' marital relationship are at greater risk for lower marital satisfaction and greater decline than securely attached partners or partners with positive representations of their own parents' marital relationship (Kohn et al., 2012; Perren, von Wyl, Burgin, Simoni, & von Klitzing, 2005). Couples with good adaptation skills, including well-functioning communication and mutual support, are better able to cope with the stress the transition brings and therefore experiences less or no decline in their marital satisfaction. Couples with greater commitment to their relationship are also less likely to experience a decrease in marital quality after the birth of a child. Furthermore, the response of a couple's relationship to the transition is dependent on how stressful the pregnancy itself is. For example, an unplanned pregnancy poses a greater risk for decline of marital quality during the transition than a planned pregnancy (Lawrence et al., 2008).

The small negative change in marital quality in the transition to parenthood can also be considered a part of the adaptation to parenthood process (Strauss & Goldberg, 1999). A couple needs to make room for a new attachment relationship in addition to their mutual attachments (Slade, Cohen, Sadler, & Miller, 2009). They may also experience increasing satisfaction from their relationship with the child and their co-parenting, among other new things brought to them by parenthood.

The transition to parenthood can be a positive developmental step for a couple's relationship when it is based on a mutual decision and both partners are committed to it, but it can be the beginning of severe deterioration of a couple's relationship when it is not agreed upon and the partners lack skills to cope with new and stressful situations.

2.1.3 Early postnatal parent-infant relationship

The early postpartum period is considered a sensitive time for parental bonding to the infant (Feldman, 2015; Klaus, Kennell, & Klaus, 1995). While the psychological and physiological process of pregnancy prepares parents for this moment of meeting the infant, the postnatal bonding is also triggered by the birth experience and is dependent on ongoing inputs from the infant (Feldman, 2016). Parents, especially mothers, show immediately after birth specific parenting behaviors, including gazing at their infant's face and body, expressing positive affect, vocalizing with high-pitched voice, and affectionate touching (Feldman, 2016). The core experiences for early parent-to-infant bonding are physical closeness with the infant, social reciprocity between parent and infant, and the possibility for parenting behavior (Feldman et al., 1999; Feldman, 2016). Physical closeness is a prerequisite for the activation of hormonal and physiological mechanisms, such as oxytocin release, related to bonding and attachment (Feldman, 2015; Rilling & Young, 2014). Physical closeness is also a prerequisite for parenting behaviors expressed during postnatal bonding.

Primary parental preoccupation is also related to building a unique relationship with the infant (Leckman et al., 2004; Winnicott, 1956). Both mothers and fathers have been shown to experience this intensive, obsessive-like, preoccupation with the infant during late prenatal and early postnatal weeks. The mental content of the preoccupation is related to reciprocity with the infant, infant safety, and the baby's physical perfection. Mothers have been shown to be even more preoccupied with the infant than fathers are and first-time parents are more preoccupied than veteran parents (Kim, Mayes, Feldman, Leckman, & Swain, 2013; Leckman et al., 1999). Normally the high level of preoccupation and anxiety decreases during the first four months after the birth and is replaced with increased positive feelings about parenting (Kim et al., 2013).

An optimal level of parental preoccupation and a higher amount of parenting behaviors during the postnatal period have been shown to facilitate social reciprocity between the parent and the infant (Feldman & Eidelman, 2007; Leckman et al., 2004). The social reciprocity, in turn, has been found to be associated with subsequent child development, (e.g. self-regulation, IQ, and social skills) (Feldman,

2007). Thus, the early postnatal period can be considered a limited time frame during which the effects of certain experiences are particularly strong and, thereby, the beginning of developmental trajectories (Feldman, 2015).

2.1.4 Breastfeeding

Decisions related to infant feeding can be seen as part of mothers' psychological reorganization after the birth of a child (Stern, 1995). Stern (1995) proposed that life-growth is one out of four themes related to the new psychological organization of a mother with a newborn infant, the motherhood constellation. The life-growth theme includes essential questions a mother is asking herself: "Can I keep my child alive?" and "Can I make my child grow and thrive physically?" (Stern, 1995). Therefore, the decision regarding early feeding methods and success at infant feeding can be vital, loaded with lots of fears and insecurities, or can be a source of pleasure and confidence for the mother.

Most mothers choose to initiate breastfeeding right after the birth of the infant, but the decision concerning the feeding method has been shown to be made in early pregnancy or even before (Earle, 2000; Sheehan, Schmied, & Cooke, 2003). The decision may be guided by a mother's representation of her parenting role (Roll & Cheater, 2016) and her bond with the infant (Scharfe, 2012), but it is also shaped by cultural conditions and norms (Roll & Cheater, 2016). Fathers can also significantly influence mothers' decisions regarding the infant feeding method. Fathers' active involvement may have a two-way impact. The pregnant couple may feel that by choosing bottle-feeding they can more equally share the parenting than by choosing breastfeeding, which is solely provided by the mother (Earle, 2000). Some couples may have problems finding an active role for the father in breastfeeding. Some fathers have even expressed that they could not establish a full emotional bond with the infant until the infant was weaned from the breast. However, a father can provide emotional support, information, and practical assistance for the breastfeeding mother (Rempel & Rempel, 2011).

2.1.4.1 Breastfeeding recommendations and duration

During the period when the current study was conducted the Finnish national recommendation for normal-weight, healthy term infants was exclusive breastfeeding until six months of age and partial breastfeeding up to one year of age based upon the World Health Organization's (WHO's) guidelines (Hasunen, 2004; WHO & UNICEF, 2003). The Finnish recommendation for exclusive breastfeeding allowed the intake of small amounts of water, contrary to the WHO's recommenda-

tion. The WHO's recommendation is based on evidence of the benefits of breastfeeding on child development. The evidence shows that prolonged and exclusive breastfeeding improves children's cognitive development (Binns, Lee, & Low, 2016; Jedrychowski et al., 2012; Kramer et al., 2008; Kramer & Kakuma, 2012). Children who have been partially breastfed until the age of nine months or longer have higher cognitive performance throughout the first three years than formula-fed infants (Binns et al., 2016). In addition, other health benefits (e.g. decrease of childhood gastrointestinal illnesses, infections, asthma, allergy and long-term obesity) have been shown to be associated with breastfeeding (Allen & Hector, 2005).

Despite high breastfeeding initiation rates and generally undisputed advantages of long breastfeeding duration for the optimal health of children, the continuity of partial or exclusive breastfeeding seems to be a challenge for mothers in Finland. According to a Finnish nationwide survey from the year 2010, 57% of infants were partially breastfed and 9% were exclusively breastfed. Between six months and one year, the total breastfeeding rate dropped from 58% to 33% and the exclusive breastfeeding rate varied between 0% and 3% (Uusitalo et al., 2012). Internationally, short breastfeeding duration has been associated with a mother's low level of self-esteem, low breastfeeding self-efficacy, and experienced stress, depression, and anxiety (O'Brien, Buikstra, & Hegney, 2008; O'Brien, Buikstra, Fallon, & Hegney, 2009).

2.2 Marital distress, depressive symptoms, and premature birth as risk factors in the transition to parenthood

2.2.1 Marital distress

Marital distress refers to a lack of marital adjustment, which can be seen as disagreement between the couple on decisions, religious matters, housework, and/or leisure-time activities and interests (Busby, Christensen, Crane, & Larson, 1995).

2.2.1.1 Prenatal and postnatal marital distress

Marital satisfaction has been shown to modestly increase during pregnancy (Don & Mickelson, 2014; Dyrddal et al., 2011; Whisman, Davila, & Goodman, 2011). However, during pregnancy 13% of women and 11% of men experience marital distress (Bower et al., 2013). Couples with marital problems during pregnancy may be at risk for more severe problems after the birth of the baby (Kluwer & Johnson, 2007), but the marital distress could, alternatively, recover after the birth of the

infant (Salmela-Aro, Aunola, Saisto, Halmesmäki, & Nurmi, 2006). Existing depression and anxiety symptoms and unplanned pregnancy are associated with a higher prenatal marital distress (Bower et al., 2013; Whisman et al., 2011). A higher amount of marital distress is especially related to postpartum years, as described earlier. During the postpartum period, 62% of mothers have been reported to have low marital satisfaction. Overall, 55% of couples with children reported low marital satisfaction, whereas for couples without children 45% reported low marital quality (Twenge et al., 2003).

2.2.1.2 Impact of marital distress on prenatal representations and bonding

The postnatal marital relationship and parent-child relationship have been shown to be robustly and positively interrelated. Thus, a positive parent-child relationship is less likely to exist if there are problems in the marital relationship (Erel & Burman, 1995). The effect of marital distress on developing parental representations during the prenatal time has rarely been studied. Only the effect of domestic violence on prenatal representations has been studied (Huth-Bocks, Levendosky, Theran, & Bogat, 2004). Mothers who had experienced domestic violence perceived their unborn infants less openly, with less coherence, and in a less sensitive manner, and they also experienced themselves as less competent caregivers than the mothers who had not been exposed to violence during pregnancy (Huth-Bocks et al., 2004). Because domestic violence often leads to traumatic experiences, and trauma experience have an effect of their own on attachment representations, domestic violence is not comparable with marital distress.

Several studies have shown that mothers' prenatal marital distress predicts mothers' lower quality and intensity of emotional bonding to their unborn infant (Condon & Corkindale, 1997; Hjelmstedt, Widstrom, & Collins, 2006; Hjelmstedt & Collins, 2008; Siddiqui, Hagglof, & Eisemann, 1999; Yarcheski, Mahon, Yarcheski, Hanks, & Cannella, 2009). Interestingly, the prenatal marital distress of fathers has not been shown to be associated with their emotional bonding to their unborn infant (Hjelmstedt & Collins, 2008). As a higher level of prenatal bonding has been associated with balanced prenatal representations, (Vreeswijk et al., 2015), one could hypothesize that marital distress may increase the likelihood of mothers having unbalanced prenatal representations.

2.2.1.3 Impact of marital distress on breastfeeding

The results related to the effect of marital distress on breastfeeding are few and somewhat contradictory. While Sullivan, Leathers, and Kelley (2004) found higher marital distress predicted earlier breastfeeding cessation, Falceto, Giugliani, and Fernandes (2004) found no association between the interruption of breastfeeding

and the quality of a couple's relationship. Papp (2012), in turn, found that a longer duration of breastfeeding was able to predict an increase in quality of mothers' partner relationship, but not for fathers. A good couple relationship facilitates paternal support of breastfeeding and involvement in the care of the infant (Falceto, Giugliani, & Fernandes, 2004), whereas marital distress is associated with mother's greater responsibility for housework, which, in turn, is related to earlier breastfeeding cessation (Sullivan, Leathers, & Kelley, 2004). These results imply that there are probably several mediating factors in the association between marital distress and breastfeeding.

2.2.2 Depressive symptoms

Depression is a mental health disorder with prolonged feelings of sadness, tearfulness or blueness. Clinically depression can be categorized into minor and major depressions. In major depression a person reports, in addition to depressive symptoms, several others symptoms such as sleep disturbances, loss of appetite, fatigue, loss of interest in usual activities, and suicidal thoughts. In minor depression a person reports only a few of the symptoms or weaker symptoms, whereas in major depression the mood and anhedonia symptoms as well as five additional symptoms must be present for two weeks or longer (American Psychiatric Association, 2013). The presented prevalence rates in the literature are mostly evaluated with self-reported depression screeners. The screeners give a probability for minor or major depression, but not a diagnosis. From here onwards "depressive symptoms" will be used to refer to the evaluations made using a self-report depression screener.

The perinatal period (throughout the prenatal and postnatal periods) time is a time of increased vulnerability for the onset or relapse of depressive symptoms for women (Sundstrom Poromaa, Comasco, Georgakis, & Skalkidou, 2017). The prevalence of women's major depression ranges from 1.0% to 5.6% and minor depression from 6.5% to 12.9% during the perinatal period according to evaluations with structured clinical interviews (Gavin et al., 2005). Postnatal depressive symptoms have often been shown to be a continuation of prenatal depression (Underwood, Waldie, D'Souza, Peterson, & Morton, 2016): from 39% to 75% of women who have experienced prenatal depressive symptoms also have the symptoms during the postnatal period (Paulson, Bazemore, Goodman, & Leiferman, 2016; Underwood et al., 2016). Several studies have shown the prevalence of women's depressive symptoms to be higher during pregnancy than in the first year following the birth of the child (Evans, Heron, Francomb, Oke, & Golding, 2001; Green, 1998; Underwood et al., 2016).

Men have also been shown to have heightened risk for depressive symptoms during the perinatal period. In a meta-analysis of several studies the rate of depressive symptoms among men during pregnancy and the postnatal period was nearly twice the rate of depressive symptoms in the adult male population (Cameron, Sedov, & Tomfohr-Madsen, 2016). The prevalence of men's depressive symptoms throughout the perinatal periods has been shown to be approximately 10% (Paulson & Bazemore, 2010), with an 86% stability from pregnancy to six months after the birth of the child (Paulson et al., 2016). Perinatal depressive symptoms among men and women are positively correlated (Paulson & Bazemore, 2010), often having a pattern where the onset of a symptoms of a man follows the onset of his woman partner's depressive symptoms (Wee, Skouteris, Pier, Richardson, & Milgrom, 2011). However, the female-male ratio of prevalence of perinatal depressive symptoms remains approximately 2:1 throughout the perinatal period across different populations (Paulson & Bazemore, 2010).

2.2.2.1 Prenatal depressive symptoms

According to international reviews, the prevalence of depressive symptoms among pregnant women varies between 7.4% and 11% during the first trimester and between 8.5% and 12.8% during the second and third trimesters (Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Gavin et al., 2005; Underwood et al., 2016). The prevalence rates in Finnish studies have been shown to be similar, varying from 7% to 14% (Luoma et al., 2001; Mäki et al., 2010; Pajulo, Savonlahti, Sourander, Helenius, & Piha, 2001; Tammentie, Tarkka, Astedt-Kurki, & Paavilainen, 2002). International prevalence rates of depressive symptoms for expectant fathers have been found to be 11.2%, 7%, and 8.9%, for the first, second, and third trimester, respectively (Cameron et al., 2016).

Identified predictors of women's prenatal depressive symptoms are numerous: 1) a personal or family history of previous depression or other mental illness, 2) antenatal anxiety, 3) marital distress and violence, 4) lack of partner or social support, 5) poverty, 6) history of abuse, 7) increased life stress, 8) substance abuse, 9) history of previous abortions, 10) unplanned or unwanted pregnancy, 11) present/past pregnancy complications, 12) anxiety about the fetus and miscarriage (Biaggi, Conroy, Pawlby, & Pariante, 2016; Bowen & Muhajarine, 2006; Leigh & Milgrom, 2008). A higher probability of men's prenatal depressive symptoms is also related to a previous depression history, low social support, and marital distress (Escribe-Aguir, Gonzalez-Galarzo, Barona-Vilar, & Artazcoz, 2008; Wee et al., 2011) In addition, men with partners with elevated depressive symptoms are at increased risk for prenatal depression (Escribe-Aguir et al., 2008; Wee et al., 2011).

2.2.2.1.1 Impact of depressive symptoms on prenatal representations and bonding

Prenatal depressive symptoms have multiple adverse effects on birth outcomes, neonatal well-being, and later child development (Field, 2011; Luoma et al., 2001). There is some evidence that prenatal depressive symptoms have a negative impact on mothers' developing relationships with the infant during pregnancy. A Finnish study (Flykt et al., 2012) found that depressive symptoms were a specific risk factor for developing negative prenatal representations. They found that the women with a high amount of depressive symptoms had more negative representations of themselves as a mother than women with low levels of depressive symptoms. Mothers with prenatal depressive symptoms and psychosocial risks were more frequently found to have nonintegrated/ambivalent prenatal representations with less coherence, limited openness to change, and lack of awareness in differentiating their own mind from the mind of another (Ammaniti et al., 2013). Depression also decreases the amount and quality of maternal-fetal emotional bonding, increases women's ambivalence toward the pregnancy, and reduces feelings of involvement with the unborn infant (Condon & Corkindale, 1997; McFarland, Salisbury, Battle, Halloran, & Lester, 2011; Seimyr, Sjogren, Welles-Nystrom, & Nissen, 2009).

The impact of prenatal depression on expectant fathers' prenatal representations and emotional bond to their unborn infant is rarely studied and the results are somewhat contradictory. While some studies found the prenatal depression to decrease the paternal-fetal emotional bond (Condon et al., 2004; Vreeswijk et al., 2014), another study found no association (Kunkel & Doan, 2003). According to Vreeswijk et al. (2014), no association was found between a combined depression and anxiety factor and fathers' prenatal representations.

2.2.2.2 Postnatal depressive symptoms

The prevalence of probable minor and major depressive symptoms among mothers in developed countries based on the Edinburgh Postnatal Depression Scale (EPDS) ranges during first postnatal month from 5.5% to 34.4%; the second month from 2.6% to 35%; at six months, from 2.9% to 25.5%; and at 12 months from 6% to 29% (Norhayati, Hazlina, Asrenee, & Emilin, 2015). A high prevalence of maternal depressive symptoms is shown to be typically during the first three postpartum months (Gavin et al., 2005). The risk for high level of postnatal depressive symptoms is higher for mothers with prenatal depression or anxiety, lower income and occupational status, younger age, stressful life events, marital problems, the presence of several other children, lack of social support, experiences of early mother-infant separation, and negative birth experience (Norhayati et al., 2015; Righetti-

Veltema, Conne-Perreard, Bousquet, & Manzano, 1998; Segre, O'Hara, Arndt, & Stuart, 2007).

Contrary to mothers, the current evidence has not shown an increased risk for high level of depressive symptoms among fathers during the postpartum period (Sundstrom Poromaa et al., 2017). The self-reported prevalence rate of fathers' probable major depressive symptoms during the postnatal period is about 10% (Paulson & Bazemore, 2010). The peak prevalence of fathers' postnatal depressive symptoms is shown to be somewhat later than mothers, between three and six postpartum months (Paulson & Bazemore, 2010). The identified risk factors for high level of postpartum depressive symptoms for fathers are depression or negative affectivity during pregnancy, marital distress, lack of social support, lack of information about pregnancy and childbirth, gender role stress, and having a depressed partner (Boyce et al., 2007; Wee et al., 2011).

2.2.2.2.1 Impact of depressive symptoms on early parent-infant relationship

In general, there is little evidence that maternal depression is causally linked to impaired parenting (Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Turney, 2012). However, a large body of research has identified several negative parenting components and practices that are associated with increased maternal depressive symptoms (e.g., negative/coercive behaviors, lack of positive behaviors, disengagement, increased parenting stress, and problems in feeding practices and sleep routines) (Field, 2010; Leigh & Milgrom, 2008; Lovejoy et al., 2000; Turney, 2012). A review (Lovejoy et al., 2000) pinpointed important patterns in the relations between maternal depression and parenting. First, the association between maternal depression and parenting was manifested more strongly for negative maternal behavior than for positive behavior or disengagement. Second the timing of depression functioned as a moderator of the association between depression and negative maternal behavior; the current active depression was associated with the largest effects. Third, the negative effects of maternal depression were equally evident in studies using self-report measurement than in studies using diagnostic interviews. Fourth, the negative effects of depression were strongest for the parenting of mothers of who have infants.

Early postnatal depressive symptoms of mothers negatively affect their bonding with their infant, especially during the sensitive early postpartum weeks (Moehler, Brunner, Wiebel, Reck, & Resch, 2006). However, the negative effect has been shown to last long into the child's second year of life (Moehler et al., 2006). Mothers with elevated postnatal depression symptoms also have more negative perception of themselves, their infant, and the relationship between them. For example, depressed mothers reported their infants as having more eating and sleeping difficulties and crying more than the way in which non-depressed mothers report their

infants to be (Field, 2010). Furthermore, maternal depression has been found to increase negative and intrusive maternal behavior and decrease mothers' expression of positive affect, communication, and responsiveness in the interaction with their infant (Field, 2010; Korja et al., 2008). Infants of depressed mothers, in turn, are more withdrawn and express more negative affect and anger in their interaction behavior than do the infants of non-depressed mothers (Field, 2010). The depressed mother-infant dyads have been found to be lower in mutual affect regulation and, therefore, are often in the state of mismatched affective interactions (Riva Crugnola et al., 2016; Tronick & Reck, 2009). Perhaps, as a result of distorted emotional communication, early maternal postpartum depression is related to their children's later depression, behavioral problems, and psychopathology (Tronick & Reck, 2009).

Only a few studies have focused on the effects of paternal depression on the early father-child relationship. Father's higher amount of depressive symptoms is associated with their weaker emotional bonding to their infant (Hjelmstedt & Collins, 2008) and in decreased positive and increased negative parenting behaviors (Wilson & Durbin, 2010). In addition, the depressed fathers are more withdrawn, display less vocal and behavioral stimulation during interaction with their infants, and their speech comprised more negativity and criticism compared with non-depressed fathers (Sethna, Murray, & Ramchandani, 2012; Sethna, Murray, Netsi, Psychogiou, & Ramchandani, 2015; Zaslow, Pedersen, Cain, Suwalsky, & Kramer, 1985). However, contrary to findings related to mothers, depression has not been shown to decrease fathers sensitivity in interaction with their infants (Sethna et al., 2015). Similar to mothers, however, the parenting of fathers with young children was especially vulnerable for the effect of depression (Wilson & Durbin, 2010).

2.2.2.2 Impact of depressive symptoms on breastfeeding

Mothers' prenatal and postnatal depressive symptoms and breastfeeding are distinctly associated (Dias & Figueiredo, 2015; Pope & Mazmanian, 2016). However, the association seems to be complex and bidirectional (Hahn-Holbrook, Haselton, Dunkel Schetter, & Glynn, 2013). Literature has not been able to reveal the directionality and mechanisms of the association (Hahn-Holbrook et al., 2013; Pope & Mazmanian, 2016). The existing evidence shows that the association is most evident between prenatal and postnatal depressive symptoms and a shorter duration of breastfeeding (Bascom & Napolitano, 2016; Dias & Figueiredo, 2015). Mothers with high level of prenatal depressive symptoms have been shown to terminate breastfeeding an average of 2.3 months earlier than mothers without a history of prenatal depressive symptoms (Hahn-Holbrook et al., 2013). However, research that specifically examines the effect of psychosocial factors on exclusive breastfeeding (EBF) to 6 months duration is still limited (de Jager, Skouteris, Broadbent,

Amir, & Mellor, 2013). Some studies have shown that both high levels of prenatal and postnatal depressive symptoms decrease the duration of EBF (Dias & Figueiredo, 2015) and other research has shown only prenatal symptoms to predict the duration of EBF (Figueiredo, Canario, & Field, 2014). Specifically, the high depressive scores at the third trimester have found to predict the duration of EBF (Figueiredo et al., 2014; Sharifi, Nouraei, & Shahverdi, 2016). High level of prenatal depressive symptoms may already compromise the initiation of breastfeeding (Insaf et al., 2011). Emerging evidence also shows that the continuing high level of depressive symptoms from pre- to postnatal period may have the most adverse effect on the total duration of breastfeeding (Pippins, Brawarsky, Jackson, Fuentes-Afflick, & Haas, 2006).

2.2.3 Marital distress and depressive symptoms

Marital distress and depressive symptoms in both women and men have been found to have strong positive correlations (Gustavson et al., 2012). The association also occurs during pregnancy, as well as among couples and individual parents. A higher amount of depressive symptoms within a spousal relationship is shown to be associated with increased marital distress (Salmela-Aro et al., 2006). Therefore, the association between marital distress and depressive symptoms can be considered as an accumulation of risk factors within a family unit. Previous studies have also shown that parents' marital distress and high levels of depressive symptoms have intertwined and complex effects on child development (Papp et al., 2004).

2.2.4 Preterm birth of the child

An infant is considered to have been born preterm when it takes a place below 37 completed weeks of gestation (WHO). Preterm infants can be classified based on their gestational age to extremely preterm (<28 weeks), very preterm (28 - <32 weeks) and moderate preterm (32 - <37 completed weeks of gestation: WHO). The average rate of preterm births worldwide was 11.1% in 2010 (Blencowe et al., 2013), whereas in Finland the average rate was 6.0% in 2015 (<37 gestational weeks). In that year there were totally 55,000 births in Finland, which means that 3,300 infants were born prematurely (National Institute for Health and Welfare, 2016). The major risk factors for preterm birth are previous preterm births, young or advanced maternal age, multiple pregnancy, infections, maternal chronic illness, psychological problems, and substance addictions (Blencowe et al., 2013).

Infants born preterm are usually transferred directly following or soon after delivery to the neonatal intensive care unit (NICU). The preterm infants require intensive medical care to support their body temperature and immature respiratory capacity, as well as to provide intravenous fluids, nutrition, medication and blood products as needed. In Finland, very preterm infants are hospitalized on average for 8 weeks (Stolt, Yliherva, Parikka, Haataja, & Lehtonen, 2017). Traditionally, NICUs are designed for the medical care of a newborn, which does not facilitate parental presence in the units. Therefore, an infant's admission to the NICU has led to the separation between the newborn infant and parents.

2.2.4.1 Impact of preterm birth on bonding and early parent-infant relationship

Parents are seldom prepared for a preterm birth. The preterm birth can begin unexpectedly or the consequences of the preterm birth can come as a surprise (Jackson, Ternstedt, & Schollin, 2003). The preterm birth interrupts parents' psychological preparation for parenthood. It can also violate their expectations related to the infant. Pregnant parents may have imagined the unborn infant as having the appearance of a term infant with the normal skills of a newborn. Thus, the appearance and immaturity of the preterm infant may feel unfamiliar, and the infant may not seem to be their own. In addition, the birth of a preterm infant can be traumatizing for parents, as there is often a fear of the loss of the vulnerable infant and sometimes a fear of loss of the partner for the fathers (Beck & Harrison, 2017; Mehler et al., 2014). All of these aspects complicate the adjustment to parenthood after the preterm delivery. Mothers and fathers of preterm infants have described feelings of ambivalence about their parenthood and relationship with the infant and feelings of unreality of being a parent during the weeks following the premature birth (Jackson et al., 2003).

Qualitative studies have reported mothers and fathers experiencing feelings of separation and exclusion when having their newborn infant in a NICU. Feelings of separation may be related to a lack of closeness with the infant, both physical and emotional (Flacking et al., 2012). The physical and emotional closeness are intertwined and important factors in the process of parent-infant bonding (Feldman, 2016; Flacking, Thomson, & Axelin, 2016). The physical separation from newborn makes a new mother feel that she is "not being a mother" (Wigert, Johansson, Berg, & Hellstrom, 2006). During separation, a mother is also likely to experience complicated feelings of guilt, loss, grief, despair, and disappointment (Nyström & Axelsson, 2002). Parents' feelings of exclusion are related to a lack of participation in the care team of their infant and thereby alienation from their parenting role. Parents may feel insufficient when their caretaking is restricted and controlled by staff or when comparing themselves to experienced nursing staff (Wigert et al., 2006). Open com-

munication and a supportive relationship between staff and parents, in turn, can facilitate parents' feelings of inclusion. Inclusion in everyday care increases parental emotional bonding to their infant and parents' sense of control (Lindberg, Axelsson, & Öhrling, 2007; Vazquez & Cong, 2014; Wigert et al., 2006).

Quantitative studies have shown that the prematurity, per se, does not have long-term negative effects on the parent–child relationship (Korja, Latva, & Lehtonen, 2012). Parents of very preterm infants have been shown to have a higher degree of bonding and less bonding problems at one month postpartum than parents of term infants (Hoffenkamp et al., 2012). In further comparison to the term infants, parents of preterm infants have been shown just as likely to have balanced parental representations at the child's first birthday (Korja et al., 2010; Tooten et al., 2014), and often have as optimal quality of interaction with the child throughout the postnatal years (Bilgin & Wolke, 2015). These results are encouraging and show that the premature birth of an infant does not, on average, have negative consequences for the parent–infant relationship. However, it is important to consider the heterogeneity of the preterm population and contextual differences in the hospital environment. Previous studies have identified some specific subgroups of parents of preterm infants, who are at higher risk for later relationship difficulties than others. The prolonged separation between parent and preterm infant has been shown to have a negative effect on the parental bonding (Feldman et al., 1999). The bonding was especially at risk when a very preterm infant was separated from his/her mother and the mother was anxious or depressed (Feldman et al., 1999). Parents having negative and unrealistic perceptions about the infant and hospital environment during the postnatal period are shown to be less sensitive, more intrusive, and more withdrawn, in terms of interactive behavior toward the preterm infants at 6 months of age (Hall et al., 2015). In addition, a high amount of maternal depressive symptoms has been shown to be a risk for lower quality of maternal interactive behavior with their preterm child when the child is 6 and 12 months old (Korja et al., 2008).

2.2.4.2 Impact of preterm birth on parental postnatal depressive symptoms

The preterm birth of an infant has found to be an independent risk factor for elevated prevalence of maternal and paternal depressive symptoms. The prevalence rates of probable depression among parents of preterm infants vary from 6% to 48% (Helle et al., 2015; Lefkowitz et al., 2010; Pace et al., 2016; Vigod et al., 2010). The large variation depends on differences in the study populations, the time points for measurements, and the screening methods and their cutoffs. Shortly after the preterm birth the rates of depression are shown to be at their highest: 40% of mothers and 36% of fathers score above the cutoff of probable major depression (Pace et al., 2016). The mean scores of depressive symptoms seem to be linearly reduced over the first months after the preterm birth among both parents (Pace et al., 2016).

However, the frequency of probable depression seems to remain high among the parents of preterm children throughout the early years of the child. In an Australian cohort at six months after the preterm birth 14% of mothers and 19% fathers still scored above the cutoff of probable major depression (Pace et al., 2016). In a Finnish cohort study, 19% of mothers and 13% of fathers scored above the cutoff for probable major depression when the child was two years of corrected age (the child's actual age minus the preterm weeks, CA) (Huhtala et al., 2011). These studies were follow-up studies of very preterm infants, a gestational age group that has been found to be associated with a sustained high level of parental depression (Pace et al., 2016; Vigod et al., 2010). Among parents of very preterm infants, the risk of having probable depression is 4 to 18 times higher for mothers and 3 to 9 times higher for fathers than for mothers and fathers of term infants (Helle et al., 2015). Contrary to general expectations, the severity of the infants' medical condition has not been shown to be associated with parental depressive symptoms (Korja et al., 2008; Pace et al., 2016; Vigod et al., 2010). Previous parental mental health problems and lack of social support have, in turn, been associated with the high level of postnatal depressive symptoms among the parents of very preterm infants (Helle et al., 2015; Korja et al., 2008). The distinction between preterm infants and very preterm infants is important because of the increased length of hospital stay and possibility of long-term disabilities or developmental problems in the group of very low birth weight infants.

2.2.4.3 Interventions supporting bonding and parent-infant relationship in the neonatal intensive care

The need to support parenting and the parent-infant relationship in the NICU context is widely recognized. In recent decades, several interventions programs aiming to improve relationships between parents and their preterm infants have been developed and the effectiveness of the interventions has been studied. Table 1 summarizes the interventions and the main findings from the effectiveness studies. The summary table includes only interventions that are provided entirely or mostly during an infant's hospitalization in a NICU. As a summary of Table 1, it can be stated that the interventions have had positive effects on parental psychological well-being, parent-infant interaction, and preterm children's behavioral and cognitive outcomes. A recent meta-analysis (Benzies et al., 2013) also found that early parenting interventions in NICUs decreased maternal anxiety, depressive symptoms, and increased mothers' sense of self-efficacy, but did not have an effect on parenting stress or sensitive/responsive interaction behavior. They also explored the key components of the effective interventions. The interventions that reduced anxiety included parental education and support. The interventions that improved parental self-efficacy consisted of different types of parental education, including providing information

and guidance for parents to observe their infant's behavior, and active involvement of parents in practicing infant observation. However, it remained unclear which intervention components were related to decreased maternal depressive symptoms. Interestingly, they found that the interventions that had positive effects on maternal anxiety, depression, and self-efficacy also had positive effects on short-term child outcomes and some on long-term outcomes of up to 24 months. Most of the interventions that had positive effects on both maternal and child outcomes included direct support for the parents (Benzies et al., 2013). Another meta-analysis (Herd, Whittingham, Sanders, Colditz, & Boyd, 2014) confirmed the positive effect of early parenting interventions on behavioral outcomes of the preterm children. The researchers concluded that the interventions focusing on mother-infant interaction had the greatest potential to be effective. Both meta-analyses also included interventions that were provided entirely after the infants' discharge from a NICU.

Evidence of the benefits of early interventions targeted to the parents of preterm infants is obvious. Therefore, the effective components of the interventions should be considered as a part of high quality preterm care. However, the challenge remains how to implement these components in everyday neonatal intensive care. One potential implementation model is the Family Integrated Care program, which facilitates parents to become primary caretakers of their infant during a NICU stay (Jiang, Warre, Qiu, O'Brien, & Lee, 2014). However, the implementation requires a change of the entire care culture in a unit, away from a professional-centered care culture to a more family-centered care culture. The family centered care is defined as a partnership between parents and NICU health care team, which is based on shared responsibility of infant care, collaboration, open information shearing, and joint decision-making (Mikkelsen & Frederiksen, 2011). The provision of family-centered care is, in turn, related to professionals' attitudes and to the relationship they establish with the families (Saunders, Abraham, Crosby, Thomas, & Edwards, 2003). Therefore, changing the care culture in a NICU requires a systematic goal-oriented training for the staff (Rycroft-Malone et al., 2013).

If the effective components of the NICU parenting interventions are implemented on unit-wide practices, then the effectiveness of the implementation should be evaluated. Based on previous studies positive effects of the interventions can be expected to be seen earlier, during early postpartum weeks and months, in the parent-infant interaction quality and in the parental psychological well-being and the improvement in child outcomes become more obvious later in development. Therefore, long follow-up times are recommended for the early intervention programs in the NICU (Brecht, Shaw, Horwitz, & John, 2012). In addition, the systematic follow-up of both parental and child outcomes is recommended to gain better understanding of the mechanisms for change (Benzies et al., 2013).

Table 1. Effectiveness studies of NICU interventions improving the parent-infant relationship quality during the NICU stay

Intervention	Effectiveness study design	Study and intervention description	Target population	Main significant effects
<p>Mother-Infant Transaction Program (MITP) Aims to increase parents' sensitivity by sensitizing them to infant cues.</p>	<p>RCT: PI n = 38; PC n = 40; TC n = 41</p>	<p>The study was carried out in a NICU in Vermont, USA, between 1980 and 1981. Consisted of 11 sessions led by a nurse. Seven of the sessions were carried out the week prior discharge and four sessions at home 3, 14, 30 and 90 days after discharge.</p>	<p>Parents of preterm infants born < 2250g and 37 GW. Excluded: multiple births, congenital anomalies, severe neurological defects, single mothers.</p>	<p>At 6 months of age: The PI mothers had higher self-confidence and perceived their infant as being less difficult than the PC mothers (Rauh, Achenbach, Nurcombe, Howell, & Teti, 1988)</p> <p>At 3, 4, 7 months and 9 years of age: The PI children had better cognitive outcomes than PC children and had caught up with the TC children by age 3. The difference between PI and PC became greater by time (Achenbach, Phares, Howell, Rauh, & Nurcombe, 1990; Achenbach, Howell, Aoki, & Rauh, 1993; Rauh et al., 1988).</p>
	<p>RCT: PI n = 72; PC n = 74; TC n = 75</p>	<p>The study was carried out in the NICU of Tromsø University Hospital, in Norway, between years 1999 and 2002. Intervention consists of 11 sessions: 7 were carried out the week prior discharge and 4 after it. Addition: An initial grief-handling-session was added to the original MITP intervention.</p>	<p>Parents of preterm infants born < 2000g, without congenital anomalies, and mothers speaking native Norwegian. Excluded: triplets, infants with neurological sequelae.</p>	<p>At 6 months of age: The intervention mothers had less parenting stress than the mothers from the PC group (Kaaresen, Ronning, Ulvund, & Dahl, 2006)</p> <p>At 12 and 24 months of age: Both parents in the PI group had less parenting stress than the parents in the PC group. The mothers in the IP group had more nurturing child-rearing attitudes than the mothers in the PC group (Kaaresen et al., 2006; Nordhov, Kaaresen, Ronning, Ulvund, & Dahl, 2010a; Nordhov et al., 2010b).</p> <p>At 5 years of age: The PI children had fewer behavioral problems and better cognitive outcomes than the PC children (Nordhov et al., 2010a; Nordhov et al., 2010b; Nordhov, Ronning, Ulvund, Dahl, & Kaaresen, 2012).</p>

<p>Mother-Infant Transaction Program (MITP) Aims to increase parents' sensitivity by sensitizing them to infant cues.</p>	<p>RCT: PI n = 35, PC = 33</p>	<p>The study was carried out in a women's hospital in Melbourne, Australia, between 2001 and 2002. It consisted of 9 sessions based on the original MITP intervention. Seven of the sessions were carried out prior discharge during a 2-week-period; two others occurred at home, 1 and 3 months after discharge. Information related to kangaroo care, massage, and an infant bath was added.</p>	<p>Mothers of preterm infants born < 37 GW. Excluded: infants with congenital abnormalities, gross neurological damage, triplets or higher multiples, or if parents were non-English speaking or drug dependent.</p>	<p>At 7 and 9 years of age: The PI children had fewer attention problems and better adaptation to school, and at age of 9 they had fewer problems and better academic performance at the school than the PC children and had caught up to the TC children (Landsem et al., 2015). At the age of 3 months: The PI mothers had less parenting stress and the interaction between them and their infant was more synchronized, also at the age of 6 months, than the mothers in the PC group. At the age of 24 months: The PI children scored higher in their communication skills than the PC children. (Newnham, Milgrom, & Skouteris, 2009)</p>
	<p>RCT: PI n = 56, PC = 50</p>	<p>The study was carried out in a level III hospital in Oslo, Norway, between 2005 and 2006. It consisted of 11 sessions; 7 sessions were carried out 7–10 days prior discharge, 4 at home during the first three months.</p>	<p>Parents of preterm infants with ultrasound $GA \geq 30.0$ and < 36 weeks (moderate or late preterm) and with skills to read and write Norwegian, and no history of drug or alcohol abuse or severe psychiatric disorders, and if a hospital stay of minimum eight days was anticipated. Excluded: infants with congenital abnormalities, neurological sequelae, hearing loss or chromosomal disorders.</p>	<p>At the age of 1 month: Fewer depression symptoms were found among the mothers in the PI group than in the PC group 8 (no significant difference at 6 or 12 months). At 9 months of age: The PI mothers were more likely to have breastfed their infants than the PC mothers (not significant at 6 or 12 months). At 12 months of age: More optimal mother–infant interactions were seen in the PI group than in the PC group. The PI mothers were more sensitive and responsive, and less intrusive. IP infants were more positive. IP dyads were evidenced more mutuality than was seen in the PC mother–infant dyads. Interestingly, the PI mothers reported less positive temperament features in their children than the PC mothers, also at the age of 6 months. (Ravn et al., 2011; Ravn et al., 2012)</p>

<p>Creating Opportunities for Parent Empowerment (COPE) Aims to support parent-infant interactions and parent mental health.</p>	<p>Multicentre RCT: PI n = 147, PC = 113</p>	<p>The study was carried out in two NICUs in New York, USA, between 2001 and 2004. Intervention consisted of 4 educational-behavioral intervention sessions of audiotaped and written materials. The first intervention session was 2 to 4 days after the infants' admission to the NICU and the last was delivered in the home 1 week after the infant discharge.</p>	<p>Parents > 18 years of age who could read and speak English, with an infant born between 26 and 34 gestational weeks and birth weight of <2500. Exclusion: Infants who were not born at the study site, anticipated not to survive, twins or multiples, or had severe handicapping conditions including grade III or IV intraventricular hemorrhage. Families who had had another infant admitted to the NICU.</p>	<p>During NICU stay: The mothers in the PI group had less stress than the mothers in the PC group. Both parents in the PI group had more positive interaction with their infant than the parents in the PC group. At 2 months of age: The mothers in the PI group had less depression and anxiety than the mothers in the PC group. (Melnyk, Crean, Feinstein, & Fairbanks, 2008)</p>
<p>Family Nurture Intervention (FNI) Aims to facilitate communication and coregulation between mothers and infants.</p>	<p>RCT: PI n = 59, PC = 56</p>	<p>The study was carried out in a level IV hospital in New York, USA, between 2009 and 2012. Intervention consisted of 3,5 weekly calming sessions (6.4h/week) led by a specialized nurse. Sessions started on average 7 days after the birth of the child and continued throughout the hospital stay.</p>	<p>Mothers of preterm infants between 26 and 34 weeks gestational age, who were a singleton or a set of twins and were free of congenital defects. Mothers were >18 years old; fluent in English; free of current or prior mental illness, addiction, or substance use; and had access to social support from at least one adult in the home.</p>	<p>At 36 gestational weeks of age: The mothers in the PI group had better quality of caregiving behavior than the mothers in the PC group. At 4 months of age: The mothers in the PI group had less depressive and state anxiety symptoms than the mothers in the PC group. At 18 months of age: The PI infants had better neurodevelopmental outcomes than the PC children. The PI infants had also better social-relatedness and fewer attention problems than the PC children. (Hane et al., 2015; Welch et al., 2015; Welch et al., 2016)</p>
<p>Video Interaction Guidance (VIC) Aims to promote parental bonding, interactive behavior, and well-being.</p>	<p>Multicenter RCT: PI n = 75, PC n = 75.</p>	<p>The study was carried out in the Netherlands between 2009 and 2012. Intervention consisted of three video interaction guidance sessions for both during the first week after birth.</p>	<p>Parents with very preterm infants, less than 32 gestational weeks, were recruited from two neonatal intensive care units. Parents were eligible if they had had a preterm hospital delivery. Excluded: If the parents had a poor understanding of the Dutch language.</p>	<p>From the second week to 1 month after birth: The parents in the PI group had more sensitive interaction behavior than the parents in the PC group. The difference between groups was not significant at the age of 3 and 6 months. At 1, 3, and 6 months of age: The parents in the PI group had better quality on parent-infant bonding than the parents in the PC group. No effect was found on parenting stress, parental psychological well-being, or emotional state. (Hofenkamp et al., 2015)</p>

<p>Individualized family-based intervention Aims to provide individualized psychosocial support for the families.</p>	<p>RT: PI n = 18, PC n = 16.</p>	<p>The study was carried out in Rhode Island, USA. The amount of intervention sessions ranged between 3 and 17 based on the individual needs of the family. Duration of intervention ranged from 2 to 8 weeks. Intervention was started when infant was medically stable.</p>	<p>Parents with very preterm infants, $\leq 1500g$. Excluded: Infants with congenital anomalies, intrauterine growth retardation, protective service involvement, plans for foster placement or adoption, substance abuse, or serious psychiatric conditions.</p>	<p>At the time of infant discharge: The mothers in the PI group had less parental stressor, depression, and feeding problems and had higher quality of interaction with their infants than the mothers in the PC group. (Meyer et al., 1994).</p>
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Footnote RCT Randomized controlled trial, PI Preterm intervention group, PC preterm control group, TC term control group, RT Randomized trial

3 AIMS AND RESEARCH QUESTIONS

General aim

The general aim of the study was to explore the effect of certain perinatal risk factors on the transition process into early parenthood. The perinatal risk factors explored included marital distress, depressive symptoms, and prenatal birth of an infant. Explored were the following aspects of early parenthood: the quality of parental prenatal representations, initiation and duration of breastfeeding, and the amount of postnatal depressive symptoms as one marker of the level of parental psychological well-being.

Specific aims

First aim was to explore the effects of prenatal marital distress and depressive symptoms on parents' prenatal representations. (Study I)

The specific research questions included the following:

1. Do mothers' experienced prenatal marital distress and depressive symptoms, when existing independently or co-existing, have negative effects on the quality of prenatal representations of mothers?
2. Do fathers' experienced marital distress alone, or coexisting with depressive symptoms, have negative effects on prenatal representations of fathers?
3. Do co-existence of marital distress and depressive symptoms on the family level (combined symptoms of a mother and father from the same family) have negative effects on both parents' prenatal representations?

Second aim was to explore the impacts of perinatal marital distress and depressive symptoms on breastfeeding (Study II).

The specific research questions included the following:

1. Do prenatal (maternal, paternal, and family-level) depression and marital distress have negative effects on initiation of breastfeeding?

2. Do prenatal, postnatal, and continuing perinatal (maternal, paternal, and family-level) depression and marital distress have negative effects on the duration of exclusive breastfeeding (EBF)?

Third aim was to develop a comprehensive intervention to train the neonatal intensive care staff to provide support for parenting and early parent-infant bonding during hospitalization after the premature birth of an infant. A large assessment protocol to evaluate the effectiveness of the intervention was to be planned and built within the protocol. (Study III) The aim included within the current thesis was to explore the effectiveness of the intervention in terms of amount of maternal postnatal depressive symptoms (Study IV).

The specific research questions included the following:

1. Do mothers in the post-intervention cohort have fewer postnatal depressive symptoms than mothers in the baseline cohort?
2. Do mothers in the post-intervention cohort score less frequently above the cutoff for major depression than mothers in the baseline cohort?
3. Do the possible differences in the amount of maternal postnatal depressive symptoms between the post-intervention cohort and the baseline cohort exist in all gestational age groups of the preterm infants?

4 MATERIAL AND METHODS

4.1 Participants and procedure

4.1.1 *The STEPS Study Cohort (Studies I and II)*

The STEPS study (“Steps to the healthy development and well-being of children”) is a multidisciplinary population-based follow-up study of children and families, designed to follow the development of the children until school age. The Steps study cohort population consisted of all Finnish and Swedish speaking mothers who gave birth to a living child/ children between 1st of January 2008 and 31st of April 2010 in the Hospital District of Southwest Finland, and their children (n = 9811 mothers, n = 9936 children). The recruitment for the follow-up study included two phases (Figure 1). First recruitment phase was carried out during pregnancy through all maternity clinics of the Hospital District of Southwest Finland. The second recruitment phase was carried out at the delivery ward of Turku University Hospital and Salo Regional Hospital. This thesis includes only the cohort population recruited during the first trimester of pregnancy. In addition to the 1387 mothers, the pregnancy cohort population included 1325 partners. The cohort was somewhat skewed towards middle-class families compared to the general population. The cohort profile has been described in more detail elsewhere (Lagström et al., 2013).

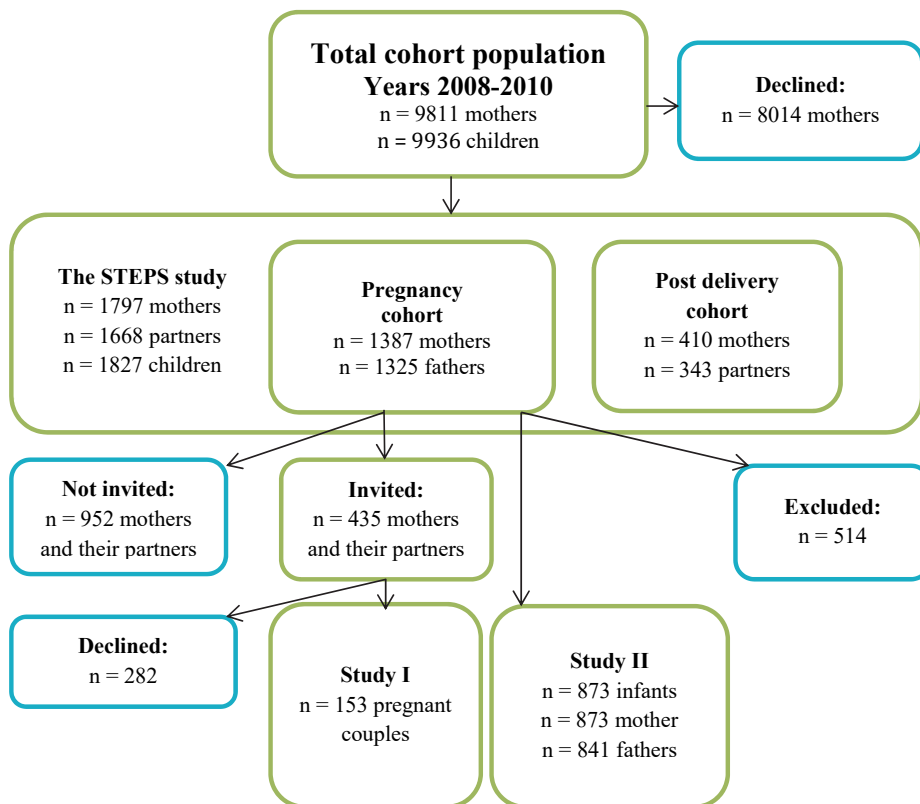


Figure 1. Flowchart of participants related to the STEPS cohort study.

4.1.1.1 Study I

Study I sample consisted of a sub population of the STEPS study pregnancy cohort: 153 parental married or cohabiting couples. From the pregnancy cohort 435 couples were invited by an invitation and information letter to the study I based on their scores on the Revised Dyadic Adjustment Scale (RDAS) (Busby et al., 1995) at gestational week 20; if either of the parents scored 36 or more on the RDAS, they were recruited to the group of couples more likely to be distressed in their marital relationship and if the parents scored less than 36 they were recruited to the group of couples less likely to be distressed in their marital relationship. The 153 (35%) couples that were willing to participate returned the signed consent. In this study, those couples ($n = 72$) in which either of the parents scored over the cutoff (mothers, $n = 72$; fathers, $n = 63$) are referred to as *distressed*, and those scoring under the cutoff as *non-distressed* ($n = 81$).

A dropout analysis was performed among the couples ($n = 153$) who participated and those who declined to participate ($n = 282$). There was no statistically significant difference between participant and non-participant couples in the number of couples belonging to the distressed group. However, non-participant couples were less educated (mothers $\chi^2 = 17.36$, $p = < .001$; fathers $\chi^2 = 10.45$, $p = .001$) and lived more often in non-marital couple relationships ($\chi^2 = 8.36$, $p = .003$) than the participant couples.

The 153 couples were contacted by the research assistant and an appointment for the interview regarding prenatal representations at gestation weeks 29-32 was agreed. Altogether, 304 interviews were conducted. Two of the parents already agreed to attend withdraw their participation.

Table 2. Data collection in Study I.

Assessment point	Data source	Source of information	Target
Gestation week 10	Questionnaire	One of the parents	Sociodemographic background
Gestation week 20	Questionnaires	Mother and father	Parents individual experience of marital distress and depressive symptoms
Gestation week 29-32	Interview	Individually, mother and father	Parents' prenatal representations related to their prospective parenting role and unborn child

4.1.1.2 Study II

The Study II sample consisted of 873 families from the STEPS study pregnancy cohort (Figure 1). All families, for whom data was available on depressive symptoms, marital distress, and breastfeeding practices, were included in the study. In this study the data were used from mothers and fathers during pregnancy and postnatally, and diary data regarding breastfeeding from birth till 24 months of child's age (Table 3).

Table 3. Data collection in Study II.

Assessment point	Method	Source of information	Target
Gestation week 10	Questionnaire	One of the parents	Sociodemographic background
Gestation week 20	Questionnaires	Both parents	Parents individual experience of marital distress and depressive symptoms
Child age 4 months	Questionnaires	Both parents	Parents individual experience of marital distress and depressive symptoms
Child age 0-24 months	Diary	One of the parents	Breastfeeding practice follow-up

4.1.2 The Close Collaboration with Parents Intervention –study (Studies III and IV)

Studies III and IV are connected to an intervention development and evaluation process. The Close Collaboration with Parents (CC) intervention was developed and implemented by the author and her colleagues between years 2009 and 2012 (<http://www.vsshp.fi/en/toimipaikat/tyks/to8/to8b/vvm>).

4.1.2.1 Study III

The Study III is purely a method development and evaluation protocol description of the Close Collaboration with Parents (CC) intervention. The CC intervention is a systematic training program for multiprofessional health care teams in NICUs. It was developed and carried out in the regional level III NICU of Turku University Hospital. The detailed description of the intervention is in section 5.2.1

4.1.2.2 Study IV

In Study IV the effect of the CC intervention was explored in terms of maternal postnatal depressive symptoms. The eligible subjects were mothers 1) with an infant with birthweight $\leq 1500\text{g}$ who was alive at discharge without major congenital anomalies or syndromes, 2) who spoke fluent Finnish or Swedish, and 3) who lived in the catchment area of the hospital. Mothers from the NICU of the Turku University Hospitals from pre-intervention cohort (baseline, from 1/2001 to 12/2006) were compared with mothers from post-intervention cohort (from 3/2011 to

2/2015). The post-intervention cohort consisted of 93 mothers of 103 VLBW infants. 130 eligible infants and their mothers were recruited to the CC Intervention Study. The mothers of 40 eligible infants declined to participate and 11 dropped out before 6 months measurement time. In addition, 37 infants and their mothers participated only in the follow-up visits and from these 4 dropped out. The data of 21 mothers was available both from the study and from the follow-up visits. The baseline data consisted of 173 infants very low birth weight (VLBW) infants and their 145 mothers from to the PIPARI follow-up study (The Development and Functioning of Very Low Birth Weight Infants from Infancy to School Age, www.utu.fi/pipari) (Figure 2).

In both studies, the CC Intervention Study and in the PIPARI follow-up study, a trained research assistant approached eligible mothers before the infants discharged from the NICU to home. After verbal and written information about the study, parents had one day to consider their participation. An informed consent was signed if the parents decided to participate in the study. Before discharge from the hospital mothers received a folder with questionnaires for specific measurement time points. They filled out the postnatal depression screener at home when the infant was at six months corrected age (CA) and returned by mail to the research assistant. In the follow-up clinic mothers filled out the postnatal depression screener during the follow-up visit when the infant was at 4 months (CA) and returned it to a nurse or to a doctor. Some of the mothers filled out the depression screener both in the study and in the follow-up clinic. An informed consent was sent to those 21 mothers to ask permission to compare their data from patient records with the data from the effectiveness study. All of them returned the signed consent.

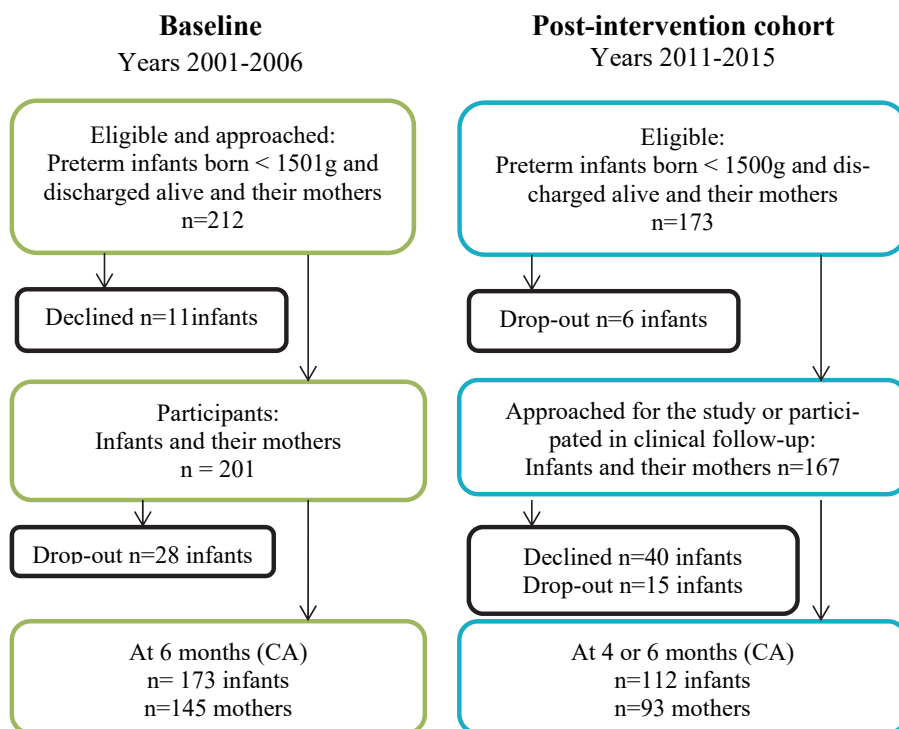


Figure 2. Flowchart of participants in the Close Collaboration with Parents Intervention Study.

4.2 Measures

Marital distress was assessed using the RDAS (Busby et al., 1995), a 14-item version of the Dyadic Adjustment Scale (Spanier, 1976). The RDAS is a self-report questionnaire completed by one or both partners in a relationship to characterize the quality of a couple relationship. It has found to be effective in distinguishing couples with marital distress from non-distressed couples (Busby et al., 1995). In the current study, both parents filled out the questionnaire. The original questions were used, but item scales were inverted and ranged from 1 to 5/6, so that a maximum score of 83 indicated distress, and a minimum score of 14 indicated non-distress. The scale was inverted for consistency with the direction of the other questionnaire scales in the study. The used cutoff score for marital distress was 36 or more. The cutoff score was decided before the recruitment of the participants to the Study I. The cutoff was based on the distribution of the existing data from the whole cohort ($n = 201$). The cutoff score (36) corresponded with the upper-20th percentile of the existing data. A three-factor model that has been presented by Busby et al. (1995), including factors regarding (a) consensus, (b) satisfaction, and

(c) cohesion within a couple relationship, was used in Study I. The scores for the factors were calculated based on item loadings by confirmatory factor analysis. The three factor model fit the data well: χ^2 (df) 105.206(72), $p = 0.006$; CFI 0.942; TLI 0.926; RMSEA 0.055; SRMR 0.066 (for mothers) and χ^2 (df) 98.507(73); $p = 0.025$; CFI 0.955; TLI 0.944; RMSEA 0.048; SMSR 0.056 (for fathers). A few minor modifications were made—for example, allowing errors of items 9 and 10 (for both parents' data) and items 7 and 8 (for the mothers' data) to correlate with each other.

Depressive symptoms were assessed using The Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987). The EPDS is a 10-item, self-reported questionnaire for screening postnatal depressive symptoms. The EPDS can also be used to screen for depressive symptoms during pregnancy (D. Murray & Cox, 1990) and with fathers (Areias, Kumar, Barros, & Figueiredo, 1996; Matthey, Barnett, Kavanagh, & Howie, 2001). The maximum score in the scale is 30 and the minimum is 0. The EPDS score can be used both as a continuous sumscore variable and a dichotomous variable based on cutoff. For women, recommended prenatal cutoff of the EPDS for probable minor depression has been ≥ 13 and for probable major depression ≥ 15 . Recommended postnatal cutoff for probable minor depression has been ≥ 10 and for probable major depression ≥ 13 (Matthey, Henshaw, Elliott, & Barnett, 2006; D. Murray & Cox, 1990). Because there is no validated prenatal cutoff for men, the recommended postnatal cutoff score ≥ 10 for probable major depression was used both as pre- and postnatal cutoff in this study (Madsen & Juhl, 2007; Matthey et al., 2001).

Prenatal attachment representations were assessed using The Working Model of Child Interview (WMCI) (Zeanah et al., 1996). In the Study I a prenatal modification of the WMCI (Benoit et al., 1997) was used. The prenatal WMCI is a one-hour, semi-structured interview, exploring systematically the narrative patterns of parents' thoughts, feelings, and perceptions of their unborn baby and their emerging relationship with this particular baby. It consists of questions about pregnancy, anticipation of delivery and infant development, the unborn infant's personality, anticipation of the infant's future behavior, and the parent's relationship with the infant during pregnancy and after birth. The prenatal WMCI has been found valid and reliable method for prenatal use with mothers (Benoit et al., 1997; Zeanah et al., 1994), but has not been validated for the use with fathers during pregnancy.

The scoring of the quality of parents' representations was conducted from video recorded interviews (Zeanah et al., 1996). First, the quality and the content of the representations were scored straight from the videotapes of the interviews using with the seven scales presented in the manual. The qualitative scales were (a) richness of perceptions, (b) openness to change, (c) intensity of involvement, (d) coherence, (e) caregiving sensitivity, and (e) acceptance. The content scales were (a)

infant difficulties and (b) fear for the infant's safety. These scales were scored with a Likert type scale ranging from 1 to 5. Second, from the video-recorded interview the parental representations were classified based on the manual into three main categories: balanced, disengaged, and distorted (Zeanah et al., 1996). The balanced representations had high emotional involvement, rich and detailed descriptions about the expected infant and relation with the infant, openness for positive and negative aspects, and respect and empathic appreciation of the infant. The disengaged representations showed emotional distance, minimal and stereotyped descriptions, and diminished importance of the infant's negative affects and needs for dependency. The distorted representations included emotional confusion and distortion; descriptions about the unborn infant and expected relationship with the infant were incoherent and self-involved, and the relationship may even be seen as role-reversed. Only these main categories were used in the data analysis.

The coding of the interviews was done by two trained researchers; main coder coded 100% of interviews and reliability coder 25% of them. The main coder was blinded to whether the parents' belonged to the distressed or non-distressed group. The coders were trained by Dr. Charles Zeanah and Dr. Anna Smyke at Tulane University in 2003. After the training, the main coder passed a WMCI-training reliability testing with interrater agreement of 80% for the reliability interviews ($n = 30$). In our study, the interrater agreement between main and reliability coder was 80% ($Kappa = 0.648$) ($n = 60$). The interrater agreement was assessed by calculating the proportion of overall agreement regarding the three main classifications.

Information about *exclusive breastfeeding* (EBF) was obtained through a self-administered follow-up diary. Families were asked to collect real-time information about the child's somatic health condition, medications, physician visits, developmental skills, and nutrition related issues to the diaries from birth to 24 months of child's age. Families were instructed by study nurses to report to the diary the dates when they started and ended exclusive and partial breastfeeding. The Finnish definition of EBF was used: the infant receiving no other food than mother's breast milk since birth, except small amounts of water. The definition of partial breastfeeding was: the infant receiving breastmilk and any liquid or food including non-human milk and formula. Data from follow-up diaries were then obtained through the study visits at one and two years of child's age. The diaries were copied and saved in the electronic database.

4.3 Statistical analysis

4.3.1 Study I

The Chi-Square tests were used to analyze the associations between the mothers' and fathers' marital distress and depressive symptoms (the independent factors) and parental prenatal representations (the dependent variable), which were classified into three main categories. Second, a latent profile analysis (LPA) was used to identify parents with similar patterns of marital distress and depressive symptoms. LPA is a model-based variant of traditional cluster analysis, which is used to find unobserved subpopulations (latent classes) within the data (Muthén, 2001; Vermunt & Magidson, 2002; Wang & Bodner, 2007). The data of mothers and fathers were modelled separately for both parents and couple-wise (the parents from the same families were paired together) in order to study phenomena within each group. After establishing their latent groups, a series of Chi-Square tests were conducted in order to examine the associations between the chosen LPA class solutions and parents' WMCI classifications.

To estimate the significance of the Chi-Square tests, the Fisher's exact test was used when the data were distributed unequally among the cells of the tables, resulting in low predictability of the cell counts. In addition, Cramer's V-value was used to measure the strength of the associations. In order to choose the optimal amount of latent classes, the following criteria were used: (a) the fit of the model (AIC and BIC), (b) the distinguishability of the latent classes (using entropy and average latent class posterior probabilities), (c) the latent class sizes (class proportions), and (d) the theoretical justification and interpretability of the latent classes (Muthén, 2001). The AIC and BIC estimates guides to choose between competing statistical models such that the smaller the value, the more parsimonious the model is indicated to be (Akaike, 1987). Additionally, the entropy value (which varies between 0 and 1) was used in a following condition: a value closer to 1 indicates a clearer classification. The probability estimates of cases were used to indicate the distribution of cases between different classes and the most likely membership of cases into a particular class (Vermunt & Magidson, 2002; Wang & Bodner, 2007). The analyses were run by SPSS software, version 19, and by Mplus software, version 6.11 (Muthén & Muthén, 2010).

4.3.2 Study II

The relations between mothers' and fathers' prenatal and postnatal depressive symptoms, marital satisfaction and EBF were studied with path modeling. The

models were fitted into the covariance matrix using the Maximum Likelihood method. The overall fit of models was considered to be acceptable with χ^2 values of less than three times the degree of freedom (df) value, comparative fit index (CFI) of 0.90 or higher, Tucker-Lewis index (TLI) of 0.90 or higher, and root-mean-square error of approximation (RMSEA) as well as Standardized Root Mean Square Residual (SMSR) values below 0.08 (30). The regression coefficients and the p-values of the standardized model results are reported. Structural equation models were performed using Mplus, version 6.11 (Muthén & Muthén, 2010).

The analyses consisting of dichotomous or categorical variables were conducted using independent sample t test or one-way ANOVA. The Tukey's post-hoc test was used for post hoc analyses. These analyses and descriptive statistics were performed using SPSS statistical software (International Business Machines Corp., Armonk, NY, USA), version 22.0.

4.3.3 Study IV

An independent sample t-test was used to compare the EPDS scores of the mothers who had the scores from both 4 and 6 months time points. Paired samples t-test was used for comparison between the two time points. Differences between the study groups and continuous background variables were analyzed using analysis of covariance. Logistic regression was used for dichotomous response variables. The associations between continuous EPDS sumscores and background variables were studied with analysis of covariance. Mixed model repeated measures analysis was used with continuous EPDS sumscores as response variable. A subject was used as a random effect. When the EPDS was used as dichotomous variable the Wilcoxon-Mann-Whitney test was used to analyse the differences between the study groups. Statistical analyses were done using SAS for Windows version 9.4. P-values below 0.05 were considered as statistically significant.

4.4 Ethics

All studies were approved by ethical committees. The STEPS study was approved by the Ethics Committee of the Southwestern Finland Health Care District in February 2007. The Close Collaboration with Parents intervention –study was approved by Ethics Committee of the Hospital District of Southwest Finland in February 2011 and the review of the mothers' patient records from the clinical follow-up was approved in June 2014. The PIPARI study was approved by same committee in December 2000.

5 RESULTS

5.1 Study I and II

5.1.1 *Sample characteristics*

The characteristics of the samples used in the studies I and II can be seen in the Table 4.

Table 4. Characteristics of the samples used in the Study I and II.

Characteristics	Study I N = 153		Study II N = 873	
	(%)	Mean (SD)	%	Mean (SD)
Mother				
Age, years		30.1 (3.9)		30.7 (4.39)
Education, > 12 years	85		64	
Father				
Age		32.2 (5.0)		32.8 (5.3)
Education, > 12 years	66		59	
Family				
Length of relationship		7.5 (3.6)		7.02 (4.5)
Income per month				
> 4000€	16		13	
2000–4000 €	67		67	
< 2000€	17		20	
Nuclear family	89		97	
First child	52		52	
Child				
Sex, girls			50	
Birth weight < 3000g			13	

5.1.2 *Descriptive statistics and results*

5.1.2.1 *Frequency of prenatal and postnatal marital distress*

In the study II (where the sample was not selected based on couples' marital distress), 18% of the mothers and 16% of the fathers scored above the cutoff of marital distress at gestation week 20. At four months after delivery the percentages were 16% for the mothers and 13% for the fathers. During pregnancy the mean scores

of marital distress for the mothers were 32.6 (I, $n = 152$; $SD = 6.1$) and 31.3 (II, $n = 809$; $SD = 6.0$) The mean scores for fathers' prenatal marital distress were 31.6 (I, $n = 153$; $SD = 6.5$) and 30.7 (II, $n = 760$; $SD = 5.8$) Four months after the birth the mean score of marital distress was 31.3 for mothers (II, $n = 768$; $SD = 6.3$) and 30.9 for fathers (II, $n = 698$; $SD = 6.2$). In our data marital distress did not increase from prenatal time to postnatal time for neither of the parents.

5.1.2.2 Frequency of parental prenatal and postnatal depressive symptoms

At gestational week 20, the proportion of the mothers scoring above the lower cutoff (probable minor depression) were found to be 9.2% and 9.5% (studies I and II, respectively). The proportion scoring above the higher cutoff (probable major depression) was 4.0% for mothers and 7.8% for fathers (II). At child's age of four months, the proportion of the mothers scoring above the lower cutoff was 18 %, and above the higher cutoff was 6.7% (II). At the same postnatal time point 9 % of the fathers scored above the cutoff of probable major depression.

Mothers' average level of depressive symptoms was higher during pregnancy than postnatally. Fathers' average level of depressive symptoms tended to stay on same level from pregnancy to postnatal time (Table 5).

Table 5. Means and standard deviations of the EPDS scores of the mothers at gestational week (GW) 20 and at 4 months of infant's age.

Time point	Mother			Father		
	n	Mean	SD	n	Mean	SD
20 GW						
Study I	153	6.17	4.42	153	3.54	3.54
Study II	829	6.01	4.10	766	4.01	3.40
4 months						
Study II	802	5.41	4.10	715	4.18	3.60

5.1.2.3 Associations between prenatal and postnatal depressive symptoms and marital distress

In both samples, at gestation week 20, mothers' RDAS scores correlated with their EPDS scores moderately, $r = 0.37$, $p < 0.01$; $r = 0.33$, $p < 0.01$ (respectively, I and II). A moderate correlation also appeared between the fathers' RDAS and EPDS scores in both samples, $r = 0.47$, $p < 0.01$; $r = 0.34$, $p < 0.01$. In addition, scores of the mothers' and fathers' prenatal RDAS, $r = 0.52$, $p < 0.01$, and EPDS, $r = 0.21$, $p < 0.01$, were positively correlated (I).

5.1.2.4 Prenatal parental representations

The distribution of the main WMCI categories for the mothers and the fathers in the sample is presented in the Figure 3. The difference between mothers and fathers in distribution of their prenatal representations categories was found to be significant ($p = 0.01$).

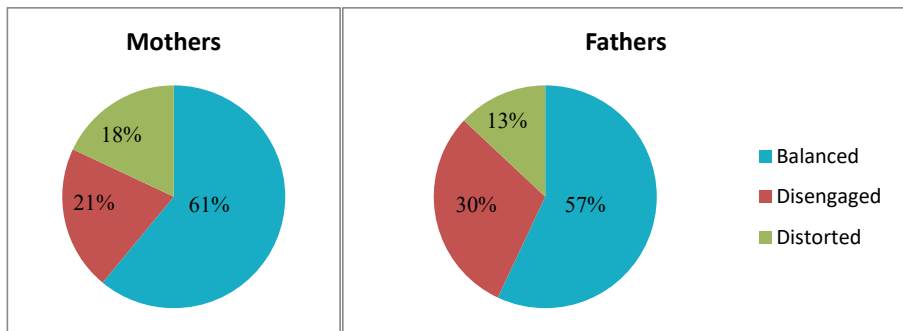


Figure 3. Distribution of the WMCI categories among the mothers and the fathers.

5.1.2.5 Initiation and duration of breastfeeding

Majority of the mothers (94.8%) initiated breastfeeding after birth of the infant. The average duration of exclusive breastfeeding (EBF) was 2.69 months (SD = 2.1, range from 0 to 7), and the average duration of total breastfeeding was 7.26 months (SD = 4.5, range from 0 to 27).

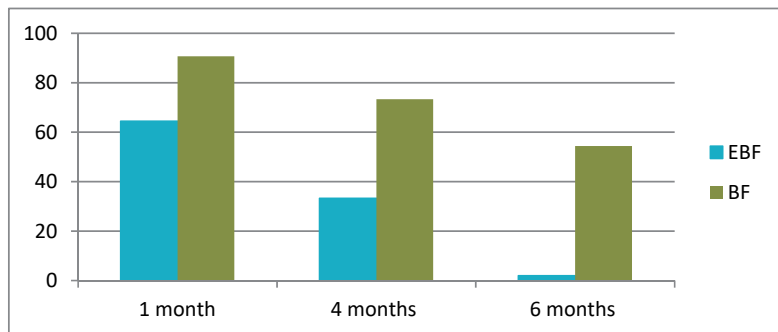


Figure 4. Proportion of exclusively breastfed (EBF) and partially breastfed (BF) infants.

5.1.3 Marital distress, depressive symptoms, and prenatal representations

5.1.3.1 Mothers' marital distress, depressive symptoms, and prenatal representations (Study I)

Mothers with high levels of depressive symptoms were less likely to have balanced prenatal representations and more likely to have distorted ones than were mothers in the low depressive symptoms group, $\chi^2 = 18.23$, $p < 0.001$. Within the high depressive symptoms group ($n = 14$), 23% of the mothers had balanced representations, 15% had disengaged ones, and 62% had distorted ones, whereas in the low depressive symptoms group ($n = 136$) the distribution of representations was 65% balanced, 21% disengaged, and 14% distorted. The strength of the associations was moderate (Cramer's $V = 0.35$). The distribution of mothers' WMCI classifications did not differ between marital distress or non-distress groups, $\chi^2 = 3.25$, $p = 0.21$.

To analyse the coexistence of marital distress and depressive symptoms we performed a latent profile analysis (LPA) to identify mothers with similar patterns of marital distress and depressive symptoms. Based on estimates the three class solution was chosen for mothers (Satisfied/ Happy, Middlemost, and Distressed/Unhappy) (Figure 1/ I). The analysis on mothers LPA classes and their prenatal representation classification (WMCI) showed them to have weak association, $\chi^2 = 10.77$, $p = 0.03$, Cramer $V = 0.21$. Mothers who experienced most marital distress and had high amount of depressive symptoms (Distressed/Unhappy-group) had more often distorted representations compared to the mothers who had some (Middlemost-group) or little (Satisfied/ Happy-group) amount of marital distress and depressive symptoms (31,0 % vs. 15,2 % vs. 1,3 %, respectively).

5.1.3.2 Fathers' marital distress, depressive symptoms, and prenatal representations (Study I)

First, we analyzed the association between fathers marital distress and their prenatal representations including all three main classifications and, found nearly significant association, $\chi^2 = 5.93$, $p = 0.05$. Based on this result we decided to carry out dichotomized analyses, reducing the classification into balanced vs. non-balanced categories. Fathers' marital distress was found to be associated with the dichotomized WMCI classification, $\chi^2 = 5.32$, $p = 0.02$, although the association was weak, Cramer's $V = 0.19$. Within the distressed group, 46% of the fathers were found to have balanced and 54% non-balanced representations. Within the non-

distressed group, 65% of the fathers had balanced and 35% non-balanced representations. Regarding fathers depression, no statistically significant difference was found in the distribution of the fathers' WMCI classification between fathers in the high and the low depressive symptom groups.

To analyse the coexistence of the fathers marital distress and depressive symptoms the five class solution was chosen based on the estimates (Dissatisfied/Unhappy, Middlemost, Satisfied, Happy/Satisfied, and Coherent) (Figure 2/ I). The distribution of the fathers' WMCI classification did not differ by their LPA classes, $p = 0.08$.

5.1.3.3 Family-level marital distress and depressive symptoms and parents' prenatal representations (Study I)

To identify the families where both mother and father had similar patterns of marital distress and depressive symptoms we performed the LPA analysis so that parents from same family were paired. Based on the estimates the five class solution was chosen (Figure 3/ I). Five classes are presented in the Figure 5. We found significant difference between the family-level LPA classes and the mothers' WMCI classifications, $p = 0.04$. However, the association was weak, Cramer's $V = 0.19$.

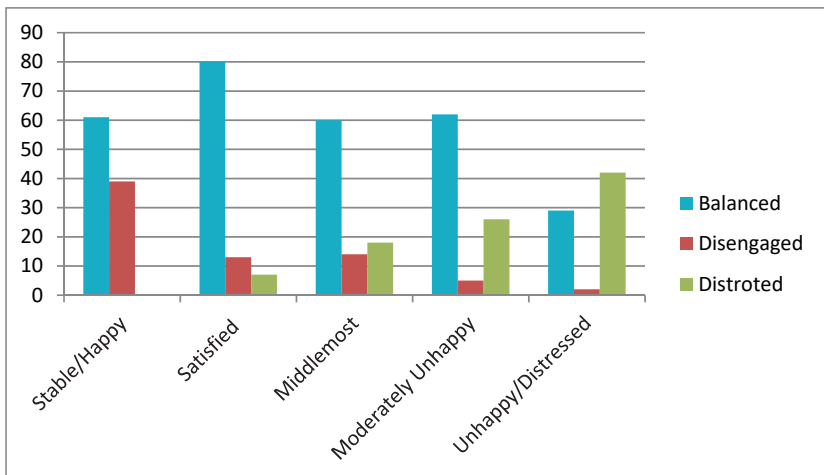


Figure 5. Distribution of the WMCI classifications by the family-level latent profile analyses (LPA) classes.

5.1.4 Marital distress, depressive symptoms and breastfeeding

5.1.4.1 Coexisting prenatal and postnatal marital distress and depressive symptoms and breastfeeding (Study II)

A structural equation model was conducted for the mothers' and fathers data, including both prenatal and postnatal factors, to test the association of the prenatal and postnatal depressive symptoms and marital distress with duration of exclusive breastfeeding (EBF). The fit of the model for the mothers' data was acceptable, 2 (df) 6.445 (2), $p = 0.039$; CFI 0.994; TLI 0.972; RMSEA 0.050; SRMR 0.023, after autocorrelations were allowed. Postnatal depressive symptoms were associated with duration of EBF, $\beta = -0.159$, $p = 0.001$. The higher amount of depressive symptoms was associated with shorter duration of EBF. Mothers' prenatal depressive symptom level was not associated with the duration of EBF, even when they predicted higher postnatal depressive symptoms, $\beta = 0.483$, $p < 0.001$. Mothers' prenatal marital distress predicted the duration of EBF. The higher prenatal marital distress was related with longer duration of EBF, $\beta = 0.114$, $p = 0.029$.

Fathers' prenatal and postnatal level of depressive symptoms and experienced marital distress were not associated with the initiation or the duration of breastfeeding. In addition, second-order family-level EPDS and RDAS factors were constructed from the mothers' and fathers' EPDS or RDAS as first-order factors. A structural equation model was conducted with the family-level factors. Regarding family-level symptomatology, no associations were found between prenatal or postnatal family-level depressive symptoms and marital distress with initiation or duration of EBF.

5.1.4.2 Parents' marital distress and depressive symptoms prenatally, postnatally or continuing throughout perinatal time, and duration of exclusive breastfeeding (Study II)

We conducted the one-way ANOVA to test if the mothers' high levels of depressive symptoms (probable major depression) and marital distress continuing throughout the prenatal period had a stronger impact on duration of EBF than the depressive symptoms or marital distress at one time point alone. The results showed that mothers who had high levels of depressive symptoms both prenatally and postnatally displayed shorter duration of the EBF than mothers who had them only prenatally ($M = 1.05$ months, $SD = 1.54$ and $M = 2.83$ months, $SD = 2.06$, respectively, $p = 0.030$). The mothers who had high levels of depressive symptoms only postnatally also had longer duration of EBF than the mothers with continuing symptoms, but the difference was not significant ($M = 1.69$ months, $SD = 2.041$, $p = 0.621$). Regarding marital distress, the significant difference in the duration of EBF was found between the mothers who had marital distress only prenatally and

the mothers who had marital distress only postnatally ($M = 3.165$, $SD = 2.104$ and $M = 2.017$, $SD = 2.092$, respectively, $p = 0.018$). The duration EBF of mothers with continuous marital distress did not differ significantly from the mothers with only prenatal or postnatal marital distress.

5.2 Studies III and IV

5.2.1 *Development of the Close Collaboration with Parents Intervention (Study III)*

The CC intervention is a systematic training program for multiprofessional health care teams in NICUs. It was developed and carried out in the NICU of Turku University Hospital from 2009 to 2012. The initial motivation to develop the program was the desire of the NICU health care team to prepare for the future single-family room unit structure and increased participation of parents in the care of their infant. The development of the intervention was a multiprofessional collaboration; including psychologists specialized in early developmental psychology and infant neurodevelopment and neonatologist as an expert of neonatal care.

The theoretical background for the Close Collaboration with Parents training program consists of infant neurobehavioral organization theory, early parent–child relationship-based developmental theories (e.g., attachment theory), and perspectives on reflective supervision. Theoretically the training program was based on assumption that parental care and an emerging relationship with the parents are crucial for the development of newborn infant. The early parent-infant relationship is unique development environment. Therefore, the parents can support the development of their preterm newborn already during hospitalization by being present, in proximal contact, and caring for their infant.

The stated goals of the training program were to 1) increase parents' presence and active role in the care team, 2) support parents becoming primary caretakers of their baby during hospitalization, 3) support parents' self-esteem and their bonding with their infant, 4) support the transition from hospital to home, and 5) prepare the unit culture for a future transition to a single family room unit.

5.2.1.1 *The content and structure*

The main aim of the program was to improve the care culture and practices of the NICU to be more supportive for parenting and early parent-infant bonding. Therefore, the training was targeted to the whole staff of the unit, including both medical

and nursing staff members. To obtain the change the training aimed to increase, first, the skills of the staff to identify the individual needs of an infant by observing the infants together with the parents. Second, to increase the skills of the staff to work collaboratively with parents, considering their individual needs as caretakers and as a family (Table 6).

Training utilized different learning modalities (theoretical, experiential, and reflective) that are known to facilitate attitude changes and the integration of new learning into practice immediately during training (Kitson, Harvey, & McCormack, 1998; Kolb & Klob, 2005; Manley & McCormack, 2003). The training involved a process in which each of the four theoretical phases is built on the previous one. The training for each phase began with one week of theoretical education, including one day of lectures followed by demonstrations and small group practice in the NICU. After this initial week, the training continued as practicing at the patient's bedside. Each staff member participating in the training got an individual mentor and bedside practices were done together with the mentor. The mentor, who was a NICU nurse from the unit, was trained about the content of each phase and the role of the mentor was to support staff learning. Each training phase included weekly reflective group supervision sessions led by the psychologist in order to reflect on the practice sessions and to help the individual staff internalize and integrate the new ideas into their everyday practice.

The whole staff of the unit was trained in two groups (Figure 1/III). The initial group, about half of the staff, was trained by the program developers and two trained mentor nurses. The tutored group, the other half of the staff, was tutored by their colleagues who participated in the initial group with the help of the training manual. The training of the initial group lasted about two years, while training was always paused for summer and Christmas vacation periods (Figure 6). The tutored group was trained during the period of one and a half years. Individual mentoring for the bedside practicing was provided for an average of 49 hours (about six work shifts) per trainee in both training groups.

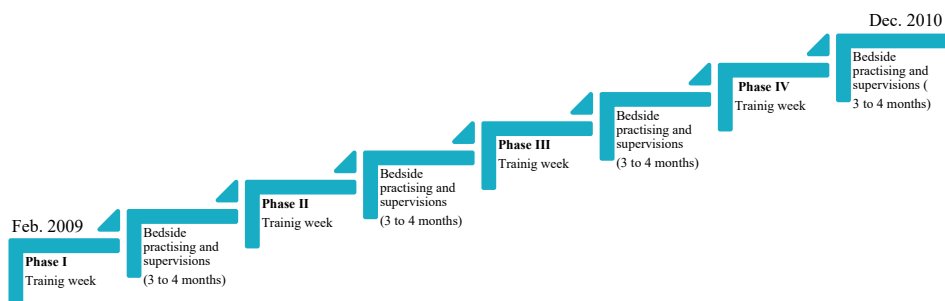


Figure 6. Progress of training during the training of initial group in the NICU of Turku University Hospital.

Table 6. Phases and aims of staff training in the Close Collaboration with Parents intervention

Training phases	Aim		
	Staff	Infant	
<p>I Observing Preterm Infant Behavior</p> <p>To expand the staff capacity to observe and communicate about infant's neuro-behaviour.</p>	Capacity to see infant's individual features and cues and to communicate observations to parents and colleagues.	Individuality and sensitivity of care	
Parents			
<p>II Watching Babies with Parents</p> <p>To engage parents to observe their infant. Collaborative care planning with parents based on the individual observation of their infant.</p>	Capacity to listen to parents' perceptions and to give psychological space for parents in order to strengthen parent's voice and to create common base for care recommendation.	Continuity of care and increased parental closeness.	Feeling welcome in the unit, being heard and respected as a parent and resuming ownership of the baby. Participating care and decision regarding care. Increasing physical and emotional closeness.
Family			
<p>III Understanding Individual Characteristics of Parents and Families</p> <p>To understand uniqueness and differences in families, parents and their possible responsiveness with their infant</p>	Capacity to see families' individual features and to get to know families better in order create partnership, including collaborative decision-making.	Parents are able to express more openly their hopes for infant care, and the way they are participating in care is respected. Parents become experts of their infant care. Parent-infant relationship is strengthened.	
<p>IV Family centered transition to home</p> <p>To prepare the transition collaboratively with the parents from the beginning of care.</p>	Capacity to integrate parents in the care from the beginning and increasing it towards the discharge. Transition to home is planned together with parents.	Parents know their infant and feel confident in going home. Infant knows her/his parents and feels secure with them.	

5.2.1.2 Implementation

The implementation of the intervention took into account essential context and facilitation mechanisms (Harvey & Kitson, 2016; Kitson et al., 1998). Critical contextual factors that were considered included the ability of the leadership and the organization to change the attitudes and beliefs. Therefore, implementation process was started by negotiating of the commitment of the leadership of the unit and also, therefore, the training was targeted to the entire multiprofessional staff of the unit. Learning was facilitated by individual mentoring (Harvey & Kitson, 2016; Kitson et al., 1998) and reflective supervision discussions. Individual mentoring was integral to facilitate bedside practice and to enable staff to consolidate their learning from these experiences. Reflective supervision was another key method to support staff and to help them develop a deeper understanding about their work with infants, parents, and parent–infant relationships (O'Rourke, 2011). The reflective group supervision was also a core element to move beyond conceptual learning toward reflection upon individual attitudes, professional identities, and the unit's existing norms. Changes in individual attitudes were reflected in the care culture at the unit level. In reflective supervision, each staff member was listened to and respected in what he or she was able to say about his or her practice. Thereby, the staff members could achieve skills for self-reflection and capacity to listen to parents (Heffron & Murch, 2010). Furthermore, with group supervisions we ensured that the new understanding and ideas of individual staff members was shared with colleagues and thereby transferred into organizational level.

5.2.1.3 Building of evaluation protocol

The results and components of previous NICU parenting interventions' effectiveness studies were considered in the planning of the evaluation study design. Long follow-up of both parental and child outcomes formed the key components of effectiveness study of the intervention (Benzies et al., 2013; Brecht et al., 2012). The ongoing comparative follow-up study includes the evaluation of the parental and the child outcomes by drawing a comparison between the prospective follow-up cohort gathered post-intervention and findings from the baseline data gathered before intervention. The baseline data guided the choice of the measurement and measurement points in the post-intervention follow-up. In addition to baseline data, the evaluation of parental bonding was included in the post-intervention follow-up. The protocol is presented in the publication III.

5.2.2 Close Collaboration with Parents intervention and maternal postnatal depression (Study IV)

5.2.2.1 Sample characteristics

The study included 145 mothers and their infants recruited before intervention (baseline cohort) and 93 mothers and their infants recruited after the intervention (post-intervention cohort). Participant characteristics are summarized in Table 7.

Table 7. Characteristics of the participants in baseline and post-intervention samples in Study IV.

Characteristics	Baseline	Post-intervention
Infant	(N = 145)	(N = 93)
Male sex, n (%)	81 (56)	46 (49)
Gestational age (weeks), mean (SD)	28.90 (2.88)	28.36 (2.36)
Birth weight (grams), mean (SD)	1077.04 (288.93)	1004.76 (276.88)
Small for gestational age (SGA ^a), n (%)	53 (39)	25 (28)
LOS (days), median (SD)	60 (38.03)	64 (45.37)
Mother		
Age (years), mean (SD)	30.98 (5.13)	31.29 (5.71)
Primiparous, n (%)	81 (57)	39 (59) ^b
Singleton pregnancy, n (%)	117 (81)	74 (80)
Vaginal birth, n (%)	51 (35)	34 (38)
Smoking during pregnancy, no (%)	24 (17)	8 (12) ^c
Previous mental health problems, n (%)	18 (13)	10 (18) ^d

LOS = The total length of stay in hospital before discharge home

^a SGA is defined as a birth weight of <-2.0 SD according to age- and gender specific Finnish growth charts.

^b Missing data n = 27

^c Missing data n = 29

^d Missing data n = 38

5.2.2.2 Descriptive statistics

No statistically significant difference between the EPDS scores of 4-month data and 6-month data in the post-intervention cohort were found (M = 4.25, SD = 3.85 and M = 4.17, SD = 3.97, respectively, $p = 0.86$). Therefore they were considered as equal and used both in the mixed model repeated measures analysis. We tested the significance of the following background factors: gestational weeks at birth, birth weight, sex, SGA status (defined as < -2 SD or \geq -2 SD according to the national reference values for gestational age, sex, parity or multiple birth), the mode of delivery (vaginal or c-section), the total length of hospital stay before

discharge home, multiple birth (singleton or multiple), older siblings (yes or no), smoking during pregnancy, previous mental health diagnoses of the other. Only previous mental health problems of the mothers were statistically significantly associated with the EPDS scores, $F = 11.61$, $p < 0.001$. However, the mental health history was available only in 59% of the mothers in the post-intervention sample. Because the proportion of mothers with a history of mental health problems in post-intervention sample was at the same level as at the baseline sample (Table 7), we chose not to include this background factor in the multivariate model.

5.2.2.3 Mothers' postnatal depressive symptoms in baseline and post-intervention groups

Maternal postnatal EPDS scores were compared between baseline and post-intervention groups using multivariate model. Mothers average EPDS scores in the post-intervention group were significantly lower than of mothers in the baseline group ($M = 4.32$, $SD = 3.67$; $M = 6.45$, $SD = 4.79$, respectively) and the estimate of the difference between the study groups in the model was 2.54 ($p < 0.001$). Cohen's $d = 0.50$, implied a medium effect size. The proportion of mothers who scored above the EPDS cutoff of probable major depression was 15/145 (10.3%) in the baseline cohort and 2/93 (2.1%) in the post-intervention cohort, $p = 0.066$.

5.2.2.4 Mothers' postnatal depressive symptoms and gestational age of the infant

Furthermore, the differences in maternal postnatal EPDS scores according to gestational age groups were tested using multivariate model. The results have been presented in the (Table 8). The differences in the mothers' EPDS scores between the post-intervention and the baseline groups were statistically significant in two of the gestational week groups, 28-29 and 30-31.

Table 8. Estimates and confidence intervals of differences between baseline and post-intervention groups in maternal postnatal EPDS scores according to gestational age of the infants.

Gestational weeks	Baseline			Post-intervention			Difference	
	Mothers EPDS			Mothers EPDS			Estimate (95% CI)	p-value
	n	Mean	SD	n	Mean	SD		
23-25	27	5.22	3.63	15	5.00	3.67	1.37 (-1.20 to 3.96)	0.287
26-27	26	6.42	4.71	29	5.28	3.99	1.69 (-0.86 to 4.25)	0.189
28-29	43	7.05	5.49	30	3.61	3.31	3.64 (1.03 to 6.25)	0.007
30-31	26	6.31	4.60	9	2.77	3.37	4.22 (0.56 to 7.89)	0.025
32+	23	7.00	4.99	10	4.87	2.67	2.66(-33.48 to 38.81)	0.520

Summary of the main results

- Most mothers and fathers had balanced prenatal representation in the beginning of third trimester of pregnancy.
- Elevated prenatal maternal depressive symptoms were associated with parents' suboptimal prenatal representation, more precisely with distorted representations, of their unborn infant and their relationship with the infant.
- Fathers' marital distress increased their likelihood of having unbalanced prenatal representations.
- Mothers co-existing prenatal marital distress and depressive symptoms were associated with the mothers' likelihood of having distorted prenatal representations. Co-existing prenatal marital distress and depressive on family-level were only associated with the mothers' likelihood of having suboptimal prenatal representations.
- Mothers' prenatal depressive symptoms did not predict the initiation of breastfeeding or the duration of exclusive breastfeeding.
- Prenatal depressive symptoms predicted postnatal depressive symptoms and that, in turn, was associated with shorter duration of exclusive breastfeeding.
- The continuous high level of depressive symptoms, from prenatal to postnatal period, had most adverse effect on the duration of exclusive breastfeeding.
- Mothers' prenatal marital distress predicted longer duration of exclusive breastfeeding.
- No associations were found between fathers' prenatal or postnatal marital distress or depressive symptoms and breastfeeding initiation and exclusive breastfeeding. Neither was found associations between family-level marital distress or depressive symptoms and breastfeeding.
- A new comprehensive intervention to support parenting after preterm birth, the Close Collaboration with Parents, was developed and successfully implemented in a NICU.
- After the intervention, the mothers of very low birth weight infants were shown to have significantly lower level of depressive symptoms than the mothers in the cohort before the intervention.

6 DISCUSSION

This study gives insight into how prenatal and postnatal depressive symptoms and marital distress affect the development of parental representation and breastfeeding during the transition to parenthood in Finnish families; it is based on data from 2008 through 2010 for a birth cohort in Southwest Finland (from the STEPS study). In addition, the results expand knowledge regarding a comprehensive intervention that supports parenting and parent–infant bonding during the early phase of parenthood after a preterm birth.

6.1 Depressive symptoms, marital distress, and prenatal representations

6.1.1 *Prenatal representations of mothers and fathers*

Among the mothers in the current study, in the prenatal period, 61% had balanced representations, 21% had disengaged representations, and 18% had distorted representations. The distribution between the balanced and unbalanced categories was comparable with the international distribution that Vreeswijk et al., 2012 reported (62% balanced, 17.5% disengaged, and 20.5% distorted). The current study also had a typical distribution of categories for low-risk postnatal samples (Vreeswijk et al., 2012). The balanced representation has been found to be the most stable and to predict a positive and emotionally engaged postnatal interaction style among mothers (Benoit et al., 1997). In our sample, the mothers' representations were more disengaged and less distorted than those in the study by Vreeswijk et al., 2012, but our result was in accordance with that of a previous Finnish study (Korja et al., 2009). The disengaged prenatal representation has been found to predict weak maternal emotional involvement and high maternal controlling behavior in postnatal interactions (Benoit et al., 1997), but it has also shown low stability, with only 13% remaining throughout the prenatal and postnatal periods.

Most of the fathers (57%) were also found to have balanced prenatal representations. The proportion of disengaged representations (30%) was higher in the distribution of the fathers' prenatal representations than in mothers' representations. The proportion of distorted representations (13%) was lower for fathers than for mothers. Vreeswijk et al. (2014) also found a high proportion (49%) of disengaged

prenatal representations among fathers. They found that the balanced representations were very stable (87%) throughout the prenatal and postnatal periods, but the disengaged representations were less stable (41%). In addition, Vreeswijk et al. (2014) found that fathers' representations were likely to evolve from unbalanced prenatal representations toward balanced postnatal representations. This result may indicate that fathers' prenatal representations can change by strengthening emotional tie with their infants and interacting with them after birth. Thus, further research is needed to confirm the stability and predictive value of fathers' prenatal representations.

The mechanisms behind the gender differences in the quality of prenatal representations are not known and can only be speculated upon. These differences may be due to the mothers' direct physical contact with their fetuses during pregnancy and to differences in assumptions regarding forthcoming responsibilities as primary caregivers after the infants are born. It may be that the higher percentage of disengaged prenatal representation among fathers is characteristic of their representation development, which some researchers have argued is slower and more complicated than mothers' development (Stern, 1995). On the other hand, the studies exploring fathers' and mothers' emotional bonds with their unborn infants (prenatal attachment) have not found any gender differences. Like mothers, fathers have been shown to form emotional bonds with unborn infants that strengthen throughout the pregnancy and that are highly stable through the first postnatal year (Condon, Corkindale, Boyce, & Gamble, 2013). Further research is needed to reveal the mechanism behind the development of paternal representations (i.e., the relationship between emotional bonding and representations).

6.1.2 Mothers' and fathers' prenatal depressive symptoms and representations

In Study I and in Study II, using the EPDS at gestational week 20, about 9% of the mothers reported symptoms of probable minor depression, and about 4% reported symptoms of probable major depression. These frequencies are in accordance with those of previous studies. In a systematic review, the prevalence of minor and major depression together in the second trimester was 8.5%, and the prevalence of major depression alone was 4.9% (Gavin et al., 2005).

In mothers, depressive symptoms above probable minor depression were associated with more distorted prenatal representations. These results are in line with previous results, which showed that prenatal depression increased the negativity of representations (Flykt et al., 2012) and decreased representations' coherence

and openness to change among mothers (Ammaniti et al., 2013). Based on the coding manual used to evaluate the interviews, the descriptions of the unborn infant and the expected relationship with the infant were classified as distorted when they were incoherent, emotionally confused, or distorted (Zeanah et al., 1996). This negativity toward the self is a well-known cognitive schema of depression (Beck, 2002). Because representations about the child, the self, and parenting develop in a complementary manner during pregnancy (Ammaniti et al., 1992), a mother's negative view of herself may spread into how she views her unborn infant. The results of the current study suggest that maternal prenatal depression is a significant contributor to mothers' prenatal representations of their own caregiving roles, of their unborn infants, and of their relationship development. These results are in line with Daniel Stern's (Stern, 1995) theoretical assumption that a mother's affective experiences affect her representations of motherhood and her relationship with the infant. From the perspective of child development, distorted representations are a risk factor, as maternal representations are highly stable throughout pregnancy and into the postnatal period (Benoit et al., 1997). Distorted prenatal maternal representations have been shown to be associated with dysfunctional interaction behavior, hostility, and anger (Dayton et al., 2010; Tambelli et al., 2014). The quality of postnatal interaction has been shown to have a significant impact on the child's development of attachment representations. Benoit and colleagues (1997) found that, of the children whose mothers had distorted prenatal representations, 40% displayed a resistant attachment style at the age of 12 months. Therefore, further studies on the stability of representations from prenatal to postnatal time and on the effectiveness of prenatal treatment methods on the dynamics of representations among depressed mothers are warranted.

Among fathers, depressive symptoms were not found to be associated with the quality of prenatal representations. This confirms a previous finding by Vreeswijk et al. 2015, who showed that the combination of depression and anxiety was not associated with fathers' prenatal representations. The effect that parental depression has on prenatal representations may not be direct. Postnatal studies have, for example, shown that the effect that fathers' psychological well-being has on children's outcomes is mediated by marital relationship quality (Papp et al., 2004). In future studies, this finding should be tested with a sample in which fathers' depression is evaluated through a clinical interview; mediation models should also be applied to explore the indirect effects of paternal depression.

6.1.3 Mothers and fathers' prenatal marital distress and representations

Fathers' prenatal marital distress had a negative effect on their prenatal representations. Distressed fathers were more likely than non-distressed fathers to have unbalanced (disengaged or distorted) representations. No association was found between mothers' marital distress and their prenatal representations. This is in line with a recent Finnish study of the prenatal and postnatal periods (Flykt et al., 2014), in which a direct association was found between fathers', but not mothers', prenatal marital problems and negative changes in their representations. According to Cummings et al. (2010), the vulnerability of father-child relationship is related to specific dimensions of the marital relationship, rather than to marital quality overall. They suggested that security within the marital relationship is a more important dimension in the father-child relationship than in the mother-child relationship. Our findings also suggest that the quality of the marital relationship plays a more important role in the balanced-unbalanced quality of representations among fathers than among mothers. However, the association between marital distress and quality of representation was weak in the current study. This may be due to methods used. As only the sum of the self-reported marital distress scores was used in the current study, other dimensions (such as security) were not explored. Further studies on the interrelatedness of prenatal marital relationship quality and the organization of prenatal parental representations are needed. Especially, the relationship between different dimensions of marital quality and parental representations should be explored, instead of comparing only the global rating of marital quality to representation quality.

6.1.4 Prenatal representations and the coexistence of marital distress and depressive symptoms

One of the aims of the study was to explore the combined effects that marital distress and depression have on prenatal representations at the individual and family levels. A moderate and positive correlation was found between marital distress and depressive symptoms for both mothers and fathers in our sample. The coexistence of marital distress and depressive symptoms had a significant association with prenatal representations only for mothers. These results suggest that distress in the marital relationship, together with a high level of depressive symptoms, increases the probability that mothers will have distorted prenatal representations. However, among mothers, depressive symptoms alone increased the probability of distorted representations more than did the combination of risk factors; this was true at both

the individual and family levels. Therefore, the negative effect of maternal depression on mothers' prenatal representations may be rather direct rather than mediated or moderated by marital quality. Mothers' mental health problems have been shown to have direct effects on representations and to mediate the effects that marital problems have on representations (Flykt et al., 2014; Papp et al., 2004). Papp et al. (2004) also demonstrated that the connection between mothers' psychological well-being and their children's adjustments is direct; however, the effect of fathers' psychological well-being is mediated by marital relationship quality. In the current study, coexisting depressive symptoms and marital distress (at the individual or family level) was to not impact fathers' prenatal representations. Based on the current study's findings, the combination of marital distress and depressive symptoms at the individual or family level does not increase these symptoms' negative impact on parents' prenatal representations. However, the mediation models used in past studies (Flykt et al., 2014; Papp et al., 2004) could be used in the future to explore the associations between parental psychological well-being, marital distress, and parental representations during the prenatal period.

6.2 Depressive symptoms, marital distress, and breastfeeding

6.2.1 Mothers' depressive symptoms and breastfeeding

In this study, higher amount of maternal postnatal depressive symptoms was associated with shorter duration of exclusive breastfeeding (EBF), but no relationship was found between prenatal depressive symptoms and EBF duration. However, the prenatal depressive symptoms did predict the postnatal depressive symptoms, which is in line with earlier studies of perinatal depression (Paulson et al., 2016; Underwood et al., 2016). We found that continuous high level of depressive symptoms (throughout the prenatal and postnatal periods) were associated with a shortest average duration of EBF compared with high level of depressive symptoms that appeared only in one time point (either prenatally or postnatally).

Several mechanisms could be behind the finding that continuous perinatal depression is associated with breastfeeding. A depressive symptomatology that begins during the prenatal period is associated with a severe postnatal depressive symptomatology (Putnam et al., 2015). The severity of these symptoms, in turn, could lead to increased difficulties in breastfeeding. However, Bogen, Hanusa, Moses-Kolko, & Wisner (2010) did not find an association between the severity of depressive symptoms (at 2 and 12 weeks postpartum) and the duration of breastfeeding. Prenatal depression may also affect fetal development directly. There is emerging evidence that the functioning of placenta changes when the mother is

depressed. That, in turn, increases the risk of the fetal brain being exposed to factors such as changes in hormone and neurotransmitter levels (Glover, Ahmed-Salim, & Capron, 2016). In newborns, for example, difficult temperament and low responsiveness to stimulation have been shown to be associated with maternal prenatal depression (Field, 2011). These early difficulties in infants' neurobehavior could be important mediators of maternal depressive symptoms' effects on breastfeeding; thus, these factors related to the infant should be taken into account in future studies.

Prenatal and postnatal depression may also affect breastfeeding through negative ways of thinking, which are characteristic of depressive people (Beck, 2002). Negative thinking may be directed at the infant, the self (as a person or as a mother), or parenting skills. Our previous results showed that prenatal depression was associated with disturbed maternal prenatal representations; this could include negative perceptions of the infant and of the parent's own caregiving. Depressive mothers' negative representations of themselves as mothers were also found in a previous Finnish study (Flykt et al., 2012). In addition, prenatal depression is associated with low parenting self-efficacy. Rahman and colleagues (2016) found that depressed mothers felt that their breast milk was insufficient for their babies, even though no differences were found in terms of the amount of milk that the babies received from depressed or non-depressed mothers.

6.2.2 Mothers' marital distress and breastfeeding

Among mothers, higher prenatal marital distress was related to longer duration of EBF. The finding is not in accordance with earlier studies, in which marital dissatisfaction has been associated with early breastfeeding cessation (Sullivan et al., 2004). Compensation theory is a possible explanation for this finding (Belsky & Fearon, 2004). According to this theory, mothers' experiences of marital distress may lead them to more strongly invest in their relationships with their children. Previous studies have found an association between mothers' postnatal marital distress and strong mother-child relationships (Melrose, 2010). In addition, no association has been found between low-quality postnatal relationships, including violent relationships, and the initiation or duration of breastfeeding (James, Taft, Amir, & Agius, 2014). To some extent, mothers' prenatal marital distress could be related to positive psychological adaptations in the transition to parenthood (Strauss & Goldberg, 1999), thus supporting emotional bonding with the infant by decreasing mothers involvement in the couple relationship and increasing investment to the unborn infant. More research is needed to confirm this somewhat surprising finding.

6.2.3 *Fathers' marital distress, depressive symptoms, and breastfeeding*

In the current study we did not find associations between fathers' prenatal or postnatal marital distress or depressive symptoms and breastfeeding initiation and duration of EBF. Based on these findings it can be speculated that maternal psychosocial well-being is more directly associated with breastfeeding than the paternal psychosocial well-being, which seems logical. However, fathers can be considered as active participants in the breastfeeding (Rempel & Rempel, 2011) and, thereby, have an effect on breastfeeding. The effect can be mediated through breastfeeding decisions, their assistance at breastfeeding, and breastfeeding support they provided to their partners, or their desire to participate to infant's bottle-feeding (Bar-Yam & Darby, 1997), but the study did not explore these factors. Future studies, could explore the associations between fathers prenatal and postnatal marital distress and their assistance at breastfeeding and the quality of their breastfeeding support. A recent study, for example, showed that a responsive breastfeeding support by fathers had positive impact on the duration of breastfeeding, whereas intensive involvement alone had a negative impact on the duration (Rempel, Rempel, & Moore, 2016).

6.3 A new intervention – Close Collaboration with Parents

We developed a new intervention that applies the current psychological understanding of the transition process to parenthood in the medical context of the neonatal intensive care unit (NICU) (III). The aim of the current intervention is to improve care practices in the NICU so that they better support parenting and parent–infant bonding during the hospitalization of newborn infant. The intervention was a training program for the unit's multi-professional staff. The main learning strategies consisted of enhanced bedside practices, guidance from individual mentors, and participation in reflective discussions about practicing experiences within supervision groups. Each phase of the training process was built on the previous phase. The theoretical phases include recognizing the infant's individual needs, sharing observations with the parents, understanding each family's individual characteristics and contexts. By integrating this knowledge into the everyday work in the NICU, the training process created a basis for the staff to support parenting and the parent–infant relationship through closer collaboration with parents regarding infant care.

After the Close Collaboration with Parents (CC) intervention took place at Turku University Hospital, the NICU nurses there reported a significant improvement in the unit's atmosphere (Axelin, Ahlqvist-Bjorkroth, Kauppila, Boukydis, & Lehto-

nen, 2014). They felt that the transformed unit culture made parents feel more welcome. The nurses reported that they had gained new tools to support and guide parents. Their role had also transformed from an active caretaker to the role of a coach or facilitator that supports the parents to become the active and primary caretakers of their infant. The nurses felt that the new culture and practices increased the parents' presence in the unit and parents' participation in their infants' care. However, the increased collaboration between nurses and parents and the empowered role of the parents also caused some confusion in terms of role boundaries, especially regarding communication and decision-making, such as during medical rounds. Taken together, the findings from the nurses' interviews suggest that the training program supported collaboration between the staff and parents, which facilitated parents' presence in the unit, involvement in the daily care of their infants, and participation in decision-making (Axelin et al., 2014).

6.3.1 Lessons learned from intervention development

Saunders and colleagues (2003) observed that the implementation of family-centered care practices requires changes in leaders' beliefs and the culture of the entire organization. Originally, the CC training was planned to include 50% of the staff, with the idea that the new culture would spread to the rest of the staff through passive diffusion. However, it was soon recognized that the dissatisfaction of the individuals who were not initially involved in the training was a threat to the progress of the implementation. The solution was to add an extra tutoring year for those who were not initially included so that those who had participated in the initial training would tutor those who were not yet trained (see Figure 1 in publication III).

Saunders and colleagues (2003) also argued that collaboration with families is dependent upon the attitudes of the care providers and on the relationships that the care providers establish with the families. Practice with a mentor and reflective supervision discussions were the key strategies to support attitude changes and new ways of establishing relationships with families. The mentors, as respectful and empathetic facilitators, were central in enabling the individual trainees to become aware of the existing care practices and in helping trainees to explore new ways of working with infants and families. The use of the relationship-based supervisory approach—reflective supervision—gave the staff members the experience of being heard and understood. This increased their abilities to listen, reflect, and accept different perspectives (e.g., those of the infants, parents, and staff members) in the collaborative care and decision-making process (Heffron & Murch, 2010). Group supervision also enabled the integration of individual learning into the organizational level through the shared discoveries that staff members had

made during their practice sessions with mentors or during the discussions (Kim, 2008). The supervision groups also provided the opportunity to discuss resistance—mainly, the conflict between new ideas and old beliefs. Therefore, the supervision groups were important forums that provided new and internalized understanding that integrated concrete applications from the training content into the day-to-day care practices at the unit level. Through this process, the staff members became agents in the development of new care practices, and those practices were directly adopted into the existing care context.

6.3.2 Comparison with other NICU interventions

There are several similarities between the Close Collaboration with Parents intervention and the previous interventions listed in the Table 1. Most of the similarities are in regard to the interventions' components. The overarching similarity is the focus on the parent–child relationship. In addition, as in most of the previous interventions, the CC intervention applied the observational structure from infant neurobehavioral assessment methods into the training program for the staff. In the CC intervention and in most of the previous interventions, the parents were integrated into infant observations. However, in most of the previous interventions, the aim of joint observation with parents was to educate them, but in the CC intervention, the aim was to listen to parents' perceptions of their infants' behavior and, thereby, form a basis for collaborative care planning. Similarities can also be found with the Norwegian modification of the Mother Infant Transaction Program intervention, which provided an opportunity to debrief parents about the experience of having a preterm infant. The debriefing has similarities with the Clip-I interview (Appendix/ III) in phase III of the CC intervention.

The focuses on negotiating and shared decision-making with parents make the CC intervention unique. These components together cannot be found in any previous interventions. Some other crucial differences exist between our intervention model and the ones described in Table 1. First, most of the other interventions models were randomized research interventions that did not aim to change an entire unit's care culture. In fact, in such trials, the unit's culture changes had to be minimized to avoid contamination. Therefore, the CC intervention is the first comprehensive and unit-wide model to improve the care culture of an entire unit. Second, as all staff members were trained in the CC intervention, they all became providers of the intervention; thereby, the benefits were available equally for all infants and parents admitted to the unit. In the previous interventions, special training usually was provided to a small number of staff members, who implemented the procedure to the selected parents. Third, the core idea of the CC intervention were to provide salutogenic care, to support the parents' normative bonding and intuitive parenting

skills by allowing close proximity and interactions between parents and infants, and to encourage parents' participation in daily care and decision-making. Contrary to this approach, the previous interventions were based on the idea that preterm birth per se disturbs parenting and the parent–infant relationship; therefore, the parents were treated as needing therapeutic help or psychoeducation. Fourth, none of the earlier interventions specially included the doctors of neonatal units. We included both nurses and doctors to enable a sustained implementation. The teamwork between nurses and doctors is recognized as an important element in any care culture, and it can improve the implementation of evidence-based practice (Kitson et al., 1998).

6.3.3 Evaluation protocol

The CC intervention aimed to facilitate comprehensive and sustainable changes in staff–parent communication as well as universal collaboration at the unit level. Therefore, it was not appropriate to use an experimental setting or a randomized controlled trial for the evaluation protocol. However, the unit had relevant baseline data on parent and child outcomes for a six-year cohort. Therefore, we recruited a comparable prospective post-intervention cohort of preterm infants and their parents. A systematic long-term follow-up of both parental and child outcomes was identified beneficial for intervention evaluation in a meta-analysis (Benzies et al., 2013; Brecht et al., 2012) and, therefore, the study protocol was planned to include both the parents' and children's outcomes. A long-term follow-up when the children turned 5 years old was planned based on earlier literature, which showed that the effects of early parenting interventions are evident in child development after 2 years (Achenbach et al., 1993; Nordhov et al., 2010; Nordhov et al., 2012)

6.3.4 Impact on maternal postnatal depression symptoms

The CC intervention was found to be effective in decreasing the level of postnatal depressive symptoms in mothers of very low birth weight (VLBW) infants. The proportion of mothers scoring above the clinical cutoff for postnatal depression was 8 percentage points higher in the baseline cohort than in the post-intervention cohort, but this difference was not statistically significant. The reduction in mothers' postnatal depressive symptomatology increased the mothers' psychological well-being and may also have had a significant impact on the development of the VLBW infants of these mothers. Decreased postnatal depression may decrease the risks of distorted maternal postnatal representations, lower-quality mother–infant interactions, and preterm children's lower cognitive performance and behavioral

problems; all of these factors have been shown to be associated with mothers' depression after giving birth to preterm infants (Huhtala et al., 2011; Huhtala et al., 2012; Huhtala et al., 2014; Korja et al., 2009; Korja et al., 2008). The impact of the intervention can be also considered by comparing the prevalence and level of postnatal depressive symptoms for the two samples included in the study. The samples were gathered from the same geographical area in Finland and during the same time period. Before the CC intervention was implemented, the prevalence and severity of postnatal depression were both higher among the mothers of VLBW infants (10.3%, $M = 6.45$) than among mothers from the low-risk birth cohort (6.7%, $M = 5.41$; see study II), but after the CC intervention, the prevalence and average level of depression were both lower among the mothers of VLBW infants (2.1%, $M = 4.31$) than among those in the low-risk cohort.

The findings from the current study are also in accordance with previous findings of four randomized NICU intervention studies (Melnyk et al., 2008; Meyer et al., 1994; Ravn et al., 2012; Welch et al., 2016). These interventions were able to decrease postnatal depression among mothers of preterm infants. All four studies had a design using a control group, and three out of the four also randomized the subjects. The studies showed that the interventions led to a significant decrease in maternal depressive symptomatology when measured at the end of the hospital treatment, and 1, 2, and 4 months after birth. All four studies used self-report measures (the Beck Depression Inventory and the Center for Epidemiological Studies Depression Scale) that differed from the one used in the current study.

Four effective previous interventions, Creating Opportunities for Parents Empowerment (Melnyk et al., 2008), Family Nurture Intervention (Welch et al., 2016), Mother-Infant Transaction Program (Ravn et al., 2012), and Individualized Family-Based intervention (Meyer et al., 1994) (Table 1) and the CC intervention all focus on supporting the parent–infant relationship. Like the CC intervention, three out of the other four interventions start almost immediately after birth and last throughout the hospitalization phase. The CC intervention and the Individualized Family-Based intervention provide more comprehensive support for the whole family. The greatest difference between the CC intervention and previous interventions is in terms of implementation: The CC intervention aims to support all infants and parents in the unit by training the whole staff. The CC intervention also contains of shared decision-making with parents, which is not included in the content of other four interventions.

There is already evidence that maternal depressive symptomatology can be alleviated by supporting parenting during infants' stays in the NICU. The next step in future studies would be to gain a better understanding of the specific components of parenting support that are most central for the desired outcome. At the moment, the specific mechanisms can only be speculated on. According to previous studies

on the topic, separation from the infant, feelings of exclusion from the care team, and alienation from the parental role can all cause feelings of sadness, guilt, stress, and depression in parents (Feldman et al., 1999; Nyström & Axelsson, 2002; Wigert et al., 2006). We speculate that parents are empowered by their experience of receiving more trust and confidence from staff members and by their higher involvement in the care of their infants (Axelin et al., 2014). This way of involving the parents also makes it possible for new parents to really fulfill their need to interact with their infants—and hence, to learn to know their infant. Although this topic is not explored in the current study, it may enhance intuitive parenting skills and make parents feel confident in the care of their infants, thus leading to stronger emotional bonds with the infants. Decreased separation, increased involvement, and stronger bonding may be the specific routes in alleviating maternal postnatal depression (Feldman et al., 1999).

The positive effect that the CC intervention had on maternal postnatal depressive symptoms was smallest and non-significant in the groups of mothers who had the smallest preterm infants, those born between gestation weeks 23 and 27. These mothers and their families probably suffered from more severe distress, anxiety, and posttraumatic symptomatology relative to the mothers in other gestational age groups. Parents who have undergone the birth of an extremely preterm infant probably need intensive and therapeutic help, in addition to the support received from the NICU staff.

6.4 Strengths and limitations of the study

6.4.1 Design

A major limitation of study I was that marital distress, an inclusion criterion, was defined using a self-reported measurement rather than a clinical evaluation or any other, more objective methodology. Heyman, Sayers, and Bellack (1994) showed that, among couples classified as being dissatisfied in their marital relationships using the Dyadic Adjustment Scale or similar self-report methods, only 39% to 65% were truly dissatisfied. Although the RDAS was not specifically included in the study (Heyman, Sayers, & Bellack, 1994), the possibility of selection bias should be taken into account when interpreting the results of the current study. The prospective follow-up design used in study I, on the other hand, can be considered a strength.

In study IV, the existence of the historical control group, which consisted of preterm infants from the same unit and the same population and which used the same

depression screening measurement, made it possible to study a care culture change within a unit. Not using a randomized controlled trial as the research design could also be considered as a limitation from the point of view of testing the effect of the new intervention. The baseline cohort was gathered from 2001 through 2006, and the post-intervention cohort applied to 2011 through 2015, one might argue that some other changes in care practices might have functioned as confounding factors for maternal depression. The NICU at Turku University Hospital has monitored the medical interventions, the neonatal diagnoses, and other markers of care quality, as it has been a member of the Vermont Oxford Network since 2001. Based on the time trends, it can be concluded that the unit has performed consistently well in comparison to the comparison network regarding neonatal mortality and morbidities. Therefore, no other major changes in the unit practices, except for the CC intervention, can be identified in the years 2009 through 2012. Throughout that period, the NICU was at or below the average performance level for a large peer-comparison network (Vermont Oxford Network Database, 2017). Although this is only a rather rough estimate, it suggests that there have been no major changes in the quality of medical care during the period between the study cohorts.

6.4.2 Sampling

One strength of the STEPS study (I and II) was the high participation rate of fathers. In addition, the sample size of study I was fairly large, considering the methodology it used, which was in-depth interview (the WMCI) with a demanding scoring system. The study's limitation, in turn, was that generalizability of the results related to the mothers in article I and II may be limited because the STEPS study sample was skewed toward highly educated mothers (Lagström et al., 2013). However, the sample represented the younger Finnish generation well, as the women in this group are often highly educated (Official Statistics of Finland, 2013). The families who gave consent were also more likely to be married, to be expecting their first child, to live in an urban area, and to have a higher occupational status when compared to the total cohort population (Lagström et al., 2013). Thus, generalization of the results should be done with caution. In addition, the sampling and attrition bias should be considered in relation to the results of depressive symptoms in all studies included in the thesis, because it is plausible that the most depressed parents are less likely to participate in laborious follow-up studies.

The strength of the CC intervention study (IV) was that it used relatively large patient groups when compared to those from other interventions. The limitation of this study was the compromised sample size in the post-intervention cohort. The sample was partly compromised because it was limited to the mothers of infants

who were born with birth weight below 1500 g. This was done to increase homogeneity between the compared cohorts. Thus, the power of the sample was lower than what was presented in study III. The EPDS scores from the patient records of eligible mothers were recorded on follow-up visits and included to compensate for the decreased sample size and the resulting selection bias.

6.4.3 Measures

The use of the WMCI in-depth interviews, which the researchers scored, increased methodological strengths of the study I. However, the shortage of validity information regarding the use of the WMCI method with fathers, especially during pregnancy, limits the understanding of the results.

In studies I and II, marital distress was assessed using the RDAS method (Busby et al., 1995). This standardized method utilized a multiple-item approach to assess the quality of the marital relationship (Twenge et al., 2003). In most of the analysis, the RDAS was measured with a continuous variable: the sum of all the scores or the sum of the scores for three factors (Busby et al., 1995). However, a sample-based cutoff score was used as an inclusion criterion for the sample in the study I. Dividing the entire sample into distressed and non-distressed participants using a single cutoff score could be considered artificial. However, the cutoff score used in the current study was more rigorous for the distressed group than the established cutoff was (Crane, Middleton, & Bean, 2000).

The validity, reliability, and use of the EPDS method's cutoff scores are well-established in screening for postnatal depression (Gibson, McKenzie-McHarg, Shakespeare, Price, & Gray, 2009), but there is an ongoing debate about the accuracy of the method and of the used cutoff scores (Meijer et al., 2014). However, most of the criticism is related to the predictive accuracy of the cutoff scores for the prenatal period, which was not the main focus of this study. To distinguish between depressed and nondepressed pregnant mothers, we used the most rigorous cutoffs that have been established (Matthey et al., 2006). Although a subclinical level of depressive symptoms should also be considered, as these symptoms have been shown to be associated with parenting difficulties (Lovejoy et al., 2000). The use of the EPDS and cutoff scores to screen for depression among fathers has been studied more thoroughly for the postnatal period than for the prenatal period (Matthey et al., 2001). A recent study (Massoudi, Hwang, & Wickberg, 2013) found the EPDS to be sensitive enough to identify fathers' major postnatal depression with a cutoff of 12, but found that it had low accuracy in identifying minor depression with a cutoff of 9. Massoudi et al. (2013) also found also that the EPDS did not primarily capture depression when used for fathers; instead, it seemed to assess

fathers' distress. Therefore, the use of the EPDS to screen for fathers' depression may be a significant limitation of the current study.

The use of real-time parental reports, in the form of a diary, to determine the initiation and duration of EBF (II) could be considered a methodological strength. The reliability and validity of retrospective data collection in infant-feeding practices has been criticized, but most of these criticisms have been in relation to maternal recall for the age when food and fluids other than breast milk were introduced (Li et al., 2005).

7 CONCLUSIONS AND CLINICAL IMPLICATIONS

The results from the current study show that maternal prenatal depressive symptoms have a significant negative effect on the transition into motherhood. Mothers with high levels of prenatal depressive symptoms are at risk of having distorted prenatal representation of their unborn infants, their own caregiving role, and their relationships with their infants. The results revealed that prenatal depressive symptoms predict postnatal depressive symptoms. A higher amount of postnatal maternal depressive symptoms, in turn, are related to shorter EBF duration. In addition, continuous depression throughout the prenatal and postnatal periods is related to very short EBF duration. The study concludes that maternal depression during the transition to motherhood is an independent risk factor for suboptimal representations and short EBF duration, as the combination of depression and marital distress did not increase risk at either the individual or the family level.

The results of the current study further elaborate on the literature related to the psychological processes of the transition into fatherhood during pregnancy. Most of the fathers, like the mothers, had balanced prenatal representations, which can be considered a resilience factor in the transition to parenthood. However, the fathers were more likely than the mothers to have disengaged prenatal representations. Experiences of marital distress were found to increase the fathers' likelihood of having suboptimal prenatal representations. Thus, the problems in couple relationship seem to have a negative effect on the transition into fatherhood.

The CC intervention was designed to bring a preventive and salutogenic approach to the support of early postnatal parenting and the parent–infant relationship during the hospital stay after a preterm birth. The intervention was meant to increase staff members' skills to support the natural processes of postpartum bonding and early parenting under NICU conditions. The CC intervention was implemented successfully and significantly decreased postnatal depressive symptoms in the mothers of preterm infants. All the nurses and doctors in the neonatal units could apply the CC intervention. Thereby, the benefits of the intervention are available for all infants admitted to the NICU and their parents. These benefits may also be seen during the subsequent development of the preterm children, as decreased parental depression may enhance parenting quality.

These results highlight the importance of preventing, screening, and treating maternal depressive symptoms during the transition to motherhood in both low-risk and high-risk samples. The Finnish National Institute of Health and Welfare has established screening guidelines for prenatal and postnatal depression so as to support parents during the transition to parenthood. However, the current results elaborate on clinicians' understanding of the effects that prenatal depressive symptoms have on a mother's early relationships with her unborn infant and early parenting. Thereby, the results may motivate clinicians for routine screening and for providing interventions and treatments for mothers with moderate or high levels of depressive symptoms during pregnancy. In addition, the current study implies that, from the perspective of prenatal fathers, support for the couple relationship would be most beneficial to their developing fatherhood. Prenatal preventive interventions and treatments should be developed and implemented, with specific focus on the parent–infant and couple relationships. Considering the substantial effect that the CC intervention has on maternal postnatal depression in the context of neonatal intensive care, a similar collaborative approach could be implemented in primary care maternity clinics to prevent depression during transition to parenthood. However, before wider implementation, the effectiveness of the intervention should first be evaluated in a new context.

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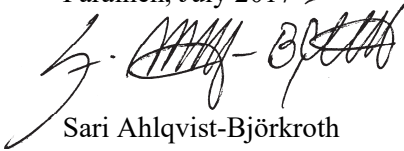
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Parainen, July 2017

A handwritten signature in black ink, appearing to read 'Sari Ahlqvist-Björkroth'. The signature is stylized and cursive, with a large initial 'S' and a long horizontal stroke.

Sari Ahlqvist-Björkroth

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