MATERNAL POSTNATAL DEPRESSION, CAUSES AND CONSEQUENCES

PAULIINA HILTUNEN

Department of Paediatrics,
University of Oulu

OU卢 2003
Hiltunen, Pauliina, Maternal postnatal depression, causes and consequences
Department of Paediatrics, University of Oulu, P.O.Box 5000, FIN-90014 University of Oulu, Finland
Oulu, Finland
2003

Abstract
A longitudinal follow-up study of postnatal depression was performed in the years 1995-2000 in the University of Oulu. A volunteer, randomly selected group of 187 mothers from maternal wards of the University Hospital of Oulu were studied with different questionnaires in the first postpartum week. Depressive symptoms were re-assessed with Edinburgh Postnatal Depression Scale four months postpartum when paternal depression was evaluated with Beck Depression Inventory. 16.2% of the women were immediately after delivery screened as being depressed. Four months postpartum 13.0% of the mothers were depressed whereas 5.1% of the fathers were having depressive symptoms. The cumulative incidence of maternal postnatal depression within the first four months was 22.2%.

These mothers who immediately showed depressive symptoms were at a higher risk to be depressed later. Maternal age 30 years or less predicted postnatal depression. The occurrence of maternal postnatal depression varied slightly during different seasons; during dark time immediate depressive symptoms increased and the spring seemed to protect from later postnatal depression. Analgesia during vaginal delivery, e.g. nitrous oxide, epidural analgesia or paracervical blockade, protected from postnatal depression as well. Caesarean section, either elective or emergency, did not predict postpartum mental well-being. Scores from the GHQ and the EPDS were strongly interrelated. Seven (5%) fathers were depressed four months postpartum. They all were men whose partners also scored high in the EPDS.

Those mothers who were depressed interpreted infant facial signals differently, seeing less joy, disgust and anger, but more sadness in the infant facial pictures. Cultural variability was found in complex blended facial features of emotions, e.g. distress, in the Infant Facial Expression from Looking at Picture scale, although remarkable agreement was achieved and reinforced.

In the videotaped early mother-infant interaction small, but essential, changes were observed at 10 months postpartum. Overall, mothers who had had persistent depressive symptoms showed less negative expressions and had less anger and anxiety in their interaction. Their children were slightly less impulsive and seemed to have less visual and communicative contact with their mothers. The dyad was characterised by short periods of uninvolvment between the mother and the infant; e.g. the moments of reciprocity were less frequent than in the non-depressed mothers. At 42 months postpartum, the children of the persistently depressed mothers scored lower on the Expressive language scale than the children of the mothers who were depressed in one measurement or never.

Keywords: early interaction, emotion, labour analgesia, postnatal depression, postpartum depression, season
Kokin ristinsä kantaa ja kompuoi,
ei enempää kuin parhaansa tehdä voi.
Riittää, kun yrittää.

K. Kärkinen
To my grandmothers and my mother
Acknowledgements

Long before I started to study medicine a book called "Dibs In Search of Self" by Virginia Axline awaken my interest to children with mental health problems. Later I applied both to the medical and pedagogic schools; medicine won. The study was realised in the Department of Paediatrics, Clinic of Child Psychiatry in the University of Oulu during the years of 1995 to 2000. The topic was suggested by professor Irma Moilanen and our visiting colleague, Nathan Szajnberg, from the University of San Francisco.

I am grateful to my supervisor and mentor, professor Irma Moilanen, who has been endlessly encouraging and supportive and is both excellent scientist and warm, heartening person. I am likewise grateful to my other supervisor Hanna Ebeling. Her wise comments and practical assistance in writing the manuscripts has been irreparable. I owe much to and I am deeply grateful for my other co-authors; Tytti Raudaskoski, Nathan Szajnberg, Kaarina Kemppinen and Anne Kunelius, who have provided a comfortable and easy-going atmosphere for this study and have given constructive comments and new ideas for our manuscripts. Tytti taught me beautiful English and guided with the obstetrical knowledge and proficiency. Especially, I express my warm gratitude to Leila Paavola who I am in dept for many things. She answered for children’s linguistic testing and she assiduously explained about theories of the linguistic development and assisted in writing the fourth manuscript. Warm thanks to my co-scientists and colleagues Jutta Raita-Hasu, Pirjo-Liisa Kurki, and Tiina Tirkkonen, for your inspiring spirit, advice and time in data collection.

I owe my respectful gratitude to the official reviewers, Jari Sinkkonen and Liisa Lehtonen, for their valuable criticism of the manuscript and careful revision of this study, which helped me improve the final manuscript. I am grateful to Anna Vuolteenaho for reviewing the language of the thesis and I thank her and Sirkka-Liisa Leinonen for checking the publications.

I am much obliged to Ulla Palmu and Meeri Jämsä, for their secretarial assistance throughout this work. I thank Jari Jokelainen, Risto Bloigu, Helinä Hakko and Aila Kanniainen for statistical advice in various situations. I wish to acknowledge the staff of the maternity wards 11, 13 and 14 and the staff of the Medical library of the University
of Oulu for their generous assistance. I express my gratitude to Matti Pukkila for printing this thesis. My deepest thanks to all the mothers, infants and fathers who participated in this study.

Special thanks to my parents for your encouragement, including practical support such as VCR and tons of paper for this study. My sister, colleague Johanna, I thank for the fun and supportive conversations and practical insight to postpartum life. I wish to thank my fellow colleagues and friends who make sure to remind me that there are intriguing roads outside medicine and research. Finally, my dearest thanks to Marko. Your patience, your smile, your tales and just being there has made my world.

I wish to express my gratitude for financial support to the Child Psychiatric Research Foundation, Oulu and the Child Psychiatry Research Foundation, Helsinki, the University Foundation of Oulu, the Alma and K.A. Snellman Foundation Oulu, the Finnish Medical Society Duodecim Foundation, the Paediatric Research Foundation, the University Pharmacy Foundation, Oulu and the Alli Paasikivi Foundation which make this study concrete.

Lahti May 13th

Pauliina Hiltunen
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI</td>
<td>Beck Depression Inventory</td>
</tr>
<tr>
<td>CBCL</td>
<td>Child Behaviour Check List</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>CS</td>
<td>Caesarean section</td>
</tr>
<tr>
<td>DSM-IV</td>
<td>Diagnostic and Statistical Manual of Mental Disorders IV</td>
</tr>
<tr>
<td>EPDS</td>
<td>Edinburgh Postnatal Depression Scale</td>
</tr>
<tr>
<td>ERA</td>
<td>Early Relational Assessment Scale</td>
</tr>
<tr>
<td>GHQ</td>
<td>General Health Questionnaire</td>
</tr>
<tr>
<td>ICD-10</td>
<td>International Classification of Diseases 10</td>
</tr>
<tr>
<td>IFP</td>
<td>IFEEL Pictures, Infant Facial Expression from Looking at Picture method</td>
</tr>
<tr>
<td>OR</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>PCB</td>
<td>Paracervical blockade</td>
</tr>
<tr>
<td>PMS</td>
<td>Premenstrual syndrome</td>
</tr>
<tr>
<td>PPD, PND, PD</td>
<td>Postpartum depression, postnatal depression</td>
</tr>
<tr>
<td>RDLS</td>
<td>Reynell Developmental Language Scale</td>
</tr>
<tr>
<td>SAD</td>
<td>Seasonal Affective Disorder</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package of Social Sciences</td>
</tr>
<tr>
<td>VD</td>
<td>Vaginal delivery</td>
</tr>
</tbody>
</table>
List of original papers


Contents

Abstract
Acknowledgements
Abbreviations
List of original papers
Contents
1. Introduction ..................................................................................................................17
2. Review of the literature ................................................................................................19
  2.1. Postnatal depression ..............................................................................................19
  2.1.1. The concept of postnatal depression ...............................................................19
  2.1.2. Symptoms of postnatal depression .................................................................20
  2.1.3. Epidemiology of postnatal depression ............................................................21
  2.1.4. Aetiology of postnatal depression .................................................................22
    2.1.4.1. Risk factors of postnatal depression ........................................................22
    2.1.4.2. Prediction of postnatal depression using risk factors ..............................26
  2.1.5. Detection of postnatal depression ...................................................................26
  2.1.6. Prevention and treatment of postnatal depression ..........................................27
  2.1.7. Impact on child development and early interaction ........................................29
    2.1.7.1. Early interaction ......................................................................................29
    2.1.7.2. Cognitive and linguistic development .....................................................30
    2.1.7.3. Behavioural and emotional development ................................................31
  2.1.8. Impact on the partner and paternal depression ...............................................32
  2.2. Affect inference .....................................................................................................33
    2.2.1. Viewing emotions ...........................................................................................33
    2.2.2. Affect and culture ...........................................................................................34
      2.2.2.1. Facial expressions of emotions ...............................................................34
      2.2.2.2. Measuring facial expressions of emotions .............................................35
      2.2.2.3. Cultural issues in adapting a new method .............................................36
  3. Aims of the study ........................................................................................................37
  4. Material and methods ................................................................................................38
    4.1. Study design .........................................................................................................38
      4.1.1. Pilot study ....................................................................................................39
1 Introduction

Postnatal depression is a rather common and acknowledged phenomenon following childbirth. Over 10 percent of parturients go through clinical depression and over half of all women suffer from lability of mood and anxiety, i.e. postnatal blues, for a few days. Nevertheless, as common as the topic is, depressed mothers are poorly recognised in primary health care. The reasons for poor recognition are various. Postnatal depression may be considered a trivial concept, which is normally part of the postpartum time. Some of the symptoms are quite normal, such as fatigue. Facilitating questionnaires or interview techniques are not used sufficiently, and both the mother and the nurse at the well-baby clinic may be unable to recognise depressive symptoms.

Although the prevalence and the diagnostic criteria for postpartum depression are equal to ordinary depression, postpartum depression forms its own entity. This period in a woman’s life is unique, as a new relationship is developing between the new-born and the mother. Hence, both prevention and treatment put special demands on health care professionals in the postpartum period.

The basis of postnatal depression is complex. The biological base is scant, but low prolactin and high progesterone levels and thyroid dysfunction are most frequently discussed. The leading etiologic factor is of social nature. Lack of social support from spouse, family or friends and stressful life events seem to be the most important risk factors for postnatal depression. Also previous mental disorders or depressive symptoms during pregnancy are seen as important risk factors. Various obstetrical factors have also been studied and even then social factors continue to be of importance; social support during delivery has shown to be a protective factor. The data arguing that Caesarean section is a risk factor predisposing to postnatal depression are contradictory, and very few studies explore experienced labour pain and modern labour analgesia.

This study contributes to prevention trying to reveal new unexplored factors associated with maternal postnatal depression, such as seasonality, e.g. light, and analgesia during labour.

Numerous studies of long-term effects of postnatal depression to the child have been performed. The child’s cognitive, socioemotional and behavioural development has been studied and it is obvious that maternal postnatal depression has adverse effects on an infant’s development, but the exact mechanisms or magnitudes are not yet known.
Depressed mothers are suggested to be less sensitive, less responsive to their children and less able to sustain social interaction. Still, it can be the poor parental skills of the mother that transmit the negative effect, not the depression itself. This study assesses maternal sensitivity and capacity to interpret infant emotions from facial expression and then continues to clarify if there is a link between mother’s affect interpretation and child linguistic development at the age of three and half years. It tries to answer whether maternal depression affects mother’s abilities to read her infant’s non-verbal signals and weakens her means and ways of interacting with her child, and then affects the infant’s psychological development.
2 Review of the literature

2.1 Postnatal depression

2.1.1 The concept of postnatal depression

Depression, in general and especially in mothers, has been actively and extensively studied during the last decades. Having a child is a time of changes in a woman’s life, both in the biological, psychological and in the social sense. These changes can contribute to personal growth and be wonderful, but they can also predispose to mental disorders.

It is well known that the incidence of depression, both after the child’s birth and in general, is higher in women than in men. In recent years, mental health issues have been discussed repeatedly in the public media and thus the concept of postnatal depression (PPD) has become acknowledged—maybe to such an extent that it is sometimes easy to think that postnatal depression is a natural phenomenon in maternal life. Even recently, some researchers have claimed that perceived postnatal depression seems to be transient, mild, and less intense than a major depression (Najman et al. 2000). Luckily, often that is the case; depression is mild and lasts for weeks, not several months; but this does not lessen the significance of this disorder to the mother, her motherhood and especially to the infant.

The line between "normal" mood changes and depression can be vague. Traditionally and nosologically, postnatal depression has been classified into three different categories: maternal blues, postnatal depression and puerperal psychosis. It can be seen as a continuum, where at the other end maternal blues represents a normal reaction after childbirth and the other end, puerperal psychosis, represents a serious mental disorder. Although maternal blues is considered to be a frequent reaction following childbirth, it has been observed that mothers with severe maternal blues are at high risk to be depressed later (Beck et al. 1992).
Previously Najman with his team (2000) questioned the whole use of the concept of postnatal depression, as they stated that PPD does not differ quantitatively or qualitatively from ordinary depression, and therefore does not constitute a health problem in its own. It can be argued that, maternal depression during the postpartum period is particularly important based on information of its impact to the child’s emotional and cognitive development as well as the mother’s own health and ability to act as a mother. The postpartum period also sets demands of a different kind on the prevention and treatment of depression.

2.1.2 Symptoms of postnatal depression

Maternal blues is considered to be a transitory phenomenon of mood changes that begins within the first few days after delivery. It is characterised by lability of mood, fearfulness, anxiety, irritability and depression. Puerperal psychosis is characterised e.g. by obsessive thoughts and loss of the sense of reality and it can manifest without depressive symptoms. This study concentrates purely on postnatal depression, excluding blues and psychosis.

The symptoms and clinical criteria of postnatal depression are considered similar to ordinary depression. Diagnostic and Statistical Manual of Mental Disorders’ (DSM-IV, American Psychiatric Association 1994) criteria for major depression includes at least a two-week period of depressed mood or loss of interest in almost all normal activities and at least four other symptoms from the following: changes in weight, sleep or psychomotor activity, feelings of guilt or worthlessness, difficulty in thinking, concentrating or making decisions, decreased energy or recurrent thoughts of death, or suicidal thoughts, ideation or attempts. International Classification of Diseases (ICD-10, WHO 1992) classifies depression into three categories: mild, moderate and severe. Ten symptoms are identified including changes in appetite, pessimism and low self-esteem in addition to DSM-IV. Clinically postpartum onset depression can be defined as major depression occurring within 4 (DSM-IV) to 6 (ICD-10) weeks of delivery. In most of the epidemiological studies more loose criteria are used; postnatal depression usually occurring within 6 to 12 weeks postpartum and being qualitatively moderate or mild (e.g. Kumar and Robson 1984, Bågedahl-Strindlund and Monsen-Börjesson 1998, Josefsson et al. 2002).

Earlier, postnatal depression has been called “atypical” depression. Postnatal depression is characterised by self-blaming thoughts, guilt, anxiety, tearfulness, depressive mood, excessive fatigue, irritability and sometimes sleep disorders. The mothers are worried, anxious and scared, and they have a feeling that everything around them is overwhelming (Pitt, 1968).

Thoughts of harming the infant have been shown to be common in depressive mothers, but actually doing something to the infant is rare. Mothers with severe, obsessive thoughts of harming their infant should be carefully followed and assessed with reality testing in the case of puerperal psychosis (Donahue Jennings et al. 1999). Also, thoughts of hurting oneself or thinking about or actually a committing suicide are
very rare. Puerperal depression, excluding psychosis, is not destructive or self-destructive in its nature, as has been observed in previous studies (O’Hara et al. 1994, Beck 1998), and this is one quality difference compared to ordinary depression.

It has been criticised that many very different disorders are labelled under postnatal depression, such as postpartum anxiety disorder, panic disorder, obsessive-compulsive disorder and post-traumatic stress disorder (Wisner and Stowe 1997, Beck 1998, Stuart et al. 1998). Research in the areas of the different disorders has been scarce and conflicting (Reynolds 1997, Beck 1998, Stuart et al. 1998) and many of the studies have been based on case reports or retrospective study designs. Therefore more relevant data are needed. There seems to be high comorbidity and all these disorders can occur similarly during other periods of a woman’s life as well as in the postpartum period (Eerola 1999).

The problem of detecting other disorders besides depression in the postpartum period lies also in the screening. Measurements or screening tests have not been validated for the postpartum period for other disorders than depression, nor do we know whether they need to be specifically aimed at that period of life.

Stuart with his team (1998) found that, when they used Cox’s depression scale, it had a strong correlation with anxiety scale, and they concluded that the scale measures both depression and anxiety. Barnett and Parker (1986) reported anxiety to be associated with postpartum depression, newborn’s prematurity and delivery complications in primiparous women. Due to similarity and overlapping of the symptoms of these disorders, depression can be a part of the anxiety disorder or vice versa.

2.1.3 Epidemiology of postnatal depression

In the 60s and 70s, Yalom and Pitt (1968, 1973) suggested that as many as 50-70 percent of mothers go through maternal blues. The most serious form of depression, puerperal psychosis, is rare. The occurrence of puerperal psychosis has been estimated as 0.1-0.2% of the postpartum women (Kendell et al. 1987), the majority being bipolar illnesses.

Postpartum depression is common and its occurrence has been estimated as being between 10-15% in different countries and cultures worldwide (e.g. Kumar and Robson 1984, Stein 1991, Cox et al. 1987, Jadresic 1995). The rate has varied due to different criteria (e.g. self-report questionnaire, clinical interview, general practitioner’s or psychiatrist’s diagnosis), different study designs (prevalence or incidence) and different time intervals (from few days up to several years) used.

Based on the review by O’Hara and Swain (1996) including the findings of 59 studies (n = 12,810), the average rate of postpartum depression was 13 percent. The occurrence of PPD in Finland was 12% in a study population of 279 women (Tamminen, 1990). In a more recent study of Finnish primipara women a surprisingly low prevalence, from 2.5% to 8.8% was found three to four months postpartum, whereas anxiety and stress disorders (24.7%) were observed more often (Eerola 1999). A few studies have set clinical criteria for PPD instead of self-report questionnaires and the estimated occurrence of PPD has then ranged between 3-12% (Tamminen 1990, Kumar 1997, Eerola 1999).
When antenatal women were compared to postnatal women at 3, 6 and 12 months postpartum the prevalence rates of depression were the same (Cooper et al. 1988). However, Cox and his colleagues (1993) argued that the risk to become depressed is higher during first three months, especially during the first five weeks postpartum than during other times of a woman’s life.

The symptoms can be relieved and diminished within one to six months. But sometimes, depression can become chronic. O’Hara (1987) found out in his study group that depression lasted for 6 months or longer in half of the postnatally depressed women. Thus, it should be acknowledged that without effective treatment postnatal depressive symptoms may continue for as long as one to two years.

2.1.4 Aetiology of postnatal depression

2.1.4.1 Risk factors of postnatal depression

Demographic factors. Mother’s higher education has been reported to be a protective factor and lower age a risk factor for depression (O’Hara 1986, Bernazzani et al. 1997). In another study low professional occupation with lower life satisfaction connected to other factors (e.g. infant’s low birth weight and disappointment with delivery) were associated with risk of depression (Bergant et al. 1999). Two Swedish studies found a positive link between single parenthood and postnatal depression (Wickberg et al. 1997, Bågedahl-Strindlund and Monsen Börjesson 1998), on contrary to earlier studies (O’Hara 1988, Murray et al. 1995). In addition, primiparity has been associated with PPD (Bågedahl-Strindlund and Monsen-Börjesson 1998) and more severe maternal blues (Beck et al. 1992).

Age has claimed to associate with postnatal depression; both older and younger women are at increased risk (Paykel et al. 1980, Kumar and Robson 1984). On the other hand, in various studies mother’s social class, education, race, age or parity has not been associated with postnatal depressive symptoms (Watson 1984, Cooper 1988, Murray et al. 1995). The consistent finding of demographic variables as risk factors for maternal depression is that they may increase the vulnerability to become depressed, such that depressive symptoms manifest after childbirth due to added stress to mother’s life with e.g. single parenthood or unemployment (Murray et al. 1995, Lane et al. 1997).

Obstetric factors. Some studies have demonstrated that the mode of delivery affects maternal mood and depression; Caesarean section (CS) being a risk for depression (Fisher et al. 1997, Boyce and Todd 1992). It seems that elective CS is not as traumatic to mothers as emergency CS. In a Swedish study groups of women delivered by emergency or elective CS did not differ from each other a few days after delivery, while at one month the emergency CS group showed more symptoms of post-traumatic stress than the mothers with elective CS (Ryding et al. 1998). The factors following explaining the higher risk of depression after CS have been suggested: 1) the mother is less likely to see
the newborn immediately after the delivery, 2) the partner may not be present to support
the mother during the delivery, 3) emergency CS is very unexpected and stressful to both
parents, 4) infants may have more postnatal problems, and 5) mothers with CS may have
more complications, like wound infection or post-operative pain than the mother with
normal vaginal delivery (VD). There are studies on the mode of the delivery and
depression that did not find any relation between CS and postnatal depression (Culp and
review article that fairly consistent findings in different studies indicate that CS mothers
have a higher risk of adverse psychosocial outcome than vaginally delivering women.
However, when assessing these results, methodological questions and weaknesses must
be taken into account, e.g. data collection immediately after the procedure, and elective
and emergency CS parturients in the same sample.

Pop (1995) studied home versus hospital deliveries and found no differences in the
occurrence of blues or depression between women who delivered at home and women
who delivered at hospital. Nor have any obstetric factors, such as episiotomy or induction
or augmentation of labour, or referral during pregnancy or labour been found to be

Previous gynaecological pain has been strongly associated with the intensity of labour
pain, but the association to postpartum mood has not been investigated (Niven and
Gisberg 1984). High childbirth burden followed by high anxiety have been reported to be
a risk for depression in a cohort study of 1,250 mothers in Austria (Bergant et al. 1999).

An interesting association between pain relief during delivery and a decreased risk of
the offspring to commit suicide in adult life has recently been observed. Jacobson and
Bygdeman (1998, 1999) found out that in a group of mothers who received multiple
opiate treatments during delivery, the estimated relative risk of the offspring to
subsequently commit suicide was smaller than in the group where the mothers did not
receive multiple pain relief during delivery (RR 0.26, p = 0.007). Earlier, Jacobsen with
another group (1990) argued that in the group of offspring who subsequently became
opiate addicts, a significant proportion of the mothers had received opiates or
barbiturates or both and had also received nitrous oxide for a longer time and more often
compared to offspring whose mothers had delivered without such pain relief. These
partly contradictory studies, however, were made in a population where the children
covered by the former study had been born between 1945 and 1980 and those covered by
the later study between 1945 and 1966.

Very few studies have assessed how modern analgesia during delivery affects the
occurrence of postnatal depression. In a recent Finnish study of 211 women, the major
predictors of disappointment with delivery were pain during labor and the mode of
delivery. Emergency CS or experienced inadequacy of pain relief were also associated
with disappointment. However, reported pain did not predict postnatal depression (Saisto
et al. 2001).
Biological and hormonal factors. The connection between many hormonal changes after delivery and postnatal depression has also been investigated, thyroid dysfunction and lower plasma levels of prolactin having the strongest associations with postnatal depression (Abou-Saleh et al. 1998, Hendrick et al. 1998). In the study of Abou-Saleh (1998), the women who were depressed immediately after delivery had significantly lower levels of prolactin. Also, those who developed depression within 6 to 10 weeks had significantly lower levels of prolactin and higher levels of progesterone than non-depressed women. Women experience thyroid dysfunction at a rate of up to 7% following childbirth compared with a rate of 3 to 4% in the general population. Approximately 12% of pregnant women are positive for thyroid antibodies, and hypothyroidism is the commonest thyroid dysfunction. It is shown that depressed mood occurs in a third of these women (Harris 1992). This may play an important role for a subgroup of postnatally depressed women (Goldman 1986, Harris 1992).

Breast-feeding has naturally been found to associate with hormone levels, but also with depressive symptoms. Mothers who breast-fed their newborns had higher levels of prolactin and significantly lower depression scores than mothers who did not breast-feed (Abou-Saleh 1998). Lack of breast-feeding has been associated with postnatal depression in many studies, but lack of breast-feeding could be either the cause or the consequence of maternal depression and mood (Tamminen 1990, Cooper et al. 1993, Lane et al. 1997).

Ploeckinger and his colleagues (1996) have claimed rapid decrease of serum cholesterol to be associated with PPD, but Luckas et al. (1997) have commented that oestrogen may be a confounding and mediating factor of serum cholesterol. Usually in the immediate postpartum oestrogen concentrations fall. In that study oestrogen levels were not controlled. A small sample of women with major postpartum depression, who subsequently relapsed, had a significantly greater growth hormone response to apomorphine than women who remained well. This difference has been particularly observed in women with anxiety and panic symptoms (Mc Ivor et al. 1996). Also changes in immune and neurotransmitter systems have also been investigated, but further research is needed.

The presence of maternity blues is commonly associated with later depression. This is partly thought to be transmitted through hormonal or biological changes after delivery, which unfortunately are obscure (O’Hara 1997). Many study results have been negative or contradictory for most of the hormonal variables, and a causal relationship between biological variables and postpartum mood has not yet been proved.

Social factors. Various epidemiological studies have come up with data suggesting that the major aetiological factors are largely of social nature (Thurtle 1995). Especially important are absence of social support from spouse, friends or family and stressful life events (Kendell 1985, O’Hara 1986, Cooper and Murray 1997). Social support consists both of practical support (e.g. baby-sitting, housework) and emotional support. Partner’s emotional support and positive thinking decreased relapses of the postpartum depression in a study of 38 couples during a six month follow-up (Marks et al. 1996). In a meta-analysis of 26 studies, lack of social support was found to have medium correlation to the PPD (Beck 1996).
A large, systematic study of 2,375 women found unplanned pregnancy, not breastfeeding and unemployment to be associated with postpartum depression (Warner et al. 1996). In a study of Lane and her colleagues (1997), single status, unemployment, unplanned pregnancy, public status and bottle feeding have been associated with high EPDS scores at 6 weeks postpartum.

Paternal mood and depression are also associated with maternal depression. Father’s risk of depression was significantly higher in those fathers whose partners were depressed both at 6 weeks and 12 months postpartum (Matthey et al. 2000).

Infant factors. In addition to many factors on the mother’s side, there may be infant factors that influence on maternal depression. Difficult behaviour in two-month-old babies was associated with maternal postnatal depression. Explaining factors for this finding might be that irritable infants have difficulties in controlling their emotions, and they are less easy to soothe compared to other infants (Whiffen and Gotlib 1989). In another study of 188 primiparous women neonatal irritability and poor motor function was found to predict postnatal depression (Murray et al. 1996). There are fewer studies on the role of infant factors in the aetiology of postnatal depression. It is possible that the infants react to parental mood and depression and vice versa.

Psychiatric factors. Hannah with her colleagues (1992) have reported a highly significant positive correlation of high EPDS scores at 5 days and 6 weeks postpartum. In two separate studies a close association between maternity blues and postpartum depression was found where blues at one week postpartum increased the risk of maternal depressive symptoms at 6 and 12 weeks postpartum (Beck 1992, Fossey et al. 1997).

A psychiatric history, especially a previous depressive episode, is commonly reported to predict postnatal depression. A history of bipolar illness in the family and a personal history of bipolar illness are known to associate with puerperal psychosis, but not with postnatal depression (Kendell et al. 1987). Cooper and Murray (1997) compared in a five year follow-up study a group of mothers with postpartum depression as a recurrence of prior non-postpartum mood disorder to mothers who suffered from their first postpartum depression. The former group was found at risk for developing subsequent non-postpartum depression, and the later group at raised risk for developing subsequent postpartum depression, but not for subsequent non-postpartum depression. Depression during pregnancy is also found to be a risk factor for postpartum depression (Areias et al. 1996). Premenstrual syndrome (PMS) was correlated to postnatal mood and depression in the survey of 1,329 women, although the screening used was a self-report questionnaire not specifically designed to detect postpartum depression (Sugawara et al. 1997).

243 mothers were found to have past psychiatric history with treatment or attempted suicide prior to postnatal depressive symptoms, but no association was found between prior family psychiatric history and maternal postnatal depression (Murray et al. 1995).
2.1.4.2 Prediction of postnatal depression using risk factors

There have been efforts to create a predictive index for PPD. Unfortunately scientific evidence for the significance of any risk factors or their interactions has been relatively weak. In addition, sample sizes in several studies have been small (Cooper and Murray 1997). Risk factors, such as lack of social support or a previous history of maternal depression only doubled the odds over the base risk rate (Cooper et al. 1996). However, in another study simultaneous maternal blues and infant irritability predicted significantly the onset of postnatal depression (Murray et al. 1996). Other meta-analyses have emphasised the importance of lack of marital or social support and previous psychiatric illnesses (Beck 1996, Cooper and Murray 1995, 1997). Good predictive risk factors for postnatal depression have not been created. There exists no stereotypical person who might represent all women with depressive symptoms.

2.1.5 Detection of postnatal depression

Because of huge difficulties in detecting postnatal depression, it has been called a hidden illness that secretly steals the motherhood from a woman herself and sometimes from the whole family. Symptoms of postnatal depression may be occasionally hard to detect as, weight loss, menstrual change, low libido, appetite change or lack of general interest may be natural postpartum phenomena. The mother may suffer from sleeping difficulties, or the newborn may frequently wake up. This has led to the development of many self-rated questionnaires, of which The Edinburgh Postnatal Depression Scale (EPDS, Cox et al. 1987) may be the one the most often used. The scale has shown to be superior to the Beck Depression Inventory (Beck et al. 1961) and equal to Hamilton Scale (17-item, Hamilton 1960) and the Montgomery-Asberg Depression Rating Scale (Montgomery and Asberg 1979) in the postpartum period. The EPDS captures the core features of low mood, anhedonia, anxiety and sleep disorder due to anxiety or other worries.

Thirteen years ago Tamminen (1990) pointed out in her study of 279 primipara mothers that postnatal depression is under-detected in the Finnish health-care system and around the world. In that study depressed mothers breast-fed their infants shorter period of time and had more negative experiences of breast-feeding. In addition, the depressed mothers felt that the nurses of the well-baby clinics were more controlling instead of supporting or understanding their problems. In a Swedish study of well-baby clinics, as many as 8.4% of postpartum mothers were depressed according to diagnostic criteria. However, public health nurses, who knew the mothers and had ongoing contacts with them, recognised only 2% of the mothers as being depressed (Bågelund-Strindlund and Monsen-Börjesson 1998).

The easiest way to detect PPD would probably be by directly asking about depressive symptoms. This does not always seem to work, either because the questions are not asked, or the mother declines to discuss the problematic emotions or issues due to incapability to recognise her emotions. Mother may be ashamed of not being the ideal
mother. She may deny her depression or she may be afraid of that her depression would damage her infant in some way.

As the symptoms of postnatal depression are not distinctive, one facilitating factor in the detection of depression could be more frequent use of self-report questionnaires. Usually, questionnaires are easily manageable and simple to interpret. Systematic screening by depression questionnaire could disclose those mothers who should referred to a more detailed clinical interview. The possibility to use double screening tests, e.g. two self-report questionnaires, might increase the sensitivity of detection of postpartum depression (Lee et al. 2000).

Also other screening tests, such as Postpartum Depression Screening Test (PDSS), Postpartum Depression Predictors Inventory (PDPI) and Postpartum Depression Check List have been developed to ease the work in open health care (Beck 2000). Two last mentioned have been designed as interview tools to health care professionals.

Although, the EPDS has been abundantly used and studied, is has also been criticised by Beck. She feels that the omission of three separate items of irritability from the original version of EPDS diminishes the power of this instrument (Beck 2000). However, in several studies the EPDS has shown to be a strong valid assessment of postnatal depression because it covers the core symptoms of depression.

### 2.1.6 Prevention and treatment of postnatal depression

With regard of the fact that PPD is a fairly common condition and causes suffering to many women, their infants and other members of the family, its prevention has provoked surprisingly little research interest. One obvious direction of prevention would be antenatal psychosocial support for both parents and, indeed, there is some support for its benefits. Midwives counselling, given support and explanations about the childbirth prior to labour provided a better postnatal mental health of the mothers (Lavender and Walkinshaw 1998). The statistical power of existing studies is, however, very limited (Lawrie 2000). The pregnancy is intensively monitored by midwives and GP in Finland, which gives the good opportunity to prevent maternal depression, e.g. by educating mothers.

In a more recent study early intervention of one hour prevention session between the second and fifth day postpartum resulted a significant reduction in frequency and persistence of depressive symptoms at 4 to 6 weeks postpartum, but not within the whole study group (Chabrol et al. 2002).

Another possibility of prevention might be the use of hormones. It is known that oestrogen treatment may alleviate postnatal depressive symptoms in severely depressed women (Gregoire 1996, Lawrie 2000). On the contrary, injections of synthetic progesterone (norethisterone) enhanced high maternal depression rates compared to placebo at six weeks postpartum (Lawrie 1998). Higher thyroxin levels predicted severe, concurrent maternal depression, whereas higher progesterone and lower prolactin levels enhanced occurrence of depressive symptoms at two to three months postpartum, and the prolactin levels were significantly higher with the non-depressed women, who breast-
fed their children (Abou-Saleh et al. 1998). More randomised, controlled studies are needed to clarify the role of hormones as etiologic factors and in prevention.

Typically, postnatally depressed mothers go through silent suffering. Effective treatments are available, but help is often not actively sought. Small and his group (1994) found out that only one third of depressed mothers sought professional help. However, these mothers often advised other depressed mothers to find someone to talk to. Treatment for depression has varied according to the severity of the illness. Mild to moderate depression can be treated with either psychotherapy or antidepressant medication, but severe depression often requires both, and sometimes hospitalisation is needed (Stotland 1999).

For antidepressants, selective serotonin reuptake inhibitors (SSRI) are preferred, because they are effective and easy to describe and use (Rothschild 1995). They have a benign side effect profile, they are not toxic when taken in overdose, and although they are excreted in breast milk, there are no known short-term adverse effects to the infant, e.g. paroxetine, fluvoxamine and sertraline produce only minimal exposure to infants when taken by breast-feeding mothers (Lamberg 1999, Hendrick et al. 2002). Fluoxetine has occasionally been associated with infant’s crying, watery stools and sleep disturbance, and sitalopram with disturbed sleep (Lester et al. 1993, Schmidt et al. 2000). Although, long-term effects on the developing infant brain are not yet known, and therefore prescription of an antidepressant for a breast-feeding woman should be made on a case by case basis (Wisner et al. 1996, Gupta et al. 1998).

Various forms of psychotherapy modalities can be effective (e.g. supportive, cognitive-behavioral, psychoanalytic or family therapy) (Holden et al. 1989, Cooper and Murray 1997, O’Hara 2000). Treatment should always begin in primary care. Cognitive therapy is directed at problem solving and infant-management problems. Dynamic psychotherapy is centred on the mother-infant relationship, e.g. parental coaching and infant massage is used to improve dyad. Supportive therapy gives guidance for child rearing situations, encourages expressing negative feelings and helps to deal with aspects, such as ideal motherhood or negative birth experiences. The most often used therapy modalities are supportive or cognitive therapies. In one community-based study, a group of 87 women with PPD was divided into four subgroups of twelve weeks treatments. The first group was treated with placebo and the second with fluoxetine. The third group received one session counselling and the last group six sessions of counselling. It was found that both fluoxetine and intensive counselling improved maternal depression significantly at one week postpartum. Although, all four study groups had recovered after four weeks (Appleby et al. 1997). In a small study by Stuart (1995), short-term interpersonally oriented therapy seemed to have potential in the treatment of PPD. Group therapy, besides reducing mother’s depressive symptoms, tries to facilitate, enable and support each member of the dyad and family to respond better to one another, and to find positive behaviours in each dyad by structuring, modelling and reflecting affect and behaviour seen (Clark 1993).

Although the seasonality of postnatal depression has not been investigated bright light therapy has proved to be successful for treating postnatal major depression in two case reports (Corral et al. 2000).

If hospitalization is needed it is important that mothers continue to look after their child, because depressed mothers who take care of their children seem to function better
(White et al. 1995). In addition, staff can closely monitor mother’s behaviour and encourage continuation of bonding and provide positive feedback and support in different interactional situations.

In conclusion, both active counselling or therapy and antidepressants are suitable for treatment of postnatal depression. First it is important to recognise mothers with depressive symptoms. Many successful studies of the treatment of postnatal depression are placed in the primary health-care (Holden et al. 1989, Mynors-Wallis et al. 1995, Chabrol et al. 2002) and therefore it is important to provide sufficient knowledge and resources in the well-baby clinics to improve maternal postnatal mental health.

2.1.7 Impact on child development and early interaction

2.1.7.1 Early interaction

Early parent-child relationship in relation to the developmental psychopathology of children has been studied in last twenty years. Nowadays, the child is viewed in the context of social, psychological and biological factors which constantly intervene with each other. For academic research, methods based on the Bowlby’s attachment theory (1969, 1980) have proven very useful. Postnatal mental illnesses of the mother have been claimed to cause insecurity, avoidance of attachment on the part of infant and problems of bonding between the mother and her newborn (Radke-Yarrow 1985, Kumar 1997). Murray (1992) found that children of depressed mothers had more often insecure attachments at the age of 18 months than the children of non-depressed mothers.

Stern’s theory (1985) impresses the importance of early experiences. It is based on the idea that infant has innate observable capacities which will be organised into the sense of self and others within social experiences. The initial early experiences constitute a sensitive period of development, but new development occurs through life-span. The mother regulates infant’s physical needs, such as sleep or hunger, but also infant’s affect intensity, state of arousal and security. Maternal characteristics that facilitate “good enough” interaction are seen important, such as emotional availability, correct and appropriate timing and responsiveness and interpretation of infant’s needs. In this study we have focused on identifying quality of interpersonal functioning when interacting with the mother (Rutter 1991, Cummings and Davies 1994).

Several models of the effect of postnatal depression on early interaction have been suggested: Field (1992) has suggested that mother’s behaviour is imitated by the infant, whereas Tronick and Gianino (1986) have emphasised the importance of a critical, sensitive time period of the infant’s early development when inadequate stimulation in the dyad leads to weaker interactional skills. Field has later suggested that a combination of these two factors may explain the effect of maternal depression on the infant. Little is known about the exact parameters involved, and more elucidating data are needed. Although, it is evident that postnatal depression poses a risk for mother-infant relationship. The impact is likely to be more pernicious when depressive symptoms are
severe and persistent, and when it occurs in the context of personal and social adversity (Murray and Cooper 1997).

2.1.7.2 Cognitive and linguistic development

Studies of the effects of postnatal depression on later cognitive development of the infant are largely based on developmental psychology. For two centuries, researchers have been occupied with the issues of heritability and developmental flexibility of human intelligence. Intelligence has been seen as a highly genetic heritable feature, which is influenced and coloured by unique, individual experiences (Scarr 1992, Hay 1997).

In the study of Cogill (1986), further analysed by Hay (1996), children of depressed mothers had lower scores on cognitive testing (several tests) than children whose mothers were not depressed during the first year. Some researchers have claimed that there could be vulnerability factors within the child that provoke maternal depression and later developmental problems. One such proposed factor has been the newborn’s low birth weight (Kumar and Robson 1984, Cicchetti 1991). In contrast to newborn’s low birth weight, maternal education seems to be protective factor. In a study of 50 British women, the difference of the cognitive outcome during the first year between children of depressed and non-depressed mothers was only marked out when the mothers were less educated (Hay 1997).

Recent research in normal language acquisition has emphasised the role of social interaction in linguistic development. The social theory on language acquisition assumes the interaction between the caregiver and the child to be of primary importance, with responsibility resting largely on the adult who brings structure to the dyad and guides the language learning process (Bruner 1975, 1983, Vygotsky 1978). However, the child is viewed as an active participant who learns to affect the behaviour and attitudes of others through active signalling (Bates 1976, Harris 1992, Tomasello et al. 1992).

The most central elements of adult behaviours which contribute to the child’s early communicational development are responsiveness to the child’s actions and the quality of attention-directing strategies (Elliot 1981, Akhtar et al. 1991). Stern (1985) has considered the relationship between communication development and socioemotional development in young children as he has identified socioemotional achievements that appear prior to and concurrent with the development of intentional communication. Maternal sensitivity, i.e. being able to respond appropriately and consistently to the child’s stimuli, and reciprocal communication are associated with better language development in children (Tomasello and Farrar 1986, Fiese 1990, Laakso et al. 1999). Parental sensitive activity includes, e.g. maintaining the infant’s attention and motivation, explaining and simplifying the task, demonstrating and suggesting critical features (Stevens et al. 1998).

Symptoms of clinically significant depression are likely to foster less sensitive and less engaged maternal care as well as more maternal negativity (Cummings and Davies 1994, NICHD 1999). In general, depressed mothers are less responsive to their children and less able to sustain social interaction (Cox et al. 1987). However, the infant-focus speech of the mother predicted better the performance on linguistic testing at 9 months.
and on cognitive testing at 18 months than maternal diagnosis (Murray et al. 1993). One has to remember that earlier studies are fairly conflicting and some of them are contradictory, partly due to differences in methods, sample sizes and the criteria used for postnatal depression. One contributing factor that could explain the consequences of maternal depression to child’s cognitive development is the persistence of depression. The longer it lasts, the deeper the impact (NICHD 1999). More conclusive data are needed to determine the specific impact of maternal depression on language and communication development. Available data underscore the importance of the social context of the child’s cognitive development.

2.1.7.3 Behavioural and emotional development

The importance of early experiences has been extensively studied from both the emotional viewpoint, associated with attachment theory, and from the cognitive viewpoint (Bowlby 1958, Ainsworth 1969, Rutter 1991).

In a study of 92 primipara mothers it was found that depressed mothers as well as mothers with marital discord reported significantly more behavioural and emotional difficulties in their children, compared to women without depressive symptoms or social disharmony (Caplan et al. 1989). A meta-analysis of 4,561 mother-infant dyads from the studies published between 1977 and 1995 found maternal postnatal depression to increase child’s behavioural and adjustment difficulties, but again the results were largely influenced by sample sizes (Beck 1999). In one study design, the child’s behaviour at the age of five at school during free play situation was not associated with maternal postnatal depression or with the child’s gender, family’s social class or marital conflict. However, postnatal depression had an adverse effect on the child’s physical and creative play at school (Murray et al. 1999).

Keller and colleagues (1986) found that the more severe and more chronic the parental depression, the poorer the adaptive functioning and the greater the difficulties, e.g. depression, in the children. In a more recent study based on 1,215 families at 36 months postpartum, maternal reports of behaviour and co-operation varied among mothers with chronic depression, mothers with occasional depressive symptoms and mothers without any depressive symptoms (NICHD 1999). Chronically depressed mothers rated their children as less co-operative and more problematic than other women. The results were associated with maternal sensitivity, so that when maternal sensitivity was high, the depressed mothers did not rate their children lower on the behaviour scale than non-depressed mothers (NICHD 1999).

As for infant characteristics, it is possible that in the presence of postnatal depression, gender is a risk factor for boys and a protective factor for girls. Sometimes boys are more likely to be avoidant in the interaction. They express equally both negative and positive affects, as opposed to girls. In addition, in some studies postpartum illness is associated with later problems in boys only (Murray 1992, Tronick and Winberg 1997).

Different mechanisms have been proposed to explain the effect of postnatal depression to child’s psychopathology (Murray and Cooper 1997). First, maternal depressive
symptoms have a direct effect to the child. Mothers with chronic depression have infants with more behavioural problems such as sleeping and eating problems and temper tantrums (Campbell et al. 1997), and severity of depressive symptoms associates with compromised cognitive and attachment security (Lyons-Ruth et al. 1986).

Second mechanism might be the maternal interactional and parenting style, secondary to maternal depression. Postnatally depressed mothers may be emotionally unavailable for their infants and they may withdraw from interaction situations. In addition, they may respond in an inappropriate or unexpected or even hostile manner to their child. A meta-analysis of 19 studies attempted to answer the question of what is the magnitude of the effect of postnatal depression on the mother-infant relationship during the first year postpartum (Beck 1995). A moderate to large effect was found on maternal and infant interactive behaviour. Depressed mothers may not pick up their infants’ signals, smiles, gestures or vocalisations and, thus the synchrony of the interaction may not be found and the infant’s needs not be satisfied. Murray (1996) analysed face-to-face interaction of two-month-old babies and their depressed mothers. No severe engagement disturbances were found, but the depressed mothers were less affirming and less sensitively attuned towards their children than non-depressed mothers. Also, social context influenced the outcome results of postnatally depressed mothers and their children.

Third, samples of women with postnatal depression drawn from disadvantageous populations have been reported to have more severe problems of interaction than samples from low-risk groups (Field 1992, Murray 1996). A study of 49 mothers and their infants showed that marital and social difficulties were the best predictors of unsatisfactory interaction between mother and infant, not maternal depression. In addition, lack maternal warmth was not found to have association with depression, except with chronic and severe marital and social difficulties (Stein et al. 1991).

Fourth, the impact of maternal factors, such as depression, might not be reason to later, poor child outcome. There are infant factors which influence on the early relationship as well, such as infant irritability or avoidance (Murray et al. 1996).

In summary, maternal postnatal depression can be a risk for longer-term behavioural and socioemotional difficulties in children, but many additional or mediating factors may exist (e.g. marital discord or infant gender).

2.1.8 Impact on the partner and paternal depression

Paternal postnatal depression has been far less frequently studied than maternal depression. Estimated rates of paternal depression have varied from 4 to 13% (Ballard et al. 1994, Areias et al. 1996) in the early postpartum period, but as in general when comparing depression among men and women, the prevalence rates of maternal depression seem to be higher.

In an Irish study, 1% of the fathers were rated as depressed 6 weeks postpartum, but the result may have been an underestimation due to a lower (n = 175) response rate in men compared to women (n = 244). Coexistent depression in both parents was rare (Lane et al. 1997). In another study, prevalence, couple morbidity and risk factors were studied
in parents in the postpartum period (Matthey et al. 2000). 59% (n = 166) men agreed to participate, 2.8% to 5.3% of whom were scored as being depressed. As significantly greater risk of fathers scoring high at 6 and 12 weeks postpartum was found in men having had a depressed partner, but the risk was not found in antenatal assessment or 4 months postpartum. As risk factors, low antenatal mood and difficulties in partner relationship predicted postnatal depression for both partners, and by the end of the first year postpartum couple morbidity increased. In a Portuguese study, the rate of postnatal depression in men was low (3%), and men were depressed later during the first postnatal year compared to women. Men were more likely to become depressed if their partner was depressed, and 50% of depressed men had had major depression according to Research Diagnostic Criteria (Areias et al. 1996).

A history of paternal psychiatric problems as well as maternal depression has been also associated with childhood behavioural difficulties (Caplan et al. 1989). Clark (1998) has pointed out that the fathers may be confused, overwhelmed by and afraid of the practical and emotional demands when the mother is depressed. This issue should be taken into account when treating maternal depression.

2.2 Affect inference

2.2.1 Viewing emotions

Emotions have for centuries been considered central to human functioning. In ancient Greece, Aristotle divided mental functioning into a tripartite system: cognition, emotion and motivation. Before that, Homer in Iliad mentioned emotions and faces when warriors confronted each other “shamefaced, pale with fear”. Early in the twentieth century emotions were viewed as trivial or disruptive to stimulus-response sequence of thinking and functioning. Since mid-twentieth century, emotions have again gained a central and important position within other aspects of mental functioning. Hinde (1985) has viewed emotions as a continuum, with motivational functions at the one end and communicative functions at the other end with cognitive functions intertwined between.

Emde (1993) has pointed out four principles to guide our thinking with regard to emotional signals and their use in infancy. The first principle is obvious as, previously discussed: emotions are inseparable from other aspects of mental functions.

The second principle is that human emotions are biologically prepared for communication at birth and they develop within social context. This means that the newborn is programmed to send emotional signals to the caregiver which reflect states of satisfaction and need, degree of alertness and adaptation. In early infancy emotions are limited to express distress and pleasure and degrees of arousal, but it is thought that within six postnatal months discrete patterns of emotions develop (Izard 1972, Emde 1980). This means that when interpreting emotions a large number of regularities based on biology are seen, but later on individual variations representing the uniqueness of the newborn’s environment are observed (Emde 1993).
Thirdly, affect is a construct which cannot be thought of as a single facial expression, voice, gesture or word. At psychological level each newborn constructs the meaning of each emotion using its experiences, particular memories or expectations. At social level, the emotions are organised in the context of shared meaning with others. Therefore early, basic emotions are practised and moulded by the newborn’s own and shared experiences with the caregiver. This partly determines issues such as what the infant is proud or ashamed of or hurt by.

The third principle leads us to the fourth one: the emotional availability of the caregiver is important for the infant’s development. The infant’s emotional life is largely dependent on the basic emotions becoming exercised and fine-tuned, and more complex emotions evolve with the caregiver and others.

In this thesis we have concentrated to view emotions as pre-verbal language, e.g. the newborn’s means to communicate before learning language, which is influenced by maternal sensitivity to interpret the infant’s emotional signals and her availability when interacting with the infant. Affect is a measure of emotion, which may be expressed by vocalisations, gestures or facial expressions. Emotions are connected with physiological appearances, which when sustaining and pervasive construct a person’s mood. In this study, we have focused purely on facial expressions of emotions from still pictures.

2.2.2 Affect and culture

Charles Darwin (1872/1965) has described and studied states of emotions and their facial appearances on his children and different animals. He concluded that there are eight basic emotion categories, which serve as species-important adaptive functions and survival. These emotions have been and are the following: joy, surprise, anger, fear, sadness, disgust, interest and other. These emotions are thought be biological and universal. Beyond these Darwinian affect categories a vague area begins. There is debate as to which emotions or feeling words are universally expressed, labelled and recognised and which may be interpreted differently according to different situations, environments or cultures. The exact number and the most suitable names for emotions with universal expressions have not yet been determined.

2.2.2.1 Facial expressions of emotions

In several studies, Ekman has proved the universality of facial expressions of emotions such as fear, anger, disgust, sadness and happiness or joy. Since the late 1960s, he has studied preliterate and literate, isolated and modern, Western and non Western cultures, and found overwhelming universality of perception and recognising emotions from facial appearances (e.g. Ekman et al. 1969, 1987, Ekman 1994). Three different kinds of study designs have been used: 1) members of one culture have been asked to show how their face would look if they had been the person feeling each of the different emotional
contexts, 2) facial expressions shown during unpleasant and neutral situations of Japanese and American have been measured, and 3) photographs of faces have been shown to observers who had been asked to judge one emotion displayed. Unknowingly from each other, at the same time as Ekman and colleagues, Izard studied the cultural issues of emotion in literate cultures, and later in infants and adolescents, and found the same uniformity in recognising and labelling facial countenances in different cultures (e.g. Izard 1972, 1990, 1994). In order to prove the universality of recognition of facial expressions when using more than one feeling word and judging intensity of emotion, Ekman and Friesen (1987) conducted a study of 550 college students from 10 countries ranging from Estonia to Sumatra. Strong universality was found concerning recognition of the first and the second emotion expressed, but there was some evidence of cultural differences in intensity judgements. Less intense emotions were reported when evaluating foreigners’ facial expressions compared to the faces of people coming from the same racial background.

The hardest criticism against the universality theory has been presented by Russell, who based his criticism mostly on the observation that Ekman’s and Izard’s work was partly highly dependent on words which are not directly translatable from one language to another (Russell 1994, 1995). Izard (1994) in her reply has reminded us that in different languages, emotion expressions labelling, finding semantic equivalents, should be separated from the universal capacity to express and recognise facial emotional expressions, even if there were only a limited set of emotions which are innate and universal.

A recent Japanese study has compared Japanese and American observers when recognising and judging the intensity of emotions from still photographs, and they have suggested that the Japanese might be less responsive to emotions which are blended or weakly expressed due to different cultural codes (Shioiri et al. 1999). In a Japanese IFEEL Picture studies of interpreting infant’s emotions from still pictures Japanese investigators felt in necessary to create an entirely new deck of pictures portraying only Japanese infants. They also found it necessary to establish 18 rather than the standard 12 or 13 emotion categories (Inoue et al. 1994). This has led questions such as; does infant race significantly affect adult emotion inferences? Are there feeling states and facial configurations that Western cultures are missing when compared to Japanese culture?

In conclusion, facial expressions of emotion are mostly universal (e.g. neurology or muscle action and recognising basic emotions), but partly culturally variable (e.g. displaying rules and semantics).

### 2.2.2.2 Measuring facial expressions of emotions

Expressed emotions can be pure or blended, spontaneous or volitional. Many researchers have pondered on the idea of the sequential nature of emotions; the person is feeling ashamed, but is trying to deceive that by laughing or the person is angry and relieved and happy at the same time when finding her lost child or the person is surprised and happy or wondering and sad at the same time. Nummenmaa (1988) has speculated around the
possibility to recognise blended facial expressions of emotion from still photographs. He has raised the question: what emotions, pure or blended, can be read from the face alone? After five multimethod approached studies he has come to conclusion that using still photographs is useful in certain study designs, such as investigating individual differences in facial repertoires.

Both Ekman and Izard (1993, 1994) have developed a code system for scoring any observed face movement during each expressed emotion. EMG can also be used for assessing physiology of facial expressions of emotion. Films, videos, photos or even live actors can be used when measuring recognition of facial appearances.

In limitation we have to remember that as stated by Ekman (1992), studies of facial expressions of emotion seen out of context answer the question what the face is able to signal, not what it does actually signal in each situation of everyday life.

2.2.2.3 Cultural issues in adapting a new method

The fact that emotion words in different languages do not translate in a one-to-one fashion is one of difficulties that has to be solved before adapting a method based on words in a foreign language. Many researchers have noticed this (e.g. Russell 1994, Izard 1994), but in some studies the translation issues have been ignored or are very difficult to solve. In some cultures, different concepts of emotion are used, e.g. the Japanese emotion concept Amae, (a form of intimacy and silent mutuality) (Emde 1992), and in others, some emotion categories are not translatable into specific words (Russell 1995).
3 Aims of the study

The study is a prospective follow-up study of mothers with postnatal depression and their children, emphasising the importance of special risk factors and consequences.

The aims were:

1. to measure the occurrence of maternal, postnatal depression in different seasons, during the dark and light periods
2. to examine pain relief during labour in relation to postnatal depression
3. to measure the occurrence of paternal depressive symptoms
4. to examine and to adapt a new method of parental affect inference (the Infant Facial Expressions of Emotion from Looking at Pictures) to our culture and to Finland
5. to evaluate the effects of maternal postnatal depressive symptoms on mother-infant interaction at 10 months postpartum and the child’s linguistic abilities at the age of three and a half years of age.
4 Material and methods

4.1 Study design

This is a prospective, longitudinal follow-up study of mothers and their children from Northern Finland, which focuses on the development of maternal postnatal depression; risk factors and its later consequences to the child and the early mother-infant relationship.

Original data were collected from maternity wards of the University Hospital of Oulu from 1<sup>st</sup> January 1996 to 31<sup>st</sup> March 1997. The mothers of the newborn infants were informed of the study by the nurses or by the researcher at the maternity wards. Questionnaires were handed out seven days each month of the year in order to get data from the entire year. Data collection was continued over the year due to the fact that it was decided to add two further questionnaires (Beck Depression Inventory (BDI) and General Health Questionnaire (GHQ)) later.

During the second phase a group of mothers and their children were selected randomly for videotaping limiting the selection to inhabitants of the city of Oulu and requiring that at least one mother videotaped each month had high depressive scores on Edinburgh Postnatal Depression Scale (EPDS). This group was named as the Early Relational Assessment, (ERA) subgroup (n = 51). The videotapings were carried out from January 1997 to April 1998. At three and a half years of age, the children’s linguistic development was evaluated by logopaedist.
A pilot sample of 42 women who had just given birth was collected in 1995 from University Hospital of Oulu. The purpose was to evaluate and adapt the Infant Facial Expression of Emotion from Looking at Pictures (IFP) in Finland. Part of the method is based on categorising emotions according to a special compiled lexicon (Emde et al. 1993). This lexicon was translated from English to Finnish by a native American and re-translated from Finnish to English by another native English speaker to verify accurate translation. An excellent certainty was achieved (95%) between the English and Finnish words.
### 4.2 Subjects

The study was performed at the maternity wards of the University Hospital of Oulu in 1996 and 1997. On admission to the maternity wards after delivery inquiries were made to the mothers about their willingness to participate in a follow-up study of maternal and newborn well-being. Approximately 660 mothers were potential participants. 187 volunteer mothers completed the IFP and the EPDS ($n = 185$) immediately after delivery. 155 of those mothers also completed the GHQ. Depressive symptoms were reassessed four months postpartum ($n = 162$). At the second phase 23 (12.4%) of mothers dropped out, and at the third stage 28/79 (35%).

![Flow chart](image)

**Fig. 2. Flow chart**

Demographic data were obtained from all the parturients. The mean age (SD) of the mothers was 29 (5.3) years (range 19 to 44 years). 87/187 (46.5%) women were primiparous. 176 (94.1%) of the women were living with a partner during the infant was born, 8 (4.3%) women were single, and 3 (1.6%) were divorced. 60/187 (32.3%) of the women had university education, 117 (62.9%) had high school degree or vocational education, and 9 (4.8%) had basic education, i.e. 9-year compulsory comprehensive school. 6/189 (3.2%) children were prematurely born and there were two twin deliveries. 53.9% of all children born were boys.
Mothers were divided according to the EPDS scores into two groups: mothers with and without high depressive scores. Mothers, who persistently reported depressive symptoms in the EPDS, in the first week and 4 months postpartum, were defined as persistently depressed; and those who reported depression only once or never were viewed as a control group when assessing mother-infant interaction and toddler’s linguistic development.

Obstetrical data were collected in order to assess the effect of labour analgesia on postnatal depression. The parturients were divided into five different groups according to the mode of delivery and the analgesia used during labour. The first group of women (n = 23) delivered vaginally without any pain relief. The second group of women (n = 17) received either inhaled nitrous oxide, or acupuncture with intracutaneous injections of sterile water or both during vaginal delivery (VD). The third group of women (n = 104) received epidural analgesia or paracervical blockade (PCB) during VD. Some of them were also given pudendal blockade (n = 4), nitrous oxide (n = 47), or acupuncture (n = 18). The fourth group comprised 32 women who had an elective Caesarean section (CS), and the fifth group of 11 women underwent emergency Caesarean section. The elective CSs had been done using spinal or epidural anaesthesia or their combination. The length of labour as well as the time spent in the delivery room before the child was born were also calculated to rule out the possibility that there was no time to administer analgesia.

Paternal depressive symptoms (n = 136) were assessed by the BDI at four months postpartum. 51 mother-child pairs were videotaped to assess early interaction by the ERA when the child was ten months old. The children were selected randomly to include both families with and families without maternal depression including equal number of children born each month of the year. Of the videotaped families, 44/51 children were tested for linguistic competence using the Reynell Developmental Language Scales III (RDLS III) by a logopaedist at the age of three and a half years.

4.3 Methods

4.3.1 Methods of the first phase: Questionnaires

4.3.1.1 Edinburgh Postnatal Depression Scale

Edinburgh Postnatal Depression Scale, constructed by Cox (1987), is a self-report questionnaire, especially designed to detect postnatal depression. It consists of 10 items, such as being able to laugh and enjoy, being anxious or scared or worried, self-blaming, inability to cope, depressive thoughts, sleeping difficulties based on depression, and suicidal thoughts. The scale rates the intensity of depressive symptoms present during the previous seven days.
Each item is scored on a 4-point scale (0 to 3). Maximum total score is 30. A cut off point of 13 (≥13) or 10 (≥10) points is used to detect depressive mothers. It has been noticed that to be able to recognise every mother with depressive symptoms, one should use a lower cut-off from 13. If the cut off point 10 is used the sensitivity of the method increases, but at the same time the number of false positive cases increases as well (Cox et al 1987). Therefore we used both cut-offs and classified scores 13 or more as "depression" and scores 10 or more as "mild depression". Persistent depressive symptoms were defined as EPDS scores 13 or higher once and another EPDS score of 12 or higher (Murray et al 1995, Chabrol et al 2002).

The EPDS has been used worldwide (Cox 1987, Jadresic et al. 1995, Wickberg and Hwang 1996, Areias et al. 1996, Pajulo 2001) and it has been translated at least into 12 different languages. The estimates of the rates of postnatal depression using the high score (13 or more) criteria of the EPDS are also quite similar from country to another (e.g. Great Britain, Chile, Germany, France, Sweden, Finland and United States). It has shown a good sensitivity and specificity in different countries and cultures; 96% and 49% in Sweden, 86% and 78% in Britain respectively (Wickberg and Hwang 1996, Cox et al. 1987, Harris et al. 1989). Tamminen reported a 12% incidence of postnatal depression in Finnish mothers in the 1990’s, when sensitivity of the EPDS was 64% and specificity 96% (Tamminen 1990). However, in a recent Finnish study none of the depressed women were found with the higher cut-off of thirteen (cut off 9/10, se 84% sp 67%, Eerola 1999).

### 4.3.1.2 General Health Questionnaire

To detect psychiatric morbidity and the need for psychological support, Goldberg (1972, 1978) developed a self-report assessment; the General Health Questionnaire. Originally the questionnaire consisted of 60 items, but shorter, combined versions (36, 30, 28, 20, 12-items) are used more often today. The versions most often used might be those with 30 or 12 items. However, GHQ-36 is reported the most accurate in detecting anxiety and depression with anxiety (Katz et al. 1995, Aalto-Setälä 2002).

The items of the 12-item questionnaire relate to distress, depression, self-esteem and inability to cope in everyday situations. It emphasises everyday life activities, and therefore some of the items may not be quite suitable for postpartum screening, such as: "Have you been able to concentrate on your work?" or "Have you recently been constantly under strain? ".

The items are scored on a 2-point scale (0 to 1, maximum score 12). The cut off points of three or more is used to detect psychiatric morbidity. As score of two or less indicates normal mental health. The method has been recently validated in Finnish society, and it has been used in several Finnish studies (Viinamäki 1994, 1997, Eerola 1999, Aalto-Setälä 2002).
4.3.1.3 Infant Facial Expressions of Emotion from Looking at Pictures

Emde, Osofsky and Butterfield (1987) have developed an instrument entitled the Infant Facial Expressions of Emotion from Looking at Pictures in order to study individual differences in the perception and interpretation of infant emotions of facial appearances. The IFP provides a new foundation for studying the mother-infant emotional relationship because it tries to capture the parental interpretation of the infant emotions by non-verbal signalling of facial expressions. This foundation is based on the observation of regularities in maternal responses to infants’ emotional signals. The manner of perception depends both on the signal emitter (i.e. the child) and the signal receiver (i.e. the mother) and is always considered an interpretation, because the mother sees the infant facial expressions according to her own frame of reference (e.g. experiences from other children, experienced maternal depression or new-born’s illness).

The IFP consists of a standardised set of 30 pictures of one-year-old infants which have been developed to present 15 pictures displaying clear and distinct facial expressions of emotion, such as joy and sadness, and 15 pictures portraying rather more ambiguous expressions of emotion, like shyness, anxiety or contentment (Figures 3a and 3b). The variety of colouring, shadowing and clarity of the photos is designed to model daily occurrences rather than clear prototypes of distinct emotional expressions.

![Fig. 3. a) and b) The IFP pictures numbers 114 and 112.](image)

The IFP were viewed by the mothers during the first postpartum week. The mothers were asked to look at the 30 infant photographs in a standardised order, and they were asked to express in one word the feeling which they thought the infant showed.

There are two methods for scoring the word responses from the IFP. The first is the categorical method, which classifies a response to a specific emotion category. The second is a dimensional method, which classifies a response by coordinates of emotional intensity and hedonic tone; according to their location on two dimensions. All the responses of the mothers were scored by the categorical method and a small sub-sample of the responses was also analysed by the dimensional method (n = 18). The dimensional
approach was used to test the similarity of the Finnish lexicon compared to the English one.

When using the categorical method a lexicon is used where the categories are made up of words which tend to cluster together when rated for their dimension of positive versus negative tone and high versus low emotional intensity. Each word is grouped into one of the 13 affect categories according to the manual (Emde et al. 1993): surprise, interest, joy, content, passive, sad, cautious/shy, shame/guilt, disgust/dislike, anger, distress and fear. When an answer is not found in the lexicon, it is classified in the category ’other’. If there is no answer, it is classified as empty.

4.3.1.4 Beck’s Depression Inventory

Beck (1961) constructed an inventory to measure depression, Beck’s Depression Inventory (BDI). It has been used worldwide for decades and it has shown a high degree of reliability and validity, although it is not very suitable for detection of postnatal depressive symptoms (O’Hara et al. 1984, Gotlib et al. 1988, Beck 2000). The 22 items are scored by a 4-point scale (0 to 3) and a cut-off of 15 or more is used to indicate depression. We chose the BDI as a method to detect paternal depression at four months postpartum.

4.3.1.5 Family scale

An additional scale was developed to gather information on infant’s feeding, sleeping, crying and health as well as social aspects at home, such as nursing and housework in the postpartum period. There were seven structured and two free questions. The free questions were: 1) What kind of emotions does being a mother arouse in you? and 2) Would you like to tell us about some special events of your everyday life, problems or pleasures? (See Appendix 7)

4.3.2 Methods of the second phase

4.3.2.1 Early Relational Assessment Scale

The mother-child interaction was evaluated by using the ERA (Clark 1985). The purpose of ERA is to evaluate the affective and behavioural characteristics which both the child and the mother express in the dyadic interaction. This assessment measures the areas of strength and areas of concern in the parent, the child and the dyad; both from the child’s and mother’s viewpoint. The method provides a window to observe different items in
different everyday life situations, e.g. parent’s emotional availability, behaviour and capacity to structure environment, child’s responsiveness, communication, behaviour and play as well as mutuality and joint attention of the interaction.

The ERA consists of 65 variables. These variables encompass parental, infant and dyadic items. The parental scales are: Tone of voice, Affect, Characteristic mood, Expressed attitude toward child, Affective and behavioural involvement and Parental style. The child scales are: Affect, Behaviour abilities, Activity level and Communication, and the dyadic scales are Affective quality of interaction and Mutuality. (see Appendix 3)

All videotaped episodes were 5-minute segments of free play or semistructured task situations including free play. The videotapings were taped in the home environment.

The variables are scored on a 5-point scale, on which one (1) is the poorest and five (5) is the best. This rating scale can be arranged into three different categories (1-2 = area of concern, 3 = some concern, 4-5 = area of strength). However, in this study there were only four ratings of 16,575 alternatives with score one (51 infant-mother dyads x 65 items /dyads x 5 alternatives /item) as it is extremely alarming behaviour or emotion. Additionally, there is only a modest difference between scores four and five, e.g. considerable amount of positive affect versus characteristically positive affect (see appendix 2). Therefore the scales were combined into three categories: area of concern (category one, score 1), area of some concern (category two, scores 2-3) and area of strength (category three, scores 4-5).

In order to get a measure of reliability, 20 percent (n = 10) of the videotapes were randomly selected and separately assessed by two independent evaluators (one child psychiatrists, A.K and the author), who had been trained in the use of the ERA-method by Pia Risholm-Mothander. Both raters were blind to maternal depression status and to any other data about the mothers and their families.

In standardised reliability test, 80% or more of inter-rater agreement was achieved in 52/65 items which were selected for further analysis. 100% reliability was achieved on 20 items, 90% on 19 items and 80% on 13 items.

4.3.2.2 Reynell Developmental Language Scales III

Children’s language competence was assessed with the Reynell Developmental Language Scales III (RDLS III) (Edwards et al. 1997), administered during a home visit at 42 months by a logopaedist (Leila Paavola). The scales are designed for assessment of language abilities that normal children display from one and a half to seven years, giving scores on expressive language and comprehension.

The Expressive Scale has 62 items organised into six sections. Various aspects of language are covered, such as naming and labelling of objects, describing activities and defining words. In order to score, the child has to use appropriate vocabulary and grammar to convey a message. The items are introduced with toys, pictures or finger puppets in addition to verbal stimuli.

The Comprehension Scale also has 62 items in ten sections, which tests comprehension of single words and basic relations between words, understanding of
attributes and spatial relations, understanding of thematic roles in sentences as well as complex grammatical and inferencing skills. The items in the Comprehensive Scale use toys or pictures.

Each item in both the Expressive and Comprehensive Scales is scored on a 0 to 1 point scale (maximum total score 62). The 42-month-old children are expected to pass 24 to 26 items on the Expressive Scale and 46 to 47 items on the Comprehensive Scale.

### 4.4 Analysis of dropouts

No formal record was kept of the number or characteristics of women who declined or were otherwise missed (e.g. already discharged prior to interview) in the data collection. The estimated number of women who participated from those who were potential to participate is quite low, 28% (187/660), partly due to many simultaneous ongoing studies in the maternal wards, heavy workload of midwives and multiple tests included in the study.

In the second phase, the dropouts (n = 23) were analysed using demographic data obtained from the first interview. The dropout women did not differ from other women in parity, age, education, marital status, new-born’s maturity at birth, maternal past or new-born’s recent problems or illnesses, nor did any of them have high depressive scores by the EPDS immediately postpartum.

At the third stage 28/79 (35%) of the mothers dropped out: eleven mothers declined, ten mothers had moved away from Oulu, six mothers had an unknown addresses and one child had an acute illness. 8/28 (28.6%) of them had depressive scores in the first EPDS. In the first assessment of depression the corresponding proportion of mothers who remained in the study with high depressive scores was 8/51 (15.7%). Seven of those eight depressed mothers were women who declined for further study. All mothers videotaped with their children had middle or high education, so mothers from the group with low education (n = 9) were not represented. Other demographic data or maternal depression status immediately postpartum or later did not differ between the original study (n = 185) group and the ERA subgroup (n = 51).

### 4.5 Statistical methods

The statistical method used in cultural assessment of the pilot study of the IFP was Confidence Interval Analysis (the CIA test), because we did not have access to original American raw data during that time. When the Finnish and American samples (Emde et al. 1993) on particular affects were tested for t-test, two samples-unpaired case was used with the confidence limit 99% (when the limit did not include zero, the p-value is under 0.01). When analysing differences between pictures of infants from different racial backgrounds (e.g. pictures of black and white babies) among Finnish mothers the Pearson Chi-square test was used.
When seasonality of postnatal depression was assessed the chi-square test for multinomials was used as an overall measure of deviation (Wonnacott and Wonnacott, 1990). The null hypothesis was that maternal depression occurs in any season with a probability proportional to the length of that season. If there is no difference in the maternal depression between seasons, the chi-square value is small. When calculating the expected frequency of maternal depression in each season we assumed that the maternal depression is uniformly distributed over the seasons. The same method has also been used when measuring the seasonality of Finnish suicides (Hakko et al. 1998). In order to identify those seasons where a possible difference between the observed and expected number of the maternal depression was statistically significant, the ratio of the observed number of maternal depression to the expected number of maternal depression with 95% confidence interval was calculated. If the 95% confidence interval does not include the value of 1, the difference between observed and expected number is statistically significant at the level of p-value under 0.05.

The overall level of deviation in the EPDS scores was assessed by the Pearson Chi-square test and Fisher’s exact test, when 20% or more of the cells had an expected count of less than five. The risk (OR) for later postnatal depression was compared between mothers with and without high depressive scores immediately postpartum. The risk (OR) of depressive scores immediately and four months after delivery adjusted to the mean length of labour was analysed in the five different delivery groups.

The statistical associations between postpartum depression, emotional interpretations, early interaction and linguistic development were assessed and the differences were tested by comparing means, with Student’s t-test for unpaired cases. The statistical software used was SPSS version 6.1, 9.0 or 11.5 for Windows.
5 Results

5.1 Postnatal depression (II,III,V)

30/185 (16.2%) of the mothers had high depressive scores by the EPDS immediately after delivery. Two thirds, 20 (66.7%), of them recovered before the second measurement at four months postpartum, whereas 21/162 (13.0%) previously not depressed mothers were scored as depressed. 10 (5.4%) of the mothers had high depressive scores at both measurements and they were considered persistently depressed. Those mothers who were depressed immediately after delivery were at a higher risk to be depressed later at second assessment (RR 4.3, 95% CI 1.9; 8.5). The cumulative incidence of postnatal depression at the follow-up period from 1\textsuperscript{st} January 1996 to 31\textsuperscript{st} March 1997 was 22.2% (n = 41). The maternal postnatal prevalence rate corresponds to the overall morbidity of depression in women.

All questionnaires were filled in with no missing items. The most often reported symptoms were self-blaming and guilt (item 3), anxiety (item 4) and indistinct fear or worries (item 5). The most rarely reported item was self-destructiveness (item 10) (Figures 4 and 5).
Fig. 4. Frequencies of the answers in EPDS immediately postpartum.

Fig. 5. Frequencies of the answers in EPDS four months postpartum.
Table 1 presents the EPDS sum scores in different study groups.

**Table 1. EPDS scores immediately and four months postpartum in persistently depressed mothers and mothers with depressive scores once or never.**

<table>
<thead>
<tr>
<th></th>
<th>Not depressed</th>
<th>Depressive scores only immediately</th>
<th>Depressive scores only four months postpartum</th>
<th>Persistently depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=121</td>
<td>n=20</td>
<td>n=11</td>
<td>n=10</td>
</tr>
<tr>
<td></td>
<td>mean (mode)</td>
<td>range</td>
<td>mean (mode) range</td>
<td>mean (mode) range</td>
</tr>
<tr>
<td>The first postpartum week</td>
<td>6.1 (6)</td>
<td>0-12</td>
<td>16.4 (13) 13-25</td>
<td>9.4 (10) 5-12</td>
</tr>
<tr>
<td>Four months postpartum</td>
<td>5.1 (5)</td>
<td>0-12</td>
<td>8.5 (10) 3-12</td>
<td>14.4 (13) 13-18</td>
</tr>
</tbody>
</table>

The frequencies of depression in the follow-up period are presented in Figure 3.

**Fig. 6. Maternal depressive symptoms.**
The percentage of depressed mothers did not differ between primiparas and multiparas, between married and single or divorced mothers, between healthy mothers and those with chronic or gestational disease, between mothers of premature babies and those of full-term newborns, nor between mothers whose newborns were treated at the NICU and those who had their newborns with them in the maternal ward. Maternal education was divided into three groups: 1) low = compulsory comprehensive education of nine years; 2) middle = vocational education, total education between 12 -15 years and 3) high = university education, total education more than 15 years. All mothers who had persistently high depressive scores were middle educated mothers (10/101, 9.9%).

Demographic and obstetrical characteristics are shown in Tables 2 and 3, respectively.

Table 2. Sample characteristics of the mothers with and without high (≥13) depressive scores by the EPDS.

<table>
<thead>
<tr>
<th>Characters</th>
<th>Not depressed n = 144</th>
<th>Depressed n = 41</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n  Percent (%)</td>
<td>n  Percent (%)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic education</td>
<td>6  4.2</td>
<td>2  4.9</td>
<td></td>
</tr>
<tr>
<td>Middle education</td>
<td>86 59.7</td>
<td>30 73.1</td>
<td></td>
</tr>
<tr>
<td>University education</td>
<td>51 35.4</td>
<td>9  22.0</td>
<td>ns.</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couple</td>
<td>136 94.4</td>
<td>38 92.7</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>6  4.2</td>
<td>2  4.9</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>2  1.4</td>
<td>1  2.4</td>
<td>ns.</td>
</tr>
<tr>
<td>Mother’s age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (S.D.)</td>
<td>29.9 (5.5)</td>
<td>27.7 (4.5)</td>
<td>ns.</td>
</tr>
<tr>
<td>Maternal illnesses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>135 93.8</td>
<td>37 90.2</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>9  6.3</td>
<td>4  9.8</td>
<td>ns.</td>
</tr>
<tr>
<td>Number of children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>55 45.5</td>
<td>23 56.1</td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>48 39.7</td>
<td>16 39.0</td>
<td></td>
</tr>
<tr>
<td>4+</td>
<td>18 14.9</td>
<td>2  4.9</td>
<td>ns.</td>
</tr>
<tr>
<td>Neonatal problems:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation needed in</td>
<td>12 8.3</td>
<td>6 14.6</td>
<td>ns.</td>
</tr>
<tr>
<td>the maternal ward or in the NICU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestational age in weeks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 37</td>
<td>4  3.3</td>
<td>1  2.4</td>
<td></td>
</tr>
<tr>
<td>≥ 37</td>
<td>117</td>
<td>40</td>
<td>ns.</td>
</tr>
</tbody>
</table>
Table 3. The demographic and obstetrical information in the five different labour groups.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No analgesia</th>
<th>Nitrous oxide and/or acupuncture</th>
<th>Epidural or paracervical blockade</th>
<th>Elective section</th>
<th>Emergency section</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total n= 185</td>
<td>n = 23</td>
<td>n = 16</td>
<td>n=103</td>
<td>n = 32</td>
<td>n = 11</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.043*</td>
</tr>
<tr>
<td>basic</td>
<td>-</td>
<td>17.6</td>
<td>3.9</td>
<td>3.1</td>
<td>9.1</td>
<td></td>
</tr>
<tr>
<td>middle</td>
<td>65.2</td>
<td>58.8</td>
<td>62.1</td>
<td>65.6</td>
<td>63.6</td>
<td></td>
</tr>
<tr>
<td>high (%)</td>
<td>34.8</td>
<td>23.5</td>
<td>34.0</td>
<td>31.3</td>
<td>27.3</td>
<td></td>
</tr>
<tr>
<td>Age mean (SD)</td>
<td>30.0 (4.3)</td>
<td>30.8 (4.9)</td>
<td>28.7 (5.7)</td>
<td>31.8 (4.5)</td>
<td>26.3 (4.2)</td>
<td>0.043*</td>
</tr>
<tr>
<td>Primipara/ multipara (n/n)</td>
<td>9/14</td>
<td>4/12</td>
<td>53/50</td>
<td>13/19</td>
<td>8/3</td>
<td></td>
</tr>
<tr>
<td>Spontaneous/ induced (n/n)</td>
<td>23/0</td>
<td>16/1</td>
<td>101/3</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Oxytocin augmentation (n)</td>
<td>5</td>
<td>1</td>
<td>28</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Number of vacuum extractions (n)</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

* Difference between mothers of the emergency Caesarean section group compared to other parturients

Maternal diagnosis, gestational and prior to labour, and newborns’ diagnosis and treatment at NICU were examined to reveal confounding factors (Table 4).

Table 4. Maternal and newborn diagnosis.

<table>
<thead>
<tr>
<th>Number</th>
<th>Problem</th>
<th>Gestational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal (total n = 12)</td>
<td>Prior to pregnancy</td>
<td>Diabetes</td>
</tr>
<tr>
<td>n = 3</td>
<td>-</td>
<td>Hepatosis</td>
</tr>
<tr>
<td>n = 1</td>
<td>-</td>
<td>Pre-eklampsy</td>
</tr>
<tr>
<td>n = 1</td>
<td>-</td>
<td>Fear of delivery</td>
</tr>
<tr>
<td>n = 2</td>
<td>Hypertension</td>
<td>-</td>
</tr>
<tr>
<td>n = 2</td>
<td>Morbus Chrohn</td>
<td>-</td>
</tr>
<tr>
<td>n = 1</td>
<td>Colitis ulcerosa</td>
<td>-</td>
</tr>
<tr>
<td>n = 1</td>
<td>Epilepsy</td>
<td>-</td>
</tr>
<tr>
<td>Newborn (total n = 24*)</td>
<td>neonatal jaundice</td>
<td>Admitted in</td>
</tr>
<tr>
<td>n = 8</td>
<td>maternal ward n = 6, NICU</td>
<td>NICU</td>
</tr>
<tr>
<td>n = 6</td>
<td>respiratory problem</td>
<td>NICU</td>
</tr>
<tr>
<td>n = 3</td>
<td>asphyxia</td>
<td>NICU</td>
</tr>
<tr>
<td>n = 2</td>
<td>hypoglycaemia</td>
<td>NICU</td>
</tr>
<tr>
<td>n = 3</td>
<td>infection</td>
<td>NICU</td>
</tr>
<tr>
<td>n = 1</td>
<td>Rh-immunisation</td>
<td>NICU</td>
</tr>
<tr>
<td>n = 3</td>
<td>prematurity</td>
<td>NICU</td>
</tr>
<tr>
<td>n = 1</td>
<td>reason unknown</td>
<td>NICU</td>
</tr>
</tbody>
</table>

* Three children had more than one diagnosis.
The characteristics of the original group and the ERA subgroup were compared to evaluate the representativeness of that subgroup (Table 5).

**Table 5. Characteristics of the original study group compared to the ERA subgroup.**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Original group % (n = 187)</th>
<th>ERA group % (n = 51)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age in years mean (SD)</td>
<td>29.4 (5.3)</td>
<td>29.1 (4.8)</td>
</tr>
<tr>
<td>Maternal education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>basic</td>
<td>4.8</td>
<td>--</td>
</tr>
<tr>
<td>middle</td>
<td>62.9</td>
<td>58.8</td>
</tr>
<tr>
<td>high</td>
<td>32.3</td>
<td>41.2</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. child</td>
<td>51</td>
<td>46</td>
</tr>
<tr>
<td>2 to 3 children</td>
<td>43</td>
<td>41</td>
</tr>
<tr>
<td>4 or more children</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Labour analgesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VD without analgesia</td>
<td>11.9</td>
<td>5.9</td>
</tr>
<tr>
<td>VD with nitrous oxide or acupuncture</td>
<td>10.8</td>
<td>9.8</td>
</tr>
<tr>
<td>VD with epidural analgesia or PCB</td>
<td>56.2</td>
<td>56.9</td>
</tr>
<tr>
<td>Elective CS</td>
<td>16.2</td>
<td>19.6</td>
</tr>
<tr>
<td>Emergency CS</td>
<td>4.9</td>
<td>7.8</td>
</tr>
<tr>
<td>Maternal depression n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not depressed</td>
<td>121 (65.4)</td>
<td>35 (68.6)</td>
</tr>
<tr>
<td>Depressive scores once</td>
<td>31 (16.8)</td>
<td>5 (9.8)</td>
</tr>
<tr>
<td>Persistent depressive scores (EPDS ≥12)</td>
<td>10 (5.3)</td>
<td>7 (13.7)</td>
</tr>
<tr>
<td>Paternal depression n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDI&gt;14</td>
<td>0</td>
<td>7 (5.1)</td>
</tr>
</tbody>
</table>
In this study increasing maternal age seemed to associate with fewer depressive symptoms. Younger mothers, aged 30 years or less, had significantly more depression compared to mothers aged 31 or more immediately postpartum (23.0% vs.5.6%, p 0.002) or when analysing the total incidence of postnatal depression (33.3% vs.12.7%, p 0.003). Younger mothers had higher EPDS sum scores immediately postpartum compared to the mothers aged 31 years or more (mean 9.0 vs. 6.7, p 0.001, 95% CI of Difference 0.94; 3.62). In addition mothers less than 31 years of age had more depression than other mothers measured four months postpartum (14.3% vs. 10.9%, p 0.54), but not when assessing persistent depressive symptoms (7.1% vs. 4.8%, p 0.55).

Scores from the GHQ and the EPDS were strongly interrelated (high scores from the GHQ had a positive correlation with high scores from the EPDS) (Table 6).

**Table 6. Psychiatric symptoms by the GHQ (%) in those with depressive symptoms by the EPDS.**

<table>
<thead>
<tr>
<th>Time period</th>
<th>Not depressed</th>
<th>Depressed</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediately postpartum</td>
<td>5.3</td>
<td>23.1</td>
<td>0.002</td>
</tr>
<tr>
<td>4 months postpartum</td>
<td>4.6</td>
<td>20.8</td>
<td>0.005</td>
</tr>
<tr>
<td>Once or both times of measures</td>
<td>10.8</td>
<td>36.1</td>
<td>0.001</td>
</tr>
<tr>
<td>Persistent depression</td>
<td>0</td>
<td>9.7</td>
<td>0.014</td>
</tr>
</tbody>
</table>

At four months postpartum parents answered the Family scale about household work, nursing and the health of the baby (Table 7). Depressed mothers were more worried about their infant’s health than other mothers (16.7% vs 2.5%, p 0.03) four months postpartum. Additionally all parents could share their opinions, problems or pleasures about parenthood.
Table 7. Family scale at 4 months postpartum (n=138).

<table>
<thead>
<tr>
<th>Item</th>
<th>No maternal depression</th>
<th>Maternal depression at four months postpartum</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td>Tending the infant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only mother</td>
<td>72 (60)</td>
<td>13 (72.2)</td>
<td></td>
</tr>
<tr>
<td>Only father</td>
<td></td>
<td>48 (40)</td>
<td></td>
</tr>
<tr>
<td>Both parents together</td>
<td>13 (72.2)</td>
<td>5 (27.8)</td>
<td>ns.</td>
</tr>
<tr>
<td>Household work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only mother</td>
<td>30 (25)</td>
<td>6 (33.3)</td>
<td></td>
</tr>
<tr>
<td>Only father</td>
<td>1 (0.8)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Both parents together</td>
<td>89 (74.2)</td>
<td>12 (66.7)</td>
<td>ns.</td>
</tr>
<tr>
<td>Health of the infant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy</td>
<td>61 (50.8)</td>
<td>9 (50)</td>
<td></td>
</tr>
<tr>
<td>Slight problems</td>
<td>56 (46.7)</td>
<td>6 (33.3)</td>
<td></td>
</tr>
<tr>
<td>Worry about health</td>
<td>3 (2.5)</td>
<td>3 (16.7)</td>
<td>0.03</td>
</tr>
<tr>
<td>Sleeping of the infant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine</td>
<td>69 (57.5)</td>
<td>8 (44.4)</td>
<td></td>
</tr>
<tr>
<td>Depends on the evening</td>
<td>44 (36.7)</td>
<td>9 (50)</td>
<td></td>
</tr>
<tr>
<td>Sleep disorder</td>
<td>7 (5.8)</td>
<td>1 (5.6)</td>
<td>ns.</td>
</tr>
<tr>
<td>Feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast-fed</td>
<td>59 (49.2)</td>
<td>9 (50)</td>
<td></td>
</tr>
<tr>
<td>Formulas and solid food</td>
<td>23 (19.2)</td>
<td>3 (16.7)</td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td>38 (31.7)</td>
<td>6 (33.3)</td>
<td>ns.</td>
</tr>
<tr>
<td>Breast feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfactory</td>
<td>77 (70)</td>
<td>12 (70.6)</td>
<td></td>
</tr>
<tr>
<td>Moderately good</td>
<td>20 (18.2)</td>
<td>3 (17.6)</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>13 (11.8)</td>
<td>2 (11.8)</td>
<td>ns.</td>
</tr>
<tr>
<td>Crying of the infant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rare</td>
<td>21 (17.5)</td>
<td>1 (5.6)</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>98 (81.7)</td>
<td>17 (94.4)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1 (0.8)</td>
<td>-</td>
<td>ns.</td>
</tr>
</tbody>
</table>

5.1.1 Seasonal variation of postnatal depression (II)

The data were collected during seven days of each month of the year in order to achieve representative sample to evaluate possible seasonality of postnatal depressive symptoms. The null hypothesis was that the maternal depression occurs in any season with a probability proportional to the length that season.

To recognise the factors that influence the amount of light that we observe, e.g. the amount of hours of sunlight per day, light reflected from snow or water, the year was divided in two separate ways. Seasons were divided firstly by the amount of light, which varies from 4.5 to 22 hours per day in the Oulu area, in other words by the length of the
day. We also took into account the presence of snow, which has a huge influence on how people sense the luminosity in Finland. The days are shortest in October, December and January. In addition November is darker than February, because there is not any snow yet in November. Thus, three different time periods were selected: dark (November, October, December and January), intermediate (February, March, August and September) and light (April, May, June and July). Second, the year was divided by seasons: winter (December, January, February), spring (March, April, May) summer (June, July, August) and autumn (September, October, November) (University Calendar, 1995).

Immediately after delivery mild depression was more common in the autumn and dark time, more severe depression during dark time. Four months postpartum, there was less depression in the spring (Tables 8 and 9).

Table 8. Depression and seasonal variation in the first postpartum week.

<table>
<thead>
<tr>
<th>Season</th>
<th>Mild maternal depression EPDS cut-off ≥10</th>
<th>Maternal depression EPDS cut-off ≥13</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed</td>
<td>Ratio²</td>
</tr>
<tr>
<td>Winter</td>
<td>19</td>
<td>0.89</td>
</tr>
<tr>
<td>Spring</td>
<td>14</td>
<td>0.80</td>
</tr>
<tr>
<td>Summer</td>
<td>11</td>
<td>0.84</td>
</tr>
<tr>
<td>Autumn</td>
<td>21</td>
<td>1.62</td>
</tr>
<tr>
<td>Day light</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dark</td>
<td>32</td>
<td>1.46</td>
</tr>
<tr>
<td>Intermediate</td>
<td>17</td>
<td>0.66</td>
</tr>
<tr>
<td>Light</td>
<td>16</td>
<td>0.92</td>
</tr>
</tbody>
</table>

¹Winter (Dec-Feb), Spring (March-May), Summer (June-Aug), Autumn (Sep-Nov). ² Ratio of observed/expected frequency. ³ Dark (November-January), Intermediate (March, April, September, October), Light (May-August).

Table 9. Depression and seasonal variation four months postpartum.

<table>
<thead>
<tr>
<th>Season</th>
<th>Mild maternal depression EPDS cut-off ≥10</th>
<th>Maternal depression EPDS cut-off ≥13</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed</td>
<td>Ratio²</td>
</tr>
<tr>
<td>Winter</td>
<td>12</td>
<td>1.54</td>
</tr>
<tr>
<td>Spring</td>
<td>9</td>
<td>0.56</td>
</tr>
<tr>
<td>Summer</td>
<td>18</td>
<td>1.35</td>
</tr>
<tr>
<td>Autumn</td>
<td>6</td>
<td>0.76</td>
</tr>
<tr>
<td>Day light</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dark</td>
<td>11</td>
<td>1.03</td>
</tr>
<tr>
<td>Intermediate</td>
<td>11</td>
<td>0.84</td>
</tr>
<tr>
<td>Light</td>
<td>23</td>
<td>1.09</td>
</tr>
</tbody>
</table>

¹Winter (Dec-Feb), Spring (March-May), Summer (June-Aug), Autumn (Sep-Nov). ² Ratio of observed/expected frequency. ³ Dark (November-January), Intermediate (May, April, September, October), Light (May-August).
Details about delivery and labour analgesia were obtained from 187 parturients, two of whom had not completed the depression questionnaires, so the final study group comprised 185 women. All the five delivery groups were compared to each other immediately and four months postpartum and on either or both times of measurements.

There were fewer depressed mothers immediately after delivery in the nitrous oxide/acupuncture group 1/16 (6.3%) and in the epidural blockade/PCB group 12/103 (11.7%) compared to the mothers without analgesia 8/23 (34.8%) during VD, p 0.05 and 0.01, respectively (Table 10). Comparing mothers in the nitrous oxide/acupuncture-group and the epidural blockade/PCB group together 13/119 (10.9%) the difference was even more significant to mothers with VD without pain relief, p 0.007.

The percentage of depressed mothers at both of the study phases was smaller in the epidural blockade/PCB group than in the no analgesia group (p 0.05), but there was no difference between the nitrous oxide/acupuncture group and the no analgesia group (p 0.14). There was no difference when the combined emergency and elective CS group was compared to the epidural blockade/PCB group (p 0.12), or when the emergency CS group was compared to the elective CS group (p 0.6).

Table 10. Frequencies of depression measured twice by the EPDS in five different labour groups (n = 162).

<table>
<thead>
<tr>
<th></th>
<th>No analgesia n = 22 (%)</th>
<th>Nitrous oxide/acupuncture § n = 16 (%)</th>
<th>Epidural or paracervical blockade n = 86 (%)</th>
<th>Elective section n = 28 (%)</th>
<th>Emergency section n = 10 (%)</th>
<th>Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not depressed</td>
<td>13 (56.5)</td>
<td>13 (81.3)</td>
<td>69 (67.0)</td>
<td>19 (59.4)</td>
<td>7 (63.6)</td>
<td>121</td>
</tr>
<tr>
<td>Depressed only</td>
<td>6 (30.0)</td>
<td>0</td>
<td>8 (7.8)</td>
<td>4 (12.5)</td>
<td>2 (18.2)</td>
<td>20</td>
</tr>
<tr>
<td>immediately postpartum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed four</td>
<td>1 (4.3)</td>
<td>2 (12.5)</td>
<td>5 (4.9)</td>
<td>3 (9.4)</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>months postpartum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent</td>
<td>2 (8.7)</td>
<td>1 (6.3)</td>
<td>4 (3.9)</td>
<td>2 (6.3)</td>
<td>1 (9.1)</td>
<td>10</td>
</tr>
<tr>
<td>depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*one mother had pudendal blockade

The mean length of labour and the mean length of time spent in the delivery room were longest in the epidural/PCB group of the three VD groups (Table 11).
Table 11. Duration of labour and time in the delivery room in mothers with vaginal delivery.

<table>
<thead>
<tr>
<th></th>
<th>1. No analgesia</th>
<th>2. Nitrous oxide and/or acupuncture</th>
<th>3. Epidural or paracervical blockade</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 23</td>
<td>n = 16</td>
<td>n = 103</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of delivery in minutes mean, (SD)</td>
<td>406 (335)</td>
<td>514 (203)</td>
<td>542 (272)</td>
<td>0.04*</td>
</tr>
<tr>
<td>Time in the delivery room in minutes mean, (SD)</td>
<td>255 (283)</td>
<td>274 (179)</td>
<td>386 (244)</td>
<td>0.026*</td>
</tr>
</tbody>
</table>

* difference between groups one and three ** difference between groups two and three

When the length of delivery was adjusted, women who received epidural analgesia/PCB had a decreased OR for high EPDS scores when compared to women without analgesia, but women in nitrous oxide/acupuncture group did not differ from those of the no analgesia group.

Table 12. Risk of depressive score values immediately and four months postpartum in the study groups, no analgesia group as a reference (n = 162).

<table>
<thead>
<tr>
<th>Pain relief</th>
<th>Depressive scores immediately postpartum</th>
<th>Depressive scores four months postpartum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crude OR (95%CI)</td>
<td>Adjusted* OR (95%CI)</td>
</tr>
<tr>
<td>No analgesia with vaginal delivery</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Nitrous oxide or acupuncture with</td>
<td>0.13 (0.01-1.13)</td>
<td>0.12 (0.01-1.16)</td>
</tr>
<tr>
<td>vaginal delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epidural or paracervical blockade</td>
<td>0.25 (0.09-0.71)</td>
<td>0.25 (0.09-0.72)</td>
</tr>
<tr>
<td>with vaginal delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective section</td>
<td>0.43 (0.13-1.49)</td>
<td></td>
</tr>
<tr>
<td>Emergency section</td>
<td>0.70 (0.15-3.41)</td>
<td>0.70 (0.06-7.74)</td>
</tr>
</tbody>
</table>

* Adjusted for the length of delivery

The mean age of emergency CS mothers (26.3 years) was significantly lower (p 0.04) than the age of mothers in other groups (29.6 years). Mothers with emergency CS also had their newborns treated at NICU more commonly compared to the other groups of mothers (45.5% vs. 6.3%, p 0.001).
5.1.3 Paternal postnatal depression (V)

Paternal depressive symptoms were assessed at four months postpartum. The response rate was lower than that of mothers (136/162, 83.9%). Seven men (5.1%) were scored depressed. Mean score on the BDI was 3.97, (SD 5.3), range 0-29. Over half of the men (52.2%) had sum scores of two or less.

Paternal postnatal depression was associated with maternal postnatal depression. In 119 pairs neither partner was depressed at four months postpartum. All depressed men had a partner who also scored high in EPDS. Three of the depressed fathers had a partner who had depressive symptoms at four months postpartum only and four of the depressed fathers had a partner who had been depressed both immediately after delivery and 4 months postpartum. 13.3% of the immediately depressed mothers had a partner with depressive symptoms at 4 months postpartum while 33.3% of depressed mothers were living with a depressed partner at the second assessment.

5.1.4 Maternal affect interpretation and postnatal depression (IV)

In recognising and interpreting infant facial gestures the demographic data were compared within the Finnish group: no statistical differences were found when mothers with a partner were compared to single or divorced mothers, primipara mothers to the multipara mothers, mothers of premature infants to mothers of full-term newborns, and mothers, aged less than 35 to mothers who were 35 years or more. The pilot result that demographic variables may associate with how mothers infer emotions from still infant facial expressions was disproved within the original study group.

Maternal postnatal depression was associated with the four emotions: anger, joy, disgust and sadness. Those mothers, who had depressive scores immediately postpartum (n = 30) interpreted less anger from infant facial expressions compared to other mothers (means: 0.86 vs. 1.5, out of the 30 pictures were scored in the anger category, p 0.019, 95% CI of the Difference 0.11-1.18). The mothers with persistent depressive scores (n = 9) reported less joy and disgust in the pictures of infants’ faces immediately after labour compared to the other women (1.56 vs 2.84, p 0.009, and 0.00 vs 0.27, p 0.00).

Figures 5 and 6 present the association of postnatal depression with maternal interpretations of joy and anger, respectively.
Fig. 7. Depression associated with the maternal interpretations of joy from the IFP. The line in box-plot points the median, box-part presents the inter-quartile range, and the whiskers include all but the outside observations.

Fig. 8. Depression associated with the maternal interpretations of anger from the IFP. The line in box-plot points the median, box-part presents the inter-quartile range, and the whiskers include all but the outside observations.
When interpreting emotions of those mothers who remained in the study through follow-up (n = 44) and had persistent depressive scores (n = 6), depressed mothers reported significantly more sadness compared to other mothers (n = 38) (5.0 vs 2.8, p 0.012, 95% CI -3.9, -0.5). This subgroup of mothers was analysed separately from others, because we wanted to explore whether maternal affect inference from facial expressions is associated with persistent depressive symptoms.

5.1.5 Postnatal depression and early interaction (IV)

We assessed the question how maternal depressive symptoms affect the interaction between the infant and its mother if the mother has been depressed immediately postpartum, or persistently presumably over three months according to EPDS (mean 4.1 months, range 3 to 8).

Statistically significant differences were found between children of persistently depressed and well mothers in seven (7/52) variables when assessing mother-child interaction by videotape at ten months postpartum (Table 13).

Overall, postnatally depressed mothers showed less negative affect in the 5-minute taping situation and their children were slightly less impulsive. The children of persistently depressed mothers showed less social initiatives and had less visual contact with their mother, and they were using less expressive gestures and vocalizations. They were less receptive to their mother’s initiatives than children of not depressed or at one time-point depressed women. The dyads of depressed mother and her infant were characterised by some unconnected periods of mutual interaction; lack of reciprocity, but there was less overall anxiety in the interaction of persistently depressed mothers and their children. Some of the statistically significant differences were minimal and thus assumed to be not of clinical relevance.
Table 13. Association between maternal postnatal depression and early interaction at the age of 10 months. 7 of the 52 items were statistically significant and shown in the table. Each item is scored on a 5-point scale on which one is the poorest and the five is the best.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Interaction items</th>
<th>1. Not depressed (n = 34) Mean (SD)</th>
<th>2. Not depressed or depressive scores once (n = 38) Mean (SD)</th>
<th>3. Persistent depression (n = 6) Mean (SD)</th>
<th>Significancea</th>
<th>Total (n = 44)</th>
<th>IRR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Parental Negative affect (item 5)</td>
<td>Parental Negative affect</td>
<td>4.4 (0.66)</td>
<td>4.5 (0.65)</td>
<td>5.0 (0)</td>
<td>0.00</td>
<td>-0.7, -0.3</td>
<td>90</td>
</tr>
<tr>
<td>2. Infant Social initiatives (item 39)</td>
<td>Infant Social initiatives</td>
<td>3.3 (0.86)</td>
<td>3.3 (0.84)</td>
<td>2.5 (0.55)</td>
<td>0.014</td>
<td>0.23, 1.38</td>
<td>80</td>
</tr>
<tr>
<td>Impulsivity (item 49)</td>
<td>Impulsivity</td>
<td>4.8 (0.61)</td>
<td>4.8 (0.58)</td>
<td>5.0 (0)</td>
<td>0.031</td>
<td>-0.4, -0.02</td>
<td>100</td>
</tr>
<tr>
<td>Visual contact (item 55)</td>
<td>Visual contact</td>
<td>3.1 (0.93)</td>
<td>3.1 (0.88)</td>
<td>2.2 (0.75)</td>
<td>0.021</td>
<td>0.14, 1.68</td>
<td>90</td>
</tr>
<tr>
<td>Communicative competence (item 56)</td>
<td>Communicative competence</td>
<td>3.5 (0.75)</td>
<td>3.5 (0.73)</td>
<td>2.8 (0.41)</td>
<td>0.042</td>
<td>0.02, 1.26</td>
<td>100</td>
</tr>
<tr>
<td>3. Dyadic Anger and irritability (item 58)</td>
<td>Dyadic Anger and irritability</td>
<td>4.9 (0.36)</td>
<td>4.8 (0.37)</td>
<td>5.0 (0)</td>
<td>0.012</td>
<td>-0.23, -0.036</td>
<td>90</td>
</tr>
<tr>
<td>Reciprocity (item 63)</td>
<td>Reciprocity</td>
<td>3.4 (0.92)</td>
<td>3.3 (0.88)</td>
<td>2.7 (0.52)</td>
<td>0.024</td>
<td>0.11, 1.24</td>
<td>90</td>
</tr>
</tbody>
</table>

*a significance/CI between groups two (2) and three (3).

5.1.6 Postnatal depression and toddler linguistic development (IV)

Linguistic assessment was performed by a logopaedist, who analysed the results and assisted in writing the fourth article. Both expressive and comprehensive language abilities of the toddler were evaluated.

At 42 months of age the children of depressed mothers scored lower on the Expressive Scale than did the children whose mothers had not reported depressive symptoms immediately after delivery (p 0.05, CI 0.004-11.142). The results of the Comprehensive Scale showed no statistical differences.

The children of persistently depressed mothers scored lower on the Expressive Scale than the children of non-depressed mothers (p 0.04, CI 0.28-14.17) (Table 14).
Table 14. Maternal depression and infant's linguistic development at the age of 42 months.

<table>
<thead>
<tr>
<th>Occurrence of depression</th>
<th>Language scales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comprehension</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>1 ) Not depressed a, c n = 34</td>
<td>46.85 (5.65)</td>
</tr>
<tr>
<td>2) Not depressed or depressive scores once b n = 38</td>
<td>45.80 (6.91)</td>
</tr>
<tr>
<td>3) Depressive scores once or both times a n = 10</td>
<td>46.89 (5.83)</td>
</tr>
<tr>
<td>4) Persistent depression b,c n = 6</td>
<td>44.83 (6.55)</td>
</tr>
<tr>
<td>Total n = 44</td>
<td></td>
</tr>
</tbody>
</table>

* Differences in expression scale between groups 1 and 3, p = 0.05, CI -0.04-11.14
b Differences in expression scale between groups 2 and 4, p = 0.04, CI -0.28-14.17
c Differences in expression scale between groups 1 and 4, p = 0.03, CI -0.67-17.46

5.2 Affect inference

5.2.1 Pilot results (I)

Based on the pilot study the IFP method proved to be useful, easy and quick to complete and rate.

The average scores obtained on the Finnish mothers were compared with data obtained on 145 middle class, highly educated American mothers and 103 pre-war Croatian mothers. When compared to the Croatian mothers Finnish mothers reported less distress, joy, sadness, interest and passivity but more shyness and disgust. When compared to the American mothers Finnish mothers saw less distress, but more surprise. Both the Croatian and the Finnish mothers saw more surprise compared to the American mothers.

Five of the 30 infant photographs were pictures of a black girl. We analysed how white Finnish mothers interpreted these pictures from a different racial background. There were statistical differences in four emotion (4/13) categories: Finnish mothers saw more joy and less caution, anger, and fear in the pictures of a black baby than in the pictures of white baby faces.

All these results are indicative and preliminary, because of the limited sample sizes and due to the nature of the study design.
5.2.2 Affect and culture

Demographic details about the original Finnish (n = 187) and American (n = 145) study groups are presented in Table 15.

Table 15. Demographic details about the Finnish and the American mothers.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Finnish (n = 187) mean (SD)</th>
<th>American (n = 145) mean (SD)</th>
<th>Significance</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>29.4</td>
<td>28.6</td>
<td>ns.</td>
<td></td>
</tr>
<tr>
<td>Education in years</td>
<td>13.7</td>
<td>14.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td>2.2 (1.99)</td>
<td>1.8 (1.0)</td>
<td>&lt; 0.05 &gt; 0.01</td>
<td>-0.79- (-0.07)</td>
</tr>
<tr>
<td>Marital status n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>141 (75.4)</td>
<td>128 (88.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couples</td>
<td>176 (94.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>11 (5.9)</td>
<td>16 (11.1)</td>
<td>ns.</td>
<td></td>
</tr>
<tr>
<td>Race n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>186 (99.5)</td>
<td>135 (93.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black or hispanic</td>
<td>-</td>
<td>9 (6.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1 (0.5)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ns = not statistically significant, p > 0.05

Although high consistency was found among the Finnish and the American maternal interpretations from still facial pictures, there were differences in three of the thirteen emotion categories. Two of them were the same categories as in the pilot study: Finnish mothers reported more surprise and less distress than American mothers. The Finnish mothers reported more anger than the American mothers (Table 16). The pilot result of cultural variability in the emotional expressions was confirmed and replicated, as to the emotions surprise and distress.
Table 16. Frequencies of the IFP interpretations in the Finnish and the American mothers.

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Finnish n = 187 mean (SD)</th>
<th>American n = 145 mean (SD)</th>
<th>Significance</th>
<th>CI of Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surprise</td>
<td>3.51 (2.02)</td>
<td>1.67 (1.37)</td>
<td>0.01</td>
<td>-2.35-(-1.33)</td>
</tr>
<tr>
<td>Interest</td>
<td>7.24 (3.01)</td>
<td>7.23 (3.42)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Joy</td>
<td>2.73 (1.38)</td>
<td>3.36 (2.82)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td>2.32 (1.54)</td>
<td>2.82 (1.52)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Passive</td>
<td>1.35 (1.36)</td>
<td>1.12 (1.35)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td>3.16 (2.08)</td>
<td>3.75 (2.31)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Caution/shy</td>
<td>2.63 (2.23)</td>
<td>2.46 (2.03)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Shame/guilt</td>
<td>0.08 (0.31)</td>
<td>0.13 (0.41)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Disgust/dislike</td>
<td>0.30 (0.95)</td>
<td>0.27 (0.74)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>1.40 (1.35)</td>
<td>1.88 (1.67)</td>
<td>0.01</td>
<td>0.05-0.91</td>
</tr>
<tr>
<td>Distress</td>
<td>1.23 (1.26)</td>
<td>2.22 (1.94)</td>
<td>0.01</td>
<td>0.53-1.45</td>
</tr>
<tr>
<td>Fear</td>
<td>2.03 (1.59)</td>
<td>1.94 (1.59)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1.57 (2.63)</td>
<td>0.81 (1.21)</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Empty</td>
<td>0.46 (2.98)</td>
<td>0.35 (0.92)</td>
<td>ns</td>
<td></td>
</tr>
</tbody>
</table>

ns = not statistically significant, p>0.05
6 Discussion

6.1 General discussion

The aim of the study was to survey postpartum mental health, especially depressive symptoms among Finnish mothers. The aetiological factors for postnatal depression were studied based on questionnaires and medical records of Oulu University Hospital prior to delivery, whereas the long-term implications for the infants were assessed by videotaping children and their interaction with their mothers at ten months of age. Children’s linguistic development was assessed by logopaedist’s examination at three and a half years of age.

The aetiology of postnatal depression is complex, and it remains obscure. Thus, the long-term consequences to infants of mothers with postnatal depressive symptoms must be interpreted carefully. The socio-emotional and behavioural problems of the infants may be associated with factors in interaction, not directly to maternal mental health. Also, new-born is seen as an active participant who has an influence on overall tune and mood of interaction. However, the risks associated with postnatal depression should be acknowledged.

6.1.1 Subjects

In 1996, 3,281 children were born in the University Hospital of Oulu. The data were gathered during every fourth week. 187 mothers from the three maternity wards participated in the study. The estimated number of potential candidates for this research was 660 mothers. Because the data on refused or missed mothers were not complete the representativeness of the study sample can not be thoroughly evaluated.

Information forms were distributed by the staff of the maternal wards or by the researcher. During the study it was acknowledged that the forms were not being distributed as planned. Their distribution was more or less satisfactory in two wards. The
interruptions in distribution occurred especially at one of the three maternity wards, probably sometimes due to forgetting or the heavy work load of the midwives. Occasionally, the midwives might have protected mothers, who they considered vulnerable, e.g. mothers having experienced difficult labour or having a sick newborn. Another factor which could have reduced the willingness to participate in this study was the three other ongoing studies in the maternal wards. Volunteer mothers were also missed due to quick discharges and timetables of the researcher and the mother and her newborn, which did not always match.

The study group presents the average Finnish parturient whose mean age is 29 years. 63% had a vocational education and one third of mothers had a university education. Almost half of the mothers were primiparas and 94% of them were married or cohabiting. There were 4% single mothers and 2% of mothers had been divorced. Response rate during the follow up was 87% in the second measure from which part of the families were selected for the videotaping. 65% of all the families contacted proceeded to the second stage and all the families participated were willing to take part in the linguistic testing of their child at three and a half years of age.

On the whole, the different delivery and analgesia groups in the study were well presented. In 1996 altogether half of the parturients received epidural blockade or PCB during VD in the University Hospital of Oulu, which is the same rate (56%) as in this study. Approximately 40% of all mothers, both in the study group and in the University Hospital parturients, received nitrous oxide during VD. Use of pudendal blockades was equal (3%) as well. Fifteen percent of the deliveries were by CS in the University Hospital of Oulu. In the study sample the rate of CS was higher, 23%, of which 11/43 were urgent or emergency sections. 12% of parturients in the study had no analgesia during vaginal labour.

Parturients at the University Hospital of Oulu also referred from outside Oulu. The nearest other hospitals to Oulu with maternal wards are in Oulaskangas and in Kemi (both within 100 kilometres from Oulu), from where the risk pregnancies can be referred to Oulu. This might have caused overrepresentation of mothers with gestational diseases, mothers with Caesarean section or mothers with ill newborns.

The study group was rather small, especially when subgroups were formed on the basis of delivery pattern, e.g. the emergency CS (n = 11) group or the persistent maternal postnatal depression (n = 10). This may have caused the scant significance in differences due to lack of power and type 2 error.

The use of labour analgesia was checked from obstetric records, and the effect of analgesia to later maternal postnatal depressive symptoms was assessed. No subjective measurements of experienced labour pain were gathered, nor did we address the mother’s social support in addition to the midwife during delivery. The obstetrician assisted in analysing and writing the gynaecological information.

It would have been interesting and perhaps more informative to know the lack of support given and experienced pain during delivery, and to find out whether they have a synergetic or even cumulative effect with labour analgesia on postnatal maternal mood and depressive symptoms.

Sample sizes varied greatly in the earlier follow-up studies of postnatal depression. In some of aetiologic studies of postnatal depression samples sizes have comprised 14 to 2,375 mothers meta-analysis not included (e.g. Mc Ivor et al. 1996, Warner et al. 1996,
Tammentie et al. 2002). Also in the follow-up studies of the consequences of postnatal depression samples have varied from 2 to 1,215 children (e.g. Frankel and Harmon 1996, NICHD 1999, Luoma et al. 2001). Therefore, the size of the study sample from the maternal wards of the University Hospital of Oulu in 1996 to 1997 can be considered moderately good and the study design suitable for making comparisons with other prospective follow-up studies.

6.1.2 Methods

All these four questionnaires, the IFP, the EPDS, the GHQ and the BDI, have been widely used worldwide.

The EPDS is proven as valid measurement for detection depressive symptoms in the perinatal period. There is also remarkable similarity in prevalence rates of postnatal depression based on the EPDS across different cultures (e.g. Cooper et al. 1996, Areias et al. 1996, Georgiopoulos 2001).

The fact that the EPDS is highly dependent on timing makes the comparison of the studies more difficult. The strength of the method is that it measures, besides symptoms of depression, also symptoms of anxiety (Stuart et al. 1998). This is important, because anxiety, wariness and impaired concentration are included in the core symptoms of postnatal depression. In this study a weakness is that postnatal depression and psychiatric symptoms were assessed with questionnaires, not with clinical interviews. However, maternal diagnosis prior to delivery was checked from the medical records of Oulu University Hospital during the first interview.

The weakness of the GHQ has seemed to be in the poor specificity in detecting postpartum depressive symptoms. In the study of Viinamäki (GHQ12, 1994), 28%, and in the study of Eerola (GHQ28, 1999), 39% of the mothers reached the cut off for psychiatric symptoms. The explaining factor for high postpartum prevalence rates with this method might be the items concerning physical health and psychological symptoms considered to be normal appearing after labour (e.g. concentration on work or being constantly under strain), which have led to wrong positive findings. In contrast, the BDI might not be sensitive enough to detect minor depression often reported in the postpartum women (e.g Gotlib et al. 1989). In a study of 120 postpartum women the BDI demonstrated poor sensitivity and detected only half of the depressed women (Whiffen 1988). In addition, the method includes symptoms normal to postpartum state, such as weight gain. Therefore, Beck and his colleagues published the BDI II which evaluates also the severity of depression, but it has not been validated for screening for postnatal depression (Beck et al. 1996, Beck 2000). Therefore, for screening paternal postnatal depression it might have been more accurate to use the EPDS, or both the EPDS and the BDI.

The IFP is the measure which reveals the mother’s capacity and sensitivity to recognise and interpret infant emotional signalling from pure facial expressions. A corresponding method has not been available before. The weakness of this method could be that the signalling is limited to still facial appearances, instead of different gestures,
movements and vocalisations used in everyday communication. Although, it is noticed that valid evaluations and comparisons between special groups may not be otherwise possible.

The categorical approach also places high demands on cultural issues, e.g. translation, when analysing results and adapting this method from one culture to another. We tried to solve the problem by retranslating the Finnish version of the method back to English in order to verify the original translation. 95% certainty was achieved between the English and the Finnish words. We also compared the used dimensions, arousal and hedonic tone, of the each Finnish word to an English one in a small pilot sample (n = 18). It seems that the Finnish categories of each emotion are quite equal to English categories, but new analysis with the larger sample of the Finnish mothers will be needed in the future.

The ERA is a versatile method which measures child’s behaviour, emotional status and development as well as parental behaviour and affect, including interactional status of the dyad. It does not categorise the child or view it from one point of view according to its behaviour during videotaping. Some cultural differences were found to hamper the universal agreement as to scoring and interrater-reliability (IRR), but we tried to solve this by evaluating the tapes with a Nordic work team, and by even closer assessment with a Finnish study group who were health-care professionals and trained for the ERA method.

A high IRR was achieved with 52 out of 65 variables. The ERA proved to be a good working tool for assessing the early relationship between the infant and its mother. It could have potential in clinical work due to large scale of important items concerning early interaction, such as child’s behaviour, parent’s emotional availability or emotional attunement in relationship. A video replay can be included with the interview of the parent, when both positive and negative issues of snapshots of the child-parent relationship are viewed and discussed. However, it appeared to be a time-consuming method.

The strength of this study is the longitudinal follow-up design with the multi-method approach. Seasonal variation and modern labour analgesia during labour viewed as possible risks associated with maternal postnatal depressive symptoms have not been explored. Using videotaping and team work during the second stage strengthens the evaluation of the early interaction.

### 6.2 Postnatal depression

The prevalence rates, 16.2% (30/185) and 13.0% (21/162), of maternal postnatal depression correspond to earlier studies and depression in women, in general (Pritchard and Harris 1996, Miller 2002). The purpose was to detect postnatal depression and to find out the possible association between labour analgesia and postnatal depression and to detect possible seasonal variations, not to establish a clinical diagnosis.

Paternal self-reported postnatal depression was lower than that in mothers, which is a finding similar founding to prior studies (Ballard 1994, Matthey et al. 2000). A high rate of zero symptoms reporting by men was also found. Matthey and others have suggested
that gender specific symptoms may be possible. Thus, more studies are needed to assess stress and anxiety in men. Paternal depression was associated with maternal depression, but no conclusions can be drawn of the causal relationship, other than there seemed to be strong couple co-morbidity. Fathers had no depressive symptoms unless their partner had been depressed immediately after delivery or during the first four months postpartum.

The taboo of this illness must be aborted. More discussion and more attention on both the physical and emotional well-being of the mother in the maternal ward and well baby-clinics and more frequent usage of detection questionnaires as helping device is needed to prevent postnatal depression. Mental help expertise can be provided by a well-baby clinic nurse, GP or psychiatrist (Stotland 1999). Different professionals, nurses, doctors and social workers may work together, and mental health professionals can be consulted in stead of referral. In Finland "Baby Blues"-groups have been organised for postnatally depressed mothers in different cities by the Mother and Child Home and Shelters (Ensi- ja turvakodit). Education and support groups can be found in self-help networks, such as Postpartum Support International (http://www.chss.iup.edu/postpartum/) or Depression After Delivery (http://www.depressionafterdelivery.com/).

### 6.2.1 Aetiology of postnatal depression

We found postnatal depression to be associated with maternal age and the analgesia used during delivery. The prevalence of maternal postnatal depression also varied when comparing different seasons and seasonality. In 1997 the average age of parturients in Finland was 29.8 years. Mothers, aged 30 years or less, had in general more depression than the mothers aged 31 years or more. However, maternal age did not affect the persistence of depressive symptoms.

Studies of the association of modern labour analgesia and postnatal depression are rare. In fact, only one Finnish study was found, which evaluated how the perceived labour pain was associated with postnatal depression. Inadequate pain relief and emergency CS highly predicted disappointment with delivery, but not increased the risk of postnatal depression (Saisto et al. 2001). The mode of delivery and postpartum mood has been studied a lot, and there is still debate as to whether CS, especially emergency CS, is a risk for postpartum mental health (Culp 1989, Boyce 1992, Reynolds 1997).

In this study CS was not associated with immediate or later postpartum maternal depressive symptoms, although the emergency CS mothers were younger than other mothers and their children were more often treated at the NICU compared to other children. On the other hand, the analgesia used during VD seemed to protect the mother from immediate depressive symptoms. And the epidural/PCB analgesia group had less persistent depressive symptoms compared to the group of mothers with no analgesia during VD. These findings suggest that adequate pain relief gives the mother a better basis for coping with labour pain and might therefore improve the immediate circumstances for the mother to recover and be better able to bond with the newborn.

The length of labour has been found to correlate with reported pain (Niven and Gisberg 1984, Scott et al. 1999). In our study, mothers who received epidural analgesia
or PCB had the longest duration of delivery, which may have influenced the need of pain relief. According to a systematic review by Leighton and Halpern (2002), epidural analgesia does not increase the duration of stage I of delivery. In our study, the mothers without analgesia had the shortest mean length of labour (406 minutes) and the shortest mean length of time spent in the delivery room (255 minutes), which may both have influenced to the fact that no pain relief was administered. As pain relief had favourable consequences to the postpartum maternal well-being and might diminish the risk of postnatal depressive symptoms, our results suggest that adequate pain relief is recommendable for all parturients regardless of the length of labour.

Parity was not associated with postnatal depression within these different pain relief groups, although there were more primiparas in the epidural/PCB analgesia group than in the other groups with VD. However, more emergency CS’s were performed on younger mothers. This underlines the importance of the availability of satisfactory labour analgesia not only to primiparas but to all parturients.

Even if both Seasonal affective disorder (SAD) (Rosenthal et al. 1984, Okawa et al. 1996, Maskall et al. 1997, Saeed and Bruce 1998) and postnatal depression (e.g. Warner 1996, Beck 1996, Fontaine 1997) are widely studied topics, their possible association has rarely been discussed and hardly ever been studied. During this study no previous publications on seasonal variation in postnatal depression were found.

We found more mild depression (the EPDS ≥ 10) in the autumn immediately after delivery, and less depression (the EPDS ≥ 13) in the spring measured at four months postpartum. When using classification by the amount of light there was more depression during the dark time (1.58; 1.05-2.11) immediately postpartum. This result supports the view that biological factors may have a role in the aetiology of the immediate postnatal depression.

A few hormones have been claimed to cause postnatal depression, e.g. extremely low levels of prolactin or excessive levels of progesterone. SAD, in turn is thought to be strongly related to lack of serotonin (Thorell et al. 1999, Jepson et al. 1999). But, it is also associated with changes in melatonin synthesis and secretion (Lewy et al. 1980), and circadian rhythms (Wirz-Justice et al. 1993). The symptoms of SAD are partly those of general depression, but the core symptoms include sadness, anxiety, inability to interact with other people and tiredness. The prognosis is usual good and symptoms mild (Partonen 1998). Additionally, SAD with minor depressive episodes is more frequent in women, whereas SAD with major depressive episodes in commonly experienced by men (Blazer et al. 1998). It could be that a subgroup of women is more vulnerable to biologic changes and therefore more sensitive to seasonal variation of postnatal mood in the immediate postpartum time. Indeed, in the Oulu area there is only 4.5 hours of daylight in the darkest time of the year.

Interestingly, it has been noticed that children who are born at summer have a statistically bigger birth weight and –height. The longer height can be a beneficial factor at later life, but the larger weight can predispose to overweight at adulthood (Partonen 2002). This shows that seasonal variability has been associated with and assessed in relate to birth and infant variables.

Some limitations must be considered: We did not measure depressive symptoms during pregnancy, and we have only the medical records of the mothers on their prior mental health. Knowing the fact that several mothers hide or deny their depressive
symptoms during pregnancy or postpartum, the prior depression can not be fully ruled out.

6.2.2 Affect interpretation and postnatal depression

Finnish mothers reported more surprise and less distress than American mothers. Finnish mothers also reported more anger than American mothers, but the difference was minimal. One explanation for Finns reporting more surprise than Americans could be methodological. There were pictures of the bright blue-eyed girl who were interpreted by Finns as surprised compared to American interpretations of interest. This could be partly due to the close Finnish translations of “surprise” and “interest”. It might also be cultural: American people are usually more expressive than Finns.

The interpretations of distress can not be explained by translation difficulties or other issues related to the method. It should be remembered that the Finnish group included mothers with depression, compared to American mothers, of whom the depression status was not assessed.

Although, the Finnish and the American vocabulary and lexicon may be considered almost 100% equal, some cultural variability may confound the available data. Thus, dimensional analysis must be performed in a bigger sample in order to be sure of the cultural stability using a method originally based on a foreign language. It seems probable that differences between Finnish and Croatian mothers in 7 out of 13 affect categories in the pilot study are probably due to poor validation work of the Croatian lexicon and small sample size of the Finnish pilot mothers. However, the replicated result of the differences between American and Finnish mothers supports the hypothesis that the more blended and more ambiguous the facial expression, the more cultural circumstances and customs direct what we see and interpret.

Maternal affect interpretation was associated with maternal postnatal depressive symptoms. Immediately postpartum, depressed mothers reported more anger than mothers without depressive symptoms. Mothers with high depressive scores once reported less joy immediately postpartum than other mothers. The mothers of the ERA subgroup who were repeatedly rated as depressed reported significantly more sadness compared to other ERA subgroup women. This is a similar finding to the study of American depressed mothers. Those depressed women interpreted infants to show more fear and anxiety than non-depressed mothers, and within the depressed group, the interpretations of fear correlated with the severity of depression (Zahn-Waxler and Wagner 1993).

The results indicate that depression characterises the interpretation of emotions from pure expression, as depressed mothers see less joy and more sadness from still infant facial features. Immediately after delivery, also anger was interpreted less by depressed mothers. We could assume that depressed mothers were interpreting and seeing less intensive emotions on infants’ faces than not depressed mothers. However, the method must be thoroughly validated (dimensional analysis) before setting permanent assumptions. Additionally, the IFP was completed only once, which limits the drawing of
any far-reaching conclusions. But it is possible that IFP could predict the maternal postnatal mood better than a self-report questionnaire, if depressed mothers do not recognise their depressive symptoms or are not willing to admit having them.

6.2.3 Consequences of postnatal depression

The quality of the mother-infant interaction of occasionally depressed women did not differ from not depressed mothers at ten months postpartum. Statistical differences were found when comparing mothers who had depressive symptoms once to the mothers who had persistent depressive symptoms. The main idea was to evaluate how the persistent postnatal depression affects the early mother-infant relationship.

Mothers with persistent depressive symptoms showed less negative affect in general, not only toward their infants, which were ten months old at the time of assessment. Their dyad contained less anger and were less anxious than those of other mothers. The result is not surprising when thinking about the nature of postnatal depression: silent, secret and even smiling. Only few maternal negative expressions of emotions could associate with excessive fatigue of the mothers. Mothers could have protected their infants from negative affects as well. Depressed mothers often try very hard of being good mothers and they “try to take right steps” with the child without feelings (Stern 1994). Mothers can also deny their depressive feelings or express positive feelings instead of negative ones (reaction formation) (Small et al. 1994). Also, the fact that during videotapings there was a stranger standing by next to the mother and the infant could have affected to mothers behaviour.

The children of persistently depressed mothers were slightly less impulsive. They showed less social initiatives and had fewer visual contacts with their mother. They were less expressive and receptive to their mother than children of not depressed or occasionally depressed women. In general, they had fewer social contacts with their mother. This is an opposite finding from Stern’s (1994) which has shown that children of depressed mothers attempt to invite their mothers to interact; e.g. try to wake mothers alive. However, it corresponds to the finding that mother’s behaviour is imitated by the infant: the mother is withdrawn and the infant builds her own world and is harder to drawn in social contact with the “avoidant” mother (Field 1992). The result may also be considered similar to Beck’s finding (1996) that also infant variables have a significant contribution to the early mother-infant relation. However, we do not know whether the infants were less responsive to their mother because of maternal depression, or the maternal depression was partly a consequence of infant behaviour.

The dyad was characterised by lack of mutual interaction; there were fleeting periods of unconnectedness and less reciprocity. Some of the statistically significant differences were minimal and thus thought to be without clinical relevance. Contrary to the study of chronically depressed mothers and their 36-month-old infants (NICHD 1999), maternal depressive scores in our study did not affect maternal sensitivity in interaction with their infants at videotaping.
Part of the focus of this study was in linguistics, and the linguistic analysis was made by a qualified logopaedist. Language comprehension skills of three-and-half-year-old children of depressed mothers were equal to children of not depressed mothers. Differences were found in language expression; the more persistent the maternal depressive symptoms, the poorer the child performed on the Expressive Language Scale. However, considerable individual differences were found within the group of depressive mothers. Thus, it is likely that the possible effects of maternal depression on children’s linguistic development are not straightforward.

During the interaction assessment depressed mothers did not speak or use gestures or other facilitation less frequently than other mothers. The differences were found in the infant variables and dyadic attunement. Infants of persistently depressed mothers had less visual contact and were harder to draw to social interaction with their mother than the infants of mothers who did not report depressive symptoms. This could be due to mother’s incapability (due to fatigue) to create social interaction. Infants could have also rejected maternal play or other social initiations. Also, the methodological aspect must be considered: researcher used her own toys, which could have held infant’s interest. Dyads of depressed mothers and their infants had less reciprocal moments than not depressed mothers and their infants, but their overall dyad was coloured by less anxiety than the dyads of not depressed mothers and their infants. All these issues may influence how a child learns and uses vocal expressions, but more studies are needed, preferably with a larger group.

In conclusion, persistent maternal depression characterised some issues in the mother-infant interaction at 10 months postpartum. Depressed mothers’ behaviour in interaction with their children seemed to be more empty and blank, instead of aggressive or angry. The mothers were physically present, but partly psychologically absent (Green 1986). The continuance of postnatal depression may pose a threat to the genial and active early relationship between the infant and the mother. Despite the association between maternal depressive scores and the reduced quality of some of the items of early interaction, we would like to underline the variability of the quality of early interaction between the depressed mothers and their children. Differences in some aspects of interaction were slight and may be interpreted as indicative. Nevertheless, the level of maternal depression contributes to the quality of mutual interaction.
Summary

The purpose of the present thesis was (1) to find out whether seasonal variation or analgesia used during labour is associated with the risk of maternal postnatal depression, (2) to measure the occurrence of paternal depression, (3) to clarify how postnatal depression influences maternal affect inference, (4) to evaluate and adapt a new method of affect inference (5) and to assess the importance of maternal postnatal depressive symptoms to early infant development and mother-infant relationship.

The sample consisted of 187 randomly selected, volunteer parturients who were recruited from the maternity wards of the University Hospital of Oulu. The information was gathered in three phases: firstly the data were collected during seven days of each month from 1st January 1996 to 31st March 1997, when the mothers completed two depression scales (Edinburgh Postnatal Depression Scale, General Health Questionnaire) and one emotion questionnaire (the Infant Facial Expressions of Emotion from Looking at Pictures) in the hospital during the first postpartum week. The EPDS was filled in on the second occasion when also the fathers completed another depression scale (Beck Depression Inventory) at home at four months postpartum. Secondly, part of the families living in the surroundings of Oulu (n = 51) were asked to participate in the early relational assessment, where the mother and infant were videotaped (Early Relational Assessment Scale) for a short period in their home environment. In the third phase the children who participated in the videotaping were assessed by a logopaedist (n = 44).

When assessing the whole group, maternal age was associated with postnatal depression; maternal age of less than 31 years increasing postnatal depression. Mothers who had early postnatal depressive symptoms were at four times higher risk to be depressed four months later.

There were more mild depressive symptoms in the autumn and more depression during the dark time immediately after delivery. In spring, mothers reported lower depressive scores four months postpartum. The percentage of depressed mothers was significantly smaller among those mothers, who delivered vaginally and received analgesia (epidural analgesia or paracervical blockade or nitrous oxide) than among those who did not receive any kind of analgesia during vaginal delivery. The percentage of depressive mothers delivering by Caesarean section, either elective or emergency, did not differ from women delivering vaginally.
In our study parental depressive scores were associated with each other. It is not possible to specify whether father’s depression contributed to maternal depression or the other way round. However, while assessing the developmental risks to the infant, it should be taken into account that both parents may have postnatal depressive symptoms.

In second and third phase of the study persistent maternal depression was evaluated when analysing affect interpretation, early interaction and child development. The persistently depressed mothers reported more sadness when viewing interpretations of emotions from infant facial expressions immediately postpartum. When viewing the prevalence or incidence of depression less anger, joy and disgust were observed by those who were or became depressed during the follow-up. Significant differences were found in seven (7/52) variables of parent, infant and their interaction between children of persistently depressed and occasionally or never depressed mothers. Persistently depressed mothers expressed less negative affect in general and their children were slightly more impulsive. They showed less social initiatives and had less visual contact with their mother, and they were less expressive and receptive to their mother than children of not depressed or in one assessment depressed women. The dyad was characterised by some unconnected episodes of interaction between the mother and her infant. These differences were small, but important. They can be considered indicative and they support previous findings of postnatal depression adversely affecting not only the mother but the mother-infant relationship as well.

At 42 months of age, children of depressed mothers scored lower on the Expressive Scale than did children whose mothers had not reported depressive symptoms after delivery. When investigating the mothers with persistent depressive symptoms the same result was found, only stronger. The results of the Comprehensive Scale showed no statistical differences.

It is essential to detect postnatal depression both among mothers and fathers. We also should aim to prevent it. This study may contribute to the prevention as we investigated labour analgesia and variation in postnatal depression during different seasons. Adequate analgesia during delivery seemed to decrease the number of mothers who had high depressive scores during postpartum time. Every mother should be offered good labour analgesia if needed. It seems that there might be some variation between different seasons, light and spring being the protecting factors. This could open new treatment possibilities, such as bright light therapy during dark time-period. No long-term effects between early interaction or child development in those mothers who were depressed for a short period of time after delivery and mothers who were not depressed was found. When postnatal depression continued for several months, some adverse effects were observed in the mother-infant interaction.
References


University of Helsinki (1995) Yliopiston Almanakka vuodeksi 1996 (Finnish)


Appendices

1. Inform consent to the mothers
2. IFP inquiry
3. Example of the ERA rating
4. EPDS
5. GHQ
6. BDI
7. Family scale
8. ERA scoring form
Hyvää tuleva Äiti!

Maassamme on viime aikoina kiinnitetty huomiota aivan pienen lasten ja heidän äitiänsä henkiseen hyvinvointiin. Samalla on huomattu, että meillä on hyvin vähän tietoa tavalisten suomalaisen vastasyntyneiden ja heidän äitiänsä mielihoidosta ja tunnelmista. Tämän vuoksi olemme nyt aloittamassa tutkimusta, johon pyydämme Teitä osallistumaan. Osallistuminen on luonnollisesti täysin vapaaehtoisia.

Tutkimus alkaa jo nyt, odotusaikana, ja jatkuu lapsen synnytyksen yhteydessä. Tutkimukseen pääsette mukaan täyttämällä liitteen mielivalvontakortin.

Tutkimuksen toisessa vaiheessa lähettämme kandidaatti Pauliina Hiltunen tutki Teitä tapaamaan, ja katsote yhdessä erilaisia pikkulasten ilmeitä kuivasta. Tämän jälkeen pyytämme Teitä täyttämään kyselylomakkeen koskien sen hetkisen mielihoidon ja tunnelmien.


Antamanne tiedot käsittelemme täysin luottamuksellisesti. Niiden avulla opimme lisää suomalaisperheiden hyvinvoinnista. Lisääntyneet tieto auttavat meitä auttamaan toisia, joiden kohdalla asiat eivät ole yhtä onnellisesti.

Mikäli olette halukas osallistumaan tutkimukseemme, pyydämme Teitä palauttamaan tämän lomakkeen suljetussa kirjeen pistorasian sairaanhoitajille.

Ystävällisin terveisin

Irma Möilanen
Lastenpsykiatristi professori

Pauliina Hiltunen
Lääketieteen kandidaatti
Appendix 2. IFP inquiry

YKSILÖLLINEN VASTAUSLOMAKE
I FEEL PICTURES

NIME:

IKÄ:

KOULUTUS JA AMMATTI:

SIVIELISÄÄTY:

LASTEN MÄÄRÄ:

LASTEN SUKUPUOLI:

LASTEN IKÄ:
(AIKASEMMAT LAPSET)

KOULUTUS ÄÄ AMMATTI(ISÄ):

SIKIÖIKÄ:
(RASKAUSVIIKKOJEN KESTO)

KROONINEN SAIRAUS/TAUTI (ÄITI):

KROONINEN SAIRAUS/TAUTI (ISÄ):

KROONINEN SAIRAUS/TAUTI (LAPSI):
DIMENSIONAL CODE SHEET

Subject #

Below is a copy of the Affect Grid you have just read about. Now you are ready to use the grid to describe each picture in the picture booklet. Write in the space at the bottom of each grid the picture number. Then, put an "X" on the Grid where you believe this word or feeling state belongs. Now write the word which describes the strongest and clearest feeling the baby in the picture is expressing.
DIMENSIONAL CODE SHEET

Subject #

Below is a copy of the Affect Grid you have just read about. Now you are ready to use the grid to describe each picture in the picture booklet. Write in the space at the bottom of each grid the picture number. Then, put an "X" on the Grid where you believe this word or feeling state belongs. Now write the word which describes the strongest and clearest feeling the baby in the picture is expressing.
Appendix 3. An example of the rating for one item in the ERA method.

Ratings reflect the degree to which child acts to initiate and maintain social interaction with parent. For infants under 12 months, initiations include touching, vocalizing, reaching towards, offering, or smiling. For children over 12 months initiations also include asking questions, giving, showing, speaking to, requesting to play with, or otherwise seeking social contact or expression affection.

Infant variable: Social behavior of child initiates (39)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>No evidence of initiating behaviors.</td>
</tr>
<tr>
<td>2.</td>
<td>Minimal attempts to initiate interaction: one or two instances.</td>
</tr>
<tr>
<td>3.</td>
<td>Moderate initiating. Evidence of three to four instances of initiating behaviors.</td>
</tr>
<tr>
<td>4.</td>
<td>Considerable attempts to initiate interaction; five or more times.</td>
</tr>
</tbody>
</table>
Appendix 4. EPDS

MIELIALALOMAKE

Ole hyvä ja allekirjoita se vaihtoehto, joka eniten vastaa Sinun tuntemuksiasi viimeisen kuluneen viikon aikana, eli vain täsmänneltäksiä tuntemuksiasi.

VIIMEISEN SEITSEMÄN PÄIVÄN AIKANA

1. Olen pystynyt tauramaan ja näkevän asioiden huiskan puolen
   Yhtä paljon kuin aina ennenkin
   En aivan yhtä paljon kuin ennen
   Selvästi vähemmän kuin ennen
   En olisenaan

2. Olen odottellut mielihyvällä tukevaa tapahtumia
   Yhtä paljon kuin aina ennenkin
   Hiukan vähemmän kuin aikaisemmin
   Selvästi vähemmän kuin aikaisemmin
   Tuskin olisenaan

3. Olen syttänyt tarpeottomasti itseäni, kun asiat ovat menneet vikaan
   Kyllä, useimmien
   Kyllä, joksuksen
   En kovin usein
   En koskaan

4. Olen olut ystävätan tai huoletustun ilman selvää syynä
   Ei, en olisenaan
   Tuskin olisenaan
   Kyllä, joksuksen
   Kyllä, hyvin usein

5. Olen olut peloissani tai häisissä ilman erityiscä selvää syynä
   Kyllä, aika paljon
   Kyllä, joksuksen
   Ei, en paljoakaan
   Ei, en olisenaan
6. Asiat kasautuvat päälleen

Kyllä, useimmien en ole pystynyt selviytymään nistä ollenkaan
Kyllä, toisinaan en ole selviytynyt nistä yhtä hyvin kuin aikaisemmin
Ei, useimmien olen selviytynyt melko hyvin
Ei, olen selviytynyt yhtä hyvin kuin aina ennenäksi

7. Olen ollut niin onneton, että minulla on ollut univaiseksia

Kyllä, useimmien
Kyllä, toisinaan
Ei, en kovin usein
Ei, en ollenkaan

8. Ölen tuntenut oloni surulliseksi tai kurjaksi

Kyllä, useimmien
Kyllä, melko usein
En kovin usein
Ei, en ollenkaan

9. Olen ollut niin onneton, että olen itkeskelty

Kyllä, useimmien
Kyllä, melko usein
En kovin usein
Ei, en ollenkaan

10. Ajatus itseni vahingoittamisesta on tullut mieleeni

Kyllä, melko usein
Joskus
Tuskin koskaan
Ei koskaan
GENERAL HEALTH QUESTIONNAIRE

1. Oletteko viime aikoina pyytynyt keskitymään tähän?
   1 paremminkin kuin tavallisesti
   2 yhtä hyvin kuin tavallisesti
   3 huonommin kuin tavallisesti
   4 paljon huonommin kuin tavallisesti

2. Oletteko viime aikoina valvonut paljon huolen vuoka?
   1 en ollenkaan
   2 en enempää kuin tavallisesti
   3 jonkin verran enemmän kuin tavallisesti
   4 paljon enemmän kuin tavallisesti

3. Onko Teistä viime aikoina tuntunut siitä, että mukanaolonne asioiden hoidossa on
   1 tavallisista hyödyllisempää
   2 yhtä hyödyllistä kuin tavallisesti
   3 vähemmän hyödyllistä kuin tavallisesti
   4 paljon vähemmän hyödyllistä kuin tavallisesti
4. Oletteko viime aikoina tunnetut kykenemännä päättämään asioista
1 paremmin kuin tavallisesti
2 yhtä hyvin kuin tavallisesti
3 huonommin kuin tavallisesti
4 paljon huonommin kuin tavallisesti

5. Oletteko viime aikoina tunnetut olevanne jatkuvasti rasitukseen alaisena?
1 en ollenkaan
2 en enempää kuin tavallisesti
3 jonkin verran enemmän kuin tavallisesti
4 paljon enemmän kuin tavallisesti

6. Onko Teistä viime aikoina tunnetustilalla, ette voi selviytyä vaikkeistaanne?
1 ei ollenkaan
2 ei enempää kuin tavallisesti
3 jonkin verran enemmän kuin tavallisesti
4 paljon enemmän kuin tavallisesti

7. Oletteko viime aikoina kyennyt nauttimaan tavallisista päinvettäistä toimistanne?
1 enemmän kuin tavallisesti
2 yhtä paljon kuin tavallisesti
3 vähemmän kuin tavallisesti
4 paljon vähemmän kuin tavallisesti
8. Oletteko viime aikoina kyennyt kohtaamaan vaikutensa
   1 paremmin kuin tavallisesti
   2 yhtä hyvin kuin tavallisesti
   3 huonommin kuin tavallisesti
   4 paljon huonommin kuin tavallisesti

9. Oletteko viime aikoin tunteutit itsenne onnettomaksi ja masentuneeksi?
   1 en ollenkaan
   2 en enempää kuin tavallisesti
   3 jonkin verran enemmän kuin tavallisesti
   4 paljon enemmän kuin tavallisesti

10. Oletteko viime aikoin kadottanut itsehuottamustanne?
    1 en ollenkaan
    2 en enempää kuin tavallisesti
    3 jonkin verran enemmän kuin tavallisesti
    4 paljon enemmän kuin tavallisesti

11. Oletteko viime aikoin tunteutit itäpäin ihmisenä arvottomaksi?
    1 en ollenkaan
    2 en enempää kuin tavallisesti
    3 jonkin verran enemmän kuin tavallisesti
    4 paljon enemmän kuin tavallisesti
12. Oletteko viime aikoin tunteet itsesi kaikunkaikkiaan hohtalaisena onnelliseksi?

1 enemmän kuin tavallisesti
2 yhtä paljon kuin tavallisesti
3 vähemmän kuin tavallisesti
4 paljon vähemmän kuin tavallisesti
Appendix 6. BDI

MELIALALOMAKE ISILLE

Lomakkeessa on joukko henkilökohtaisia kysymyksiä, jotka käsittelevät erilaisia mielishan pärteitä. Lue huolellisesti läpi kussakin lausesarjassa olevat vastausvaihtoehdot ja valitse niistä YKSI, SINUA PARHAITEN KYSESISTÄ VAIHTOEHDOSTA KUVAAVA KOHTA. Rengasta vaihtoehtoja numero.

1. 1. En ole surullinen
   2. Tutte itseni alakulistekseni
   3. Olen alakuloinen jatkuvasti enää pääsee siitä
   4. Olen onneton ja se tuo minulle tuokaa
   5. Olen niin onnetos, etten kokea enää

2. 1. En suhtauda tulevaisuuteen toivottomasti
   2. Tulevaisuus tuntuu minutmaa melkein masentavalta
   3. Minusta tuntu, ettei minulla ole tulevaisuudelta mitään odotettavaa
   4. Minusta tuntu, etten koskaan pääse seoppaako houluista
   5. Tulevaisuus tuntuu minutmaa toivottomalta, enää jakaan uskoa, että asiat muuttuvat parempaan päin

3. 1. En tunne epäonnistuneen elämästä
   2. Minusta tuntuu, ettei olen epäonnistunut pyrkimyksissäni tavallista useammin
   3. Minusta tuntuu, etten ole saanut aikaa paljoakaan mainitsemien arvoista
   4. Elämäni on tähän saakka ollut vain sarja epäonnistumisia
   5. Tunnet epäonnistuneesi täydellisesti tämänään

4. 1. En ole erityisen ymmärtöön
   2. Olen jatkuvasti hienon ikävästytynyt
   3. En nauti asioista samalla tavoin kuin ennen
   4. Minusta tuntuu, etten saa enää tyydyttää juuri mitään
   5. Olen täysin tyytymättömin kaikkein
5. 1. En tunne itseäni erityisen syylliseksi mihinkään
2. Tunnen itseäni huonoaksi ja arvottomaksi melko usein
3. Minulla on syyllisyystunteita
4. Nykyään tunnen itseäni arvottomaksi melkein aina
5. Olen kerta kaksikymmenen arvoton

6. 1. Minua ei mielestäni rangaista
2. Minusta tuntuu, että jotain pahaa saattaisi tapahtua minulle
3. Tunnen, että minua rangaistaan tällä hetkellä
4. Tunnen, että ansaitseen rangaistuksen
5. Haluan, että minua rangaistaan

7. 1. En ole pettynyt itseäni suhteena
2. Olen pettynyt itseäni suhteena
3. En pidä itseäni
4. Minä ihottaa oman itseäni
5. Vihaan itseäni

8. 1. Minusta tuntuu, että olen yhtä hyvä kuin kuka muu tahansa
2. Suhtaudun itseeni melko arvotselevasti heikkouksien ja
3. syrjinnän tähden
4. Moiin itseäni kaikesta, mikä "menee pieleen"
5. Mielestäni minulla on liian monia huonoja puolia
6. Pidän itseäni täysin kelvottomana

9. 1. En ole koskaan halunnut vahingoittaa itseäni
2. Olen joskus ajatellut vahingoittaa itseäni, mutta en koskaan aie tehdä sitä
3. Minusta tuntuu, että olisi parempi, jos olisin kuollut
4. Minulla on tarkat suunnitelmat itsenurhasta
5. Tekisin itsemurhan, jos vain voisin

10. 1. En itke tavallista enempää
2. Itken nykyisin enemmän kuin ennen
3. Itken nykyisin tärkeästi, enkä voi luotta sitä
11. 1. En ole sen ärsytsempi kuin ennen
    2. Ärsynnyn nykyisin aikaisemmin kuin ennen
    3. Tunnen itseä ärsyneeksi koko ajan
    4. Asiat, jotka saivat minut ennen raivoutumaan eivät enää ärsytä minua

12. 1. Olen jatkuvasti kiinnostunut toisista ihmisiästä
    2. Toiset ihmiset eivät kiinnosta minua niin paljon kuin ennen
    3. Olen melkein menettänyt mielenkiintonsa ja tunteeni toisia ihmisiä kohtaan
    4. Olen menettänyt mielenkiintonsa toisiin ihmisiin, enkä vältä heistä lainkaan

13. 1. Pystyn tekemään päätöksiä samoin kuin ennen
    2. Varmousten on vähentynyt ja yritän lyhentää päätösten tekoo
    3. Nykyisin tarvitsen apua päätösten tekoon
    4. En pysty enää lainkaan tekemään ratkaisuja

14. 1. Lasken, että ulkonäköni on pysynyt samana
    2. Pelkään näyttävän vanhasta ja epäselvästä
    3. Minusta tuntuu, että ulkonäköni on muuttunut pysyvästi ja näytän rumalta
    4. Olen varma, että näytän rumalta ja vastenniseltä

15. 1. Työkkynä on pysynyt suunnilleen ennetään
    2. Työn aloittaminen vaatii minulta ylimääräisiä pahoitoksia
    3. En enää pysty työskentelemään samoin kuin ennen
    4. Minun on vähäisin pakottavaa itseä työhön
    5. Minun on täysiin mahdollista tehdä mitään työtä

16. 1. Nukan yhtä hyvin kuin ennen kin
    2. Herätässäni aamulla olen paljon vahvempaa kuin ennen
    3. Herän 1-2 tuntia tavallisista aikaisemmin ja minulla on vähemmän mukahtaa uudelleen
    4. Herän aikaisin joka aamu, enkä pysty nukkumaan viihtää tuntia kauempaa
Appendix 7. Family Scale

Ensimmäiset 5 kahden kanan kulunevat koter

Oheessa on kuoppikäär molemmille vanhemille, johon tiedemme. Tästä vastaan on yhdeksän

1. Vanhemmien teemenn
   a) yhdessä
   b) aikaisemmin yhdessä
   c) aikaisemmin yksin

2. Kaksitut teke
   a) yksin
   b) yhdessä
   c) molemmat yhdessä

3. Vanhemmien on
   a) aivan terve
   b) melko on perässä ongelma (uskotta ennen, pelasteltu ...
   c) olemme kukaan/oleni kukaan vanhasta. Miksi?

4. Vaurio
   a) sukkuvu rypä
   b) poksu paremmilla poksu huonommilla
   c) kahella on uunattua

5. Vaurio vah: a) aurikatto
   b) liumavointo
   c) molempia

6. Imettämisen aihe
   a) hyvi
   b) kohtalaisesti
   c) huonosti

7. Vanhempi tekee
   a) etsimässä
   b) silloin tällöin, kun hänellä on jotain haitta tai terve
   c) hänellä, ei juuri kerhossa

Miten tunteita autaa ja iskua aina Teissä kerätään?

Haluavatko kerätä molemmat jotain entistä, jossa asioita tai jotain ongelmaa?
Appendix 8. ERA scoring form

Tone of Voice
1) Angry, Hostile
2) Flat, Unemotional
3) Warm, Kind

Parental Affect
4) Expressed Positive Affect
5) Expressed Negative Affect

Parent’s Characteristic Mood
6) Angry, Hostile
7) Depressed, Withdrawn, Apathetic
8) Anxious
9) Enthusiastic, Animated, Cheerful, *Joie de Vivre
10) Hypomanic Mood

Parent’s Expressed Attitudes Toward Child
11) Displeasure, Disapproval, Criticism
12) Enjoyment, Pleasure

Parental Affective and Behavioral Involvement
- Quality and Amount
- Amount of Physical Contact
- Amount of Visual Contact With Child
- Amount if Verbalization
- Quality of Verbalizations
- Social Initiative
- Contingent Responsivity to Child’s Positive or Age-Appropriate Behavior
- Contingent Responsivity to Child’s Negative or Unresponsive Behavior
- Structures and Mediates the Environment
- Parent Reads Child’s Cues and Responds Sensitive and Appropriately
- Connectedness
- Mirroring

Parental style
- Flexibility Rigidly
- Creativity/ Resourcefulness
- Intrusiveness
- Consistency/ Predictability
- Evidence of Behavioral Disturbances

Mood/Affect
- Expressed Positive Affect
- Expressed Negative Affect
- Happy, Pleasant, Cheerful
- Apathetic/ Withdrawn/ Depressed
Behavior/Adaptive Abilities

38) Alertness/ Interest
39) Social Behavior of Child-Initiates
40) Social Behavior of Child-Responds
41) Avoiding, Averting/ Resistance
42) Compliance/ Noncompliance
43) Assertion/ Aggressivity
44) Motoric Competence and Quality
45) Quality of Exploratory Play
46) Attentional Abilities
47) Robustness
48) Persistence
49) Impulsivity

50) Self-Regulation/ Organizational Capacities
51) Consolability/ Soothability
52) Focus on Parent's Emotional State

Activity Level

53) Passivity/ Lethargy
54) Hyperactivity

Communication

55) Visual Contact
56) Communicative/ Competence
57) Readability

DYADIC VARIABLES

Affective Quality of Interaction

58) Anger, Hostility
59) Flat, Empty, Constricted
60) Tension, Anxiety
61) Enthusiasm, Arousal, Joyfulness, Mutual Enjoyment, "Joie de Vivre"

Mutuality
62) Joint Attention, Activity
<table>
<thead>
<tr>
<th>Behavior/Adaptive Abilities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>38) Alertness/ Interest</td>
<td></td>
</tr>
<tr>
<td>39) Social Behavior of Child-Initiates</td>
<td></td>
</tr>
<tr>
<td>40) Social Behavior of Child-Responds</td>
<td></td>
</tr>
<tr>
<td>41) Avoiding, Averting/ Resistance</td>
<td></td>
</tr>
<tr>
<td>42) Compliance/ Noncompliance</td>
<td></td>
</tr>
<tr>
<td>43) Assertion/ Aggressivity</td>
<td></td>
</tr>
<tr>
<td>44) Motoric Competence and Quality</td>
<td></td>
</tr>
<tr>
<td>45) Quality of Exploratory Play</td>
<td></td>
</tr>
<tr>
<td>46) Attentional Abilities</td>
<td></td>
</tr>
<tr>
<td>47) Robustness</td>
<td></td>
</tr>
<tr>
<td>48) Persistence</td>
<td></td>
</tr>
<tr>
<td>49) Impulsivity</td>
<td></td>
</tr>
<tr>
<td>50) Self-Regulation/ Organizational Capacities</td>
<td></td>
</tr>
<tr>
<td>51) Consolability/ Soothability</td>
<td></td>
</tr>
<tr>
<td>52) Focus on Parent's Emotional State</td>
<td></td>
</tr>
<tr>
<td>Activity Level</td>
<td></td>
</tr>
<tr>
<td>53) Passivity/ Lethargy</td>
<td></td>
</tr>
<tr>
<td>54) Hyperactivity</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td></td>
</tr>
<tr>
<td>55) Visual Contact</td>
<td></td>
</tr>
<tr>
<td>56) Communicative/ Competence</td>
<td></td>
</tr>
<tr>
<td>57) Readability</td>
<td></td>
</tr>
</tbody>
</table>

**DYADIC VARIABLES**

<table>
<thead>
<tr>
<th>Affective Quality of Interaction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>58) Anger, Hostility</td>
<td></td>
</tr>
<tr>
<td>59) Flat, Empty, Constricted</td>
<td></td>
</tr>
<tr>
<td>60) Tension, Anxiety</td>
<td></td>
</tr>
<tr>
<td>61) Enthusiasm, Arousal, Joyfulness, Mutual Enjoyment, &quot;Joie de Vivre&quot;</td>
<td></td>
</tr>
<tr>
<td>Mutuality</td>
<td></td>
</tr>
<tr>
<td>62) Joint Attention, Activity</td>
<td></td>
</tr>
<tr>
<td>63) Reciprocity</td>
<td></td>
</tr>
<tr>
<td>64) Organization/ Regulation of Interactions</td>
<td></td>
</tr>
</tbody>
</table>