

**Transition to Parenthood After Assisted Reproductive Treatment:  
Follow-up Study of Singleton Pregnancies**

**Leena Repokari**

**University of Helsinki 2008**

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Follow-up study of Singleton Pregnancies**

**Leena Repokari**

**Academic Dissertation**

To be publicly discussed by the permission of the Medical Faculty of the University of Helsinki, in the Niilo Hallman Auditorium, Hospital for Children and Adolescents, Stenbäckinkatu 11, on **August 29<sup>th</sup> 2008**, at 12 o'clock, noon.

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## List of original publications

This thesis is based on the following original publications, which are referred to in the text by their Roman numbers.

- I. Repokari L, Punamäki R-L, Poikkeus P, Vilksa S, Unkila-Kallio L, Sinkkonen J, Almqvist F, Tiitinen A, Tulppala M. The impact of successful assisted reproduction treatment on female and male mental health during transition to parenthood: a prospective controlled study. *Hum Reprod* 20:3238-47, 2005.
- II. Repokari L, Punamäki R-L, Unkila-Kallio L, Vilksa S, Poikkeus P, Sinkkonen J, Almqvist F, Tiitinen A, Tulppala M. Infertility treatment and marital relationships: a 1-year prospective study among successfully treated ART couples and their controls. *Hum Reprod* 22:1481-91, 2007.
- III. Repokari L, Punamäki R-L, Poikkeus P, Vilksa S, Unkila-Kallio L, Sinkkonen J, Almqvist F, Tiitinen A, Tulppala M. Ante- and perinatal factors and child characteristics predicting parenting experiences among formerly infertile couples during the child's first year: a controlled study. *J Fam Psychol* 20:670-9, 2006.
- IV. Repokari L, Flykt M, Sinkkonen J, Punamäki R-L, Tiitinen A, Tulppala M. Parenting after long-term infertility – a descriptive survey. Submitted.

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## Abbreviations

ART	assisted reproductive treatment
BDI	Beck Depression Inventory
CES-D	Center for Epidemiologic Studies Depression [Scale]
DAS	Dyadic Assessment Scale
DIS	Diagnostic Interview Schedule
EPDS	Edinburgh Postnatal Depression Scale
FET	frozen embryo transfer
FSH	follicle-stimulating hormone
GHQ	General Health Questionnaire
GnRH	gonadotrophin-releasing hormone
hCG	human chorionic gonadotrophin
ICSI	intracytoplasmic sperm injection
IVF	<i>in vitro</i> fertilization
LH	luteinizing hormone
MAT	Marital Adjustment Test
NICU	neonatal intensive care unit
PCERA	Parent–Child Early Relational Assessment
PDSS	Postpartum Depression Screening Scale
SCL	Symptom Check List
SPAFF	Specific Affect [Coding System]
SES	socio-economic status
SET	single embryo transfer
STAI	[Spielberger] State Trait Anxiety Inventory
WMCI	Working Model of the Child Interview

## Abstract

The development of infertility treatments has made biological parenthood possible for many couples who during earlier times would have remained childless. Although the treatments are relatively easily available in most Western countries today, the psychological consequences of these “high-tech” treatments have scarcely been addressed. The purpose of this controlled longitudinal study was to explore the early environment of the infant born by assisted reproductive treatment (ART), namely, the parents’ mental well-being, marital relations and experience of parenting. The second aim was to find out whether long-standing infertility and several unsuccessful ART attempts affect parent–child interaction and parents’ mental representations of the child.

The ART couples ( $n=367$ ) were recruited after viable singleton pregnancies conceived by ART (own gametes) were confirmed in five infertility clinics in Finland during 1999: Helsinki University Central Hospital, the Family Federation of Finland in Helsinki, Oulu and Turku, and Helsinki Deaconess Institute. Control couples ( $n=379$ ) were recruited by a research nurse at Helsinki University Central Hospital from couples participating in routine ultrasonographic examinations offered by the community at 16 to 18 weeks of gestation, in 1999. These control couples reported no history of infertility, were Finnish speakers and the age of the woman was over 25 years. The participants in study IV were chosen from the whole study group by means of the following criteria: no previous children, at least five years of infertility and at least four unsuccessful ART cycles.

All the couples filled in questionnaires three times: at 18–20 weeks of pregnancy, 8 weeks after the child was born, and when the child was one year of age. Questionnaires included background questions, Spielberger’s State Trait Anxiety Inventory (STAI), Beck’s Depression Inventory (BDI 13), a General Health Questionnaire (GHQ 36), a Dyadic Assessment Scale (DAS) and the Abidin Parenting Stress Index – short form. The subgroup of ART couples with long-lasting infertility were interviewed, men and women separately (the Working Model of the Child Interview), and parent–child interaction was observed (Care Index) in infancy (2,5-8 months) and at toddler-age (19-24 months).

Regarding the parents’ mental health during the transition to parenthood, ART women showed fewer depressive symptoms during pregnancy and when the child was two months old, compared with controls, but the difference had vanished by the end of the child’s first year. Men in the ART group consistently had lower levels of anxiety symptoms, sleeping difficulties, and social dysfunction than control men. When there were problems with the child’s health, control women’s anxiety symptoms and control men’s depressive symptoms increased, which was not the case among ART women and men.

In marital relations, control women experienced a decrease in dyadic consensus during the child’s first year, which did not happen among ART women. After the child was born, ART men reported a higher level of sexual affection compared with control men. Depressive symptoms during pregnancy were significantly associated with lower quality as regards marital relations and a change in a negative direction during the child’s first year, but only among control women. Stressful life events were associated with a lower level of marital quality only among ART women.



The parenting experiences of ART mothers were in general at a higher level, compared with controls, and they changed in a positive direction during the child's first year. Fathering experiences were at the same level in both groups, and in the child domain they changed positively in both groups by the end of the child's first year. The parenting experiences of ART mothers and fathers were more resilient to the effects of low birth weight, lack of contact smile or difficulty soothing the child than in the control group.

Concerning parents with long-term infertility, both mothers and fathers showed more sensitive behaviour with their child in toddler-age than in infancy. Correspondingly, children's cooperation increased. Maternal controlling behaviour decreased and unresponsive behaviour increased from infancy to toddler-age and in father – child dyads, fathers' controlling and children's passive behaviour decreased. Mothers often mentioned a fear of miscarriage and difficulty in creating representations of the child during pregnancy. Descriptions of their infants were mainly rich, vivid and loaded with positive features. In toddler-age a developmentally accurate change in representations could be seen: mothers brought up the defiance that their children show, and the close relationship with the child was considered conflicting and not only positive as in infancy. Fathers in general did not remember having vivid impressions of the infant during pregnancy. In infancy, fathers had more difficulties than mothers in describing their child or their relationship with the child. Their representations of their children were mainly positive. Many fathers mentioned the reciprocal joy as an important element of their relationship with the child and in toddler-age stressed their role as a playmate.

In conclusion, ART parents in general seem to adapt well to the transition to parenthood. Former infertility and ART do affect on transition to parenthood but do not seem to constitute a risk for parents' mental health, marital relations or experience of parenting. In addition, ART parents were more resilient than control parents to child-related stressors. Among long-term infertile mothers a fear of miscarriage and difficulty in creating representations of the baby during pregnancy were seen, but this did not create a risk as regards parenting behaviour after the child was born. Even though our results are encouraging, infertility and infertility treatments are generally considered as a stressful experience, and fears for the safety of the baby during pregnancy may be more enhanced among formerly infertile parents-to-be. This probably reflects a normative response to a long-standing stress, and as such can be considered a part of working-through of former experiences. Anyway, there are also couples who need professional help to overcome the distress connected to the experiences of infertility and ART, and it is a challenge for health authorities to recognize such couples.

## Introduction

Approximately every sixth couple experience problems in conceiving during their life. It has been estimated that the number of currently infertile people worldwide is over 70 million. Procreation can be considered as a basic function of human individuals. According to surveys, the vast majority of people, around 95%, express a desire to have children. In vitro fertilization (IVF) was introduced in 1978, and since then assisted reproduction treatment (ART) in its different modes has become a common and widely used treatment for infertility. Today almost 3% of all children born in Finland are conceived by ART.

Infertility is a deeply wounding experience, and as such it has the potential to affect both partners' individual well-being and their relationship with each other. Going through infertility investigations and treatments is a long-lasting task with unsure results, and it consumes a good deal of psychological resources. Anxiety and depressive symptoms are common after infertility diagnosis, and many individuals suffer from psychological distress during infertility treatments. Even though the psychological symptoms usually are not as severe as in clinical psychiatric disorders, for those who are successful in the treatments they occur during the transition to parenthood and are therefore of special interest.

The early environment of the infant is developed by the mother and the father and their relationship with each other. The core of early development is the growth of affectional bonds between individuals and the growth of emotions, and later development is based on these. Factors associated with parents' psychological well-being and partnership are thus of utmost importance in early childhood. There is plenty of evidence of the favourable effect of parents' mental well-being and good relationship with each other on child development. On the other hand, parental psychopathology and dysfunctional marital relations are well-known risk factors for child development.

In the case of parenting after infertility and ART, the parents have had to face the injurious fact of inadequacy when it comes to reproduction. Furthermore, they have gone through a series of investigations and treatments, which may have taken years. Worries about previously infertile parents' psychological well-being, their marital relations and parenting have been presented on the basis of the perceived emotional hardship experienced by infertile people and the longstanding stress connected with ART. These have been assumed to cause emotional distress and affect infertile individuals' marital relations and expectations of the parenting experience and child characteristics.

There is a lack of follow-up studies focusing on the effects of infertility and ART on family function and parenting. The present prospective longitudinal study was designed to clarify the effects of former infertility and the experience of ART on parents' mental health, marital relations, and experience of parenting after successful ART in the Finnish population. In addition, it focused on mental representations and parent-child interaction in a subgroup of individuals with long-lasting infertility and several unsuccessful treatments, to reveal possible special features of parenting in this subgroup.

# Review of the literature

## 1. Infertility

### 1.1. Definition and incidence

Infertility, defined as failure to conceive after one year of unprotected timed intercourse, affects approximately 3.5–16.7 % of couples of reproductive age in developed countries (Snick *et al.* 1997; Evers 2002; Health 2000 2004; Boivin *et al.* 2007) and 6.9–9.3% of couples in less-developed nations (Boivin *et al.* 2007). The lifetime incidence of infertility is remarkably similar in more developed (6.6–26.4%) and less developed countries (5.0–25.7%; Snick *et al.* 1997; Health 2000 2004; Boivin *et al.* 2007). The incidence of infertility greatly varies according to the age of the female partner. It is six per cent in women in the age group under 25 years, 16% in women in the age group 30–35 years and 40% in women in the age group 40–45 years (Menken *et al.* 1986; Baird *et al.* 2005). Increasing female age above 35 years raises the risk of miscarriage (Spandorfer *et al.* 2004). Male age of 40 years and more has been suggested to decrease the ongoing pregnancy rates and to increase the incidence of miscarriages (de la Rochebrochard *et al.* 2006). According to population studies in both developed and less developed countries, however, only about half of the people experiencing fertility problems seek any medical care (Boivin *et al.* 2007). Even fewer seek specialist infertility treatment, and less than 25% of infertile people actually receive any specialist infertility treatment (Boivin *et al.* 2007). In a Finnish study it was found that women who did not seek medical help for infertility were younger, had fewer years of formal education and had tried to become pregnant for a shorter time period than treatment-seeking women (Malin *et al.* 2001). There has been concern about the increase in the incidence of infertility due to delay in childbearing. However, population-based surveys indicate no increase in the incidence of infertility (Akre *et al.* 1999; Stephen and Chandra 2006).

### 1.2. Aetiology

The cause of infertility is related both to female and male factors and to a combination of these two, each comprising roughly 25%. In approximately a quarter of couples the cause of infertility is unexplained, at least in the initial examinations (Evers 2002). Unexplained infertility is a relative inability to conceive, and many of the couples concerned may later conceive even without treatment (Practice Committee of the American Society for Reproductive Medicine 2006).

The most common identifiable reasons for female infertility are ovulatory dysfunction (34%), tubal defects (24%) and endometriosis (11%) (Wright *et al.* 2006). In males the reason for infertility remains unknown in almost 50% of cases (Iammarone *et al.* 2003). In the rest there are several underlying reasons for impaired sperm production or transport, e.g. genetic, hormonal, cryptorchidism (Skakkebaek *et al.* 1994). The reasons for infertility vary in developed and less developed countries: in Africa most cases of infertility are reported to result from infections, which is not commonly the situation in developed countries (Cates *et al.* 1985). In developed countries, instead, lifestyle factors (e.g. being overweight, and smoking) are among the main reasons for infertility, and age-related infertility has increased steadily in developed countries, which is not the case in less developed countries (Lunenfeld and Van Sterteghem 2004). The role

of psychosocial stress as an aetiological factor in infertility has been studied (e.g. Schenker *et al.* 1992; Csemiczky *et al.* 2000), and even though there is no obvious consensus about the topic, it seems probable that stress may have a causal connection with infertility (Campagne 2006). Stress has been suspected to have an effect on infertility, as it affects the autonomic nervous system, the endocrine system and the immune system. Stress may also have indirect effects on health via behaviour, for example smoking or alcohol intake. Infertility has been associated with psychosocial stress, and elevated levels of the stress-sensitive hormones prolactin and cortisol have been found in infertile women (Harlow *et al.* 1996). This may, however, be rather the result of than the reason for infertility. Differences in personality measures have not generally been found between infertile and fertile women.

## **2. Assisted reproductive treatment (ART)**

### **2.1. General aspects**

There are several treatment alternatives (e.g. ovulation induction, surgery) in cases of infertility, but in an increasing number of cases, IVF has become the treatment of choice for essentially all infertility conditions, although it was originally introduced to overcome tubal factor infertility. In 1978, Steptoe and Edwards (Steptoe and Edwards 1978), reported the first birth of a child, Louise Brown, following aspiration of a single oocyte during a natural cycle, fertilization of the oocyte *in vitro* and transfer of a cleaved embryo to the uterine cavity.

According to the European ART monitoring programme the number of ART cycles in Europe increased from 203 893 in 1997 to 365 103 in 2003, which is equivalent to an overall increase of 79%. In Finland, the number of treatment cycles increased from 5.0/1000 in 1996 to 6.6/1000 women of fertile age (15 to 49 years) in 2006. In Finland the proportion of the population going through ART is greater than in other Nordic countries (STAKES 2007). Today in Finland about 2.6–2.8% of children are born after ART (STAKES 2007), and the total number of children born by way of ART in Finland during 1983–2005 is 19 308 (STAKES 2007).

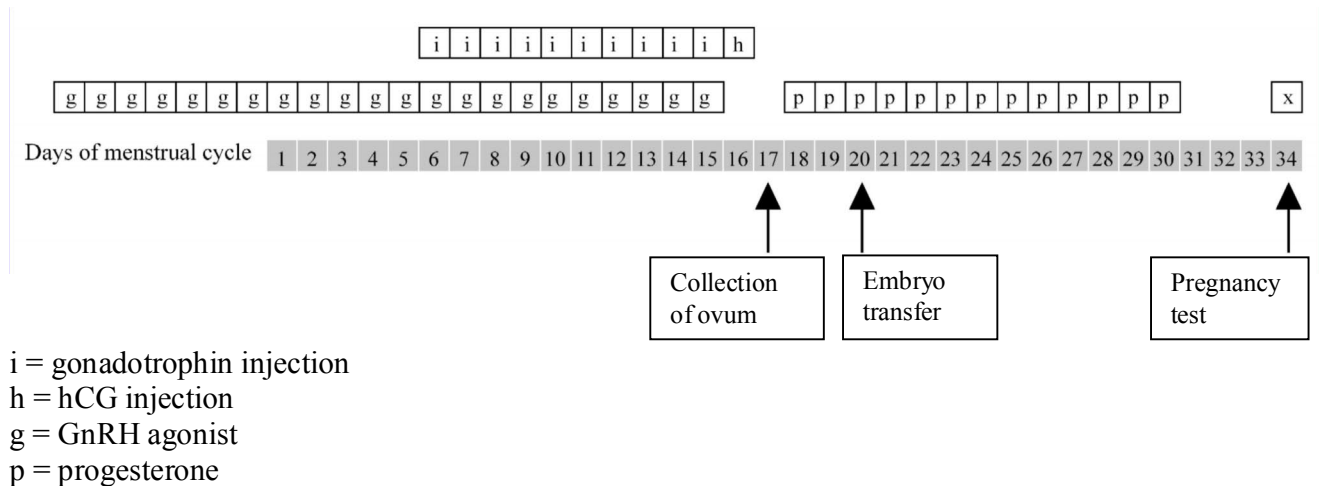
Until the beginning of the 1990s, the majority of couples with severe male factor infertility were untreatable by way of conventional IVF. The introduction of a modification of IVF, namely intracytoplasmic sperm injection (ICSI) in 1992 brought hope to many couples for whom biological parenthood would not have been possible otherwise. In addition to cases of male factor infertility, ICSI is used occasionally in cases of previous fertilization failure in conventional IVF cycles (ESHRE Capri Workshop Group 2007).

### **2.2. ART protocol**

Although IVF was initially performed in natural menstrual cycles, it soon became evident that pregnancy rates improved by using controlled ovarian stimulation to yield numerous oocytes for fertilization and subsequently for replacement of an embryo(s). The use of gonadotrophin-releasing hormone (GnRH) agonists for reversible pituitary down-regulation in combination with

exogenous gonadotrophin stimulation was introduced in the 1980s (Tapanainen and Hovatta 1994) and has remained the most widely used treatment protocol for IVF (Figure 1). In the late 1990s, antagonists of GnRH were introduced, thereby offering the possibility of shorter and milder ovarian stimulation protocols.

Figure 1. The most commonly used treatment protocol for IVF and ICSI



Follicular development is monitored by measurement of serum estradiol levels and by transvaginal sonography. When at least two follicles reach a diameter of 17 mm in sonography, exogenous human chorionic gonadotrophin (hCG) is administered to complete follicular maturation. Transvaginal ultrasound-guided oocyte retrieval is performed 34–36 hours after hCG administration. In conventional IVF, the retrieved oocytes are inseminated with semen collected by masturbation. In cases of severe male factor infertility semen can be obtained by epididymal or testicular sperm aspiration and an oocyte can be fertilized with a single sperm, as in ICSI (Poikkeus 2007).

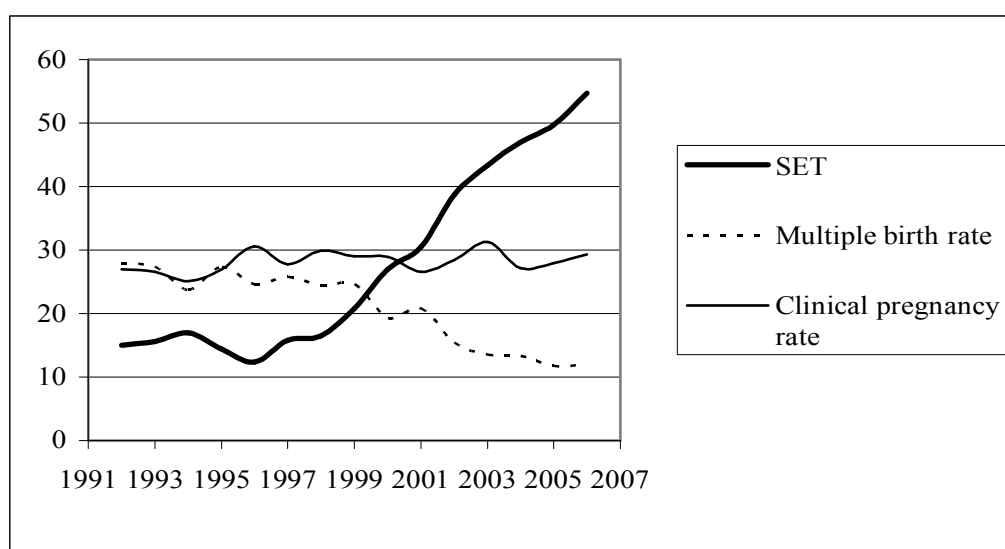
Approximately 50–70% of in vitro-inseminated oocytes are fertilized. Fertilized eggs are transferred to a growth medium and further evaluated for cleavage and growth rates, usually over the following 24–48 hours. A four-cell stage can be reached 48 hours after insemination. Embryo transfer (ET) is usually undertaken 48–72 hours after oocyte retrieval.

Supernumerary good quality embryos are suitable for cryopreservation. The first successful pregnancy after frozen embryo transfer (FET) was described in 1983 (Trounson and Mohr 1983). Nowadays cryopreservation is an essential part of ART protocols. In the early days of ART it was typical to transfer several embryos at a time in order to increase the possibility of pregnancy, which often led to multiple pregnancies. In recent years there has been a trend towards elective single embryo transfer (SET). Elective SET, combined with an effective cryopreservation programme, has been shown to result in a high cumulative pregnancy rate (Tiitinen *et al.* 2003; Martikainen *et al.* 2004). Today, 52.1% of IVF treatments and 55.7% of ICSI treatments in Finland are performed as SET (STAKES 2007).

### 2.3. Treatment outcome

European results of ART in 2003 showed that the clinical pregnancy rates per ET were 29.6% for IVF, 28.7% for ICSI and 18.6% for FET (The European IVF-monitoring programme (EIM) 2007). Compared with results in 2002, fewer embryos were transferred, and the multiple delivery rates declined. Elective SET policy in Finland has resulted in a twinning rate equal to the rate of spontaneous twinning (Tiitinen *et al.* 2001; Martikainen *et al.* 2004; Veleva *et al.* 2006).

Figure 2. The proportion of single embryo transfers, the proportion of multiple pregnancies, and the clinical pregnancy rate per 100 embryo transfers in Finland, 1992-2006, % (STAKES: Statistics on assisted reproduction).



In Finland in 2005 the clinical pregnancy rates per treatment cycle were 24.1% (IVF) and 25.4% (ICSI), and the live birth rates per ET were 21.2 % (IVF), 21.2 % (ICSI) and 16.6 % (FET) (STAKES 2007). According to Finnish statistics 74.4% of clinically confirmed pregnancies end in live birth, 20.2% in miscarriage, 3% in ectopic pregnancy, 0.4% in induced abortion and 0.5% in stillbirth (STAKES 2007).

Treatment outcome is affected by several factors, the most important of which is the female partner's age (Witsenburg *et al.* 2005). Women younger than 36 years are most likely to become pregnant after ART (Templeton *et al.* 1996). Smoking diminishes the possibility of pregnancy after ART, and this effect is comparable with an increase in female age of more than ten years from the ages of 20 to 30 (Lintsen *et al.* 2005). An overweight condition has a strong harmful effect on live birth after IVF. Smoking and being overweight produce a combined harmful effect, which seems to be largest among women with unexplained infertility (Lintsen *et al.* 2005). On the other hand, duration of infertility, pregnancy history and diagnostic category have only modest effects on treatment outcome (Lintsen *et al.* 2007).

There are findings that indicate a possible connection between psychosocial stress and poorer outcome in ART (Csemiczky *et al.* 2000; Smeenk *et al.* 2001; Boivin and Schmidt 2005; Smeenk *et al.* 2005). On the other hand, in a recent longitudinal study, no evidence of psychological stress influencing ART outcome was found (Anderheim *et al.* 2005). Recently, several studies have focused on the endocrinological changes that have been found in association with anxiety or depression, which could have an effect on treatment outcome (e.g. Meller *et al.* 1997; Csemiczky *et al.* 2000; Smeenk *et al.* 2005). The treatment itself has been shown to have an effect on psychosocial factors (Boivin and Takefman 1995), and thus the cause-effect connection of stress and outcome of ART is extremely difficult to explore.

#### 2.4. Pregnancy outcome after ART

Pregnancies after ART involve more risks than spontaneous pregnancies: e.g. complications during pregnancy, preterm birth and low birth weight of the child (Helmerhorst *et al.* 2004; Jackson *et al.* 2004). The higher prevalence of multiple pregnancies and the higher median age of the mothers are identifiable reasons for these adverse pregnancy outcomes. By reducing the number of multiple pregnancies it may be expected that pregnancy outcome could be improved. However, not all adverse obstetric and neonatal outcomes in ART singletons are overcome (Schieve *et al.* 2002; Källén *et al.* 2005). Therefore, this implies that other factors, perhaps infertility- or treatment-related, or immunological factors may be involved.

First and last trimester vaginal bleeding has been reported to be more common in singleton ART pregnancies than in singleton spontaneous pregnancies (Koivurova *et al.* 2002). Along with more frequent vaginal bleeding, increased risks of placenta praevia and placental abruption have been observed. Pre-eclampsia and gestational diabetes have also been found to be more typical in singleton ART pregnancies than in spontaneous singleton pregnancies (Källén *et al.* 2005).

Previous studies have shown that singleton pregnancies after ART are accompanied by preterm birth (<37 weeks) in 8.7% (Klemetti *et al.* 2002) to 14.1% of cases (Schieve *et al.* 2002). The corresponding figure regarding singleton births following spontaneous conception was 4.8% in Finland in 1998–9. Consequently, a small, but clinically not important difference has been found in birth-weight between ART and spontaneous singleton pregnancies.

Induction of delivery and Caesarean section are significantly more common after ART pregnancies than after spontaneous singleton pregnancies, on average 25% (Klemetti *et al.* 2002; Helmerhorst *et al.* 2004; Källén *et al.* 2005; Poikkeus *et al.* 2006a).

#### 2.5. The health of ART children

Concerns about ART children's health and development have been expressed. Infants conceived by ART are more often born preterm and are at a greater risk of low birth weight than spontaneously conceived infants (Koivurova *et al.* 2002; Helmerhorst *et al.* 2004). These problems arise mainly from the greater amount of multiple pregnancies (Koivurova *et al.* 2002), and in a Finnish study it was found that the perinatal health of ART children improved from the early to late 1990s, mainly due to a decrease of high order multiple births (Klemetti *et al.* 2002).

In some studies (Helmerhorst *et al.* 2004), but not in all (Klemetti *et al.* 2002), the perinatal mortality rate is higher in cases of ART singleton birth than after spontaneous conception.

The frequency of congenital malformations has been found to be 8–9% in singleton ART infants (Hansen *et al.* 2002; Källén *et al.* 2005). A systematic review based on all articles published up to March 2003 was carried out to assess the risk of birth defects after ART, and a statistically significant 40% increased risk of birth defects in children born after ART was found (Hansen *et al.* 2005).

In a Swedish study an increased risk of neural tube defects, choanal atresia and alimentary tract atresia has been observed (Källén *et al.* 2005). Results concerning the rate of cardiovascular anomalies are somewhat controversial: in some studies they have been found to be more common among infants born after ART (Hansen *et al.* 2002; Koivurova *et al.* 2002), but in larger samples no increase in the rate of cardiovascular anomalies has been found (Klemetti *et al.* 2005; Källén *et al.* 2005). Urogenital anomalies, especially hypospadias, are more common after ART than after spontaneous conception and may be associated with male factor infertility (Ericson and Källén 2001; Klemetti *et al.* 2005). Genetic imprinting (i.e. genetic suppression of either maternal or paternal alleles) has been suggested to be associated with ART (Cox *et al.* 2002; Orstavik *et al.* 2003; Sutcliffe *et al.* 2006). According to a Danish National IVF cohort, however, no evidence of this association was found (Lidegaard *et al.* 2005).

Prematurity is associated with a delay in neuromotor development (Marlow *et al.* 2005), and ART children are at a greater risk of prematurity than naturally conceived children. When preterm infants are excluded from the analyses, existing literature has consistently revealed no significant differences in neuromotor development between ART children and naturally conceived children (Sutcliffe *et al.* 2001; Ponjaert-Kristoffersen *et al.* 2005; Knoester *et al.* 2007). The growth and cognitive development of ART children have repeatedly been found to be comparable with those of naturally conceived children (Cederblad *et al.* 1996; Levy-Schiff *et al.* 1998; Leslie *et al.* 2003; Barnes *et al.* 2004; Ponjaert-Kristoffersen *et al.* 2005; Leunens *et al.* 2006). In a review of controlled studies on health and development of ART children, it was concluded that children born after ART are generally healthy and developmentally comparable with children born after spontaneous conception, but an increased risk of cerebral palsy associated with ART could not be excluded (Ludwig *et al.* 2006).

Concerns about the psychosocial development of ART children have been based on possible problems in parenting after ART. Long-term follow-up studies on the psychological impact of ART on the development of children are rare, and thus information about this topic is very limited. Children born after IVF have been found to be at a slightly elevated risk of emotional difficulties at the age of nine years when compared with children born after spontaneous pregnancies (Levy-Schiff *et al.* 1998). Golombok and colleagues (1995), however, found no differences between ART children, adopted children and naturally conceived children regarding their emotional development or relations with their parents or peers at the age of 4–8 years. Follow-up was continued in the transition to adolescence, and at the age of 11–12 years the ART children were functioning well and did not differ from adopted or naturally conceived children in measures of psychological adjustment (Golombok *et al.* 2002). Knoester *et al.* (2007) reported no differences in psychosocial well-being between ICSI, IVF and naturally conceived children at the age of 5–8 years except that IVF children had less behavioural problems than children in other groups.



### 3. Emotional adjustment to infertility and ART

#### 3.1. Impact of infertility on mental health and marital relations

In pre-treatment studies anxiety has often been found to be elevated, whereas depression scales in general show no difference between infertile and normal groups (see review by Verhaak *et al.* 2007). Although emotional reactions and increased psychic symptoms have been frequently detected after infertility diagnosis and during infertility treatments, the majority of reactions are not severe, and thus do not imply severe psychopathology but rather an attempt to adapt to a stressful life-situation. The distress scores of infertile individuals are generally higher than those of persons with no reported problems, but lower than those with clinical mental illness (Daniluk 1988; Wright *et al.* 1991). In a study by Edelmann *et al.* (1994), couples entering ART were investigated in respect to personality, general health, self-esteem, anxiety and mood state. The results showed very few deviations compared with normative data: women showed slightly elevated scores as regards state and trait anxiety, while other scores resembled normative data (Edelmann *et al.* 1994). Even though in general individuals seem to adjust to their infertility (Hammarberg *et al.* 2001; Leiblum *et al.* 1998) and the majority of their reactions are relatively mild, for clinicians it is important to keep in mind that some do have severe psychological symptoms associated with infertility and infertility treatments (e.g. Holter *et al.* 2006). It has been found that some individuals tend to perceive themselves to be significantly and adversely affected by their infertility (Berg and Wilson 1991) and feel more distressed than they consider normal for them (Wright *et al.* 1991).

There is a large body of evidence that infertility has a greater emotional impact on women than on men (van Balen 1996; Greil 1997; Leiblum *et al.* 1998; Beutel *et al.* 1999; Hjelmstedt *et al.* 1999; Newton *et al.* 1999; Peterson *et al.* 2003). When interviewed, 50% of infertile women considered infertility as the most upsetting experience in their lives, while the same was found in only 15% of infertile men (Freeman *et al.* 1985). Women seem to find infertility more stressful than do men (Newton *et al.* 1999) and are more vulnerable than men to mental health problems like anxiety (Beaurepaire *et al.* 1994; Laffont and Edelmann 1994), depression (Wright *et al.* 1991; Domar *et al.* 1992; Slade *et al.* 1997; Kee *et al.* 2000), low self-esteem (Dhillon *et al.* 2000), and marital dissatisfaction (Slade *et al.* 1997; Monga *et al.* 2004) during infertility treatments. In a qualitative study of women's experience of ART by Redshaw and colleagues (2007), one of the participants described infertility treatment as "going into a dark tunnel in which one has no idea of where she is going or how long it will take, and that the journey is all consuming and one just has to keep going". Women also tend more often than their spouses to feel guilt even in a situation in which the reason for infertility is in their spouses (Connolly *et al.* 1987). Women's vulnerability has been attributed, on one hand, to their more intense desire for parenthood (Hjelmstedt *et al.* 1999; Newton *et al.* 1999) and on the other hand to the greater impact of treatment, as they are physically more involved in ART than their partners (Beaurepaire *et al.* 1994). Motherhood status does not, however, seem to protect women from infertility-related distress: Neither Wright *et al.* (1991), Domar *et al.* (1992), nor Jacob *et al.* (2007) found differences in scores of distress between women with primary and secondary infertility.

Men's emotional reactions to infertility and ART have in recent years been more often included in studies. Some researchers have found the same pattern of emotional reactions in men and women (Boivin *et al.* 1998; Edelmann and Connolly 2000; Holter *et al.* 2006), even though women tend to show stronger reactions (Boivin *et al.* 1998). It has been suggested, though, that men experience

infertility as stressful as do women but react differently (Wright *et al.* 1991; Collins *et al.* 1992). Elevated scores as regards anxiety, and deterioration of self-esteem have been found among infertile men (Slade *et al.* 1997). The findings concerning the correlates of men's distress related to infertility and ART are very diverse. Male distress has been found to increase after failure of IVF (Newton *et al.* 1990; Slade *et al.* 1997; Pook and Krause 2005), and long duration of continuing infertility treatments was positively associated with heightened distress (Pook and Krause 2005). Beaurepaire and colleagues (1994), however, found no association between male distress and treatment failure. Male factor infertility has been found to be associated with a greater negative response to infertility among men when compared with diagnosis of female infertility (Nachtigall *et al.* 1992; Beutel *et al.* 1999; Newton *et al.* 1999). However, in a recent study of Pook and Krause (2005) men's distress level was independent of whether the reason for infertility was in male or female. For men, inability to fulfil the male role and the social role of becoming a parent have been found to be central (Hjelmstedt *et al.* 1999), and some men experience transient periods of impotence and sexual performance anxiety during infertility investigations (Saleh *et al.* 2003).

Even though infertility investigations and treatments are physically demanding, couples experience them more as a psychological than a physical burden (van Balen *et al.* 1996; Redshaw *et al.* 2007) – an “extremely invasive process that takes over your life”, as a female participant of an interview study described (Redshaw *et al.* 2007). Stress related to feeling of no control over reproductive capacity was reported by both men and women in a study by Hjelmstedt and colleagues (1999). A considerable amount of women (19.1%) and men (14.6%) have reported that they reached a level of distress at which they would need professional support during infertility treatments (Boivin *et al.* 1999).

Generally, couples who enter infertility treatments seem to be considerably well adjusted and stable in their relationships (Connolly *et al.* 1993; Abbey *et al.* 1994). However, there may be individual variability in the experience of infertility and its effects on life among both women and men (Verhaak *et al.* 2005). The effect of infertility on marital relations is modified by factors such as personal coping with infertility, communication between partners and partners' involvement in infertility treatments (Pasch *et al.* 2002).

Many aspects of infertility may lead to deterioration in marital relationships of infertile couples, including personal reactions like feelings of guilt (van Balen and Trimbos-Kemper 1994), lowered self-esteem (Abbey *et al.* 1992), feelings of inadequacy as a man or a woman (Lee *et al.* 2001) and interpersonal aspects like deterioration of sex life (Oddens *et al.* 1999; van Balen and Trimbos-Kemper 1994) and communication (Wright *et al.* 1991). In a study by Leiblum *et al.* (1998) women were asked a single question about the degree of negative impact of infertility on their marriage, and one third reported that it had had a very negative effect. The experience of infertility and the struggle to conceive may also bring the partners closer together and strengthen the marriage (Schmidt *et al.* 2005b). This marital benefit was reported by a quarter of women and a fifth of men in a large Danish study (Schmidt *et al.* 2005b).

The ability to reproduce is intimately tied to sexuality, self-image and self-esteem. Sexuality and sexual activity are also important means of expressing feelings of closeness and intimacy in partnership. During infertility treatments the pleasurable experience of sexual intimacy may be negatively affected, and this may contribute to marital distress. Women experience marital and sexual relationships less positively than men after infertility diagnosis and during infertility treatments (Bringhenti *et al.* 1997; Slade *et al.* 1997; Leiblum *et al.* 1998; Newton *et al.* 1999;

Monga *et al.* 2004), but also among men feelings of sexual inadequacy (Irvine and Cawood 2003), dissatisfaction (Ramezanzadeh *et al.* 2006) and functional problems (Saleh *et al.* 2003) during infertility treatments have been reported.

### 3.2. Coping strategies

Infertility can be conceptualized as a chronic and uncontrollable stressor that may exceed the individual's coping resources (Jordan and Revenson 1999). Adaptation to stress varies among individuals, and the identified variables that have effects on adaptation are personality (Johnson 1981), ability to cope (Lazarus and Folkman 1984), and social support (Kobasa 1982). High levels of neuroticism predict higher levels of negative emotional response, whereas extraversion and optimism predict a more positive emotional response to stressors (Carver *et al.* 1993). Lazarus and Folkman (1984) define coping as cognitive or behavioural means of controlling and regulating stress.

The most adaptive coping strategies in infertility-related stress seem to be problem-focused planning, information seeking and networking with social systems (Greenfeld 1997). In cases of infertility, the fear of becoming stigmatized or receiving unsupportive feedback may prevent individuals from seeking social support. Feelings of social isolation (Imerson and McMurray 1996) and increased distress in the social domain (Schmidt *et al.* 2005a) have been reported among ART couples. Women have consistently been found to be more prone than men to seek social support and to talk about infertility problems with others (Collins *et al.* 1992; Hjelmstedt *et al.* 1999). Emotion-managing strategies, such as emotional expression and processing and acceptance of the situation have been found to be associated with decreased distress (Edelmann *et al.* 1994; Berghuis and Stanton 2002). Avoidant strategies, on the other hand, have been reported to lead to maladjustment and increased levels of depression among women during infertility treatments (Litt *et al.* 1992; Peterson *et al.* 2006).

Women and men tend to use different coping strategies: women more often use emotion-focused coping strategies and men instrumental or problem-focused strategies (Jordan and Revenson 1999). ART couples benefit from getting adequate information about infertility and ART: infertility related information decreases symptoms of anxiety and depression after failed ART (Reading *et al.* 1989; Verhaak *et al.* 2005). For clinicians it is of importance to take into account the fact that individuals may adopt different coping strategies in stressful situations and thus have different needs as regards support.

## 4. Transition to parenthood and psychological well-being of parents-to-be

### 4.1. Transition to motherhood

Cowan (1991) describes transitions as long-term processes that result in qualitative reorganization of both inner life and external behaviour. Empirical research on the transition to parenthood is surprisingly recent even though the special sensitivity and a certain amount of ambivalence in mothers-to-be has long been recognized and expressed in literature and the arts. Bibring and colleagues (1961) considered emotional lability and complex feelings related to pregnancy to be

signs of a normative crisis. Later, Pines (1972) stressed the importance of the first pregnancy for a woman as a crisis of female identity. Rafael-Leff (1991) described pregnancy as a psychological process during which a woman reorganizes her emotional life in order to become adequately sensitive to the infant's needs.

During pregnancy, a woman has to work through her mental representations of herself-as-woman and herself-as-mother. At the same time she creates representations of the child as a separate individual (Ammaniti *et al.* 1992). The representations begin to develop prenatally, and a certain stability in pre- and postnatal representations has been found (Zeanah *et al.* 1986; Benoit *et al.* 1997). Stern (1991), however, has added that representations are interactive and they are affected by the infant's behaviour. Thus, they are normally open to change based upon current experiences.

Relationship with the child starts to develop from the beginning of pregnancy. Below the observable level of this relationship, there is also an unobservable level, which contains the mother's memories of her own early relationships, her fantasies, fears, personal experiences and current life situation (Stern 1995). At the beginning of pregnancy a woman's attention is on her own body and physical changes. Gradually, fantasies about the child are created; at first the infant is considered to be a part of the woman, but as foetal movements make the baby more real, the mother's representations of her baby become separate from those of herself. The fantasies seem to reach a peak in intensity at around the 7<sup>th</sup> month of pregnancy, after which they start to decline (Ammaniti 1991; Fava Vizziello *et al.* 1993). This undoing of fantasies has been assumed to be necessary to "make room" for the real infant and prevent disappointments (Ilicali and Fisek 2004).

#### 4.2. Transition to fatherhood

The paternal role as a relationally important figure in an infant's world has gained more attention in recent years. Nevertheless, literature regarding fatherhood or transition to fatherhood is scarce compared with literature about motherhood. The father has traditionally been seen as a supportive figure to the mother and a breadwinner in the family, although Winnicott (1964) stressed as early as in the early 60's the importance of a father figure as a close relational person for the infant. Later on, Lamb (1977) and Herzog (1980) addressed the importance of fathers being different from mothers in their interactions with their infants. There is plenty of evidence concerning the relationship between paternal involvement and positive mental health outcomes among children (e.g. Black *et al.* 1999; Dubowitz *et al.* 2001). The concept of paternal involvement has been a common focus of interest in research, and it has been defined in a variety of ways.

According to Lamb (1997), there are three components of paternal involvement, namely 1) paternal engagement (direct interaction with the child), 2) accessibility or availability to the child, and 3) responsibility for the care of the child. There are several determinants of paternal involvement, e.g. father's own developmental history, personality characteristics and beliefs of the father, social support, and stress and work demands of the father (Pleck 1997). Involvement is only one of several modes of paternal influence on child development. Paternal characteristics like warmth, socialization practices, and relationship characteristics seem to have an impact on children even when fathers are relatively uninvolved (Pleck 1997). In addition to direct paternal effects on children, there are also indirect effects of the father's impact on sibling relationships (Volling and Belsky 1992), and maternal role satisfaction and psychological health (Downey and Cone 1990).

The transition to fatherhood is fundamentally different from the transition to motherhood, as fathers do not become pregnant. Thus, the existence of the infant is not as concrete for fathers as it is for mothers (Gage and Kirk 2002). Becoming a father, however, means a big change in a man's internal world and relationships to others (Gage and Kirk 2002). A father's sense of responsibility and awareness tends to increase during the transition to parenthood (Holland 1994). Sometimes men do develop somatic symptoms of pregnancy during their wife's pregnancy: the *couvade syndrome* commonly includes variations in appetite, nausea, insomnia and weight gain (Masoni *et al.* 1994). The development of paternal mental presentations during pregnancy has scarcely been studied. However, prenatal paternal representations of attachment predicted infant attachment to the father and maternal representations predicted infant attachment to the mother at the age of one year (Steele *et al.* 1996).

#### 4.3. Mental health during transition to parenthood

According to Bowlby (1973; 1980), when there are significant life stressors present, a person's defences may escalate, resulting in maladaptive behaviour and vulnerability to emotional disorders and cognitive disorganization. There are several aspects that may constitute a risk to psychological well-being during the transition to parenthood, especially for women, e.g. hormonal changes during pregnancy, heightened sensitivity in new parents, stress combined with adjustment to a new life situation, and lack of sleep.

Parental psychopathology is a well-known risk-factor as regards good child development (e.g. Zeanah *et al.* 1997a). In addition to direct effects of parental psychopathology on parent-child interaction, it may have indirect effects on child development via marital conflict, which is associated with psychological distress of spouses (Papp *et al.* 2007). There are several factors contributing to and modifying the effect, such as the child's individual vulnerabilities, the amount of maternal and paternal involvement, the child's other meaningful relationships, and socio-economic disadvantage (Dierker *et al.* 1999).

Depression is a common psychiatric disorder during the transition to parenthood (Tamminen 1990; Murray *et al.* 1995), and it has been widely studied. In a recent review the prevalence of female depression during pregnancy was estimated to be from 7.4% in the first trimester to 12.0% in the third trimester (Bennett *et al.* 2004). The prevalence of postpartum depression has been reported to be between 7% and 16% (see review by O'Hara and Swain 1996). New fathers' depression has gained far less attention, and a wide range of prevalence has been reported, varying from 2 to 24% (Goodman 2004). In a recent Danish study the prevalence of male postnatal depression was found to be 5% (Madsen and Juhl 2007). Concerning postpartum depression, there seems to be a considerable degree of couple morbidity, as 22–50% of depressed fathers and 16–26% of depressed mothers have been found to have depressed partners six to eight weeks postpartum (Raskin *et al.* 1990; Ballard *et al.* 1994). The definition of depression in the studies concerned is usually based on scores in depression questionnaires, and as questionnaires alone are not sufficient for diagnostic use, it would perhaps be more accurate to present the prevalence of "depressive symptoms" instead of depression.

Postpartum depression in mothers is associated with altered maternal behaviour toward their infants (Field *et al.* 1985; Murray *et al.* 1993; Hiltunen 2003), and is thus of major importance. Depressed mothers tend to behave less positively with their infants, show flat affect, and provide less stimulation and less contingent responsiveness (Downey and Coyne 1990; Field 1988). They

also have negative perceptions of their children's behaviour (Webster-Stratton and Hammond 1988), and even though children of depressed mothers do show more difficult behaviour, depressed mothers were found by Field and colleagues (1988) to code their children's behaviour more negatively than did observers. Not all depressed mothers behave identically, and some have been shown good and sensitive interaction with their infants (Field *et al.* 2003).

Many women experience a period of “maternity blues”, after delivery, which shows up as lability of mood, anxiety, irritability and depressive symptoms, the symptomatology being milder and lasting a shorter period than in clinical depression or anxiety disorder. Even though symptoms are milder than in clinical depression, they do affect the quality of life. Most authors estimate the prevalence of maternity blues to vary from 40% to 60% (Nappi *et al.* 2001; Hau and Levy 2003). Mothers with severe maternity blues have been found to be at risk of developing depression (Beck *et al.* 1992). By way of screening procedures it is possible to detect women with depressive symptoms (Luoma *et al.* 2001).

The effects of fathers’ postpartum depression on their interaction with their infants has not been studied to the same extent as mothers’. A recent review indicated, however, that depression in fathers is significantly associated with both internalizing and externalizing symptoms in children and with father–child conflict (Kane and Garber 2004). In line with this, an association between paternal postnatal depression and adverse child emotional and behavioural outcomes at the age of 3.5 years has been found (Ramchandani *et al.* 2005). As is the case among depressed mothers, depressed fathers also show variety in their parenting behaviour: Field and colleagues (1990; 1999) found that fathers who scored high in the Beck Depression Inventory did not show a depressed quality of behaviour during interaction with their infants.

Anxiety disorders are common among women of child-bearing age (Kessler *et al.* 2001), and there is a high level of co-morbidity as regards anxiety and depression (Wilhelm *et al.* 1997). There are findings that indicate an association between anxiety disorders and withdrawn or disengaged maternal behaviour (Woodruff Borden *et al.* 2002), and there is less warmth and support of autonomy (Whaley *et al.* 1999). The infants of mothers with high levels of anxiety have been found to show more state changes and less optimal performance as regards the Neonatal Behavioural Assessment Scale (NBAS) (Field *et al.* 2003).

The consequences of prenatal depression or anxiety on child development and the parent–child relationship have not been thoroughly studied. There is evidence of an association between poor prenatal attachment and symptoms of anxiety and depression during pregnancy (Condon and Corkindale 1997). A potential for long-term effects on parent–child interaction exists, as prenatal depression is a significant risk factor of postnatal depression (Matthey *et al.* 2000). Combined prenatal depression and anxiety have been found to be associated with increased negative behavioural reactivity of infants at the age of 4 months (Davis *et al.* 2004).

Various social factors also affect mental health; for example low economic status, stressful life events, and a lack of social support from spouse, friends or family are known to be risk factors of postpartum depression (Evans *et al.* 2001). Child-related factors such as prematurity, health of the child and worry about the child appear to be important determinants of parental mental health (Stowe and Nemeroff 1995; Davis *et al.* 2003). Parents whose perceptions of their own maternal care were non-caring have been found to be more unstable in mood during the peripartum period (Mayes and Leckman 1997). In turn, social support and intimate relationships are important

factors in protecting adult individuals from depression in different life situations (Leathers *et al.* 1997; Ezquiaga *et al.* 1999).

#### 4.4. Psychological distress during pregnancy after ART

After successful ART, negative emotions related to infertility generally seem to diminish (Verhaak *et al.* 2007), but for a subgroup of women the difficult and hurtful feelings related to infertility and ART are not easily overcome even though pregnancy is achieved (Hjelmstedt *et al.* 2004). Even after successful pregnancies some women maintain a view of themselves as having been wounded by the treatment process and the intense distress related to it (Redshaw *et al.* 2007).

Difficulties in conceiving and a long period of wishing to become pregnant may produce high expectations of pregnancy and parenthood and, on the other hand, an intense fear of losing the baby. McMahon and colleagues (1999) found that women conceiving through IVF tended to idealize pregnancy. van Balen *et al.* (1996) found that previously infertile couples experience pregnancy as a less relaxed process than fertile couples, and that previously infertile women experience delivery as more exceptional than fertile women. In some studies, women undergoing ART have been reported to continue to be at increased risk of depression, anxiety and psychological distress during pregnancy (Beaurepaire *et al.* 1994; Bernstein *et al.* 1994; van Balen *et al.* 1996; McMahon *et al.* 1997; Guerra *et al.* 1998; Eugster and Vingerhoets 1999), while in other studies no differences in the levels of depression or anxiety symptoms have been observed (Reading *et al.* 1989; Gibson *et al.* 2000; Klock and Greenfeld 2000; Harf-Kashdaei and Kaitz 2007). In a follow-up study it was found that IVF mothers were significantly more anxious about the well-being of their unborn infants and about damage to them during childbirth (McMahon *et al.* 1997). The authors concluded that the elevated anxiety of IVF mothers during pregnancy may not reflect a more general personality trait but rather reality-based concerns, as pregnancy risks are somewhat higher in IVF pregnancies (McMahon *et al.* 1997). A persistent and strong fear of losing the infant throughout the whole of pregnancy among ART women has also been reported (Hjelmstedt *et al.* 2003).

Feelings of inadequacy and inferiority are expectable consequences of infertility, as infertility deeply affects a woman's sense of self and her body (Ardenti *et al.* 1999). However, Cox *et al.* (2006) found no differences in the level of self-esteem between ART mothers and naturally conceiving mothers during pregnancy, and maternal self-esteem and anxiety were found to be similarly negatively correlated in both groups. Women in an IVF group reported significantly more satisfaction with pregnancy than control women and were less concerned about changes in weight, loss of husband's attention, or losing independence through having a baby (Klock and Greenfeld 2000). In an interview study by Ulrich and colleagues (2004), no differences were found between IVF and non-IVF couples' psychological attitude towards pregnancy or their fantasies about the child. Surprisingly, non-IVF women complained more often about exhaustion during pregnancy, even though the rate of pregnancy complications was higher among IVF women (Ulrich *et al.* 2004).

Fear of childbirth has not been found to be more common among previously infertile women (Saisto *et al.* 1999), and Poikkeus *et al.* (2006b) found, interestingly, that nulliparous women more often had severe fear of childbirth only in the group of naturally conceiving mothers, while among ART women fear of childbirth was not connected to parity.

One might think that concerns about the well-being of the infant and possible loss of pregnancy would inhibit ART parents from investing an emotional attachment to the unborn child. According to existing research data, attachment to the foetus does not seem to be different among ART and control mothers and fathers during pregnancy (Stanton and Golombok 1993; McMahon *et al.* 1997; Hjelmstedt *et al.* 2006), but some reluctance to bond with the foetus and prepare for parenthood has been perceived (McMahon *et al.* 1999). Among women in an ART group, Hjelmstedt and colleagues (2006) found relatively stable individual scores as regards prenatal attachment across pregnancy, which is in line with findings among normative populations (Grace 1989). Those women who were more ambivalent about their pregnancies had a weaker attachment to the foetus in the third trimester (Hjelmstedt *et al.* 2006).

Information about the mental health of infertile men during their partners' pregnancies is very limited. Van Balen *et al.* (1996) found that IVF fathers enjoyed their wives' pregnancies more than did fertile men and at the same time they experienced pregnancy as being more stressful than controls, as did their wives as well. In a Swedish study, infertile male partners experienced more somatic anxiety and indirect aggression and were also more anxious about the progress of their partners' pregnancies than fertile men after their partners' spontaneous pregnancies (Hjelmstedt *et al.* 2003). In a follow-up study by McMahon and colleagues (1997), no difference in state anxiety or attachment to the foetus between ART and control group fathers was found. A higher level of trait anxiety, lower self-esteem and decreased marital satisfaction has been found among IVF fathers during pregnancy compared with fertile controls (McMahon and Gibson 2002).

#### 4.5. Changes in marital relationship during transition to parenthood

In family systems theory, marital relationship is considered to be the cornerstone of the family unit (Owen and Cox 1997). Bowen's central principle was the counterbalance of togetherness and individuality (Bowen 1978). Differentiation of the self is the key factor in an individual's capacity to be in intimate contact with others and at the same time maintain one's own identity, as usually is the case in well-functioning marital relations (Bowen 1978). There is a great deal of empirical evidence of the negative effect of marital discord on parenting skills, and, on the other hand, good adjustment in marital relationship supporting good parenting (Lewis *et al.* 1988; Belsky *et al.* 1995; Erel and Burman 1995). Transition to parenthood brings about more profound changes and challenges to the couple than any other developmental stage of family life (Knauth, 2001). As the child grows older and possibly more children are born, parents continuously face new life-situations and demands and they need to adjust to these. Even though the birth of the first child is of special importance for parents' mutual relationship, there is wide agreement that adding a new child to the family always brings a change in marital relationship (Belsky *et al.* 1983).

The birth of the first child is special and changes a couple's relationship in a unique way because it turns the dyadic marital relationship into a triadic one (von Klitzing *et al.* 1999; Perren *et al.* 2003). This change brings about new challenges in the marital relationship, as past experiences of attachment and family life of both spouses are activated. The family triad includes distinctive properties, which cannot be directly derived from dyadic processes within the family (Emde 1994). The triadic capacity of an individual means his/her proclivity to make room for the co-parental partner, and according to von Klitzing and colleagues (1999), the expectant parents' fantasies and representations of the future family triad during pregnancy predict the quality of the emerging triadic family process.



A decline in marital quality after the birth of the first infant is one of the most often reported findings in studies on marital relationships during the transition to parenthood, and an increased level of conflict between partners after the birth of the first child is typical (Belsky and Pensky 1988; Cowan and Cowan 2000). Even though marital quality declines over time among childless couples as well (e.g. Karney and Bradbury 1997; Kurdek 1999), the decline during the transition to parenthood is so large that it cannot be attributed solely to normal development within a marital relationship (Cowan and Cowan 2000). New parents experience a high level of stress and strain, which continues several months postpartum (Shapiro *et al.* 2000). The reality of parenting a newborn may be different from the expectations, as the infant's needs become primary, lifestyle probably changes, and new parents seldom get enough sleep. However, variability in the change in marital relationships is great: not all couples experience a decline in marital quality, and some even show improvement (Belsky and Rovine 1990; Bradbury *et al.* 2000). It has been suggested that newborns do not create distress between couples nor bring them closer together, but rather amplify already existing difficulties (Cowan and Cowan 1988a).

Several aspects of marital relationships have been reported to be associated with the change during the transition to parenthood. There is evidence showing that the psychological dispositions and personalities of spouses are of importance in predicting both the quality and change of marital relationships during the transition to parenthood (Belsky and Hsieh 1998). The share of household tasks seems to become more traditional after the birth of a child (Leifer 1980; McHale and Huston 1984), and women's dissatisfaction in marital relations has been found to be associated with this (Levy-Shiff 1994). Mothers have reported that the share of household tasks is the most important trigger of conflict in the postpartum period (Cowan and Cowan 1988b). Paternal involvement in daily childcare routines protects marital satisfaction during the transition to parenthood (e.g. Belsky and Pensky 1988; Cowan and Cowan 2000). The definition of paternal involvement, however, varies in different studies, and it may concern the amount of time the father spends with his child, the share of childcare routines he takes responsibility for, or his emotional involvement in interaction with his child.

Pregnancy and parenthood inevitably affect sexuality, and psychosexual problems are common after the birth of a child (von Sydow 1999). During pregnancy, women have generally reported a decrease in sexual desire during the first trimester, possibly related to the physiological and hormonal changes (Bogren 1991). Men have reported decreased sexual activity in the third trimester, related to concerns about harming the infant, and after childbirth (Bogren 1991). After the birth of the first child sexual closeness and sexual satisfaction seem to deteriorate, at least during the first year of parenthood (Wadsby and Sydsjö 2001; Ahlborg *et al.* 2005). Typically, sexual desire is greater among new fathers than among new mothers, which is likely to become a problem after the birth of a child (Ahlborg *et al.* 2000). Especially for women, the infant's needs become primary, and probably tiredness affects women's sexual desire more, as women in general impose greater demands as regards sexual activity (Levine 1992). Breastfeeding and reduced sexual desire and activity have been found to be associated (Hyde *et al.* 1996, Ahlborg *et al.* 2005), as have pain during intercourse and current breast-feeding (Glazener 1997). These effects are connected with low levels of circulating oestrogen during breast-feeding.

#### 4.6. Marital relationships after successful ART

Comparisons of marital relations between couples who conceived either spontaneously or by ART have shown great variation. Couples with successful ART have been reported to show greater

marital cohesion (i.e. a mutual feeling of being a couple, sharing things and ideas) (Slade *et al.* 1997), to have less marital distress (Benazon *et al.* 1992), to experience their relationships with their partners in a more positive way (Strauss *et al.* 1992) and to have more stable relationships (Sydsjö *et al.* 2002) than couples experiencing spontaneous pregnancy. Some studies have revealed no difference in marital satisfaction between ART and control couples (Colpin *et al.* 1995; McMahon *et al.* 1997; Klock and Greenfeld 2000) or between ART couples and those couples who had children through adoption (Leiblum *et al.* 1998). In contrast, there are also reports of more marital conflicts among ART parents than controls (Gibson *et al.* 2000; Hahn and DiPietro 2001). There is evidence showing that congruency of couples' perceptions of infertility, sharing their sorrow and consoling each other, is associated with good marital adjustment (Peterson *et al.* 2003). The quality of marriage has been found to be better when both spouses had a common involvement in infertility treatments and both saw having a child as important (Pasch *et al.* 2002). The majority of research on the impact of infertility and successful ART on marital relationships is cross-sectional and based on relatively small sample sizes.

Previous longitudinal follow-up studies show somewhat contradictory findings. Sydsjö *et al.* (2002; 2007) followed ART couples and their controls from pregnancy until the children were five years old. They found that during the child's first five years, ART couples did not experience a decrease in their marital satisfaction, in contrast to spontaneously conceiving couples. The authors concluded that the physically and psychologically demanding shared experience had strengthened the marital relationship (Sydsjö *et al.* 2002). However, Hjelmstedt *et al.* (2004) did not find a buffering effect against decline of marital satisfaction among ART couples. They followed ART couples and their controls from early pregnancy to 6 months postpartum and found a decrease in marital satisfaction in both groups (Hjelmstedt *et al.* 2004). Ulrich and colleagues (2004) interviewed couples during pregnancy and three and twelve months postpartum. They found a similar pattern in IVF and non-IVF couples: during pregnancy the majority of couples were satisfied with their partnerships, three months after birth a decrease in satisfaction was seen in both groups, and 12 months after birth partnership satisfaction had again reached the levels observed in the first assessment. Sexuality, on the other hand, was affected differently: both women and men in the IVF group were less satisfied with their sexuality during pregnancy than those in non-IVF group. Many IVF couples reported reduction in their sexual activities because of fear of harming the child (Ulrich *et al.* 2004).

## **5. Early parenting**

### **5.1. Early parent–child interaction**

The special nature of early parent–infant relationships has been a focus of abundant research during the last 40–50 years. Winnicott's frequently quoted statement “there is no such a thing as an infant” refers to his widely accepted idea that at the earliest stages of human development the infant and maternal care belong to each other and cannot be disentangled (Winnicott 1960). John Bowlby importantly stressed the relevance of mother–child interaction on child development as early as in the late 1950's. His attachment theory is based on the assumption that mother–child attachment has an evolutionary basis, promoting the child's survival by increasing mother–child proximity, especially when the child is under stress (Bowlby 1969). Thus the mother forms a

secure base for the infant. The infant is dependent on maternal care, which is based on empathy (Winnicott 1960). Mary Ainsworth, Bowlby's collaborator, introduced the term sensitivity as the caregiver's ability to perceive and interpret correctly the infant's emotional and behavioural signals and to respond to them appropriately, promptly and consistently (Ainsworth *et al.* 1978). Patricia Crittenden, a scholar of Ainsworth, further specified the term as not a characteristic of an individual parent but instead as a property of the parent–infant dyad (Crittenden 1981; 1983). A derivative of sensitivity, emotional availability, was introduced by Emde and Easterbrooks (1985). It consists of attentiveness, responsiveness, and a capacity to see things from the infant's point of view (Bretherton 2000).

In infancy, a central task of the parent is to tune her/himself to the child's emotional state, to interpret his/her changing needs and to respond to them in an adequate manner. The regulation of affects, both infant's fear and distress (Lyons-Ruth and Spielman 2004) and positive affects (Feldman *et al.* 1996), is necessary. Modern neuropsychology also stresses the importance of the regulatory function of the infant–mother interaction as an essential promoter to ensure the development and maintenance of synaptic connections during the establishment of functional brain circuits (Ovtscharoff and Braun 2001). The main ways of communication between infant and caregiver are physical: facial expressions, postures, tempo of movement, tone of voice and physiological charge (Bowlby 1969). Every infant has a personal rhythm and way of signalling his/her needs, and mothers need to learn to read these signals and respond to them appropriately. However, clashes between caregiver and child are essential and prepare the dyad for the next developmental phase (Kestenberg 1975). Summarizing, early mother–child interaction can be considered as a multifaceted interplay in which both the infant's and the mother's thresholds for stimuli, tolerance for dissatisfaction and ways of acting under stress play important roles, and in which frustration and gratification take turns (Kestenberg 1975).

The dyadic definition of sensitivity encompasses both the individual characteristics of the parent and the infant and the context in which the dyadic interaction takes place (Claussen and Crittenden 2001). Today this conceptualization of sensitivity is widely used in research and clinical work (e.g. McMahon *et al.* 1997; van den Boom 1997; Deater-Deckard and O'Connor 2000; Kochanska and Aksan 2004; Kivijärvi *et al.* 2005). No single type of behaviour in itself can be labelled sensitive or insensitive, because the sensitivity of the parent is evaluated as seen from the eyes of the child (Crittenden 1981). Crittenden (1988, 2003, 2004) defines adult sensitivity in play as any pattern of behaviour that pleases the infant, increases the infant's comfort and attentiveness and reduces his/her distress and disengagement. Parental sensitive responsiveness is connected to child cooperation (Rocissano *et al.* 1987; Shaw *et al.* 1994; Kochanska *et al.* 2005a). Characteristic of high quality interaction is not only sharing and mutual expression of positive emotions (Crittenden and Bonvillian 1984), but also the mother's ability to accept the child's negative emotions (Crittenden 1997; 1999b). Sensitive mothering has been found to be associated with the infant's contentment and crying behaviour: sensitive mothers' infants cried less at the age of three and twelve months (Kivijärvi *et al.* 2004).

The concept of sensitivity is not definite, and in research the sensitivity of behaviour has been defined in varying ways. Most studies on sensitivity have involved observation of the actions that are taken between infants and their parents, but it may be that the actions are far less important than the parent's affective comprehension and adjustment in the infant's state of mind, which can be shared with the infant by way of minor actions like intonation or facial expression. Today, researchers have increasingly started to be interested in mental functions behind sensitivity, i.e. mentalizing or reflective functioning.

Reflective functioning means the capacity to consider and understand oneself and others in terms of mental states, and to reason about one's own and others' behaviour in relation to these, as Pajulo and colleagues state (2006). A basic element of maternal reflective functioning involves her capacity to reflect upon her child's unique subjective intentions during stress or conflict despite her own affective experience (Slade *et al.* 2002). This capacity makes it possible for the caregiver to remain emotionally engaged and at the same time sufficiently in control, and thus contain the infant's distress and transform it into a tolerable experience (Grienenberger *et al.* 2005). In a study by Grienenberger and colleagues (2005), failures of affect containment were significantly correlated with infant attachment.

Parental mental representations can be understood as parents' internal subjective experiences of their relationships with their child (Zeanah *et al.* 1994). By studying them it is possible to obtain information about the mental processes behind observed parental behaviour. The most active representations are played out in interactive behaviour, and only those representations that come to interaction influence the child (Stern 1995).

Maternal representations contribute to infant–mother attachment security (Huth-Bocks *et al.* 2004). Fonagy and colleagues (1991) suggested that a mother's representations of her own mother would be the best predictor of security of attachment between the mother and her own child. There is a lot of research showing an association between good mother–infant interaction or secure attachment relationship and maternal positive representations of herself as a mother (Biringen *et al.* 2000; Huth-Bocks *et al.* 2004). A similar association has been found between secure attachment and a mother's positive representations of her child (Fava Vizziello *et al.* 2000; Rosenblum *et al.* 2002) and her own mother (Fonagy *et al.* 1991; Ward and Carlson 1995; Crandell *et al.* 1997; Pederson *et al.* 1998).

Paternal representations and their connection to father–child interaction have been explored to a far lesser extent than maternal representations. van IJzendoorn (1995) stated that fathers' mental representations of attachment correspond moderately to the quality of infant–father attachment. von Klitzing and colleagues (1999) studied the role of the father in early family interaction and found both mothers' and fathers' representations to be associated with the quality of triadic interactions in father–mother–infant play at four months of age. Further, fathers' own beliefs in their relational importance was connected to their capacity in triadic interaction (von Klitzing *et al.* 1999).

The innate individual features (e.g. temperament) of the infant are also known to have an impact on the quality of the interactive relationship between parents and infant (e.g. van den Boom and Hoeksma 1994; Deater-Deckard and O'Connor 2000; Kivijärvi *et al.* 2001). From very early infancy, infants' individual characteristics are in constant interaction with the effects of parental interactive behaviour, and from these interactive experiences infants start to construct representational models of interaction and to form constant behavioural patterns that are guided by these models (Stern and Bruschiweiler-Stern 1998). Infant behaviour may for its part serve to maintain adaptive or maladaptive mutual interaction (e.g. Crittenden 1983). The behavioural patterns the infant has learned with the caregiver and which he/she displays in future interactions are also known to affect later caregiver behaviour, especially future parental sensitivity (Kivijärvi 2005). It seems that responsiveness is especially important for infants with a difficult temperament, as the combination of suboptimal parent–child–relationships and difficult

temperament leads to particularly poor developmental outcomes (Sanson *et al.* 1991; Rubin *et al.* 2003; Kochanska *et al.* 2005b).

An infant's irritability, irregularity and distress have been shown to be associated with lack of playfulness in mothers, avoidance and coercive discipline (van den Boom and Hoeksma, 1994). There is also evidence of heightened parenting stress among mothers of premature and low-birth-weight infants (Davis *et al.* 2003). However, some studies show that other "problematic" child characteristics such as inhibition and fearfulness elicit protectiveness and care in parents (Belsky *et al.* 2000). Similarly, there is some evidence that mothers of helpless and fragile preterm infants show especially high sensitivity and compensatory caring (Meier *et al.* 2003). Thus, there are several factors associated with parent-child interaction, and these factors are in a complex interaction with each other, which makes them extremely difficult to explore.

## 5.2. Co-parenting and social support

Co-parenting refers to the way that parents work together in their roles as parents (Feinberg 2002). It is linked to marital relationship, parenting, and child outcomes (Abidin and Brunner 1995; Schoppe *et al.* 2001). The quality of co-parenting is associated with the quality of the relationship between parents in general but is not equivalent to it (Feinberg 2002), and in research it has been identified as an important aspect of parents' relationship with their children (Frosch *et al.* 2000). The triadic capacity of both parents is an important determinant of co-parenting, as it is connected to the space that parents give to one another in relation to the child (von Klitzing *et al.* 1999). An important component of co-parenting is the parents' capability to manage interparental conflict, which has been repeatedly connected to children's behaviour problems (e.g. Emery 1982; Jouriles *et al.* 1989; Rutter 1994). Conflict *per se* is not always harmful for children; constructive management of conflict seems to be of benefit (Cummings and Wilson 1999).

Social support has been shown to be of importance in the development of a secure attachment relationship between mother and infant, especially if the child is irritable (Crockenberg 1981; Crittenden 1985; Spieker and Booth 1988; Stern 1995). Most important seems to be support from the spouse (Crnic *et al.* 1983), but Stern (1995) has stressed the relevance of other women's support to the new mother. Kivijärvi *et al.* (2004) found more sensitive mothers to experience more support than less sensitive mothers, especially from their husbands and best friends.

## 5.3. Parenting at toddler-age

Toddler-age is a period of rapid neurological change and reorganization (NICHD Early Child Care Research Network 2006). As an infant becomes a toddler, he/she develops a growing sense of self and a need for increased autonomy, which in turn affects his/her behaviour in a way that produces more conflicts with parents. Symbolic presentation becomes possible gradually, which enhances a considerable developmental step in cognitive, emotional, communicative, and social development (Zeanah *et al.* 1997a). Parents have to adapt to these behavioural changes (LeCuyer-Maus 2000), and according to the few studies focusing on developmental changes in parent-child interaction during the transition to toddlerhood among the normative population, this seems to happen (Kopp 1989; Kochanska and Aksan 2004). Sensitive parental behaviour during toddlerhood means a different range of parental behaviour than during infancy, limit-setting, protection, supporting of early autonomy and acceptance of negative affect being central parenting functions (Rocissano *et*

*al.* 1987; Dix *et al.* 2007;). Parents are confronted with new developmental challenges, which may produce changes in family patterns. For example, the increase in the child's oppositional behaviour increases the need for discipline, which may be challenging for some parents, or the balance between maternal and paternal involvement with the child may change, as the child's dependence on the mother decreases.

Shared joy and pleasure among parents and children seem to be of importance from the very start: Herzog (1996) stresses the importance of early forms of play for the development of the capacity to solve problems, regulate emotions and handle disagreements. At toddler-age, children's play gradually becomes more complex, more imaginary, and early forms of role-play start to appear. Parents' playfulness does not necessarily mean a great deal of time spent in play activities, but rather a playful attitude of parents that enhances the child's play. Fonagy and Target (1997) regard the playfulness of caregivers as one of the preconditions of the child's later development of reflective functioning. Slade and colleagues (1999) found that mothers whose representations of their toddlers were rated high as regards joy and pleasure were also rated as having highly coherent and rich representations.

## **6. Pregnancy and early parenting after ART**

### **6.1. The impact of previous infertility and ART on parenting**

Although successful infertility treatment means fulfilment of a desire, there have been concerns about ART mothers and fathers facing difficulties in parenting their children. During a prolonged period of trying to conceive, the image of the child and oneself as a parent may become idealized (van Balen 1996), which in turn makes it more difficult to adjust to the reality of parenting an infant. The image of oneself as an infertile person is not easily overcome, even after conceiving (Braverman *et al.* 1998). In a study by Hjelmstedt *et al.* (2004) it was found that for several IVF parents negative feelings related to infertility were not overcome even though they had become parents. The wounding experience of infertility may occupy the parent's mind after the child is born, and thus interfere with parenting skills.

Concerns about anxious, controlling and overprotective patterns of parenting among previously infertile couples have been presented (Weaver *et al.* 1993; Raoul-Duval *et al.* 1994). Vulnerability among such parents is attributed to the stressfulness of infertility and treatments and an emotional over-investment in the long-awaited child (van Balen 1996). The combination of parental anxiety over the infant's well-being, excessive protectiveness and the perinatal risks associated with ART might produce a risk of overprotective parenting and the "vulnerable child syndrome" introduced by Green and Solnit (1964). As regards a child's psychosocial development this would mean a risk of inadequate development of individuation, and problems of autonomy, emotion regulation and peer relationships. Empirical evidence of ART parents' parenting is, however, inconclusive and there are several methodological problems in the studies such as small sample sizes, cross-sectional design and the lack of observation-based evaluations.

The negative impact of infertility and ART on parenting is usually related to the mother's deep concerns about the safety of the child. Such mothers have been found to be more protective towards their children (Weaver *et al.* 1993; van Balen 1998) and to consider them more vulnerable

in comparison with naturally conceiving parents (Gibson *et al.* 2000). McMahon and Gibson (2002) also found that ART mothers of four-month-old children judged themselves to be less competent as parents than did their controls and reported their infants to be temperamentally more difficult at the ages of four and 12 months. Fisher and colleagues (2005) found that women conceiving after ART were four times more likely to be admitted with their infants to residential early parenting centres for treatment of mood disturbances or unsettled infant behaviour than those conceiving spontaneously. They concluded that this is a combination of several factors connected to assisted reproduction: a greater proportion of Caesarean sections, multiple births and a lowered sense of entitlement to seek help because the infants are highly desired.

In contrast, there is evidence that ART mothers show less parental stress (Golombok *et al.* 1995, Hahn and DiPietro 2001, McMahon *et al.* 2003) and perceive themselves more competent as parents than naturally conceiving mothers (Van Balen 1996). Sydsjö *et al.* (2002) reported that IVF parents evaluated their children as being more regular, more sensitive to strong stimuli, more attentive, and more manageable than control parents, and Abbey *et al.* (1994) found that previously infertile women experienced less stress and had a better global life quality after having a baby than their fertile controls. However, becoming a parent did not have the same effect on their husbands, who did not report positive effects on their global life quality to the same extent (Abbey *et al.* 1994). There are also some studies that do not show differences between ART mothers and naturally conceiving mothers in their parenting experiences or attachment to their children (Gibson *et al.* 2000b; Greenfeld and Klock 2001; Colpin and Soenen 2002).

Parenting by ART fathers has been scantily studied, and results show positive or neutral impacts. On the basis of mothers' reports, ART fathers had more interaction with their children and less parenting stress (Golombok *et al.* 1995). However, research based on fathers' own reports have shown no differences in fathering experiences, attachment to their child, or attitudes towards parenting between ART and natural conception fathers (Gibson *et al.* 2000a).

Observational studies of parent-child interaction among ART families are scarce and reveal mainly neutral or positive impacts of previous infertility and ART on parent-child relationships. Gibson *et al.* (2000b) found no difference between ART and control mothers in sensitivity and emotional involvement when playing with their children, or in 12-month-old infants' attachment to their mothers. Hahn and DiPietro (2001) found that IVF parents showed greater emotional involvement towards their children than control parents but were not more hesitant to set limits. This finding, was, however, based on reports by kindergarten teachers, and thus is not fully comparable with other observational data. McMahon and Gibson (2002) did not find differences in any categories of observed maternal behaviour during Still-Face observation at four months, but the IVF infants showed significantly higher levels of fussing. Neither did they find differences in observed quality of infant-mother attachment at 12 months (McMahon and Gibson 2002).

## 6.2. Parenthood after long-term infertility and multiple treatment failure

According to research (Leiblum *et al.* 1987; Connolly *et al.* 1993), the most stressful aspect of infertility treatment is trying and not succeeding. Most couples adjust well to failure, but there seems to be a subgroup that develops severe emotional problems (Reading *et al.* 1989). In a qualitative study of women's experiences of infertility treatment, many women described becoming "totally preoccupied with an all-consuming need" when difficulties with conception occurred (Redshaw *et al.* 2007). In the case of long-lasting infertility this preoccupation goes on

for years and is combined with the continuous stress associated with unsuccessful ART attempts, and thus it seems reasonable to assume that some kind of effect on the image of oneself as a parent and on parenting would be seen when parenthood finally comes true. The stress connected to ART may become more pronounced as time passes, because the possibility of successful treatment outcome is diminished along with unsuccessful treatment attempts and a woman's advancing age.

There are not many studies focused on the impact of a long duration of treatment on couples and several unsuccessful treatment attempts, and the results are not entirely comparable because of the different criteria used. Berg and Wilson (1991) found stress to be moderately high during the first year of treatment, less in the second year, and it started to increase from the third year of treatment attempts. Ardenti and colleagues (1999), on the other hand, found women with 4–6 years of infertility treatment to have a higher level of state anxiety compared with those with 7 years of treatment or more. Others, however, have found that prolonged infertility (van Balen and Trimbos-Kemper 1993) or repeated treatment cycles (Beaurepaire *et al.* 1994) increase the emotional strain experienced by women, or there are adjustment difficulties during pregnancy (McMahon *et al.* 1997). Sydsjö and colleagues (2002) found no association between the duration of infertility and the experience of achieved parenthood. They concluded that couples who have gone through infertility and managed to maintain a stable relationship might be more prepared to raise a child. Another explanation could be that parents with long-lasting infertility are not prone to express feelings of stress and disappointment when they have finally achieved the long-awaited goal. Even their social environment may put pressure on being happy after succeeding in becoming pregnant. McMahon *et al.* (2003) found that parents who had had several IVF treatments showed a more positive adjustment to parenthood but at the same time showed a tendency towards more defensive responding. They assumed that a degree of idealization of parenthood may be necessary to justify the struggle needed to succeed in conceiving (McMahon *et al.* 2003). Women with a long period of infertility (seven or more years) have been found more often to have a severe fear of childbirth (Poikkeus *et al.* 2006b), which may reflect fear of losing the infant.

A long duration of infertility is usually associated with advanced maternal age, which in turn elevates obstetric risks. The knowledge of elevated risk status together with prenatal screening to detect chromosomal abnormalities may increase older mothers' anxiety and concern (Joseph *et al.* 2005). A study of older women's adjustment during ART pregnancy revealed, however, no differences in general mood, concerns about the unborn child, or attachment to the foetus (McMahon *et al.* 2007).

The results of some recent studies on couples who discontinue infertility treatment have suggested that the decision to drop out is due to several factors. Decreasing pregnancy rates and accumulating experience of disappointment with unsuccessful attempts cause increasing psychological despair, which seems to play an important part in the decision to discontinue treatment (Domar 2004; Peddie *et al.* 2005, Rajkhowa *et al.* 2006). The negative effects that infertility has on marital and sexual relations were named as important reasons to abandon further treatment, by both women who remained childless and those who became mothers by adoption, in a study by Leiblum and colleagues (1998). On the other hand, a couple's commitment to continue infertility treatment despite failures can increase their closeness, and shared hardships and disappointments may create a feeling of marital cohesion (Peterson *et al.* 2003). In cases of long-standing infertility, couples probably think about other possible options, such as adoption. It is possible that the long procedure results in selection: only couples with an intense desire for



biological parenthood and good preconditions to cope with stressful situations both individually and as a couple continue treatment despite several disappointments.

## **7. Challenges of measuring mental health, marital relations, and parenting**

### 7.1. Mental health

Questionnaires are commonly used in research and screening of psychological symptoms, as they are cheap and simple to use in large populations. A common problem regarding the use of questionnaires in assessing mental health is the weak reliability of reported symptoms. Different cut-off points produce different levels of specificity and sensitivity in detecting psychological disorders. At its best, a questionnaire may produce a fairly reliable view of the existence and division of psychological symptomatology in a population, but in diagnostic use one should be cautious.

The most commonly used self-report scales of mental health include the Symptom Check List (SCL) (Degoratis *et al.* 1973) and the General Health Questionnaire (GHQ) (Goldberg and Williams 1988), both of which are designed to measure the state of mental health. Both scales give a global score that indicates the severity of symptomatology, and both have subscales of dimensions of mental health. Their screening properties have been found to be good and similar (Holi *et al.* 2003). For detecting depressive symptoms, several specific inventories have been developed, of which the most commonly used are the Beck Depression Inventory (BDI) (Beck *et al.* 1961) and the Center for Epidemiologic Studies Depression (CES-D) scale (Radloff 1977). There are special features in the symptomatology of postpartum depression, and specific questionnaires for assessing postpartum depressive symptoms have been developed. The most widely used are the Edinburgh Postnatal Depression Scale (EPDS) (Cox *et al.* 1987) and the Postpartum Depression Screening Scale (PDSS) (Beck and Gable 2000). Spielberger's State-Trait Anxiety Inventory (STAI) (Spielberger *et al.* 1970) is used in assessing anxiety. It includes dimensions of both state and trait anxiety and thus extends to personality traits in addition to present symptomatology.

The methodology used in studies of mental health and infertility has been variable, and questions have been raised about whether specific methods of measurements related to infertility should be used, as it may be easier to express emotions when the focus is on the issue (Holter *et al.* 2006). Fekkes and colleagues (2003) found no difference in anxiety between an infertility group and a control group in general measures but they detected higher levels of emotional complaints as regards fertility-related aspects.

In clinical work a thorough interview is the basis of diagnosis. In research, though, interviews are costly and time-consuming and thus limit the sample size. An experienced clinician probably attains a more realistic picture of an individual's mental state by way of an interview rather than a questionnaire, but an interview always produces an interactive situation in which the representations of interactions are activated and affect the results. Some interviews have been developed mainly for research purposes. The Diagnostic Interview Schedule (DIS) (Robins *et al.* 1981) is a structured interview developed to obtain psychiatric diagnoses in a population using lay

interviewers. An advantage of a structured interview compared with a questionnaire is that the possibility of misunderstanding the concept or some words is diminished.

## 7.2. Marital relationship

Marital relations have been a focus of study since the 1940's. At the beginning, research was based on personality-centred self-report measures (Gottman and Notarius 2002). An interactive perspective started to gain attention in the late 1950's, when Bateson focused on dysfunctional interaction patterns within families. General system theory was introduced by von Bertalanffy (1968), and it stimulated research into social interaction by examining its components. Family systems theory, initially introduced by Bowen (1978), involves an understanding of the family system as an organized whole in which the subsystems are interdependent (Minuchin 1985). Along with systemic orientation, the children started to be seen as active participants in the family system (Maccoby 1984). The development of observational methods in the 1970's brought up the importance of affect in understanding functional and dysfunctional marriages (Gottman and Notarius 2002). However, self-report questionnaires are still the most widely used methods of assessing marital relations despite their well-known limitations, as their use makes it possible to explore big populations.

Assessments of marital interaction vary a great deal in the definition of what is assessed. The global term "marital quality" has been mixed with the commonly used and more restricted terms "marital adjustment" and "marital satisfaction". The measures include a wide variety of items from specific behaviour patterns in marital interaction to evaluation of the relationship as a whole. The most often used self-report tools for assessing marital relationship include the Dyadic Assessment Scale (DAS) (Spanier 1976) and the Marital Adjustment Test (MAT) (Locke and Wallace 1959). The former is a 32-item self-report questionnaire, which yields an overall score of marital relationship and scores in four subscales, namely dyadic consensus (agreement on spending spare time, financial matters, general view of life), dyadic cohesion (having discussions together, having interests in common), marital satisfaction (the amount of quarrels, trusting one another, general happiness in relationship) and sexual affection (sexual desire, expressions of love). The MAT is a 15-item scale that gives a score of global marital satisfaction.

An interview as a tool for assessment of marital relations adds the possibility of obtaining a more profound view of the marital system. As couples tend to have an effect on one another in a joint interview and mention problems less frequently, more reliable results may be reached by way of separate interviews (Ulrich *et al.* 2004).

Observational methods as regards marital relations rely either on a videotaped setting away from home or a video- or audiotape recorded at home without an unfamiliar observer present. In both cases, however, the situation is unnatural and may thus influence the observed couple. The strength of observation is that actual events can be described, the description meeting scientific standards as regards replicability (Heyman *et al.* 2001). The interaction is coded according to a structured coding system based on verbal communication (audiotapes) or both verbal and nonverbal behaviour (videotapes). Questions about reliability of observations, related to inter-rater agreement and representativeness of the observed occasion have been raised. Even in the case of very precisely defined criteria for behaviour there remains the possibility of misinterpretation. The Specific Affect coding system (SPAFF) (Gottman and Krokoff 1989) is an example of a coding system for dyadic affective behaviour. It involves assessment of affective behaviour patterns by

observing facial expressions, body gestures and speech quality and content displayed during dyadic behavioural interactions.

### 7.3. Parenting

There are several self-report questionnaires designed to assess parenting quality. Their use requires caution, as there are often problems with validity, and they are more reliable when there is another source of information available such as observation (Najman *et al.* 2000). Parenting questionnaires work best when used among community samples in which the majority of participants do not have psychiatric problems, as such problems may produce bias via the parent's possibly inaccurate reporting of the child's behaviour (Bassett *et al.* 2006). Even then there are possible sources of bias. First, the terms used and the alternatives given for answers may guide the response, and second, many parenting items are sensitive in nature, and a tendency for socially desirable responding has been found in the face of sensitive questions (Schwarz 1999).

The reliability of self-reports has been questioned, especially when studying parents who have undergone ART, as these parents may feel that they have no right to feel frustrated or dissatisfied with their child or themselves as parents (McMahon *et al.* 2003), and thus their responses as regards the problematic and stressful aspects of parenting and child behaviour may not be accurate. Such parents have been found to give more socially acceptable and more defensive answers (Greil 1997). The internal consistency of parenting questionnaires varies considerably (Morsbach and Pronz 2006), and concordance with other sources of data, e.g. observation, may be difficult to achieve, as observational and self-report methods often do not measure the same types of behaviour (Lovejoy *et al.* 2000).

Widely used self-report tools in assessing parenting are the Abidin Parenting Stress Index (Abidin 1990) and the Parenting Daily Hassles scale (Cmic and Greenberg 1990). The former was developed to measure the relative magnitude of stress in the parent-child system. It can be used for parents of children aged from one month up to 12 years. The short form of the test was developed for purposes of identifying parent-child systems at risk, as well as for research needs. It conceptualizes parents' experiences in child and parental domains. The Parenting Daily Hassles scale measures parental perceptions of minor everyday problems associated with parenting. It yields two separate scores, one reflecting the frequency of hassles and the other the intensity of hassles.

In clinical work, interviewing the parents is of major importance in assessing parenting quality and in constructing the image of both the present and past parent-child relationship. Advantages of an interview compared with self-reporting in assessing parenting quality are the possibility to gather more detailed information on selected areas of interest and the possibility to clarify to the respondent those items that are not unambiguous. Of main importance is the parent's emotional tone and reactions during the interview, and from a clinical standpoint it may even be less important what the parents say than how they say it (Zeanah *et al.* 1997b). A widely used instrument for both clinical work and research is the Working Model of the Child Interview (WMCI) (Zeanah *et al.* 1994), a semi-structured interview assessing a parent's internal working models, i.e. representations of the child and his/her relationship with the child.

There is great variation in the observational methods by which parent-child interaction is assessed. They vary in both setting and structure, from structured laboratory-type observations to

naturalistic, unstructured home observations, with or without videotaping. Videotaping has made it possible to analyse the interaction in detail, as the same occasion can be explored several times. Depending on the focus of research and the age of the child, different methods may prove useful. The assessment method should cover the main dimensions of the infant–caregiver relationship. Ainsworth and colleagues established four dimensions to be assessed as regards maternal behaviour in early mother–infant interactions: sensitivity, acceptance, cooperation and accessibility (Ainsworth *et al.* 1971). Emde (1989) described the domains of the infant–caregiver relationship as follows:

Parent:	Infant:
Emotional availability	Emotion regulation
Nurturance / emphatic responsiveness	Security / self-esteem
Protection	Vigilance / self-protection
Teaching	Learning / curiosity / mastery
Play	Play / imagination
Discipline / limit-setting	Self-control / cooperation
Instrumental care / structure	Self-regulation / structure

These items are included in some form in most of the modern infant–caregiver relationship assessments.

The most difficult aspect to assess, but of particular importance, is the subjective experience of the infant. Reactive behaviour is not an equivalent of feeling (Kestenberg 1975), and thus it is impossible to learn the tone of feelings only by observing behaviour. To know the infant’s experience, the observer must ask him/herself throughout the assessment what it feels like to be this particular infant with this particular caregiver at this particular time in this particular relationship (Zeanah *et al.* 1997b).

The major advantage of naturalistic assessments is that the parent and child can be observed in a setting familiar to them. They are thus more likely to engage in routinized patterns of behaviour that are of interest (Zeanah *et al.* 1997b). The question has arisen of whether a few minutes of video assessment gives reliable and relevant information about the constant interaction style of the dyad. Kemppinen and colleagues (2006) compared the assessments of video raters and observers in their preliminary study with a small sample by using Parent–Child Early Relational Assessment (PCERA) (Clark 1985). They found generally at least moderate agreement between the assessments of video raters and long-term observers, though there were also items of slight or poor agreement (Kemppinen *et al.* 2006). Another important question is whether different methods should be developed for assessment of fathering, as paternal sensitive behaviour and a father’s role in enhancing good development in children seem to be different from those of mothers (Schorre 1994; von Klitzing *et al.* 1999; Paquette 2004).

Observational assessment methods used most often include PCERA (Clark 1985), the Care Index (Crittenden 2003; 2004) and the Clinical Problem-Solving Procedure (the Crowell Procedure) (Crowell and Feldman 1988). The first gives measures of parental affect and mood, parenting style, attitude toward the child, and behavioural involvement with the child. It includes rating of the infant’s mood, affect and behaviour and items that characterize the interaction and mutuality of the dyad. Different segments of interaction are videotaped in order to find areas of both competence and conflict. The Care Index is an assessment of playful adult–child interaction under non-stressful conditions. The behaviour of the parent and that of the child are separately coded,

but they indicate *dyadic* constructs; for instance, the criteria for parent's interaction quality are based on concordance with the child's age and temperament, and his/her expressed satisfaction. The Crowell Procedure was originally designed for 24-month-old children and later modified for children of 24 to 54 months of age. It includes nine separate episodes designed to elicit types of behaviour that illustrate different domains of the parent-child relationship, including free play and structured segments including both gratifying and frustrating tasks.

The challenge of research is to find accurate and valid, but not too costly or time-consuming methods to assess the items that are the focus of the study. Questionnaires are cheap and easy to use, but they produce information mainly on conscious processes and ideas. Longitudinal measurements increase the reliability of information. When studying early parenting, we need also to be aware of the more unconscious level of a parent's mind, played out in behaviour or mental representations. Thus, to produce reliable information on parent-child interaction we need to interview the parents or observe their behaviour with the child, or both.

## **Aims of the study**

The aims of this prospective controlled follow-up study of previously infertile couples' transition to parenthood after successful ART and singleton pregnancy were:

1. to find out whether there are differences between couples undergoing ART and fertile control couples in depressive and anxiety symptoms, sleeping difficulties and social dysfunction during the transition to parenthood
2. to assess whether ART couples differed from fertile controls in the quality and change of marital relations during the first year of parenting, and to evaluate whether psychosocial stressors differently influenced the quality and change of marital relationships
3. to examine whether ART mothers and fathers differed from their fertile controls in parenting experiences during the first year of the child, and how ante- and perinatal factors and infant characteristics predicted changes and level of parenting experiences
4. to evaluate parent-child interaction and parents' mental representations of the child and the relationship with the child among ART couples with a long history of infertility and several unsuccessful ART attempts

# Subjects and methods

## 1. Study design and procedure

This is a prospective, controlled, longitudinal follow-up study of infertile couples who conceived with the help of ART (IVF, ICSI, FET) with their own gametes, and their fertile control couples. The study focused on the early environment of the child: the mental health of the parents, their marital relationships, and experience of parenting. The study was carried out by means of questionnaires, which were filled in by the participants at three time points: 18–20 weeks of gestation (T1), when the child was two months old (T2) and when the child was 12 months old (T3). A subgroup of couples with long-lasting infertility and several unsuccessful ART attempts was interviewed and observed in respect to parenting during the child's infancy (A1, 2,5–8 months) and at toddler-age (A2, 19–24 months). The study was approved by the Ethics committees of the participating clinics.

The ART couples were recruited after a viable pregnancy was confirmed in five infertility clinics in Finland during 1999: Helsinki University Central Hospital, the Family Federation of Finland in Helsinki, Oulu and Turku, and Helsinki Deaconess Institute. Control couples were recruited by a research nurse at Helsinki University Central Hospital from couples participating in routine ultrasonographic examination offered by the community at 16 to 18 weeks of gestation in 1999. These control couples reported no history of infertility, were Finnish speakers, and the age of the woman was over 25 years. Only couples with singleton pregnancies started with their own gametes were included in studies I–III. In study IV there was one pair of twins. All participants, women and men separately, signed an informed consent document. The couples were given T1 questionnaires at the time of recruitment. The questionnaires were returned in pre-paid envelopes to the research nurse, who contacted every couple before sending the questionnaires at T2 and T3 to make sure the couple still wanted to participate. Those participants who scored above the cut-off points in mental health assessments and thus were considered to have clinically significant amounts of mental health symptoms were contacted and informed about the mental health care services available to them. The participants were representative of the couples treated at the above clinics in 1999.

## 2. Subjects

### 2.1. Studies I–III

The first questionnaires were returned by 367 ART couples and 379 control couples, i.e. 80.4% and 80.5% of the recruited couples, respectively. The full response rate was 73.6% in the ART group and 66.2% in the control group ( $p < 0.001$ ). Drop-out analysis revealed that among men, lower socio-economic status (SES) ( $\chi^2(6, 724) = 18.39, p < 0.05$ ) and multiple earlier marriages/cohabiting partnerships ( $\chi^2(6, 724) = 28.30, p < 0.01$ ) were associated with lower participation rate. None of the demographic factors were associated with the participation rate among women. Within the ART group the response rate did not differ in relation to length of infertility, cause of infertility, or type or number of treatments.

Background information on the ART and control groups is presented in Table 1 and information about infertility and infertility treatments within the ART group is presented in Table 2.

**Table 1.** Background variables in ART and control groups (Studies I, II, III).

	<b>ART</b>		<b>Control</b>	
	Women % (n)	Men % (n)	Women % (n)	Men % (n)
<b>Mean age <math>\pm</math> SD (men **)</b>	33.2 $\pm$ 4.4	35.2 $\pm$ 5.8	33.3 $\pm$ 3.0	34.1 $\pm$ 5.4
<b>SES (men *)</b>				
High professional	28.2 (100)	32.4 (111)	33.4 (126)	36.4 (129)
Low professional	42.3 (150)	30.3 (104)	43.8 (165)	30.2 (107)
Skilled worker	16.3 (58)	27.4 (94)	12.5 (47)	21.8 (77)
Unskilled worker	13.2 (47)	9.9 (34)	10.3 (39)	11.6 (41)
<b>Family factors</b>				
<b>Number of couple's children ****</b>				
None	75.1 (274)		45.4 (172)	
One	22.5 (82)		36.4 (138)	
Two or more	2.5 (9)		18.2 (69)	
<b>Length of partnership *****</b>				
1–5 years	16.3 (57)		32.4 (119)	
6–10 years	43.7 (153)		38.4 (141)	
> 10 years	40.0 (140)		29.2 (197)	
<b>Number of previous partnerships *</b>				
None	72.2 (242)	70.0 (226)	63.9 (237)	62.7 (212)
One	22.4 (75)	24.5 (79)	28.3 (105)	30.5 (103)
Two or more	5.4 (18)	5.6 (18)	7.8 (29)	6.8 (23)

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , \*\*\*\*\*  $p < 0.0001$



**Table 2.** Infertility-related factors within the ART group (Studies I, II, III).

	<b>% (n)</b>
<b>Duration of infertility</b>	
< 3 years	45.7 (164)
4–6 years	34.5 (124)
7–9 years	13.6 (49)
10 years or more	6.1 (22)
<b>Aetiology of infertility</b>	
Female	33.2 (122)
Male	25.9 (95)
Combined	19.3 (71)
Unexplained	21.5 (79)
<b>Number of unsuccessful ARTs</b>	
0	30.3 (110)
1–3	50.1 (182)
4–6	14.9 (54)
7 or more	4.7 (17)
<b>Type of current ART</b>	
IVF	39.8 (146)
ICSI	19.1 (70)
FET	41.1 (151)

The prevalence of pregnancy complications was similar in the ART and control groups, but ART women were more often hospitalized during pregnancy than control women (18.8% vs. 11.2% respectively,  $p<0.01$ ). In the ART group there were more preterm deliveries (4.9% vs. 1.6%,  $p<0.01$ ), vacuum extractions (10.2% vs. 4.9%,  $p<0.05$ ) and Caesarean sections (26.2% vs. 19.1%,  $p<0.05$ ). The mean birth weight of the children was lower in the ART group than in the control group ( $3490\pm554$  vs.  $3630\pm500$  g,  $p=0.001$ ). There were no significant differences in newborn intensive care unit (NICU) admissions (3.7% vs. 1.6%,  $p=ns$ ) or in perinatal mortality rate (8‰ vs. 3‰,  $p=ns$ ).

## 2.2. Study IV

The participants of study IV were a subgroup of couples with long-lasting infertility and several unsuccessful ART attempts. The couples were selected from the whole group by means of the following criteria: Finnish speaking, no previous children, at least five years of infertility and at least five unsuccessful treatment cycles with own gametes. Fourteen couples matched these criteria, of which 11 were willing and able to participate. There was one pair of twins, and this couple was not included in studies I–III.

Information about the couples' partnership and children is presented in Table 3.

**Table 3.** Background variables of the sample.

<b>Type of partnership % (n)</b>	
Married	100 (11)
Cohabiting	0 (0)
<b>Mean duration of partnership <math>\pm</math> SD (months)</b>	145 $\pm$ 45
<b>Gender of the child % (n)</b>	
Boy	50 (6)
Girl	50 (6)
<b>Mean birth weight of the child <math>\pm</math> SD (g)</b>	3783 $\pm$ 557
<b>Age of the child <math>\pm</math> SD (months)</b>	
Assessment 1	4.2 $\pm$ 1.9
Assessment 2	22.6 $\pm$ 2.1

Infertility characteristics of the study group are presented in Table 4.

**Table 4.** Mean length and cause of infertility and number of previous ART attempts.

<b>Mean length of infertility (months)</b>	75.7 SD 23.7
<b>Reason for infertility</b>	% (n)
female	54.5% (6)
male	9.1% (1)
combined	18.2% (2)
unexplained	18.2% (2)
<b>Number of unsuccessful ARTs</b>	
5–6	36.4% (4)
7–8	27.3% (3)
9–10	36.4% (4)
<b>Type of current ART</b>	
IVF	18.2% (2)
ICSI	27.3% (3)
FET	54.5% (6)

Not all parents were willing to participate in the assessments: At A1 all mothers participated in the interview and interaction assessment, but some fathers refused. At the second assessment not all participants were reached, and some did not participate because of a busy life situation.

### 3. Methods

The study designs are summarized in Table 5.

Table 5. Study design according to the original publications.

Main assessment variables				
	Study I	Study II	Study III	Study IV
T1: 18th–20th week of pregnancy	SES Family factors: age, number of children, duration of marriage / cohabiting partnership Stressful life-events GHQ 36 STAI	Family factors: age, number of children, duration of marriage / cohabiting partnership BDI 13 Infertility and treatment characteristics	SES Family factors: age, number of children, duration of marriage / cohabiting partnership	SES Family factors: age, duration of marriage / cohabiting partnership GHQ 36
T2: two months postpartum	Stressful life events Child-related factors: child health and worry about the child GHQ 36	Dyadic Adjustment Scale Stressful life events	Problems during pregnancy Mode of delivery Birth complications Couple's experience of delivery Child characteristics Abidin Parenting Stress Index – short form	GHQ 36
T3: one year postpartum	Stressful life events Child-related factors: child health and worry about the child GHQ 36	Dyadic Adjustment Scale	Abidin Parenting Stress Index – short form	GHQ 36
A1: 2–7 months postpartum				Care Index Working Model of the Child Interview
A2: 18–24 months postpartum				Care Index Working Model of the Child Interview

GHQ 36 General Health Questionnaire 36  
 BDI 13 Beck Depression Inventory 13  
 STAI State-Trait Anxiety Inventory

### 3.1. Background information

Data concerning infertility and infertility treatment was collected from the clinics' patient registries.

### 3.2. Questionnaire survey (I–IV)

Background information about SES and family factors was collected at T1. Stressful life events were recorded at all time points. The women reported complications during pregnancy and type of delivery at T2, and the experience of delivery was recorded (both partners) at T2. The mothers reported the child's birth weight, and both mothers and fathers reported child health status, existence of contact smile, eating and sleeping rhythm and ease or difficulty of soothing the child at T2. Structured questionnaires were used to assess mental health (T1, T2, T3), marital relations (T2, T3) and experience of parenting (T2, T3).

#### 3.2.1. General Health Questionnaire 36 (GHQ 36) (I, IV)

GHQ-36 is a self-report questionnaire designed to detect short-term changes in mental health, not traits. The scale gives an effective measure of psychiatric disorders in the general population (Goldberg 1972; Goldberg and Hiller 1979; Ferdinand and Verhulst 1994), including Finland (Rantakallio 1988). The General Health Questionnaire has been widely used in epidemiological studies and it has been reported to perform well as a screening instrument (Takala *et al.* 1979; Goldberg *et al.* 1997; Viinamäki *et al.* 2000). The questionnaire consists of 36 items, and the respondent estimates how the symptom descriptions match his/her current state. The items can be separated into four subscales: symptoms of *depression* (11 items) and *anxiety* (11 items), *social dysfunction* (8 items), and *sleeping difficulties* (6 items). For this study, mean sum scores were constructed for the subscales to make the subscale scores comparable. In our sample, reliabilities (Cronbach  $\alpha$ ) ranged between 0.70 (T2 women's sleeping difficulties) and 0.91 (T3 men's anxiety).

#### 3.2.2. Beck Depression Inventory (BDI 13) (II)

BDI 13 is a shortened version of one of the most widely used self-rating scales for measuring depression, the Beck Depression Inventory (Beck *et al.* 1961). The short form has been recommended for use in medically ill individuals, as physical symptoms, which are included in the complete version, may affect the BDI somatic items (Lustman *et al.* 1997; Leentjens *et al.* 2000). In our sample, reliability was 0.75 for women and 0.80 for men.

#### 3.2.3. State-Trait Anxiety Inventory (STAI) (I)

The STAI is a widely used, reliable and valid scale to measure state and trait anxiety across cultures (Spielberger *et al.* 1970; Tasmuth *et al.* 1996). In our study we used the trait anxiety scale to assess the participants' general tendency to react with anxiety to life events and stressors. As recommended by Spielberger *et al.* (1980), separate sum variables were formed for an *Anxiety Present* (AP) variable that consists of eleven anxiety-indicating items, and an *Anxiety Absent* (AA) variable referring to nine positive feelings. In this analysis only AP scales for women and men were used. The reliabilities (Cronbach  $\alpha$ ) were 0.75 for women and 0.83 for men.

#### 3.2.4. Dyadic Assessment Scale (DAS) (II)

The DAS (Spanier 1976) is a 32-item self-report questionnaire, which yields an overall score and four subscales: dyadic consensus (agreement on spending spare time, financial matters, general view of life), dyadic cohesion (having discussions together, having interests in common), marital satisfaction (the amount of quarrels, trusting one another, general happiness in the relationship), and sexual affection (sexual desire, expressions of love). The marital relationship is assessed on a six-point scale ranging from 0 to 5. High total and subscale scores indicate positive appraisal and marriage. The DAS has proved to be a reliable and valid scale designed to detect changes in marital relationships (Spanier and Rovine 1983), and it has been widely used in relation to postpartum adjustment (Boath *et al.* 1999; Elek *et al.* 2003). It has a high convergent validity with other measures of marital adjustment and satisfaction (Heyman *et al.* 1994). The T2/T3 reliabilities of wives' perceptions were good (dyadic consensus,  $\alpha = 0.86/0.88$ , marital satisfaction,  $\alpha = 0.85/0.84$ , dyadic cohesion,  $\alpha = 0.76/0.80$ , and sexual affection,  $\alpha = 0.72/0.65$ ), as were those of the husbands (dyadic consensus,  $\alpha = 0.88/0.88$ , marital satisfaction,  $\alpha = 0.78/0.80$ , dyadic cohesion,  $\alpha = 0.73/0.73$ , and sexual affection,  $\alpha = 0.75/0.61$ ).

#### 3.2.5. Abidin Parenting Stress Index – short form (III)

The 35-item scale conceptualizes parents' experiences in child and parental domains. The child domain dimensions are adaptability (nine items), acceptance (six items) and hyperactivity (four items). The parent domain dimensions are attachment, parenting competence, and social affiliation, each consisting of six items. Higher scoring values indicate better quality of the parenting experience. The T2/T3 reliabilities of mothering variables were  $\alpha = 0.85/0.85$  for adaptability,  $\alpha = 0.80/0.74$  for acceptance, and  $\alpha = 0.72/0.62$  for hyperactivity, and  $\alpha = 0.73/0.71$  for attachment,  $\alpha = 0.72/0.75$  for parenting competence, and  $\alpha = 0.77/0.77$  for social affiliation. The T2/T3 reliabilities of fathering variables were  $\alpha = 0.85/0.85$  for adaptability,  $\alpha = 0.82/0.82$  for acceptance, and  $\alpha = 0.67/0.60$  for hyperactivity, and  $\alpha = 0.70/0.66$  for attachment,  $\alpha = 0.72/0.72$  for parenting competence, and  $\alpha = 0.79/0.82$  for social affiliation.

#### 3.3. Care Index (IV)

The Care Index is an assessment of playful adult-child interaction under non-stressful conditions (Crittenden 1992, 2003, 2004). A session of free play lasting from three to five minutes is videotaped and assessed in relation to both the parent and the child. The parent's interactional behaviour is assessed in terms of seven aspects (facial expression, verbal expression, position and body contact, affection, turn-taking contingencies, control, choice of activity) according to three qualifications (sensitive, controlling and unresponsive) and the child's interactional behaviour in the same aspects according to four qualifications (cooperative, compulsive compliant, difficult and passive). Although the behaviour of the parent and that of the child are separately coded, they indicate *dyadic* constructs; for instance, the criteria for parent's interaction quality are based on concordance with the child's age and temperament, and his/her expressed satisfaction. Based on their Care Index score values, Crittenden (2004) classified mothers into highly sensitive (score 11–14), sufficiently sensitive (score 7–10), ineptly sensitive (score 5–6) and risk group (score 0–4). Similarly, children can be classified into very cooperative (score 11–14), sufficiently cooperative (score 7–10), ineptly cooperative (score 5–6) and risk group (score 0–4). The borderline as regards a need for intervention is between the adequately and ineptly sensitive groups.

The videotaping took place at the family's home, in order to make the circumstances as convenient and natural as possible. The child was supposed to be satisfied and not sleepy, and the instruction to the parent was to "play with your child as you usually do". The videos were first scored by two trained scorers separately. The aim was to reach complete inter-rater concordance, and disagreements were negotiated together with a third trained scorer.

### 3.4. Working Model of the Child Interview (IV)

The Working Model of the Child Interview (WMCI) (Zeanah *et al.* 1994) is a semi-structured interview assessing a parent's internal working models, i.e. representations of the child and his/her relationship with the child. The mothers and fathers were interviewed separately twice, the time points being the same as in Care Index assessment. The interviews were tape-recorded and transcribed. Instead of using the scoring system developed, we assessed the answers in order to produce descriptions of parents' experiences. This use of the method was permitted by Charles Zeanah (oral permission, August 2003). The manuscripts were read repeatedly and the themes were worked out in discussion between two experienced clinicians in child psychiatry. The aspects that were chosen for assessment were: 1) "Tell me about your pregnancy; was it planned, how were you both physically and psychologically, and what did you do during pregnancy?" "When did you experience your pregnancy as reality and what kind of impressions did you have about the child during pregnancy?" 2) "Tell me about your impressions of the child at the moment." After these open requests had been answered, a more precise one was added: "Choose five adjectives that describe your child's personality and tell me what it is in your child that makes you choose these ones." 3) "Describe to me your relationship with your child at the moment." After this open request had been answered, a more precise one was again added: "Choose five adjectives that describe your relationship with the child and explain why you choose these words."

## 4. Statistical analysis

Statistical analyses were performed using SPSS-12.0.1 (SPSS Inc., Chicago, IL). The analyses were separately run for women and men, because the literature shows gender-specific trends in mental health, attitudes toward marital relations and experience of parenting. Values of  $p < 0.05$  were considered significant. Missing data was scanty. If >20% of the questionnaire was unanswered, the case was removed when counting sum variables. The missing values were imputed for those who had answered at least 80% of the questions concerning each indicator, scale, or questionnaire. The scales of dependent variables were normally distributed and mean-independent, which allows the procedure of mean substitution (Thomson & Williams 1984).

Between-group comparisons of background variables in the ART and control groups were carried out by means of  $\chi^2$  tests and Fisher's exact tests for categorical variables, and Student's *t*-tests for continuous variables, and paired *t*-tests were used to compare linear variables within couples (Studies I, II, III).

To examine the differences between ART and control groups and determinants of quality and change of mental health (study I), marital relations (study II) and parenting experiences (study III), repeated measures MANCOVAs with assessment time points as the repeated measure were applied. Results of between-subject (group) ANOVAs indicated the general differences in levels of parental and couple responses (studies I, II, III). To test the hypothesis concerning different

interaction effects, we also included corresponding two-way interaction terms in the MANCOVA models as independent variables (studies II, III).

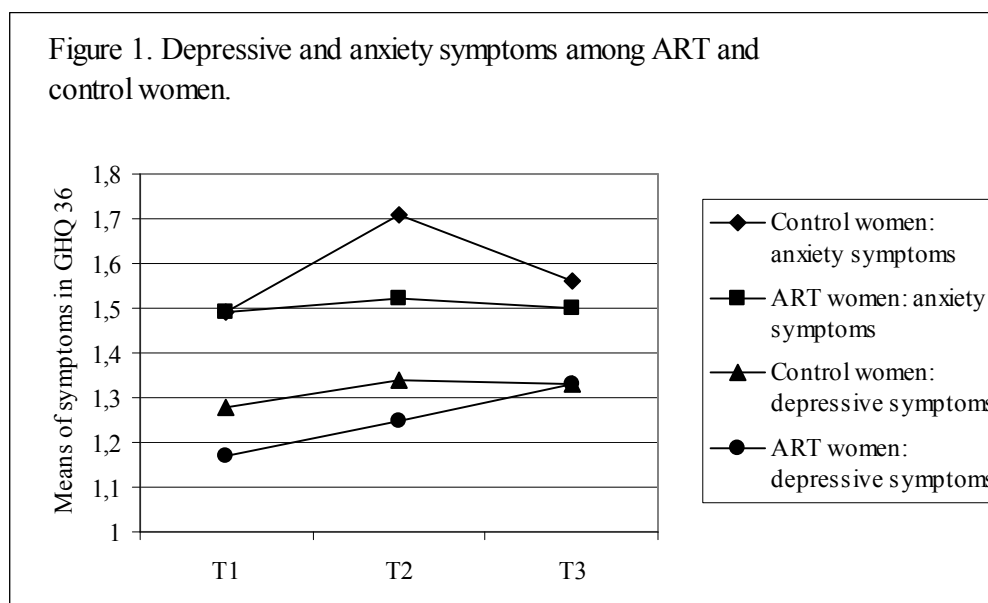
# Results

## 1. Mental health during the transition to parenthood (Study I)

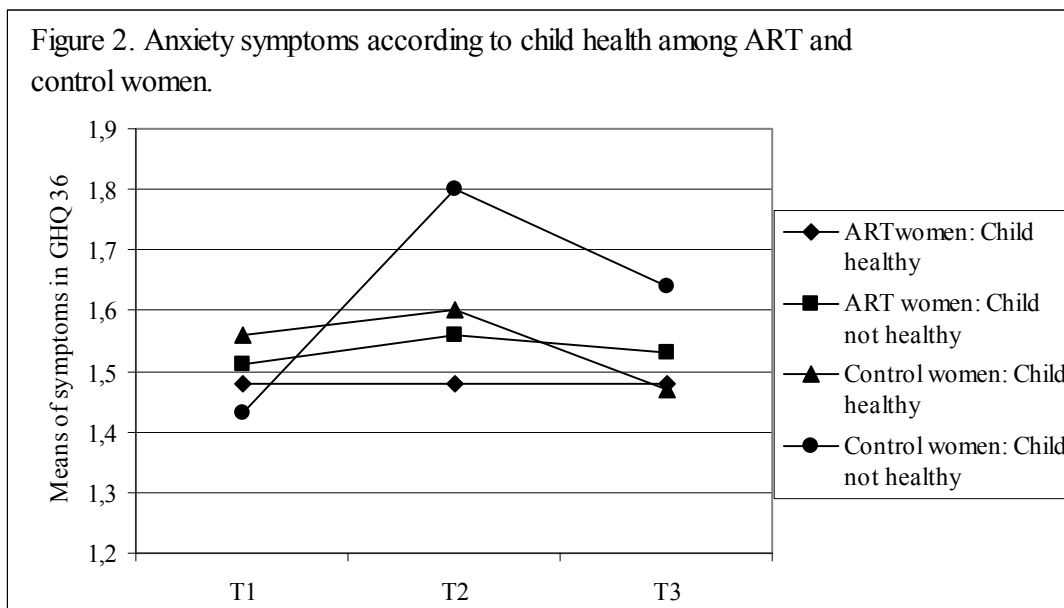
### 1.1. Women's mental health

*Depressive symptoms in women* showed a different trend among ART and control women (Figure 1). Control mothers reported higher levels of depressive symptoms at T1 and T2, but at T3 there was no difference between the groups. In both groups mothering the first child was associated with lower levels of depressive symptoms ( $p < 0.001$ ). In both groups of women, worry about the child at two months after delivery was associated with a higher level of depressive symptoms ( $p < 0.001$ ). No association was found between stressful life events or child health and depressive symptoms in women in either the ART or control group.

*Anxiety symptoms in women* showed a different trend among ART and control women during the transition to parenthood (Figure 1). Among ART women, anxiety symptoms were stable from T1 to T3, whereas among control women there was an increased level of anxiety symptoms at T2. Problems in child health had a different kind of impact on changes in anxiety symptoms among women in the ART group vs. control women ( $p < 0.01$ ). Control women with a child with a health problem were most anxious at T2, and anxiety had diminished by T3, whereas child health had no impact on anxiety in women in the ART group (Figure 2). Worry about the child was associated with an increased level of anxiety ( $p < 0.0001$ ), and with an increase in anxiety across the transition to parenthood ( $p < 0.0001$ ) in both groups.







*Sleeping difficulties in women* in general showed no differences between the ART and control groups during the transition to parenthood. Among control women stressful life events and worry about the child were associated with consistently higher levels of sleeping difficulties, while among women in the ART group with these stressors and worries there was a decreasing trend across the time points as regards stressful life events ( $p < 0.01$ ) and worry about the child ( $p < 0.01$ ).

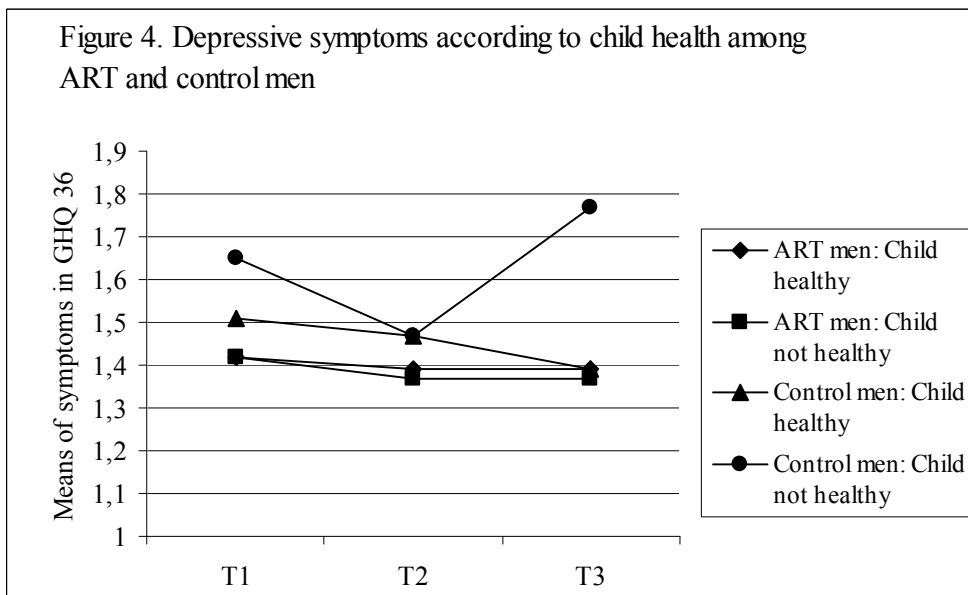
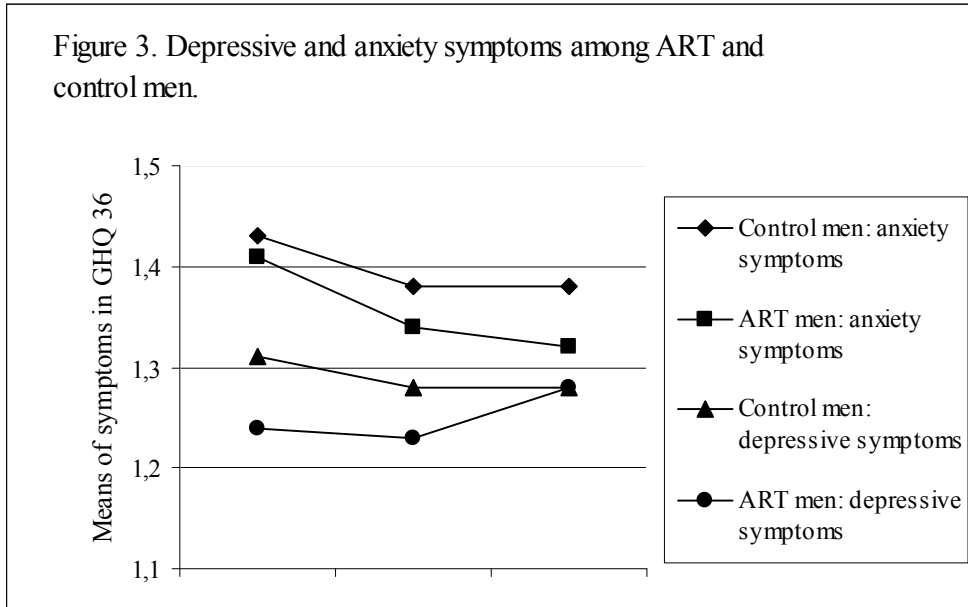
*Symptoms of social dysfunction in women* in general did not differ significantly between the ART and control groups. Interaction effects showed that stressful life events were associated with a higher level of social dysfunction among control women ( $p < 0.0001$ ), but this was not the case among women in the ART group. Worry about the child was associated with a high level of social dysfunction among all women ( $p < 0.0001$ ), regardless of fertility status. Socio-economic status was not associated with any of the mental health dimensions among women in either the ART or control group.

## 1.2. Men's mental health

*Depressive symptoms in men* were at a higher level among control men than among men in the ART group ( $p < 0.01$ ). Among men in both groups depressive symptoms decreased after delivery (Figure 3). In both groups fathering the first child was associated with generally lower levels of depressive symptoms ( $p < 0.001$ ). When there were problems with the child's health, depressive symptoms increased substantially in the control group men across the transition to fatherhood, whereas no impact was found among men in the ART group (Figure 4).

*Anxiety symptoms in men* were at a slightly higher level among control men from T1 to T3 ( $p < 0.01$ ). No difference in the change of anxiety symptoms during the child's first year was found between the groups. In both groups, men's anxiety symptoms decreased from pregnancy to the

time after delivery (T2) (Figure 3). Among control men with stressful life events, anxiety symptoms first decreased and then increased again, whereas among men in the ART group, stressful life events did not have an impact on anxiety symptoms. High socio-economic status, having the first child, good child health and no worry about the infant predicted a decrease in anxiety symptoms across the transition to fatherhood in both groups.



*Sleeping difficulties in men* increased after delivery only among control men during the transition to fatherhood ( $p<0.05$ ), the trend being stable among ART men. Worry about the child was generally associated with higher levels of sleeping difficulties among all men ( $p<0.001$ ).

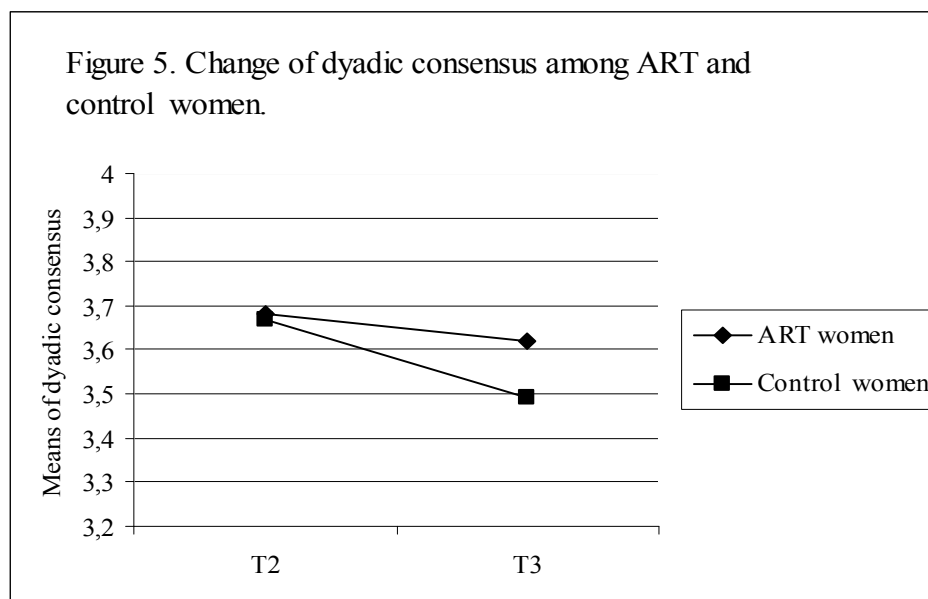
*Symptoms of social dysfunction in men* were reported less by ART men than control men ( $p<0.001$ ). In general, worry about the child was associated with a high level of social dysfunction among men in both groups ( $p<0.01$ ).

Clinically significant amounts of symptoms according to GHQ-36 total scores (depression, anxiety, sleeping difficulties and social dysfunction together) were found among 6.9% of all women at T1, 8.3% at T2 and 7.8% at T3, and among 3.8% of all men at T1, 6.3% at T2 and 6.2% at T3, using a cut-off point of 9 as recommended when establishing a norm in Finland (Holi *et al.*, 2003). In total scores there were no statistically significant differences between the ART and control groups. Using BDI 13 the prevalence of depression was 8.6% among all women at T1, 9.0% at T2, and 13.9% at T3, and 6.4% among all men at T1, 6.6% at T2, and 7.5% at T3, using a cut-off point of 13. Again there were no statistically significant differences between the ART and control groups.

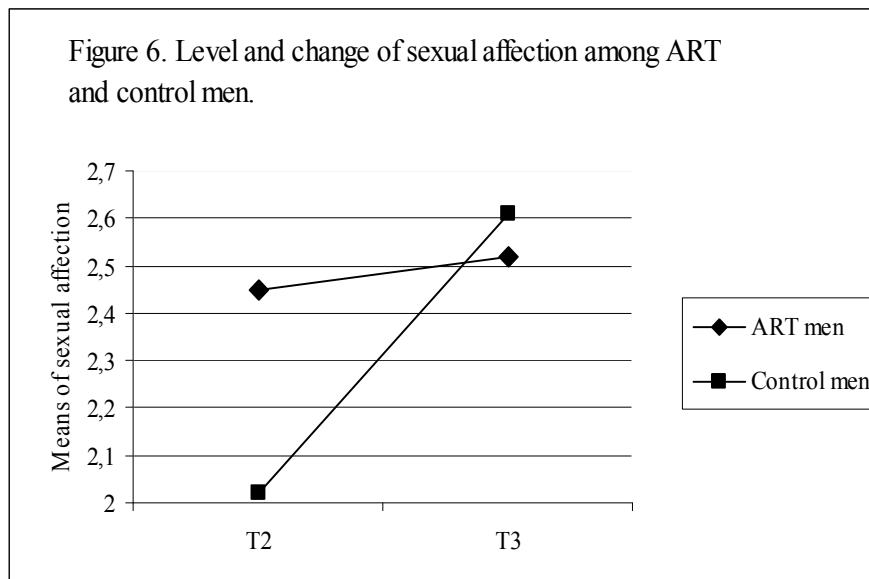
## 2. Infertility treatment and marital relations (Study II)

### 2.1. Quality and change of marital relations during the first year of parenting

*Women:* Among women, group differences were found only in dyadic consensus. The groups differed in the *change* of women's experiences of dyadic consensus across the child's first year ( $p<0.05$ ; Figure 5). Dyadic consensus decreased substantially among control women, but not among ART women during the first year of parenting. In the subgroup of first-time parents, women's dyadic consensus was higher among ART women than among control women ( $p<0.05$ ).



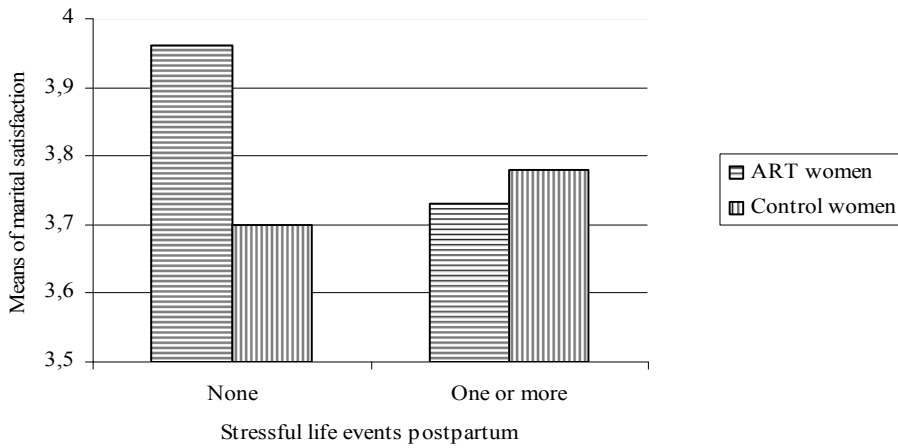
*Men:* Among men, there were no group differences in level or change of dyadic consensus, cohesion or marital satisfaction. Men in the ART group reported a higher level of sexual affection at T2 than control men ( $p<0.05$ ), while no group differences were found at T3. In both groups the level of sexual affection increased during the first year of the child, but the increase was significantly greater among control men than among ART men ( $p<0.05$ ; Figure 6). The results among first-time fathers were similar to those in the whole group: ART men reported a higher level of sexual affection at T2 than control men ( $p<0.05$ ).



## 2.2. Effects of depressive symptoms and stressful life events on marital relations

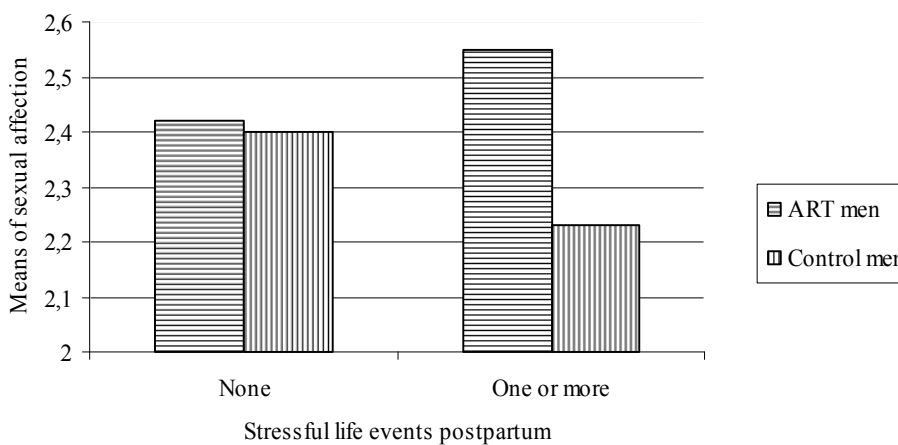
*Women:* Significant depressive symptoms during pregnancy predicted a negative quality of dyadic consensus ( $p<0.001$ ), marital satisfaction ( $p<0.001$ ), dyadic cohesion ( $p<0.001$ ) and sexual affection ( $p<0.05$ ) among control women but not among ART women. Depressive symptoms during pregnancy predicted negative changes during the first year of parenting in dyadic consensus ( $p<0.01$ ), marital satisfaction ( $p<0.05$ ) and sexual affection ( $p<0.05$ ) among control women. In the subsample of first-time parents, depressive symptoms in pregnancy predicted negative changes during the first year of parenting in dyadic consensus ( $p<0.05$ ) and marital satisfaction ( $p<0.05$ ) among control women but not among ART women. Further, stressful life events were differently associated with the quality of marital relations among ART and control women. Women in the ART group reported lower levels of dyadic consensus ( $p<0.05$ ), cohesion ( $p<0.05$ ), marital satisfaction ( $p<0.05$ ) and sexual affection ( $p<0.05$ ) when exposed to stressful life events, whereas among control women the quality of marital relations was independent of stressful life events (Figure 7). In the subgroup of first-time mothers the results were similar.

Figure 7. Impact of stressful life events on marital satisfaction among ART and control women.



*Men:* There were no interaction effects between significant depressive symptoms during pregnancy or stressful life-events, and marital cohesion, consensus or satisfaction in either group. Significant depressive symptoms in pregnancy and stressful life events differently predicted the quality of sexual affection among ART and control men. Only among control men did stressful events ( $p<0.05$ ) and depressive symptoms during pregnancy ( $p<0.05$ ) predict a lower level of sexual affection, while among ART men stressors did not have an effect (Figure 8). This result was the same among first-time fathers.

Figure 8. Impact of stressful life events on sexual affection among ART and control men.



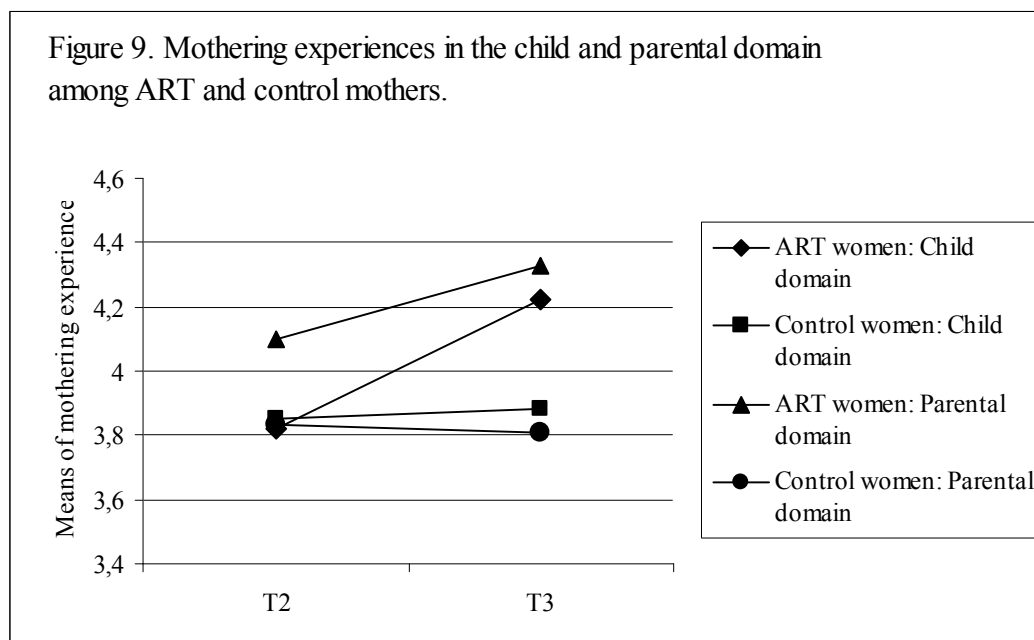
### 2.3. Infertility- and treatment-related factors predicting marital relations in the ART group

Characteristics of infertility were associated with marital relationships in both partners when the child was two months old, but this was no longer the case when he/she was twelve months old. Different factors predicted the nature of marital relations among women and men: the number of unsuccessful treatments was an important factor for women, but length of infertility was important for men. Women who had experienced miscarriages reported lower marital satisfaction than those who had not. Women who had experienced several unsuccessful treatments reported higher dyadic consensus and dyadic cohesion than women after one attempt ( $p < 0.01$ ). Men with a long duration of infertility ( $> 6$  years) reported lower levels of dyadic consensus ( $p < 0.01$ ) and marital satisfaction ( $p < 0.01$ ) than men with a shorter experience of infertility. In both groups multiple parity predicted poorer dyadic cohesion ( $p < 0.01$ ) and lower marital satisfaction ( $p < 0.01$ ) among women and lower marital satisfaction ( $p < 0.001$ ) among men.

## 3. Parenting experiences after ART during the child's first year (Study III)

### 3.1. Differences in parenting experiences in the ART and control groups

ART mothers showed generally higher levels of positive experiences in the parental domain than the control mothers ( $p < 0.05$ ; Figure 9). There was a difference between groups in the change of parenting experience from the child being two (T2) to twelve (T3) months, in the child domain. Among ART mothers, positive mothering experiences in the child domain increased, but this was not the case in the control group ( $p < 0.05$ ; Figure 9). No differences were found between the ART and control fathers in their parenting experiences in either the child or parental domains. Positive fathering experiences increased in the child domain from T2 to T3 in both groups ( $p < 0.0001$ ).



### 3.2. Associations of perinatal factors and child characteristics with parenting experience

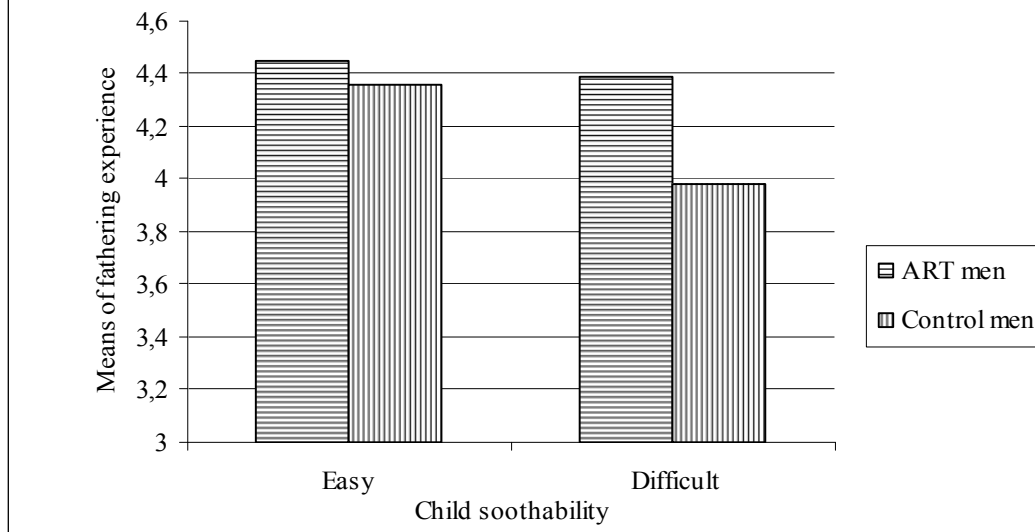
*Mothers:* The general quality of mothering experiences in the child domain was more positive among mothers in both groups when their own ( $p<0.001$ ) and their partners' ( $p<0.05$ ) birth experiences were positive, their children were of normal weight ( $p<0.01$ ), showed a contact smile at two months ( $p<0.05$ ), had regular eating and sleeping rhythms at two months ( $p<0.0001$ ) and were easy to soothe ( $p<0.01$ ). Absence of the father at delivery was associated with a lower level of positive mothering experience in the control group, but not in the ART group ( $p<0.05$ ). Among mothers in both groups, positive parenting experiences in the child domain increased from the child being two to twelve months, when there were no serious birth complications ( $p<0.05$ ), the child was of normal birth weight ( $p<0.01$ ) and had regular eating and sleeping rhythms at two months ( $p<0.01$ ). Low birth-weight ( $p<0.03$ ) and lack of the child's contact smile ( $p<0.02$ ) were associated with a negative change in mothering experiences from T2 to T3 in the control group, but not in the ART group.

Parenting experiences of mothers in the parental domain were generally positive in both groups when the child was of normal birth weight ( $p<0.01$ ). The mothering experience was also positive when the birth experience was positive ( $p<0.001$ ) and the child was easy to soothe ( $p<0.01$ ). Concerning changes in mothering experiences in the parental domain, lack of the child's contact smile was associated with a change towards a less positive mothering experience from T2 to T3 in the control group only ( $p<0.0001$ ).

*Fathers:* In the child domain, fathering experiences were more positive in both groups when the child was born after emergency Caesarean section ( $p<0.05$ ), when the birth experience was positive ( $p<0.05$ ), when the child showed a contact smile at two months ( $p<0.001$ ) and had regular eating and sleeping rhythms at that time ( $p<0.05$ ) and was easy to soothe ( $p<0.001$ ). Difficulty soothing the child was associated with generally negative fathering experiences only in the control group ( $p<0.004$ ; Figure 10). Positive parenting experiences increased from two to twelve months when the child was easy to soothe ( $p<0.01$ ).

In the parental domain, fathers reported a more positive parenting experience when the delivery had been emergency Caesarean section ( $p<0.001$ ) and when the birth experience was pleasant ( $p<0.001$ ). Ease of soothing the child was also associated with positive fathering in the parental domain ( $p<0.001$ ). Difficulty soothing the child was associated with generally negative fathering experiences in the control group, but not in the ART group ( $p<0.001$ ). Maternal negative experiences at birth predicted a negative fathering experience in the control group but not in the ART group ( $p<0.05$ ).

Figure 10. Fathering experience in the parental domain among ART and control fathers according to the soothability of the child.



#### 4. Parenting after long-term infertility (Study IV)

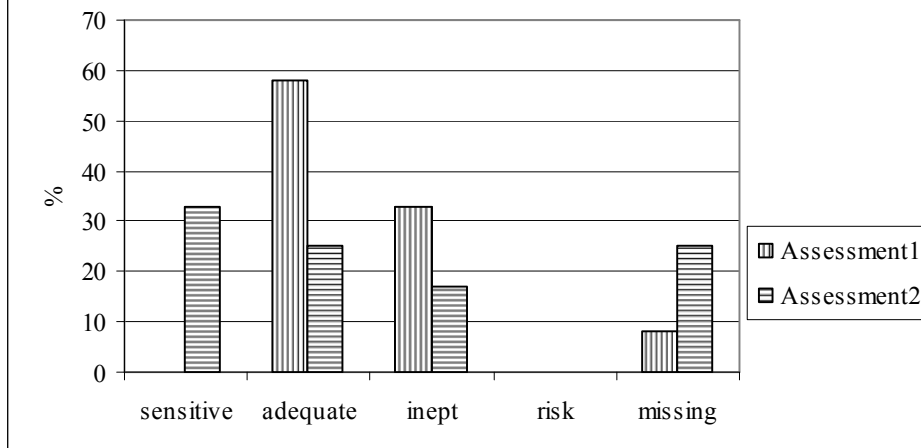
##### 4.1. Parent-child interaction

The mothers' sensitive behaviour and the children's cooperative behaviour increased from the first to the second assessment. Figure 11 shows the distribution of mothers' sensitivity classifications at assessment 1 and 2. None of the mothers was classified as a risk-mother in either assessment, and a third of the mothers were classified as sensitive in the second assessment. In mother-child dyads maternal controlling behaviour decreased and unresponsive behaviour increased from the first to the second assessment.

The fathers' sensitive behaviour and the children's cooperative behaviour increased from the first to the second assessment. At the same time, though, children's difficult behaviour increased. A decrease in fathers' controlling behaviour and children's passive behaviour was found from the first to the second assessment.



Figure 11. Percentages of mothers' categories in Care Index at Assessment1 and 2.



#### 4.2. Mothers' representations of the child and relationship with him/her

*Pregnancy and representations of the child during pregnancy:* ART mothers in general did not mention at all the long period of trying to conceive and not succeeding. Instead, most of the women (8/11) described a fear of losing the pregnancy independent of their possible previous experiences of miscarriage. A frequent answer among mothers was that they did not remember if they had any prenatal impressions of the child or that they did not dare to create any images. Some mothers mentioned a secret joy about the pregnancy that they did not dare to share.

*The child's personality:* Except for one control mother who could not describe her child's personality in infancy, mothers presented mainly positive characteristics or interpreted their child's character in a positive way. At toddler-age, mothers generally described their children mostly as active and enthusiastic and mentioned the defiance that started to come up.

*Relationship with the child:* Almost all mothers stressed the closeness of their relationship with the infant at the first interview. At the second interview many mothers in both groups still emphasized the closeness of the relationship, but the situation was considered to be more complicated: "...I feel that I am stuck with her. For example, in the morning she wanted me to hold her all the time and I should have done some housework." At the time of the second interview there was a new infant or one about to be born in the near future in some of the families, and these mothers stressed the effect of the new infant on the relationship with the first child.

#### 4.3. Fathers' representations of the child and relationship with him/her

*Pregnancy and representations of the child during pregnancy:* The fathers' answers concerning the time before delivery were vaguer than the mothers'. When describing pregnancy, fathers concentrated on the changes in daily life. Three fathers mentioned the long period of longing for

the baby before pregnancy. Fathers did not have vivid impressions of the child during pregnancy. If they remembered having impressions, they described them in comparison to other infants they had seen.

*The child's personality:* The fathers' descriptions of their children were more restricted than those of the mothers, especially during infancy. As with the mothers, the fathers also described mainly positive characteristics of their children or interpreted negative behaviour in a positive way.

*Relationship with the child:* The fathers, in general, more often found it difficult to describe their relationship with the child than mothers. Many fathers brought up the joy of coming home after work, and most of them stated the reciprocal joy: "...it feels so good to come home and hold her, you can see that she is happy and likes it". At the second interview fathers stressed their role as a playmate with the child, doing things together: "Close, warm, but at the same time we are like pals; it is connected to doing things together. We have done many things together, laughed together and sometimes cried together. That's how it has become like this".

## Discussion

Becoming a parent is one of the major transitions in adult life. It is difficult, if not impossible, to predict parenting behaviour of a certain individual beforehand, but according to the literature and clinical practice we know that there are several factors that interfere with parenting skills. One of the most important of these is support from the spouse (Crnic *et al.* 1983). Parenthood brings about new challenges in family life, and according to the literature marriage is especially vulnerable during the early years of a child (e.g. Cowan and Cowan 2000). When infertility becomes apparent, the couple faces, usually unexpectedly, a deeply wounding experience. The stress connected to infertility and ART is of a specific nature, as it deeply influences one's self-image, is long-standing, and includes both physical and psychological stressors. Women seem to be more prone to the direct stressful influences of ART, as the procedure is at least physically more demanding for women than men. Working through this has the potential to threaten a couple's mutual relationship, but it may also pull the partners closer to one another, and thus strengthen their relationship, as has been suggested in some recent studies (Sydsjö *et al.* 2002; Schmidt *et al.* 2005a). Infertility is a highly stressful experience, and treatments of infertility are also experienced as generally being stressful. As such, it is of very great interest to discover how the experience of infertility affects the parents' psychological well-being.

The present study was designed to explore widely the child's early environment within families created by ART, compared with controls. Even though ART couples create a special group in respect to conceiving, they are not assumed to constitute a homogeneous group according to mental health, marital relations or parenting styles. Thus the study population was normative, and the focus of the study was in the transition period of a family when a new child arrives, with the added stress connected with conceiving.

A longitudinal setting is of special importance when studying normative samples, as the differences between groups are not supposed to be great, and the relevance of findings can only be assessed in terms of their consistency. The three assessment points were chosen to reflect developmentally different phases of family life.

The groups were not matched; the only selection was exclusion of the youngest control mothers in order to diminish age differences between groups. Finally there was no significant difference in the age of the women, but men in the ART group were older than men in the control group. Family composition differed between groups, as ART couples had longer partnerships, and control couples had more children. The longer duration of partnerships demonstrates the difference in time frame between formation of marital relations and conception of a child in the ART and control groups. Longer marital relations may indicate a more stable marriage, which probably produces a more favourable emotional environment for transition to parenthood. Becoming a parent for the first time is different from later transitions, and thus the number of couples who went through this more profound transition was greater among ART group parents than those in the control group. These differences represent the existing general differences in families created by ART.

Most of the ART couples were from southern Finland, mainly from cities, but rural areas were also represented. A minority of the participants were from western and northern Finland. The ART couples were representative of all subjects in participating infertility clinics. The control couples were for practical reasons recruited only from southern Finland, and the majority of them lived in

cities, though some were from rural areas. A difference between the ART and control groups in socio-economic status was found among men, as control men had a higher SES than ART men. This may have to do with the geographical distribution of the sample. Epidemiological research results suggest that, in contrast to somatic health, mental health does not directly depend on socio-economic status in European countries (Martikainen *et al.* 1999; Lahelma *et al.* 2004). In our results SES was not associated with mental health in women, whereas for men higher SES was associated with fewer symptoms of psychological distress.

The full response rate was fairly high, which makes the results more reliable. Attrition analyses showed that the full response rate in the ART group was higher than in the control group. Also, the participation rate differed according to SES and the number of previous marriages/cohabiting partnerships among men: low socio-economic status and two or more previous partnerships were associated with a lower response rate. Thus the results regarding men's mental health, marital relations and parenting experiences are based on men of relatively advantageous social status. The attrition rate was similar in the ART and control groups, and therefore it is not considered to have a major effect on the comparison of the groups.

Studies I–III were based on questionnaires, as the study groups were large and the focus of the study was wide. Problems with questionnaires are well known, and we know from previous research (Greil 1997; Holter *et al.* 2006) that infertile individuals tend to give more socially desirable answers, which has to be kept in mind when considering the results. The General Health Questionnaire was selected because it gives a multidimensional point of view of mental health. As the study population represented a normative population and we thus did not expect to find a great deal of obvious psychopathology, and as the aim of the study was to explore the dynamics of the transition to parenthood, mean sum scores were used instead of detecting clinically meaningful scores. The versatility of GHQ 36 made it possible to detect differences that would not have come up by using a more general instrument. BDI 13 was chosen to detect depressive symptoms, as there were three measuring points, and thus the use of a depression scale designed for postnatal depression would not have been accurate. The sub-score of depression in GHQ 36 highly correlated with scores in BDI 13.

The study may be criticized for not including the Dyadic Assessment Scale in the first assessment. This is because another, more multidimensional test for assessing family relations was initially included, which proved too complicated for the purposes of these analyses, which is why the DAS was added in the second and third assessments.

Assessment of parenting by simply using a questionnaire is not possible, as parental behaviour is not equivalent to parental reports of their behaviour and as self-reported parenting experiences are vulnerable to social desirability, especially during the first year of the child. This is the reason why the focus of study III was limited in the subjective experience of parenting. An observational method, which is time-consuming and costly, was used only in study IV, in the small subgroup of parents with an extreme experience of infertility treatments. We expected to find a condensed impact of infertility and treatments on parenting in this subgroup.

In study IV there was missing information, especially among fathers, who often were unwilling to be videotaped. The missing fathers did not constitute a consistent group in respect to mental health symptoms or infertility characteristics. It is possible that this group of fathers constituted those who place high demands on themselves as fathers. In spite of the large proportion of missing fathers, the separate interviews, and observations of both mothers and fathers at two

developmentally different ages of the child form a setting that gives reliable information about this very special subgroup of infertile parents with a long history of treatment.

### **Symptoms of psychological distress connected to infertility and ART**

Previous studies have given surprisingly dissimilar results on the effects of infertility and ART on psychological distress and mental health. According to the literature, it seems that women are more affected by infertility than men, but actually there is insufficient data available about men's reactions, as they have been very seldom studied in this regard. Some recent studies have revealed a similar pattern of emotional reactions in men and women (Edelmann and Connolly 2000; Holter *et al.* 2006), though women generally show stronger reactions. As the studies are mostly cross-sectional and based on questionnaires, it is questionable whether women and men can be compared reliably. The timing of reactions may be different among men and women, and men tend to report fewer symptoms in self-reports than women (Edelmann and Connolly 2000).

In our study, control mothers showed more depressive symptoms than ART mothers during pregnancy and the first weeks of mothering, and their depressive symptoms were more consistent across all three assessments. This may reflect the fact that success in conceiving after infertility affected the mood of the mother in a positive way or that ART mothers were not as prone as control mothers to report depressive feelings. Anxiety symptoms showed a more stable trend among ART mothers both generally and in interaction with child health problems. Connected to the fact that there were no differences between groups in trait anxiety assessed during pregnancy, it seems more probable that this result indicates better resilience of ART mothers to child-related stressors rather than defensive responding. Stressful life events were associated with consistently higher levels of sleeping difficulties and social dysfunction among control women, a finding suggesting that ART women are less vulnerable when facing difficulties in life.

The procedure connected with infertility investigations and treatments is demanding and stressful, but according to the results of the study it seems that after successful treatments there are no harmful effects on women's mental health. This finding is in line with some previous findings of women's good adjustment to pregnancy after ART (Hjelmstedt *et al.* 2003; Ulrich *et al.* 2004). There is a lack of follow-up studies in this field, and our findings are in line with the findings of the few follow-up studies that do exist. Klock and Greenfeld (2000) reported more satisfaction with pregnancy in ART women than among naturally conceiving women, and there were no differences between groups in symptoms of depression or anxiety. Sydsjö *et al.* (2002) reported better global life satisfaction in IVF women compared with those conceiving naturally.

Our research contributes to the scarce knowledge about the mental health of men experiencing infertility and successful treatment outcome. In addition, in general, men's psychological well-being during their wives' pregnancy and during the child's early development has not been given much attention in research even though it is of utmost importance, as the emotional climate of the family is significant for the child's well-being. Our results showed that ART men had fewer depressive and anxiety symptoms, sleeping difficulties and social dysfunction than control men. When there were problems in child health, ART men were more resilient in terms of depressive symptoms, and when facing stressful life events, ART men showed more resilience according to anxiety symptoms. These results suggest the same conclusions as among ART women: it seems that infertility and successful ART are associated with a better capability to cope with difficulties in life. Worry about the child was associated with a higher level of sleeping difficulties and social

dysfunction among men in both groups, but this variable probably reflects merely a general tendency to react by worrying or being anxious. When interpreting these results, it has to be kept in mind that men with an advantageous socio-economic status were somewhat over-represented. In our study control men represented, however, a higher SES than ART men, and despite this, as a group they reported more symptoms of psychological distress. This justifies the conclusion that ART men actually do show better adjustment during the transition to parenthood than their controls.

The prevalence of prenatal depression among women detected by means of BDI 13 was 8.6% in our sample, which is consistent with the results of previous studies (see review by Bennett *et al.* 2004). The prevalence of postnatal depression was 9.0%, which also is in line with existing literature (Tamminen 1990; Hiltunen 2003). The literature on postnatal depression among fathers is scarce, and the prevalence has varied from 4.8% to 13.0% (Ballard *et al.* 1994; Areias *et al.* 1996; Matthey *et al.* 2000). In our study, 7.5% of all men scored above the clinically significant level in BDI 13. Prenatal depression of men has not been studied widely, but it should be given some attention, as it may affect the infant at least indirectly, by affecting the mother's state of mind. A surprisingly high proportion of women scored high in BDI 13 at T3, compared with the sub-score of depressive symptoms in GHQ 36. It is possible that BDI 13 detects as symptoms of depression some normative features that are inevitable characteristics of life with a young child, such as feelings of tiredness, social withdrawal or difficulty in making decisions.

Our results are encouraging for couples seeking treatment for infertility. It is possible, though, that some infertile individuals with less effective coping strategies and more tendencies towards psychological distress were excluded beforehand, i.e. before entering an infertility clinic. The support given by the staff of the clinics may also be of importance for the good adjustment of the participants. The reported symptoms were in general not on a clinically significant level, and the differences between groups imply on differences in tendencies. When detecting clinically meaningful amounts of symptoms, there were no differences between the ART and control groups. Our results also indicate that resolved trauma may have an advantageous effect on coping with normal life stresses, as a trend towards more resilience when facing everyday difficulties in life could be seen among both women and men in the ART group.

### **Marital relations after successful ART**

Research shows a wide variety of effects of infertility and ART on marital relations. There are reports of very negative effects (e.g. Leiblum *et al.* 1998), but also of marital benefit (Schmidt *et al.* 2005b). The effects of infertility and treatment on marital relations are modified by several factors, both personal and interpersonal. Thus it is no wonder that different samples, different methodologies and different manners of questioning produce variable results. In many studies, only a general variable ("marital satisfaction" or "marital adjustment") is assessed, whereas in others more defined subscales are used. Follow-up studies are scarce on this topic, and their special value comes from their capacity to produce information concerning the dynamics of the change during the many phases of transition to parenthood.

In our study, in general, the quality of marital relations was good in both groups, and there were no differences between men and women in the scores of sub-scales. This is in conflict with the most typical findings of women in general being less satisfied in marital relations, especially after the birth of a child (Shapiro *et al.* 2000). According to the literature, marital relationships seem to

be especially vulnerable during the transition to parenthood, and several studies have revealed a decline in marital satisfaction and an increase in marital conflict among parents (e.g. Cowan and Cowan 2000; Shapiro *et al.* 2000; Rholes *et al.* 2001). In our study, a decrease in dyadic consensus was found only among control women during the first year of the child. This finding is in line with the results of a follow-up study by Sydsjö *et al.* (2002; 2007), in which ART couples were found to have more stable relationships than their controls during the transition to parenthood.

Psychological distress is known to increase marital problems, but surprisingly, in our study significant depressive symptoms during pregnancy were associated with a lower level in all and a decrease in all but one sub-scale of the DAS (dyadic cohesion), and this only among control women. The shared crisis of infertility may pull spouses closer to one another and create a more stable and thus more supportive reciprocal relationship, which seems to be more resistant to the psychological distress of partners. It is possible that infertility brings about such a challenging situation that the partners have to learn to communicate with each other better, support one another, and find effective ways to cope with stress together. It is also possible that the most fragile marriages break up when infertility becomes a reality, before couples even enter investigations and treatments. Stressful life events were associated with lower levels of dyadic consensus, cohesion and marital satisfaction only among ART mothers. This finding is surprising, as ART women were more resilient to life stressors in regard to mental health symptoms. It is possible that previously infertile mothers connect their feelings of frustration or exhaustion to their mates rather than to the long-awaited child.

Control men reported a significantly lower level of sexual affection at T2 than ART men. It seems that among ART men the demands of parenting a small child do not interfere with sexual life to the same extent as among control men. This may be connected to their better mental well-being during this period compared with control men. In addition, only among control men were significant amounts of depressive symptoms during pregnancy, and stressful life-events associated with sexual affection. It is possible that ART men are not as prone as their controls to reveal problems; on the other hand, this finding is in line with the results concerning mental health, i.e., ART men are more resistant to stressors.

Our results suggest that different aspects of infertility and its treatment are important as regards marital satisfaction among women and men. The procedures of ART are directed mainly to women, and thus several unsuccessful treatment cycles may increase a woman's distress and feelings of unfairness. Surprisingly, this seems not to be reflected in marital relations, as we found that ART women with several unsuccessful treatments had higher scores in dyadic cohesion and consensus. Men in the ART group with a long duration of infertility reported lower levels of dyadic consensus and marital satisfaction. For men the increasing stress of long-lasting infertility seems to be more wounding, as has been reported earlier (Connolly *et al.* 1993).

### **Parenting experiences after successful ART**

Doubts have been presented about infertile parents' adjustment to parenting after ART. When a couple faces infertility, it may take years from the decision to try to have a child to the reality of getting one. During this period it may be necessary to create a very positive picture of parenthood to maintain the motivation to keep on trying. If the image of being a parent is idealized, it may be difficult to adjust to the reality of parenting. Studies on parenting experiences and parenting

quality after infertility and ART are diverse in methodology and setting, and the results are controversial. Studies on parenting after infertility have focused mainly on mothering. Most of the studies are cross-sectional and as such do not produce reliable information about such a complicated and dynamic phenomenon as parenthood. Most of the previous studies show minor positive or neutral effects of infertility and ART on the parenting experience (Golombok *et al.* 1995; Hahn & DiPietro 2001; McMahon *et al.* 2003). In some studies, though, mothers' deep concerns about the vulnerability of the child (e.g. Gibson *et al.* 2000) and feelings of incompetence (McMahon & Gibson 2000) have been demonstrated. There is a need for a long-term follow-up study on parenting and psychosocial development of these children.

In our study ART mothers showed higher levels of a positive mothering experience in the parental domain and an increase in positive mothering experience in the child domain when compared with their controls. Among fathers no group differences were found. Infertility and treatments may have prepared women more thoroughly for positive mothering, while both positive and negative biological and psychological impacts may be less dramatic among men. Parenthood has been suggested to be more central in the lives of women than men (van Balen 1996), and thus it is possible that having a child has a more profound positive effect on women's than on men's lives, especially after the experience of infertility. Men in general may find it easier than women to balance parenthood with other goals in life. Abbey and colleagues (1994) reported that becoming a father after ART treatment did not have as positive an effect on men's as on women's global life quality.

The hypothesis that ante- and perinatal complications and negative birth experiences would particularly affect ART parents' parenting experience was based on a multi-risk model (Sameroff 1999), suggesting that accumulation of stressful and traumatic life experiences, such as infertility, make people more vulnerable when facing new demands and disappointments. In contrast to our hypothesis, obstetric risk factors and problems and negative subjective birth experiences were negatively associated with parenting in the control group, but not in the ART group. This result is in line with the results we had from ART parents' mental health and marital relations: our results consistently suggest that ART couples cope better when facing stressful situations connected with family life.

It is obvious that the children in the ART group were highly desired. Thus it was hypothesized that ART parents would be more resistant as regards difficult child characteristics than control parents, and our findings were supportive of this hypothesis. Apparently, parenthood has a very special meaning to infertile couples, though it is possible that ART parents do not dare to reveal negative feelings or attitudes towards the child, as having one has been a highly hoped-for and uncertain possibility.

There is increasing evidence that men's positive experiences of fatherhood contribute to favourable child development and family relationships (Fagan and Iglesias 1999; Chan and Paterson-Brown 2002). Our results emphasize the facts that paternal support at delivery enhances positive mothering and a mother's pleasant birth experience predicts good fathering. The results therefore support a family approach to delivery that allows both parents to create an early commitment to the child, to share a precious experience and to give mutual support. Similar results have been reported earlier. Fathers felt comfortable and enjoyed being present at childbirth, found it a highly rewarding experience, and felt that it improved their relationship with their partners (Chan and Paterson-Brown 2002). Vehviläinen and Lauri (1984) reported that fathers' relationships with their partners deepened after sharing the experience of delivery.



The transition to parenthood is a more profound process when it happens for the first time. A parent's relationship with each child is, however, special and unique, and each pregnancy initiates a new transition. In our sample there were more first-time parents among ART couples, and the number of children was used as a covariant in all analyses, thus controlling for its impact.

### **Parenting after long-term infertility**

There are only relatively few studies concerning children's behavioural patterns towards both parents. Regarding ART parents there is a lack of studies including observational measures, and to our knowledge there are no previous studies on parenting after long-standing infertility. Those observational studies that have been performed show no differences in parental behaviour among ART mothers versus controls (Gibson *et al.* 2000b, McMahon and Gibson 2002). The only observational study to our knowledge that includes fathers is the study by Hahn and DiPietro (2001) in which the judgment of parenting quality was made by kindergarten teachers in an unstructured situation. They found that IVF parents showed greater emotional involvement with their children than control parents.

In our study ART mothers showed increasingly sensitive behaviour in interaction with their child as the child progressed to toddler-age. At the same time they described their toddlers as peppery or strong-willed, which seems an accurate perception from a developmental point of view. This may reflect ART mothers' strong commitment to parenthood, which makes it easier to adjust to the new challenges of mothering that toddler-age brings about.

We expected to find anxious and controlling pattern of parental behaviour among ART parents, as the highly hoped-for and "expensive" child may awaken overprotective behaviour. This was not the case in our study group. Among mother-child dyads the children's cooperative behaviour also increased from infancy to toddler-age, which is an expected response to sensitive maternal behaviour, which also increased. Mothers were less controlling and more unresponsive when the child was at toddler-age, findings that are parallel with the results of a recent Finnish study of mother-child interaction (Kemppinen & Kumpulainen 2006).

Fathers' sensitive behaviour and children's cooperative behaviour increased from infancy to toddler-age. This is in concordance with earlier research on fatherhood (Belsky *et al.* 1984) and with the finding in the whole study group of the fathering experience becoming more positive as the child grew. Child behaviour defined as difficult increased in father-child dyads from infancy to toddler-age. It may be assumed that for ART fathers, limit-setting in general may be more demanding, which may lead to behaviour being assessed as difficult. The study group of ART fathers was small, however, and there were several fathers who declined the request to take part in videotaping. None of these fathers scored high in the GHQ at any of the time points, and thus they did not constitute a special group in relation to mental health symptoms. It may be speculated, however, that they were a group with high expectations of themselves as fathers, or they were those who were most uncertain of their role as a father.

Mental representations describe the mental processes connected to parenting, even though not all representations appear in interaction. Gloger-Tippelt (1983) described how mothers develop close relationships with and more vivid mental representations of their children as early as during pregnancy, while fathers are first capable of creating the relationship during the first year of

interaction with the infant. In our study, representations during pregnancy were enquired about retrospectively, and as such they cannot be evaluated as genuine representations during pregnancy. Even so, they do give valuable information about a group that has not been a focus of study. Mothers constantly reported fear of losing the baby or difficulty and fear of imagining “too much” during early pregnancy. This may reflect the anxiety and fear for the safety and well-being of the infant, as has been reported in a recent study (Hjelmstedt *et al.* 2006). After the child was born, though, the representations of the infant were vivid and positive. This finding supports the supposition that ART mothers represent normative mothers and is in line with the finding of Fava Vizziello and colleagues (1993) that mothers’ representations of their infants and of themselves as mothers are not stable over the transition to parenthood. Literature on the transition to fatherhood is scanty, and the mental representations of fathers-to-be have not been a focus of study. A recent study of Hjelmstedt and Collins (2008) showed continuity between IVF fathers’ feelings during pregnancy and strength of attachment to the infant postnatally. Their focus was not on fathers’ feelings towards the baby during pregnancy but fathers’ feelings in general. Fathers do have contribution on the infant’s development right from the start, and thus there is a need for better knowledge about transition to fatherhood. In our study, the fathers did not remember having vivid impressions of their child during pregnancy but rather a general image of something they had seen in other infants. After the child was born, though, fathers could describe their child’s personality and their relationship with him/her. This is in line with a general clinical observation that fathers tend to create their relationship with the unborn baby later than mothers.

McMahon and colleagues (2003) stated that ART parents who have experienced several treatment cycles are particularly committed to parenthood and therefore may find parenting a more satisfying experience than those who become mothers and fathers without fertility treatment. Our findings are in concordance with this, but as our study group was small, far-reaching conclusions cannot be made. It is possible that the study group consisted of selected couples, i.e. those who had been persistent and flexible enough to continue treatment despite several failures and disappointments that put great pressure on both personal adjustment and adjustment as a couple to a long-standing emotionally stressful situation.

### **Considerations and clinical implications**

As an entity, our study represents a multi-dimensional approach to a special subtype of parenting, namely parenting after infertility and ART. Consistently, throughout all these studies, ART parents showed good adjustment, and no signs of problems during the transition to parenthood were found. Even in extreme cases of long-standing infertility with several unsuccessful treatment attempts the couples were well adjusted to parenthood. Infertility as such, has, however, been repeatedly found to be an extremely stressful experience for many couples, as are the investigations and treatments that precede possible parenthood. As infertility treatment is a long process, the nursing staff may become an important support for the couples. Adequate information about the possibility of pregnancy, the risks of the treatments and other alternatives such as adoption are important in creating a confident relationship between the staff and the couple seeking help.

The participants of this study were those who succeeded in having a child. A successful treatment is a success for the staff of the infertility clinic as well. Nevertheless, staff members also have to face the fact that not all couples are equally lucky. Adequate education and the opportunity to engage in consultation are needed to maintain the ability of the staff to support all the couples and guide them to seek additional help when needed.

A striking feature in the literature in this field is the scanty information concerning men's experiences when facing parenthood after infertility and ART. Traditionally, pregnancy and nurturing a newborn have been the sole domain of women. In the case of ART, the treatments are physically more focused on women. It is of importance, though, to emphasize the role of the father from the very beginning of a new life, regardless of the type of conception. For a family's well-being the father's participation is essential, and thus fathers should be considered as active participants as early as during pregnancy, and their well-being should be considered to be as important as mothers'. This brings a challenge to well-baby clinics, as traditionally mothers-to-be have been the focus of interest and care. Fathers should also be encouraged to find their own ways of interacting with their children, as paternal and maternal functions in child development are separate.

Even though our study did not reveal problems in the transition to parenthood after infertility and ART, previous studies have shown some special features connected to pregnancy after ART. For some women it may be difficult to overcome the emotional pain and loss of self-esteem that infertility may bring, even though parenthood is finally achieved (Hjelmstedt *et al.* 2004, Redshaw *et al.* 2007). Suggestions of accentuated fear for the safety of the infant have been reported repeatedly among ART mothers (McMahon *et al.* 1997; Hjelmstedt *et al.* 2003). As ART has become more common and ART parents are seen in all well-baby clinics, how these parents could be supported in the best possible way to avoid the harmful effects of hurt self-esteem or feelings of insecurity in parenthood should be taken into consideration. For future study it would be important to focus on the possible special features among ART parents that would predict problems during transition to parenthood. Information concerning ART fathers' experiences of infertility and parenthood is scanty, and this topic needs to be studied further.

## Summary and conclusions

### Mental health

- ART women had lower levels of depressive symptoms during pregnancy and postpartum than control women, but the difference had vanished by the end of the child's first year; the same difference was found among men
- when there were problems with the child's health, anxiety symptoms increased only among control women when the child was two months of age
- stressful life events were associated with a higher level of sleeping difficulties and social dysfunction only among control women
- anxiety symptoms, sleeping difficulties and symptoms of social dysfunction were consistently at a higher level among control men than among ART men
- depressive symptoms increased among control men but not among ART men, when there were problems with the child's health

### Marital relations

- ART and control women differed only as regards dyadic consensus, which decreased among control women during the child's first year
- among men the only difference between the ART and control groups was a higher level of sexual affection postpartum among ART men
- significant depressive symptoms during pregnancy were associated with a lower quality and a negative change in marital relations among control women
- stressful life events were associated with a lower level of marital quality among ART women

### Parenting experiences

- mothering experiences (in the parental domain) were in general more positive, and a change towards more positive (in the child domain) occurred among ART mothers
- among fathers in both groups, fathering experiences (in the child domain) became more positive in both groups as the child advanced from two months to one year of age
- generally, among mothers and fathers in both groups, normal birth weight, good experience of delivery, child's contact smile at two months and easy soothing of the child were associated with more positive parenting experiences
- only among control parents were low birth weight, lack of contact smile and difficulty soothing the child associated with a less positive experience of parenting

### Parenting after long-term infertility

- mothers' sensitive behaviour and children's cooperative behaviour increased as the child became a toddler
- mothers' controlling behaviour decreased and unresponsive behaviour increased from the first to the second assessment
- fathers' sensitivity and children's cooperation increased from the first to the second assessment
- fathers' controlling behaviour and children's passive behaviour decreased from the first to the second assessment

- mothers often described a fear of loss during pregnancy, and it was difficult for them to remember whether they had representations of the infant during pregnancy
- fathers in general did not have vivid impressions of the infant during pregnancy
- postnatally both mothers and fathers created realistic and positive representations of their children

## **Conclusions**

Infertility and its treatments are inevitably distressing experiences. The difficult question of the effects of long-standing stress connected with conceiving on parents' well-being and experience of parenthood has received attention during the last decade, and the results so far are controversial. Our results in this multidimensional study are encouraging: they consistently suggest that infertility and successful ART do not produce harmful effects on individual psychological well-being, on marital relations during pregnancy and the child's first year, or on parenting experiences during the child's first year. Even parents with the extreme experience of longstanding infertility and several disappointments because of unsuccessful treatments were not found to have problems in their adjustment to parenthood.

From the child's point of view the early environment consists of mother, father and their relationship with each other. A favourable environment for child development is one with parents who are sufficiently stable in their mood, their relationship with each other and in their interaction with the child and who show enough warmth and empathy towards each other and the child. In cases of infertility and ART, parents have stressful and painful experiences connected to conceiving. As a group, Finnish ART parents seem to cope well with these experiences, and it even seems that the working-through of a shared difficult experience may be of benefit as regards the transition to parenthood. It has to be kept in mind, though, that there are also couples who do not cope this well, and it is a challenge to both infertility clinics and well-baby clinics to detect those parents who need help to overcome these painful experiences.

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