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**OBSTETRIC, PSYCHOSOCIAL, AND PAIN-RELATED  
BACKGROUND, AND TREATMENT  
OF FEAR OF CHILDBIRTH**

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**Academic Dissertation**

To be publicly discussed by the permission of the Medical Faculty of the University  
of Helsinki, in the Auditorium of the Department of Obstetrics and Gynecology,  
Helsinki University Central Hospital, Haartmaninkatu 2,  
on November 2<sup>nd</sup>, 2001, at 12 o'clock noon.

**Helsinki 2001**

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ISBN 952-91-3992-6 (nid.)  
ISBN 952-10-0180-1 (PDF)

Hakapaino 2001

***Non est vivere sed valere vita est***

***To Pekka, Mikko, Tuomas and Juho***

# CONTENTS

<b>Abstract</b>	6
<b>Abbreviations</b>	8
<b>List of original publications</b>	9
<b>1. Introduction</b>	10
<b>2. Review of the literature</b>	12
<b>2.1 Pregnancy as a psychological process</b>	12
<b>2.2 Anxiety and fear during pregnancy</b>	13
2.2.1 Assessment and prevalence	13
2.2.2 Effects on pregnancy and on labor and delivery	14
2.2.3 Effects on wellbeing after childbirth	16
<b>2.3 Causes of fear of childbirth</b>	17
2.3.1 Fear of pain	18
2.3.2 Previous traumatic experiences	18
2.3.3 Fear of being incapable of giving birth	21
2.3.4 Fear of becoming a parent	21
2.3.5 Fears of the father-to-be	22
<b>2.4 Individual differences in sensation of pain</b>	23
2.4.1 Physiology of labor pain	23
2.4.2 Individual pain tolerance and its measurement	23
2.4.3 Effects of pregnancy on pain tolerance	25
2.4.4 Hormonal reactions to stress and pain	25
<b>2.5 Treatment of fear of labor</b>	27
2.5.1 Childbirth preparation and support during delivery	28
2.5.2 Discussion about the previous childbirth and planning the future one	28
2.5.3 Specific intervention	29
Psychological support	29
Relaxation techniques	30
Psychotherapies	30
2.5.4 Cesarean on request	31

<b>3. Aims of the study</b>	34
<b>4. Subjects and methods</b>	35
<b>4.1 Subjects</b>	35
<b>4.2 Methods</b>	35
4.2.1 Data collection for the retrospective study	35
4.2.2 Questionnaires assessing fear of childbirth and pregnancy-related anxiety	36
4.2.3 Questionnaires assessing psychological characteristics	38
4.2.4 Cold pressor test and associated hormone assays	39
4.2.5 Treatment for fear of childbirth	40
<b>4.3. Statistical analyses</b>	41
<b>5. Results</b>	42
5.1 Psychological and obstetric background of the fear of labor (I, II)	42
5.2 Pain tolerance and hormonal reactions to pain in women with fear of labor (III, IV)	43
5.3. Satisfaction with delivery and puerperal depression (V)	46
5.4 Treatment for fear of childbirth (VI)	47
<b>6. Discussion</b>	49
6.1 Obstetric, social, and psychological factors associated with fear of delivery (I, II)	49
6.2. Individual pain tolerance and hormonal reactions to laboratory pain (III, IV)	51
6.3. Satisfaction with childbirth experience and puerperal depression (V)	52
6.4. Treatment for fear of childbirth (VI)	54
<b>7. Conclusions</b>	58
<b>8. Summary</b>	60
<b>Acknowledgements</b>	62
<b>References</b>	64

## ABSTRACT

The aim of the present study was to evaluate whether certain psychosocial characteristics, previous obstetric experiences, or individual pain sensitivity are associated with fear of childbirth, and to investigate the possibilities to treat women suffering from fear of childbirth and thence reduce the requests for a cesarean section (CS), pregnancy-related anxiety and related concerns. A further aim was to investigate whether psychosocial characteristics, fear and anxiety about pregnancy and delivery predict later disappointment with delivery, and puerperal depression. Finally, by comparing the pain tolerance of women with and without fear of childbirth, and their reaction to pain in cold pressure test (CPT), as assessed by responses in noradrenaline, adrenocorticotrophic hormone, and beta-endorphin, a theory of inherent sensitivity to pain-causing mechanisms in these women was tested.

Emergency CS and vacuum extraction during first deliveries were associated with an increased risk of secondary fear of childbirth (adjusted odds ratio (OR) for cesarean 26.9 (95% confidence interval (CI) 11.9, 61.1) and for vacuum extraction OR 4.5 (CI 2.2, 9.3).

The antecedents of pregnancy-related anxiety and fear of childbirth were studied in an unselected population of 278 less than 30 weeks pregnant women and their partners in the Helsinki capital area during 1996-1997. In multiple regression analyses psychological characteristics of the woman contributed most to the probability of pregnancy-related anxiety (increase in  $R^2=0.20$ ,  $P<0.001$ ), the strongest predictor being general anxiety ( $\beta=0.28$ ,  $P<0.001$ ), and lack of support contributed most to the prediction of fear of childbirth (increase in  $\chi^2=13.66$ ,  $P<0.001$ ), mostly by the means of dissatisfaction with partnership (Wald 8.61,  $P<0.01$ ). Dissatisfaction of the partner with life and partnership were independent risk factors.

In a longitudinal study of 211 unselected women, who were followed from mean gestational age of  $17.3 \pm 3.7$  (range 7-30) weeks to mean  $71.4 \pm 39.5$  (range 14-200) days after delivery, puerperal depression was mostly predicted by depression during pregnancy (increase in  $R^2 =0.16$ ,  $p<0.001$ ), and further by general anxiety, vulnerability, and neuroticism (increase in  $R^2 =0.32$ ,  $p<0.001$ ). The objective events during pregnancy or delivery (complications during pregnancy, pain in labor, or mode of delivery) did not predict puerperal depression. In hierarchical regression analyses, the

strongest predictors of disappointment with childbirth were labor pain (increase in  $R^2=0.14$ ,  $p<0.001$ ), emergency CS (increase in  $R^2=0.18$ ,  $p<0.001$ ), and depression in early pregnancy (beta=-0.33,  $P<0.001$ ).

Both during and after pregnancy, patients with childbirth-related fear tolerated cold-induced pain in CPT for a significantly shorter time and experienced it more painful than the controls did. In CPT during pregnancy, the response in noradrenaline was 28% smaller in women with fear of childbirth than in controls, whereas the responses of ACTH, cortisol, and beta-endorphin were similar between the groups, both during and after pregnancy. Baseline levels of noradrenaline in the pregnant fear group were higher than in controls.

During intervention for fear of childbirth ( $n=176$ ), starting from the 26<sup>th</sup> gestational week, birth-related concerns decreased in the intensive treatment group (IT), but increased in the conventional treatment (CT) group. Labors were shorter in the IT group when compared to the CT group (mean  $6.8 \pm 3.8$ (SD) hours vs.  $8.5 \pm 4.8$ hours,  $P<0.05$ ). After intervention, 62% of those primarily requesting a cesarean chose to deliver vaginally, equally in both groups. In a loglinear model, especially parous women with low motivation to treatment from the CT group chose cesarean more often than expected (standardized residual 2.54,  $P<0.05$ )

The personalities of the pregnant woman and her partner, and their mutual relationship, influences the woman's attitude towards the forthcoming childbirth. The more anxiety, neuroticism, vulnerability, depression, low self-esteem, dissatisfaction with the partnership, and lack of social support the woman reported, the more they expressed pregnancy-related anxiety and fear of childbirth. A previous complicated childbirth is an important cause of fear of childbirth and a request for CS during a subsequent pregnancy. Depression during pregnancy predicts disappointment with childbirth and is a major predictor of puerperal depression. Patients with fear of childbirth were characterized by pain intolerance, although with normal levels of ACTH, cortisol, and beta-endorphin before and during CPT. However, there might be an increase in catecholamine output in pregnant women with fear of childbirth.

**ABBREVIATIONS**

ACTH	adrenocorticotropin hormone
AUC	area under curve
CI	confidence interval
CPT	cold pressor test
CRH	corticotropin releasing hormone
CS	cesarean section
CT	conventional treatment group
FDQ	fear of delivery questionnaire
IT	intensive treatment group
OR	odds ratio
PAS	pregnancy-related anxiety score
POMC	proopiomelanocortin
PS	pain sensitive
PT	pain tolerant
PTSD	posttraumatic stress disorder
SD	standard deviation
SE	standard error
VAS	Visual Analogue Scale

## LIST OF ORIGINAL PUBLICATIONS

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

Roman numerals:

- I Saisto T, Ylikorkala O, Halmesmäki E. Factors associated with fear of delivery in second pregnancies. *Obstet Gynecol* 1999;94:679-682.
- II Saisto T, Salmela-Aro K, Nurmi J-E, Halmesmäki E. Psychosocial characteristics of couples fearing vaginal childbirth. *Br J Obstet Gynecol* 2001; 108:492-498.
- III Saisto T, Kaaja R, Ylikorkala O, Halmesmäki E Reduced pain tolerance during and after pregnancy in women suffering from fear of labor. *Pain* 2001; 93:123-127.
- IV Saisto T, Kaaja R, Helske S, Ylikorkala O, Halmesmäki E. Noradrenaline, adrenocorticotropin, cortisol, and beta-endorphin responses to cold pressor test in women with fear of labor during and after pregnancy. Submitted
- V Saisto T, Salmela-Aro K, Nurmi J-E, Halmesmäki E. Psychosocial predictors of disappointment with delivery and puerperal depression. *Acta Obstet Gynecol Scand* 2001;80:39-45.
- VI Saisto T, Salmela-Aro K, Könönen T, Nurmi J-E, Halmesmäki E. A controlled trial of intervention in fear of childbirth. *Obstet Gynecol* (in press).

## INTRODUCTION

Fear of childbirth complicates somewhat 20% of pregnancies in developed countries where it is mostly evaluated. It is expressed as being severe by six to ten percent of parturients and is manifested as nightmares, physical complaints and difficulties to concentrate on work or on family activities (Areskog et al. 1981, Jolly et al. 1999). Very often fear of childbirth leads to request for elective cesarean section (CS), in spite of the known risks of this procedure (Hall and Bewley 1999). In Sweden and the United Kingdom, fear of childbirth is the reason for 7-22% of CS births (Ryding 1991, Atiba et al. 1993, Graham et al. 1999, MacKenzie 1999), and in 1999 and 2000, 8% of all CSs carried out at the Helsinki University Hospital were conducted because of maternal fear of childbirth.

Little is known about the background factors of fear of childbirth. Fear of labor pain is strongly associated with the fear of pain in general (Areskog et al. 1983a), and previous complicated childbirth or inadequate pain relief are the most common reasons for requesting CS among parous women (Ryding 1991, Drummond and Rickwood 1997, Sjögren and Thomassen 1997). Previous psychological morbidity and a great number of daily stressors expose a woman to a great risk of fear of childbirth (Areskog, et al. 1983a, Paarlberg et al. 1996, (Sjögren and Thomassen 1997) at least if she lacks support from her close social network (Engle et al. 1990, Paarlberg et al. 1996). In general, fear of childbirth is as common in nulliparous as in parous women.

In women, previous experience of labor pain or pain in general, older age, and a high level of education are believed to increase pain tolerance (Melzack et al. 1981, Hapidou and DeCatanzaro 1992, Melzack 1993, Unruh 1996, Sheiner et al. 1999). In animal research, the increase in the pain threshold during pregnancy has been shown to be a consequence of the activation of the endorphin system during pregnancy (Gintzler 1980). The pain sensitivity of women with fear of childbirth has not earlier been studied.

During the past decade, a vivid debate about the woman's right to choose the mode of delivery has begun in obstetrical literature (Wilkinson et al. 1998, Howard 1999, Eftekhar and Steer 2000, Quadros 2000), but discussion on the reasons for women to request CS, or on the possibilities to help them overcome the fear of vaginal childbirth is scanty (Hall 1987, Hemminki 1997, Young 1999). Preliminary Swedish reports from Ryding (1993) and Sjögren and Thomassen (1997) demonstrated some of the reasons for the request of CS and the results of treatment during pregnancy, but the numbers of patients were only 68 and 33. In these small groups, half of the women withdrew their request after being able to discuss their anxiety and fear, and vaginal deliveries after treatment were successful (Sjögren 1998).

## **2. REVIEW OF THE LITERATURE**

### **2.1 Pregnancy as a psychological process**

The birth of a child into a family is among the major interpersonal transitions during adulthood (Ruble et al. 1990). It demands learning new skills and acquiring new responsibilities. The transition to parenthood is a maturing process; at the end of this developmental process both woman and man have changed permanently, but not without an emotional turbulence and conflicts during the process (Bibring and Valenstein 1976, Oates 1989). The phases of the development of human personality have to be experienced in the correct sequence. This makes, on the one hand adolescent, and on the other hand older primiparous women, as well as single, or unsupported women more vulnerable to failure in the transition to parenthood. The recognition of the special needs of these women is essential to help them with the process (Oates 1989). As well as the individual's process, transition to parenthood is also pivotal to the partnership (Cowan and Cowan 1988). Furthermore, pregnancy is also a family crisis, aiming at incorporating the new member into the family (Pines 1972).

Psychologically, pregnancy consists of consecutive interdependent phases (Gloger-Tippelt 1983). During the first trimester, the previous identity of the woman is threatened and unconscious anxiety is common. This phase is also characterized by sorrow about losing one's own childhood and fear of regression (Pines 1972). During the second trimester, the woman adapts to the prospective motherhood and conceptualizes the child as an independent being. Unconscious anxiety is reduced and replaced by more a personalized worry about the well-being of the child (Gloger-Tippelt 1983, Oates 1989). Rich regressive fantasies and colorful dreams also characterize this period (Pines 1972). The final phase of pregnancy is the time of active preparation for the birth, the infant and the new life situation. Emotionally, social withdrawal with impaired interest to outside upheavals helps the woman to concentrate on giving birth. In childbirth, the woman loses the symbiotic relationship with the infant, which can also be a source of anxiety.

The early mother-infant relationship and the formation of bonding (maternal attachment, (Bowlby 1969)), are seen as crucial for the well-being and development of the infant. The development of this relationship starts already during pregnancy, and the psychological well-being of the pregnant woman, including her feelings about pregnancy and childbirth, influences her ability to conceive the child as an independent being and therefore has an impact on attachment, as well (Robson and Kumar 1980, Hipwell et al. 2000).

The personality of the woman reflects the way in which she adapts to the changes during pregnancy. Women with a stiff, compulsive personality are less vulnerable to regression. This in turn gives the impression of rational and systematic behavior, but, in fact, leads to a rigid attitude to antenatal care, delivery, and caretaking of the child (Bibring and Valenstein 1976, Barnett and Parker 1986). Women who were able to express anxiety during pregnancy have shown to cope better with caring for the child (Barnett and Parker 1986). Similarly, Raphael-Leff (1986) described two different attitudes towards pregnancy and motherhood: the regulator and the facilitator. The former expects the baby to adapt to the mother, when the latter kind of a mother adapts herself to the baby. Strategies concerning the prevention of maternal anxiety, and low well-being during puerperium, should make it possible for every woman to embrace the individual maternal role according to her wishes and expectations (Raphael-Leff 1986).

## **2.2. Anxiety and fear during pregnancy**

### **2.2.1 Assessment and prevalence**

There is no settled definition for fear of childbirth. In studies both on prenatal anxiety and on fear of childbirth different kinds of diagnostic methods and criteria have been used. Further, the gestational age at the time of the studies varies a lot. In general, fear of childbirth can be seen as an anxiety disorder or as a phobic fear during pregnancy, which is manifested in nightmares, physical complaints and difficulties to concentrate on work or on family activities, and very often as a request for CS as the mode of delivery.

Prenatal anxiety can be seen as a construction of different dimensions of anxiety. A preliminary interview-based study (Standley et al. 1979) identified three dimensions of anxiety: pregnancy and childbirth, parenting the child, and general psychiatric symptomatology. Later, Levin (1991) identified the following three dimensions of pregnancy-related anxiety: being pregnant, childbirth, and hospitalization. In most of the studies on prenatal anxiety and its effects on pregnancy outcome, anxiety has been studied with questionnaires originally made for the measurement of general anxiety (Crandon 1979, Reading and Cox 1985, Barnett and Parker 1986, Kennerley and Gath 1989, Pagel et al. 1990, Bhagwanani et al. 1997), with combined questionnaires (Goldenberg et al. 1997), and with interviews (Lederman et al. 1981). Pregnancy or childbirth related fear or anxiety has been taken into account in some studies (Standley, et al. 1979, Kennerley and Gath 1989, Fridh and Gaston-Johansson 1990, Wadhwa et al. 1993, Ryding et al. 1998a, Hofberg and Brockington 2000), the methods of which have been either questionnaires or

interviews. Although women with fear of childbirth are often generally anxious (Areskog, et al. 1983a), the distinction between these terms in previous studies is unclear. Anxiety proneness can be seen as an individual characteristic, which reflects the way people anticipate and experience various life events, like pregnancy and childbirth (Pulkkinen 1996).

Swedish obstetrician Areskog conducted the first studies on fear of childbirth (Areskog, et al. 1981, Areskog et al. 1982, Areskog et al. 1983b, Areskog, et al. 1983a, Areskog et al. 1984). She interviewed 139 low-risk women during their third trimester of pregnancy, and combined the results with those of a new questionnaire with 19 items on childbirth, and thereby assessed the prevalence of moderate fear of childbirth to be 17% and severe fear of childbirth about 6% (Areskog, et al. 1981). Moderate fear of childbirth is more common among the nulliparous, but severe fear of childbirth and a request for CS is more common among parous women (Areskog, et al. 1982, Ryding 1991, Ryding 1993). In addition, the results of Areskog's study led to the development of a questionnaire (Areskog, et al. 1982), which has been used also in other countries (DiRenzo et al. 1984), and later further revised (Wijma et al. 1998). Also other kinds of questionnaires or interviews have been used to evaluate the degree and contents of prenatal fears (Neuhaus et al. 1994). More than 80% of low-risk pregnant women experience some fear of childbirth (Szeverenyi et al. 1998), focusing most commonly on the well-being of the child (DiRenzo, et al. 1984, Neuhaus, et al. 1994, Szeverenyi, et al. 1998). In general, anxiety during pregnancy is very constant, declining somewhat in the second trimester, but being most significant during the last trimester (Rofe et al. 1993, Bhagwanani, et al. 1997). In addition, hypochondrial fears are more common in pregnant women than in general (Fava et al. 1990). Anxiety can also appear as various complaints such as abdominal pain during pregnancy, increased need for sick leave and visits to the maternity hospital (Forde 1992, Vartiainen et al. 1994, Bhagwanani, et al. 1997). However, it is known from general practice, that up to 50% of all patients with general anxiety are diagnosed incorrectly (Zajacka 1997).

Table 1. The influence of psychological factors on pregnancy, labor, and puerperium as reported in the literature

Psychological finding	Obstetric findings	References
Fear of childbirth and pregnancy-related anxiety	Morning sickness and vomiting	Hofberg and Brockington 2000
	Low gestational age	Wadhwa, et al. 1993
	Severe pain or high need of pain relief	Fridh and Gaston-Johansson 1990, Standley, et al. 1979
	Risk of emergency CS	Ryding, et al. 1998c
Depression	Maternity blues and puerperal depression	Hofberg and Brockington 2000, Knight and Thirkettle 1987
	Preeclampsia	Kurki et al. 2000
Increased anxiety	Maternity blues and puerperal depression	Kennerley and Gath 1989, Knight and Thirkettle 1987
	Low gestational age	Pagel, et al. 1990)
	Severe pain or high need of pain relief	Barnett and Parker 1986, Reading and Cox 1985
	Prolonged labor	Crandon 1979, Lederman et al. 1978
	Fetal distress and risk of emergency CS	Crandon 1979, Lederman, et al. 1981, Pagel, 1990 Ryding, et al. 1998a
	Postdate delivery	Bhagwanani, et al. 1997
Life changes and increased stress	Maternity blues and low attachment on the newborn	Barnett and Parker 1986, Avant 1981
	Morning sickness and vomiting	Vartiainen, et al. 1994
	Depression and/or anxiety during and/or after pregnancy	Barnett and Parker 1986, Nielsen Forman, et al. 2000, O'Hara et al. 1991, Paarlberg, et al. 1996
	Low gestational age	Copper et al. 1996, Lobel, et al. 1992, Rini et al. 1999
Conflicts in acceptance of pregnancy	Low birthweight	Copper, et al. 1996, Lobel, et al. 1992, Newton and Hunt 1984, Pagel, 1990 Paarlberg et al. 1999, Wadhwa, et al. 1993
	Severe pain during labor	Niven and Gijbsbers 1984
Unstable life situation	Fetal distress	Lederman, et al. 1981
	Prolonged labor	Vartiainen, et al. 1994
Lack of support	Lower Apgar score	Vartiainen, et al. 1994
	Depression and anxiety during and after pregnancy	Paarlberg, et al. 1996, Brugha, et al. 1998, Nielsen Forman, et al. 2000
Dissatisfaction with partnership	Puerperal depression	O'Hara, et al. 1991
	Posttraumatic stress reaction after childbirth	Ryding, et al. 1998c

### **2.2.2 Effects on pregnancy and on labor and delivery**

Several studies, already from the 70's, have demonstrated the association between anxiety or increased stress during pregnancy, and an adverse perinatal outcome (Table 1). However, not all studies have been able to verify this kind of association (Newton and Hunt 1984).

A large case-control study conducted in Sweden demonstrated how fear of childbirth, anxiety during pregnancy, and a low capacity to cope with stress put the parturient at high risk for emergency CS (Ryding, et al. 1998a). Intrauterine growth retardation and asphyxia are the most remarkable fetal effects among anxious women (Lederman, et al. 1981, Newton and Hunt 1984, Lobel, et al. 1992, Wadhwa, et al. 1993, Vartiainen, et al. 1994), originating probably from increased uterine artery resistance (Teixeira et al. 1999). This altered blood flow pattern may be caused by increased noradrenaline concentrations (Starkman et al. 1990) or the stimulation of the hypothalamic-pituitary-adrenal axis (Wadhwa et al. 1996).

### **2.2.3 Effects on well-being after childbirth**

Women with antenatal fear of childbirth have been shown to have a high risk of dissatisfaction with the childbirth experience, maternity blues, and puerperal depression (Areskog, et al. 1984). Also other psychological factors during pregnancy have an impact on wellbeing during puerperium (Table 1).

Of all puerperal women, 6-17% are depressed (O'Hara and Swain 1996, Georgiopoulos et al. 1999, Brown and Lumley 2000, Nielsen Forman et al. 2000,) , and 28% of women are suspected to need psychological help during the first months after childbirth (Viinamaki et al. 1994). The strongest predictor of puerperal depression is earlier (before or during pregnancy) depression, followed by the lack of social support, distress, and a depression-related coping style (O'Hara et al. 1991, Demyttenaere et al. 1995, Beck 1996, Brugha et al. 1998, O'Hara and Swain 1996, Nielsen Forman, et al. 2000). Postnatal anxiety is predictable from prenatal anxiety, and self-depreciatory and neurotic women are at great risk to postnatal anxiety and maternity blues (Barnett and Parker 1986, Engle, et al. 1990, Hall et al. 1996).

In addition to the low level of well-being of the depressed mother herself, puerperal depression has adverse consequences on the child's development (Avant 1981, Philipps and O'Hara 1991, Fowles 1996). With depressed mothers, the mother-infant relationship (attachment) can be

disturbed, and their children are at a greater risk for behavioral and emotional problems (Murray 1992).

Dissatisfaction with delivery is highly associated with the mode of delivery; those giving birth spontaneously being the most satisfied and those having operative (either vaginal or abdominal) delivery being the most dissatisfied (Neuhaus, et al. 1994, Jolly, et al. 1999). Also intolerable or untreated labor pain, feelings of loss of control, and dissatisfaction with own coping during childbirth are related to postpartum emotional disturbance (Niven and Gijbers 1984, Reading and Cox 1985). Anxious and neurotic women rate their hospital experience and the help from the staff lower than the less anxious and neurotic women (Barnett and Parker 1986).

### 2.3 Causes of fear of childbirth

The background of fear of childbirth can be seen as biological (fear of pain), psychological (related to personality, previous traumatic events, or fear of future parenthood), social (lack of support, economic uncertainty), or secondary (originating from previous childbirth experiences). Data on factors predisposing to anxiety during pregnancy and/or fear of childbirth are collected in Table 2, and further, the common causes expressed by pregnant women for prenatal and delivery-related fears are summarized in Table 3.

Table 2. Factors predisposing to anxiety during pregnancy or fear of childbirth

	References
Young maternal age	Standley, et al. 1979
Low education or socioeconomic level	Rofe, et al. 1993, Standley, et al. 1979
Psychological problems before pregnancy	Areskog, et al. 1983a, Sjögren and Thomassen 1997
Sexually abused or problems in sexuality	Areskog, et al. 1983a,
Low assertiveness or self-esteem	Engle, et al. 1990
Fear of pain in general	Areskog, et al. 1983a
Psychological problems during present pregnancy	Areskog, et al. 1983a
Lack of social support	Engle, et al. 1990,
Great number of daily stressors	Paarlberg, et al. 1996
A previous operative delivery	Ryding 1991, Ryding 1993, Sjögren and Thomassen 1997
A previous adverse perinatal outcome	Ryding 1993
Disappointment with previous vaginal childbirth	Ryding 1991
Lack of knowledge, not attending the childbirth preparation	Engle, et al. 1990

### **2.3.1 Fear of pain**

Fear of labor pain is strongly associated with fear of pain in general, irrespective of parity (Areskog, et al. 1983a), and it is one of the most common reasons to request CS. As an innate type of fear, it differs clearly from other kinds of fears, which are acquired. In a study of 100 pregnant women with fear of childbirth, 47% of nulliparous women were afraid of intolerable pain (Sjögren 1997). In a smaller study of 28 parous women requesting CS, 36% stated the fear of pain as the main reason for their request (Ryding 1993). In an unselected population the fear of labor pain is not the foremost fear but rather a worry for the well-being of the child (Neuhaus, et al. 1994), although, up to 72% of all pregnant women are somewhat afraid of pain and 88% intend to ask beforehand for some kind of pain relief (Kangas-Saarela and Kangas-Kärki 1994).

First described by Lethem (Lethem et al. 1983), pain-avoidance is the perpetuation of learned behavior aiming at avoiding or escaping from, situations of an aversive event, mainly pain, consequently postponing or averting its appearance. Fear makes patients to react more strongly to possible signals (hypervigilance) and appraise them as dangerous by interfering with cognitive functioning and increasing the psychophysiological reactivity (Vlaeyen and Linton 2000). The fear of pain influences the way in which people react to a given information (Asmundson et al. 1997) and how they evaluate the experienced pain and its consequences (Asmundson and Norton 1995). Studies on patients with chronic pain suggest that pain-related fear can be more disabling than the pain itself, especially when it implies poor general well-being and pain-avoidance (McCracken et al. 1998, Crombez et al. 1999). Pain-avoiding behavior is associated with a neurotic personality (Asmundson et al. 1999). A request for CS due to fear of childbirth can be seen as one manifestation of pain avoiding behavior.

### **2.3.2 Previous obstetric experiences**

In a survey posted to women who had delivered their first child five years ago, 26% of those with CS, 25% of those with operative vaginal delivery, and 10% of those with spontaneous vaginal delivery were still afraid of a future childbirth (Jolly, et al. 1999). Further, in a sub-group of women, who had not wanted more children during those 5 years, 19% of those with CS, 11% of those with operative vaginal delivery, and 5 % of those with spontaneous vaginal delivery stated that the main reason for voluntary infertility was the fear of childbirth (Jolly, et al. 1999). Similarly in other studies the experience of especially emergency CS has been experienced as traumatic (DiMatteo et al. 1996, Ryding et al. 1997, Ryding et al. 1998d, Graham, et al. 1999, Durik et al. 2000).

Table 3. Prenatal and delivery-related fears in an unselected or selected population with clinical fear of childbirth

Reference	Study population	Method	Five most common fears (prevalence)
DiRenzo, et al. 1984	810 unselected Italian women at term	Questionnaire revised from Areskog et al. 1982	Rupturing (55%), uncontrollable screaming (52%), having injured or dead child (49%), being incompetent (47%), panic (47%)
Ryding 1993	33 selected Swedish women with fear of childbirth before 37 <sup>th</sup> gestational week	Interviews	Having injured or dead child (33%), intolerable pain (30%), death (12%), rupturing (9%), ending up to an operative delivery (9%)
Neuhaus, et al. 1994	122 unselected German women in third trimester	Own questionnaires	Having an injured or dead child, ending up to an operative delivery, having intolerable pain, needing episiotomy, being helpless (all > 25%)
Sjögren 1997	100 selected Swedish women with fear of childbirth in second or third trimester	Interviews	Not trusting the obstetrical staff (73%), being incompetent (65%), dying and/or having a dead child (55%), intolerable pain (44%), losing control (43%)
Szeverenyi et al. 1998	216 unselected Hungarian women in third trimester	Own questionnaires	Having a malformed or injured child (69%), ending up to an operative delivery (65%), being lonely (28%), being incompetent (11%), not knowing how the delivery was going to happen (9%)

In a retrospective analysis of 34 parous women ending up in elective CS because of their fear of childbirth, 50% had previously delivered by emergency CS (Ryding 1991). In a study by Mould et al. (1996), 38% of women with CS expressed a wish for CS in the next pregnancy as well, when asked within one week after the first CS. Overall, women who deliver their first child with emergency CS seem to have fewer children than those who have had a spontaneous vaginal delivery (Garel et al. 1990, Mutryn 1993, Jolly, et al. 1999). Fear of death is expressed by up to 41% of women with a previous experience of complicated childbirth (Sjögren 1997). However, as not every woman develops secondary fear of childbirth after emergency CS, there might exist some yet unrecognized background factors or undiagnosed primary fear of childbirth among those who experience birthing of their child as traumatic.

The reasons for and information on emergency CS are not always obvious to the parturient (Graham et al.,1999, Ryding et al.,1998b) . In a recent study (Graham, et al. 1999), 70% of women with emergency CS knew the reason and only 20 % got some information before the emergency CS. When CS has to be performed, many women are afraid of death or injury either of the infant (49%), or themselves (26%), or feel loss of reality (13%), or feel disappointment (53%) (Ryding et al. 1998b).

Spontaneous vaginal deliveries result in the elevation of mood and self-esteem, whereas women with CSs are more prone to mood deterioration, decrease in self-esteem, feelings of guilt, and puerperal depression (Gottlieb and Barrett 1986, Boyce and Todd 1992, Mutryn 1993, Fisher et al. 1997). Also women with instrumental vaginal delivery expressed a lot of negative cognitions and emotions, and were estimated to be under similar stress as women with emergency CS (Ryding, et al. 1998d). In a meta-analysis (DiMatteo, et al. 1996) concerning psychosocial outcomes and the mode of delivery, mothers who had delivered by CS were less likely to breast-feed their infants than women with vaginal deliveries.

Posttraumatic stress disorder (PTSD) can be defined as a prolonged reaction to an experience which included the threat of death or injury to oneself or someone close, and is expressed as anxiety with repeating flahs-backs of the initial event, efforts to avoid the related situations, numbed emotions, and sleeping disturbances (DSM IV). Childbirth has recently been considered able to cause PTSD or intrusive stress reactions (Ballard et al. 1995, Fones 1996), mainly resulting from intolerable pain during labor or an unanticipated complication such as emergency CS. In a Swedish studyl, the prevalence of these is 1.7% of all deliveries and 5.6% of deliveries by emergency CS

(Wijma et al. 1997, Ryding, et al. 1998d). In a British study, 3% of women with objectively normal childbirth expressed significant levels of posttraumatic symptoms (Czarnocka and Slade 2000, Ayers and Pickering 2001). Previous psychological disturbances or negative experiences as a patient, first childbirth, feelings of insecurity or threat during childbirth, poor relationship with the partner, and difficulties in the acceptance of pregnancy and transition to parenthood predisposed women to posttraumatic stress reactions (Mutryn 1993, Ryding, et al. 1997, Ryding, et al. 1998c). Further, as people's reactions to traumatic events differ from each other, some of the predisposing factors to PTSD can also be of biological origin. Neurobiological studies on differences in PTSD-patients' stress reactions will elucidate this in the future (Yehuda et al. 1998, McFarlane 2000).

### **2.3.3 Fear of being incapable of giving birth**

In a selected sample of 100 women with fear of childbirth, the second most common reason for fear, expressed by 65% of them, was the fear of being incapable of giving birth (Sjögren 1997). This involved both physical and psychological incapacity, and was unrelated to parity or previous experience of childbirth. Fear of doing something wrong and harming the fetus with one's own inappropriate behavior during labor is highly connected to the fear of being incapable of giving birth (Szeverenyi, et al. 1998).

Together with the fear of being incapable of giving birth there is often fear of losing one's mind or touch with reality, and various emotions of hopelessness and helplessness. These kinds of fears can result, on the one hand, from the actualization of some traumatic event from one's childhood (for example being abandoned or abused), or, on the other hand, from previous experiences of being neglected when asking for help (for example during previous contacts with health care). Further, this leads to a lack of confidence towards medical personnel, therefore increasing helplessness and despair. It is noteworthy, that traumatic events during childhood are often actively forgotten, and often the woman herself does not understand the antecedents of her fear (Rhodes and Hutchinson 1994).

### **2.3.4 Fear of becoming a parent**

The birth of a child into a family is among the major interpersonal transitions during adulthood (Ruble, et al. 1990). Because of the fast changes in western society during the past generation, the significance and admiration of maternity have decreased at the expense of work and career. The lack

of actual models of how to be a mother in the twenty-first century increases doubts about one's own capability of being a mother.

A prospective interview-study starting already during pregnancy (Standley, et al. 1979) defined prenatal anxiety as anxiety of future parenting, of routine caretaking, and of inability to feed the infant. These concerns were not as common as those about pregnancy and childbirth, and decreased after proper preparation and education (Standley, et al. 1979). During puerperium, anxious and neurotic women feel less confident about parenting and estimate their coping with the baby lower than women with low anxiety (Barnett and Parker 1986). Further, maternal feelings towards the infant during pregnancy predict how the maternal role is assumed when the child is born (Fowles 1996).

Regarding the marital relationship, the birth of a child into a family can be both unifying or separating, depending the structure of the relationship before childbirth (Lewis 1988). If the child is seen as an intruder, ambivalent feelings towards parenthood and dissatisfaction with the marital relationship are common.

### **2.3.5 Fears of the father-to-be**

Along with the wife's pregnancy the father-to-be meets with memories and ideas about his own mother. The meaning of these determine how he is able to accept and combine his wife's maternity with her femininity and sexuality. Also the experiences and examples of his own father either help or complicate his future paternity.

More than 80% of men have some fears relating to childbirth (Szeverenyi, et al. 1998). Of the first time fathers-to-be, 24% were afraid of operative delivery, and 22% expressed strong fear of the wife's pain and suffering and about the baby having a birth injury (Szeverenyi, et al. 1998). Up to 17% of men feared being helpless (Szeverenyi, et al. 1998). A third of the partners of women with fear of childbirth expressed a lot of fear themselves too, and even one fifth of the men requested CS for their wife (Sjögren and Thomassen 1997).

## **2.4 Individual differences in sensation of pain**

### **2.4.1 Physiology of labor pain**

Pain during labor has both a visceral and a somatic component. At the first stage of labor, pain from the increased uterine pressure, stretching of the ligaments and pressure towards the cervix is largely visceral in origin. Pain is reflected to the segments Th 11-12 in the latent phase and then it spreads to Th 10 and L1 during the active first stage. During the transitional and second stages somatic pain originating from the pressure to the pelvic floor, vagina, and perineum becomes more pronounced. It is restricted mostly to the area nerved by the pudendal nerve and reflected to the sacral segments S2-4 (Brownridge 1995).

During uterine contraction pain, a neuroendocrinological stress response is evoked, with many physiological effects. Pain during contractions stimulates breathing, and can result in hyperventilation, increased oxygen consumption, and further through respiratory alkalosis and vasoconstriction in the uterine vascular bed, to fetal metabolic acidosis (May and Elton 1998). Increased noradrenaline activity can further reduce placental blood flow, as well as diminish uterine contractions, thus compromising both the well-being of the fetus and the succession of vaginal childbirth (Lederman, et al. 1978, Brownridge 1995). Once pain is relieved, breathing returns to normal and the respiratory alkalosis is withdrawn. Furthermore the metabolic acidosis is reversed, leading to the improvement of uterine contractions and the well-being of the fetus (May and Elton 1998).

In Finland, the wide spread use of epidural analgesia makes adequate pain relief during labor possible. Epidural analgesia is estimated effective by nearly all parturients (Kangas-Saarela and Kangas-Kärki 1994), and it should be available at every maternity hospital, where women with fear of childbirth are encouraged to vaginal delivery.

### **2.4.2. Individual pain tolerance and its measurement**

Individual differences exist in sensing pain (Niven and Gijbers 1989, Melzack 1993). Pain is a subjective experience, and therefore difficult to measure. By cold pressor test (CPT), a reliable and reproducible measurements of pain can be achieved (Chapman et al. 1985, Chen et al. 1989, Hirsch and Liebert 1998, Edens and Gil 1995). The experience of pain in CPT can be modified by psychological and pharmacological modulators (Pirec et al. 1995, Zacny et al. 1996a, Zacny et al. 1996b, Hirsch and Liebert 1998). The responses of the autonomic nervous system as well as

hormonal responses to CPT have been well-characterized (Chen, et al. 1989, Bouloux et al. 1989, Costa et al. 1993, Jacob et al. 2000, Marasini et al. 1991, Pascualy et al. 2000, Patil et al. 1995) . There are no harmful effects of CPT on the fetus in normotensive pregnancies (Kimura et al. 1998).

Significant dichotomy of pain sensitivity assessed in CPT has demonstrated both pain tolerant (PT) subjects, who endure the maximal (180 or 300 seconds) duration of cold-induced pain, and pain sensitive (PS) subjects, who tolerate cold only approximately 20% of the time tolerated by the PT subjects (Chen, et al. 1989). The proportion of PT subjects was 55% of the material of 205 volunteers (Chen, et al. 1989). The pain provoked by CPT was rated severe (approximate score in Visual Analogue Scale (VAS) being 6 on a scale from 0= “no pain” to 10 =“worst pain imaginable”) (Chen, et al. 1989, Patil, et al. 1995, Pirec, et al. 1995, Hirsch and Liebert 1998)), and even worse (8.5) when all volunteers were women (Fillingim et al. 1999). Labor pain was rated by VAS score (0= “no pain” to 10 =“worst pain imaginable”) to be from 6.4 to 8.6 (Reading and Cox 1985, Sheiner, et al. 1999).

In women, previous experiences of labor pain or pain in general, older age, and a high level of education are believed to increase pain tolerance (Melzack, et al. 1981, Hapidou and DeCatanzaro 1992, Melzack 1993, Unruh 1996, Sheiner, et al. 1999). On the one hand, a certain level of nervousness or stress prepares for better pain tolerance through the release of endogenous opioids (Bandura et al. 1988, Lehofer et al. 1998). On the other hand, anxiety leads to avoidance and unacceptance of pain (Asmundson, et al. 1999, McCracken et al. 1999, Schmidt and Cook 1999, Rhudy and Meagher 2000).

Pain-avoidance behavior is shown to be associated with personality traits such as neuroticism (Asmundson, et al. 1999). Further, neurotic women have been shown to rate labor pain as more severe than those with a low level of neuroticism (Reading and Cox 1985). In phobic fear, opioid-mediated analgesia can in fact be ineffective, as the administration of naltrexone to phobic patients before noxious stimulation does not change pain ratings, but instead the reduction of anxiety by administering anxiolytic alprazolam results in lower pain ratings (Janssen and Arntz 1999). In psychologically healthy subjects, anxiolytic premedication before CPT does not affect the experience of pain (Zacny et al. 1995).

### **2.4.3 Effects of pregnancy on pain tolerance**

Changes in pain tolerance during pregnancy have been measured by gradually increasing the pressure to each finger by a specific analgesiameter (Whipple et al. 1990), by proceeding pressure from the inflation of a sphygmomanometer (Cogan and Spinnato 1986), and by electronic pressure algometer placed on the sternum (Shapira et al. 1995). All these studies demonstrate the elevation of pain thresholds with advancing gestation, and a collapse of pain tolerance after delivery.

Previously, in animal research, the increase in pain threshold during pregnancy has been shown to be a consequence of the activation of the endorphin system during pregnancy. This has been shown by demonstrating, that an increase in pain tolerance during pregnancy is blocked by the administration of opioid-antagonists (Gintzler 1980). Sex steroids can modulate the opioid system during pregnancy (Gintzler and Bohan 1990).

### **2.4.4 Hormonal reactions to stress and pain**

Primary studies on the effects of stress on pituitary, adrenal, or sympathetic hormone secretion were conducted by using physical stressors such as heat, cold, and exercise, but also stressful experiences as exposure to, or fear of an unfamiliar situation. These non-physical factors have been shown to induce a hormonal response comparable to physical stressors (Rose 1985, Johnson et al. 1992). The pituitary gland responds to stressful stimuli by increasing rapidly the secretion of ACTH, which in turn increases the secretion of cortisol from the adrenal cortex with a delay of 10 to 30 minutes (Magiakou et al. 1996) (Williams et al. 1980, Arvat et al. 2000). The release of ACTH is governed by corticotrophin releasing hormone (CRH) from the hypothalamus. In addition to stress, also the cortisol concentration and the sleep-wake-cycle control the release of CRH and ACTH. Cortisol decreases the sensitivity of ACTH-releasing cells to CRH (negative feedback). Both ACTH and cortisol have a notable diurnal variation being highest in the morning and lowest in the evening.

In accordance with the release of ACTH, also beta-endorphin is released from the central nervous system after the stimulation of CRH as a response to stress (Guillemin et al. 1977, Rose 1985, Olson et al. 1993, Gibson et al. 1994). Beta-endorphin and ACTH are derived from the same precursor, proopiomelanocortin (POMC) (Wadhwa et al. 1997). During pregnancy POMC is synthesized also in the placenta, but its proportion and significance during pregnancy remains unknown (Margioris et al. 1988, Smith and Thomson 1991, Clifton et al. 1998). Also beta-endorphin is highest during the activity period (Labrecque and Vanier 1995). Beta-endorphin suppresses ACTH and cortisol levels (Taylor et al. 1983).

The biological half-life for ACTH is 10 to 20 min, for cortisol 80 to 120 min, and for beta-endorphin 20 to 25 min (Williams, et al. 1980, Rose 1985, Iranmanesh et al. 1993). Many studies on the response of these hormones in CPT have been conducted, and both the presence and lack of significant responses have been reported (Rosa et al. 1988, Bouloux, et al. 1989, Costa, et al. 1993, Pascualy, et al. 2000). The endorphin system modulates also these responses (Posner et al. 1985, Bouloux, et al. 1989, Hughes et al. 1991).

Although pregnancy increases the secretion of both placental CRH (Clifton, et al. 1998), and ACTH, cortisol, and beta-endorphin (Laatikainen et al. 1987, Margioris, et al. 1988, Raisanen 1988, Laatikainen 1991), the diurnal variation of both ACTH, cortisol, and beta-endorphin exists also during pregnancy (Smith and Thomson 1991, Lindow et al. 1996, Magiakou, et al. 1996, Wadhwa, et al. 1996, Wadhwa, et al. 1997). Placental CRH has a role at the onset of labor (Warren et al. 1992, McLean et al. 1995, Korebrits et al. 1998, Wadhwa et al. 1998, Hobel et al. 1999). It also depresses pituitary and adrenal responses to stress and as a consequence probably influences maternal and fetal outcome (Smith and Thomson 1991, Sandman et al. 1997, Wadhwa, et al. 1997).

The importance of catecholamine response to stress can be generalized as a “fight or flight” hypothesis, the results of which can be seen as physiological consequences (increased heart rate and blood pressure) (Rose 1985). Factors increasing the secretion of cortisol also increase catecholamine secretion. During acute stress, noradrenaline is released from sympathetic nerve endings, as opposed to adrenaline, which is released from the adrenal medulla (Ross 1978). Noradrenaline vanishes rapidly from the blood (its biological half-life is 2-2.5 min), and the extrapolation from the peripheral levels of plasma noradrenaline to general sympathetic activity is difficult (Brown et al. 1981, Cummings et al. 1983, Esler et al. 1985). There is evidence that endogenous opioids can modulate sympathoadrenomedullary response to stress (Bouloux, et al. 1989, Troullos et al. 1989, degli Uberti et al. 1993).

The levels of catecholamines rise up to 1.5 to 2 fold during CPT (Bouloux, et al. 1989, Marasini, et al. 1991, Costa, et al. 1993, Jacob, et al. 2000, Pascualy, et al. 2000). Pregnancy does not affect the response of noradrenaline to CPT (Nisell et al. 1985), although in normotensive pregnancy, basal levels of noradrenaline are lower than those of non-pregnant women (Kaaja et al. 1999, Wang et al. 1999).

## 2.5 Treatment for fear of childbirth

Studies on the treatment for fear of childbirth are scanty, and no consensus exists on how, where and by whom the possible treatment should be given. Childbirth preparation and support both during pregnancy and delivery are the principal elements for every pregnant woman. Different kinds of psychotherapies could be useful, and can be combined with either simple or specific counselling (psychoeducation). Medical treatment is usually avoided, unless clinical anxiety, depression, or panic disorder calls for it. Employees at different health care levels can treat women with fear of childbirth. The PLISSIT-model which includes four different levels of confrontation and treatment can be adapted to the treatment of fear of childbirth as well (Table 4).

Table 4. **PLISSIT**-model for the treatment of fear of childbirth

Level	Target patients	Treatment	Treatment giver
<b>Permission</b>	All pregnant women	Fear is acceptable	All health care personnel
<b>Limited Information</b>	Mild fear of childbirth, nulliparous women, new maternity hospital	Childbirth preparation, information about pain relief available	General and specialized maternity clinics
<b>Specific Suggestions</b>	Moderate or severe fear of childbirth, previous complicated childbirth, request for CS	Psychoeducation (individual or group sessions) or short therapy	Specially trained obstetrician, midwife, or psychologist
<b>Intensive Therapy</b>	Fear of childbirth complicated by psychiatric problems	Psychotherapy	Psychiatrist or psychotherapist

### **2.5.1. Childbirth preparation and support during delivery**

Childbirth preparation, consisting of education and training of methods to cope with pain, aims at gaining control over fear of labor and delivery (Triolo 1987). Education and information reduce concerns on the infant's health (Klusman 1975), but the training of relaxation and methods of coping with pain are needed to alleviate general anxiety (Klusman 1975, Crowe and von Baeyer 1989). This leads to improved confidence, which in turn is a significant predictor of satisfaction with the childbirth experience (Thune-Larsen and Moller-Pedersen 1988, Crowe and von Baeyer 1989, Waldenstrom et al. 1996, McCrea and Wright 1999) . Childbirth classes are shown to be effective, as women who do not attend them are more vulnerable to postnatal anxiety and an adverse psychosocial outcome after an unanticipated CS (Mutryn 1993). However, the impact of these classes may vary, as contradictory results have been published as well (Reading and Cox 1985, Nichols 1995).

Psychoeducation is the provision of information with a psychological hold, thus aiming at teaching both new know-how and new cognitive understanding of it. The purpose is to enable the patient to change her behaviour (Pekkala and Merinder 2000). Psychoeducation is well accepted, suitable for group sessions, and shown to be effective for example in treating eating disorders (Davis et al. 1997, Geist et al. 2000). It has also an advantage of being suitable for treating a couple or a family together.

The support of a companion during childbirth is associated with shorter labors, less requirements for pain relief, and fewer complications (Gjerdingen et al. 1991, Zhang et al. 1996, Langer et al. 1998, Scott et al. 1999, Hodnett 2000). Further, self-esteem and satisfaction with the childbirth experience are higher, and the risk of postpartum depression is lower after a normal vaginal delivery than an operative one (Wolman et al. 1993, Lederman 1995, Scott, et al. 1999).

### **2.5.2 Discussion about the previous childbirth and planning the future one**

In cases of secondary fear of childbirth, many misunderstandings can be solved by proper reporting of what happened during the previous childbirth (Ryding, et al. 1998c, Graham, et al. 1999). By knowing the reasons for operative interventions and their consequences, as well as for the denial of pain relief, and the probabilities of the recurrence of these in the subsequent childbirth, women can see the differences in their situation now and then. Discussing the feelings during the

previous childbirth and accepting them are necessary before being able to plan the subsequent childbirth.

After discussion on previous experiences it is possible to plan the future childbirth according to the woman's wishes. For example the planning of proper pain relief is essential for women with secondary fear of childbirth, because parous women rate labor pain equally severe as primiparous women (Kangas-Saarela and Kangas-Kärki 1994). Also primiparous women with fear of childbirth should be guaranteed a proper pain relief in order to help them concentrate on other matters than pain.

### **2.5.3 Specific intervention**

#### **Psychological support**

Only few studies exist on the results of treatment of women with fear of childbirth (Lederman 1995). The effects of treating anxiety and fear of childbirth could be measured in terms of alleviation of perceived stress and better adjustment during pregnancy, but also in terms of withdrawal of the request of CS. No studies on the two previous factors exist, and the studies on the latter subject are also scarce. Treatment mostly includes individual psychosomatic support, given by an obstetrician. Treatment has been shown to be successful, as 56% of the 100 women with fear of childbirth withdrew their request of CS after receiving treatment (Sjögren and Thomassen 1997). In a smaller study of 33 women with fear of childbirth, 50% of women withdrew their request for CS after psychological support, counseling, crisis intervention, or short-term psychotherapy (Ryding 1993).

The vaginal deliveries were successful, after treatment of fear of childbirth and withdrawal of the request for CS, and comparable to the reference group where episiotomy and vacuum extraction were equally used (Sjögren and Thomassen 1997). However, labors were shorter in the treated fear group, even though the use of induction, oxytocin, and epidural analgesia were more common among them than in the reference group (Sjögren and Thomassen 1997). The patients were grateful; even 1-3 years later they remembered both the delivery and pain as easier than they had expected (Sjögren 1998), even when compared to a control group without fear of childbirth.

However, a large proportion of women do not accept the treatment, but simply want a CS without any discussion with or counseling from the obstetrician (Ryding 1993). This was seen even in one third of the cases studied by Ryding (1993) and Sjögren and Thomassen (1997).

### **Relaxation techniques**

Individual pain perception depends a wide variety of psychosocial factors, including mood, expectations, social support, and perception of control. A number of nonpharmacologic techniques and approaches (imagery, relaxation, biofeedback) are available for assisting patients in dealing with pain (DePalma and Weisse 1997). Hypnotherapy and simultaneous teaching of auto-relaxation and auto-analgesia (Schauble et al. 1998) have resulted in shorter labors, and less analgesic requirements, both in nulliparous and parous women (Davidson 1962, Jenkins and Pritchard 1993). The therapy in the above-mentioned studies consisted of six individual or group sessions with a medical hypnotherapist, who was not present at the labor. The subjective impression of labor was more pleasant in the autohypnosis group as compared with controls or those with conventional childbirth preparation (Davidson 1962).

### **Psychotherapy**

No studies exist on the results of psychotherapy on the treatment for fear of childbirth. The few studies on this subject have combined different kinds of support or short-term therapy (Ryding 1993, Sjögren and Thomassen 1997), which has been given by the obstetrician, not a psychotherapist. The therapy in these preliminary studies was individual, although in some situations treating the couple or the whole family would be of the greatest benefit. However, usually the problems arise during pregnancy, and the limited time reduces the possibilities for using short-term therapies. The cognitive approach is well suited for the treatment of fear of childbirth because of its short and changeable duration and focus on one problem. In addition, in some cases of severe previous traumatic events or simultaneous psychiatric problems, even long therapies are needed, preferably after pregnancy.

The main principle of cognitive therapy is to focus on one target problem with the active role of the therapist and the reformulation of the problem in a limited time. Psychotherapy aims at teaching the patient to see the problem in an altered way (self-reflection) and to change her particular target problem procedures (by cognitive and behavioral exercises) (Beck 1995). By motivational interviewing, introduced in behavioral and cognitive therapy, the change is more easily initiated

and facilitated (Miller 2000). Constructive thinking reduces anxiety during pregnancy both directly and indirectly by reducing the pregnant woman's perceptions of stress (Park et al. 1997). With a cognitive-behavioral approach people can be taught constructive thinking and coping skills, which lower the pain severity at least in experimental situations (Gil et al. 1996). Positive cognitive adaptation during pregnancy, achievable also in group sessions (Affonso et al. 1999), is related to general well-being (Affonso, et al. 1999, Salmela-Aro et al. 2001).

#### **2.5.4 Cesarean section on request**

During the 1990's, a high percentage of elective CSs have been conducted on maternal request in the developed countries. For example in Britain, 1 to 2 % of all births, 7 to 14 % of all CSs, and up to 30% of elective CSs are performed on maternal request (Atiba, et al. 1993, Wilkinson, et al. 1998, Graham, et al. 1999, MacKenzie 1999, Eftekhar and Steer 2000), and in many clinical situations the woman's involvement in the decision for CS has been high (Mould, et al. 1996, Eftekhar and Steer 2000). Repeated CS delivery has been one of the most common indications for CS in the 80's (39% of CSs in USA) and in the 90's (31% of CSs in UK) (Notzon et al. 1994). However, current results and opinions favor vaginal birth after CS rather than repeated CS in the absence of risk factors, and success rates of 70-90% of vaginal birth are reported in several studies (Pridjian 1992, Weinstein et al. 1996, McMahan 1998, Ragenth et al. 1999).

The question of the right to choose a CS without medical indication is extremely topical, on the one hand because of universally growing CS rates (Kiwanuka and Moore 1987, Notzon 1990, Barros et al. 1991, Mutryn 1993) and, on the other hand because of the fundamental medical principle of not to harm but benefit the patient (Wagner 2000,. During the past decade, however, several commentaries about the woman's right to choose the mode of childbirth have been published (Howard 1999, Eftekhar and Steer 2000, Quadros 2000), in spite of the known risks of this procedure both to the mother (Table 5) (Kirkinen 1988, Wagner 1994, de Zulueta 1999, Hall and Bewley 1999, Sachs et al. 1999) and to the infant (Hemminki 1987) (Miller 1988, Wagner 1994, Smith et al. 1997, Gronlund et al. 1999, Madar et al. 1999, Wagner 2000). The overall complication rate of CS can be even 15% (van Ham et al. 1997). Although the recent application of routine antibiotic prophylaxis for CS, infections are still the most common complications of CS (Henderson and Love 1995, Smail and Hofmeyr 2000). Furthermore, with recurrent CSs the major risks of placenta previa and associated haemorrhagia and peripartum hysterectomy increase

(Kirkinen 1988, Ananth et al. 1997, Engelsen et al. 2001, Rageth, et al. 1999), as well as the probability of involuntary infertility (Garel, et al. 1990, Hemminki and Merilainen 1996). In Italy, a law on the rights of pregnant women to choose their mode of delivery has been ratified, and 4% of CSs were conducted on maternal request during the first year after that ratification (1996) (Tranquilli and Garzetti 1997).

There are several problems concerning discussion about CS on maternal request. First, how to assess the quality of information given to woman asking for CS (Hemminki 1997, Paterson-Brown 1998, Gamble and Creedy 2000). When the woman is considered to be well-informed? Second, is it the question about women requesting CS or are they given a choice by obstetricians (Mould, et al. 1996, Turnbull et al. 1999)?

The comments against elective CS on request are scarce (Johnson et al. 1986, Lam 1993, Amu et al. 1998, Wagner 2000), and even scarcer are the attempts to find out why women request CS in the first place, and no mention is made of some kind of counseling or therapy for the fear of vaginal childbirth (Hall 1987, Hemminki 1997, Young 1999).

Table 5. Maternal morbidity and mortality after CS

Complication	Incidence	Risk ratio (95% CI)	N (births)	Reference
Maternal death (UK, 1994-1996)	59/1 000 000 in elective CS 182/1 000 000 in emergency CS	2.84 (1.72, 4.70) 8.84 (5.60, 13.94)	2 197 600	Hall and Bewley 1999
Bladder laceration	1.4/1000 in CSs	14	117 847	Rajasekar and Hall 1997
Ureteral laceration	0.3/1000 in CSs	9	117 847	Rajasekar and Hall 1997
Laceration of uterus or vagina	1.3% in CSs		7 330	Nielsen and Hokegard 1984
Laceration to uterine vessels	5/1000 in CSs		7 330	Nielsen and Hokegard 1984
Pulmonary embolism	1-4/10000 deliveries	5		Macklon and Greer 1996
Venous thrombosis	6-12/10000	5		Macklon and Greer 1996
Stroke	13.1/100 000 in all deliveries	peripartum 3.56 (2.62, 4.83) postpartum 2.40 (1.45, 3.99)	1 408 015	Lanska and Kryscio 2000
Intracranial venous thrombosis	11.6/100 000 in all deliveries	peripartum 3.10 (2.26, 4.24) postpartum 4.01 (2.56, 6.28)	1 408 015	Lanska and Kryscio 2000
Wound infection	3.97%		76 268	Chaim et al. 2000
Endometritis	0.17% after vaginal delivery 2.63% after CS	15	76 268	Chaim, et al. 2000
Sepsis	0.04% of all deliveries	11.9	48 865	Waterstone et al. 2001
Severe haemorrhage	0.7% of all deliveries	3.09	48 865	Waterstone, et al. 2001
Peripartum hysterectomy		6.07 (4.71, 7.83)	457 825	Rageth, et al. 1999
Rehospitalization	1.2% of all deliveries	1.8 (1.6, 1.8)	256 795	Lydon-Rochelle et al. 2000
Next pregnancy: ectopic or miscarriage		1.35 for ectopic 1.21 for miscarriage	34 000	Hemminki and Merilainen 1996
Placenta accreta in next pregnancy	0.01% without uterine scar	25	155 670	Miller et al. 1997
Placenta preavia in next pregnancy	0.3-0.9% of all pregnancies	2.6 (2.3, 3.0)	3 700 000	Ananth, et al. 1997
Bleeding in next pregnancy due to placenta preavia		2.06 (1.70, 2.49)	457 825	Rageth, et al. 1999
Abruption placentae in next pregnancy		2.41-3.89	34 000	Hemminki and Merilainen 1996
Increased perinatal mortality in next pregnancy		1.33 (1.10, 1.62)	457 825	Rageth, et al. 1999

### **3. AIMS OF THE STUDY**

The present study was undertaken

- to identify factors associated with fear of childbirth during and after first labor, and personal characteristics and socio-economic background of couples fearing vaginal childbirth.
- to predict disappointment with delivery and risk of puerperal depression by personality characteristics, depression, fear and anxiety about pregnancy and delivery, and socio-economic background.
- to compare pain tolerance in women with and without fear of labor during and after pregnancy, and their reaction to pain in cold pressor test as assessed by responses in noradrenaline, adrenocorticotrophic hormone, and beta-endorphin.
- to evaluate the possibility of reducing the requests for CS, anxiety and related concerns by comparing intensive and conventional treatment of fear of childbirth.

## 4. SUBJECTS AND METHODS

### 4.1. Subjects

During 1996-1999, and after approval of the Ethics Committee of the Department of Obstetrics and Gynecology, University of Helsinki, altogether, 424 women and 404 men gave their informed consent and were prospectively studied (studies II-VI). In addition, the records of 300 women were retrospectively examined (study I).

For study II, 278 women and their partners were recruited during a routine visit to a community midwife in the Helsinki capital area from 400 consequent unselected low-risk Finnish-speaking pregnant women and their partners. Of them, 211 women also participated in study V and 50 in study VI. In total, 176 obstetrically low-risk and physically healthy women, treated for fear of delivery (study VI), were referred to our outpatient clinic at the Department of Obstetrics and Gynecology after assessing the specific fear of childbirth- questionnaire. Of them, 20 also participated in studies III and IV (Table 6). The control women (n=20) in studies III and IV were recruited from routine obstetric check-ups.

Table 6. Clinical characteristics of the study population (mean  $\pm$ SD)

Study	Number of		Age (years)	Gestational age at enrollment	Proportion of nulliparous (%)	Score for fear of delivery	
	Subjects	Controls				Subjects	Controls
I	100	200	30.8 $\pm$ 3.7	33.0 $\pm$ 5.6	-	not used	
II	278 couples		28.9 $\pm$ 5.1	17.1 $\pm$ 3.9	47	2.1 $\pm$ 2.1	
III	20	20	31.5 $\pm$ 4.6	37.4 $\pm$ 1.1	50	5.7 $\pm$ 1.6	1.0 $\pm$ 1.2
IV	20	20	31.5 $\pm$ 4.6	37.4 $\pm$ 1.1	50	5.7 $\pm$ 1.6	1.0 $\pm$ 1.2
V	211		29.4 $\pm$ 5.1	17.3 $\pm$ 3.7	44	2.1 $\pm$ 2.3	
VI	176		32.0 $\pm$ 4.9	25.2 $\pm$ 1.8	51	5.9 $\pm$ 1.8	

### 4.2 Methods

#### 4.2.1 Data collection for the retrospective study

The women in study I were referred during their second pregnancies to our outpatient clinic because of fear of childbirth and a request for CS. As they all had delivered their first child in our hospital between the years 1981-1995, we collected the data on their first deliveries from their files, and for every subject two age- and parity-matched women were enrolled as controls with the option, that they had had their first child also in our hospital at the same time as the subjects and had later delivered without fear, again in our hospital.

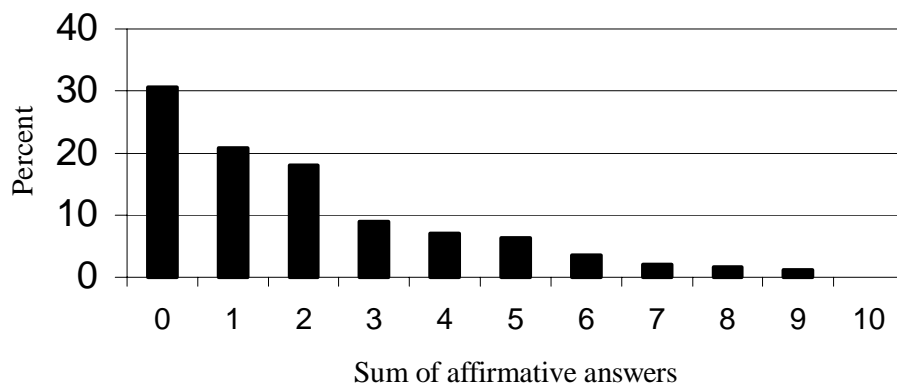
#### 4.2.2. Questionnaires assessing fear of childbirth and pregnancy-related anxiety

As no questionnaires for assessment of fear of childbirth were in clinical use, we started with a pilot study (n=45) at our outpatient maternity clinic with a revised version of the questionnaire from Areskog, et al. (1982) (Table 7). As it was well accepted, we launched that Fear-of-delivery-questionnaire (FDQ) first in study II. The sum of affirmative answers showed a positively skewed distribution with 30% of women answering affirmately to none of the questions, and the score for the 85<sup>th</sup> and 90<sup>th</sup> percentiles was 5.0 and 6.0, respectively (Figure 1). The Cronbach alpha reliability coefficient in our material was 0.76. Later, the same set of questions was used in studies III-VI, where the score of 5 or more, or a request of CS (Question no. 10) were considered as marker for significant fear of childbirth.

Table 7. The questionnaire assessing fear of childbirth (FDQ) (modified from Areskog (1982)) each question to be answered yes or no, and percentage of affirmative answers (II and VI)

Study	II	VI
1. Do you have difficulties relaxing because you are thinking of the delivery?	22.8%	74.9%
2. Are you afraid of being seized with panic at the delivery?	17.3%	67.9%
3. Are you afraid that you will scream uncontrollably during the delivery?	21.3%	38.0%
4. Have you always been afraid of giving birth?	18.8%	57.8%
5. Have you sometimes thought of the delivery as something unnatural?	4.5%	20.9%
6. Have you had nightmares about the delivery?	6.4%	33.7%
7. Are you afraid of rupturing during the delivery?	29.2%	66.3%
8. Are you afraid of painful injections during the delivery?	25.7%	47.1%
9. Are you afraid of losing control of yourself at the delivery?	17.3%	56.7%
10. Do you prefer a cesarean section to an ordinary delivery?	14.4%	66.4%

Figure 1. Distribution of the sum of the Fear-of-delivery-questionnaire (FDQ), zero meaning no affirmative answers to any questions, and ten meaning affirmative answers to all questions.

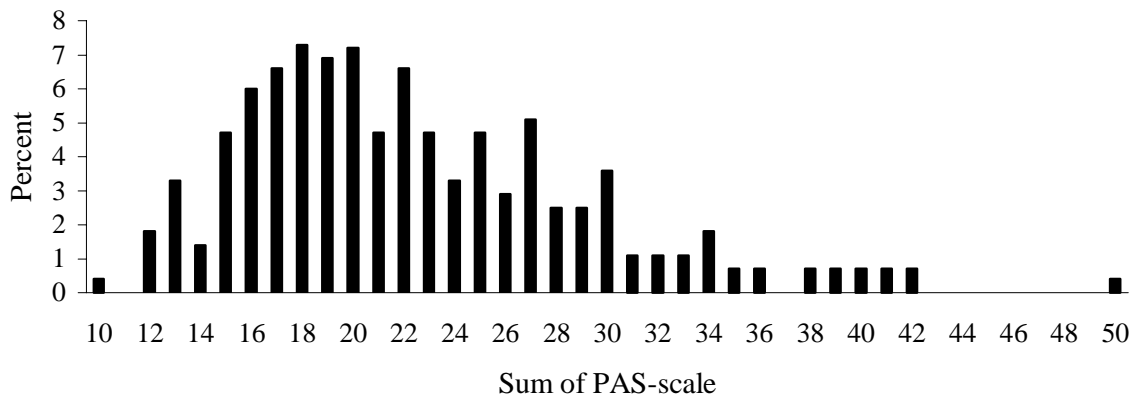


For a broader approach to the problem of fear of childbirth we included a three-dimensional questionnaire of pregnancy-related anxiety (PAS) by Levin (1991) including the dimensions of anxiety about being pregnant, about childbirth, and about hospitalization (Table 8). The answers were not normally distributed, but positively skewed with the 85<sup>th</sup> and 90<sup>th</sup> percentile at scores 30.0 and 32.0, respectively, and the Cronbach alpha reliability coefficient was 0.81 (Figure 2). There was a strong correlation between the score for FDQ and PAS ( $r=0.65$ ,  $p<0.001$ , study II and  $r=0.68$ ,  $p<0.001$ , study V).

Table 8. Pregnancy Anxiety Scale (Levin 1991)  
(answers on five-point scale: not at all=1, little=2, some=3, yes=4, a lot=5)  
score being the sum of the answers (II, V, VI)

- 
1. Has anyone frightened you about having a baby?
  2. Have you read anything that frightened you about having a baby?
  3. Do you fear that you would fall and hurt your baby?
  4. Are you afraid the pain of childbirth would be bad?
  5. Are you going to ask for pain medicine in delivery?
  6. Do you fear about being cut when the baby is born?
  7. Are you afraid your baby would not be normal?
  8. Are you afraid you would be alone in the hospital?
  9. Are you worried that the doctors might not be friendly?
  10. Are you worried that the nurses might not be friendly?
- 

Figure 2. Distribution of the sum of the Pregnancy-related anxiety-scales (PAS); ten meaning “not at all” in answer to all questions, and fifty meaning “a lot” in answer to all questions.



### 4.2.3. Questionnaires assessing psychological characteristics

The various sets of questionnaires which were used to investigate the predictors of the outcome measures in different studies can be found in Table 9. To evaluate the satisfaction with the childbirth experience we designed a questionnaire with eight questions (Table 10).

Table 9. Questionnaires used in assessing psychological characteristics

	Studies	Cronbach alpha coefficient	Reference
Revised Version of Beck's Depression Inventory BDI	II, III, IV, V, VI	0.88	Beck et al. 1961
NEO-PI Scales for neuroticism, vulnerability and anxiety <sup>1</sup>	I, V	0.73, 0.71, 0.78	Costa and McCrae 1992
Partnership satisfaction scale DAS	II, V	0.90	Spanier 1976
Questionnaire of some common symptoms*	II, III, IV	0.65	Emmons 1991
Rosenberg's Self-Esteem Scale RSE	II	0.79	Rosenberg 1979
Need and availability of social support scale	II	0.92	Aalto et al. 1995
Life-satisfaction scale	II	0.82	Diener et al. 1985
Revised Version of the Personal Concerns Scale	VI	0.95	Nurmi 1991
Satisfaction with delivery**	V, VI	0.78	

\*headache, abdominal pain, dizziness, respiratory problems, backache, gastrointestinal ailments, insomnia and fatigue

\*\*see table 10

Table 10. Satisfaction with delivery scale

1= not at all, 2=a little, 3=some, 4=yes, 5= a lot  
score being the mean of the answers (V,VI).

1. Was the labor painful?
2. Did you receive efficient pain relief during labor?
3. Was the delivery a positive experience?
4. Did you receive sufficient support from the obstetric ward personnel?
5. Did you receive sufficient support from your partner?
6. Did you feel safe during the labor?
7. Did you have enough influence on the treatment you received during labor?
8. Did the obstetric ward personnel patronize you too much during labor?

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#### 4.2.4. Cold pressor test and associated hormone assays

While lying on her left side the woman placed her bare left hand up to the elbow into a bucket filled with crushed ice (mean temperature 1°C); the ice was manually stirred during the test to ensure coldness on the skin. Pain endurance time (PET, seconds, maximally for 300 sec) is the time from immersion until removal of the arm from the bucket because of intolerable pain. The intensity of the pain experienced during CPT is assessed by the Visual Analogue Scale 0-10 (VAS), on which 0 means “no pain” and 10 “the worst possible pain imaginable”. Blood pressure and heart rate were recorded with a digital sphygmomanometer immediately before, at one minute from the immersion of the arm, and one minute after the removal of the arm from the bucket. Blood samples were collected immediately before CPT and 5, 30, and 60 minutes after it.

The blood samples in study IV were assayed with established methods the details of which are given in the Table 11.

Table 11. Characteristics of the assays

Factor	Principle of assay	Source of reagents or equipment	Intraassay CV*	Detection range
Noradrenaline	High-pressure liquid chromatography	ESA CoulArray, ESA Inc., Chlemsford, MA	2-5%	>0.2 nmol/l
ACTH	IRMA	Nichols Institute Diagnosis, San Juan Capistrano, CA	3.0	1.0 to 1400 ng/l
Cortisol	MSA	Bayer, Tarrytown, NY	3.4	55-1656 nmol/l
Beta-endorphin	IRMA	Nichols Institute Diagnosis, San Juan Capistrano, CA	4.3	14-5000 pg/ml

\*CV=Coefficient of variation (%)

MSA= magnetic separation assay

IRMA=immunoradiometric assay

#### 4.2.5 Treatment for fear of childbirth

The cognitive approach to treat the fear of childbirth was selected because of its suitability for focusing on one target problem and for involving the active role of the therapist. The aim of cognitive therapy is to reformulate the problem during a limited time. Before the study, I had attended a 185-hour course on cognitive therapy (Institute for Cognitive Therapies, Turku, Finland), and another course of 40 hours on childbirth psychology (Tampere University, Finland). During the study, I had the possibility to consult my teacher from the Institute for Cognitive Therapies.

Before the study, the community midwives from a certain area had lessons about fear of childbirth and the protocol of our study, and from the beginning of study II (May 1996), they referred all predisposed women with 5 or more affirmative answers in FDQ, or request of CS (affirmative answer to Question 10 in FDQ, Table 7) to our outpatient clinic at the Helsinki University Central Hospital, Department of Obstetrics and Gynecology, for consultation. At registration I randomized them to have either intensive (IT) or conventional treatment (CT), separately for nulliparous and parous women.

Further, I personally treated both groups with the approach of cognitive therapy, distribution of information, and routine obstetric check-ups (Table 12). Consequently, based on the contents of the sessions, the treatment can also be called psychoeducation. The aim of the cognitive approach is to teach the patient to see the problem in an altered way (self-reflection) and to change her particular target problem procedures (by cognitive and behavioral exercises). The treatment in the IT group differed from that in the CT group mostly by the number of sessions and, because of that, by the possibility to deal with fear and related feelings in greater detail.

During the sessions, the presence of the partner was allowed but not required. An appointment with the midwife and personal obstetric ward visits were recommended to women in the IT group. All women were allowed to phone either the midwife or me between the sessions. Similar written information regarding the pros and cons of vaginal delivery and of CS, as well as information on pain relief available at our hospital was given to both groups. At the last appointment before delivery, the woman's wishes related to delivery were attached to her records. If the woman still requested CS, it was arranged to be done one week before the due date.

Table 12. Study protocol for the treatment of fear of childbirth (VI)

Gestational week	Intensive treatment	Conventional treatment
24	First questionnaire Appointment with obstetrician* Written information	First questionnaire Appointment with obstetrician* Written information
28	Appointment with obstetrician*	
32	Appointment with obstetrician*	
36	Appointment with obstetrician* Second questionnaire	Appointment with obstetrician* Second questionnaire
37	Appointment with midwife**	
38	Appointment with obstetrician*	
3 months after delivery	Third questionnaire	Third questionnaire

\* 45 minutes

\*\* 90 minutes

### 4.3. Statistical analyses

Power analyses were performed to calculate the number of patients needed to achieve a significant level of 0.05 with 90% power to detect an appropriate difference in studies I, III, IV, and VI. All calculations were carried out with the SPSS program (Statistical Package for Social Sciences).

Continuous variables are presented as the mean  $\pm$  SD (studies I, II, III, V, VI) or mean  $\pm$  SE (study IV). Comparisons between and within groups were performed with two-tailed independent or paired t-test for normally distributed variables, with (II, IV) or without (I, III, V, VI) logarithmic transformation. Categorical data were analyzed by Chi square test. Pearson product-moment correlations between all dependent and independent variables were calculated. To evaluate the effect of pregnancy (III) or treatment (VI) to explicable variables two-way repeated ANOVA was applied. To be able to use more independent variables in the comparison of the mode of delivery (study VI) we used loglinear analysis, which is a multivariate method for categorical variables analyzing different types of relationships among several variables. Sequential regression analyses were carried out for continuous variables to investigate the antecedents of the pregnancy-related anxiety, dissatisfaction with delivery, and puerperal depression (studies I, V). Logistic regression analyses were carried out in studies II and VI both for the prediction and description of explicable variables, and included the calculation of adjusted odds ratios (OR) with its 95% confidence intervals (CI). The areas under the response curves (AUC) for noradrenaline, ACTH, cortisol, and beta-endorphin were calculated by the trapezoidal rule (study IV)(Matthews et al. 1990).

## 5. RESULTS

The detailed results are presented in the original publications and are therefore only briefly summarized here.

### 5.1 Psychological and obstetric background of fear of labor (I, II)

In study I of the first deliveries of 100 primiparous women with fear of childbirth manifested during their second pregnancies, the first pregnancy had significantly more often ended in emergency CS (adjusted OR 26.9, 95% CI 11.9, 61.1) or in vacuum extraction (OR 4.5, CI 2.2, 9.3) than the first delivery of age- and parity-matched controls. Only 30% of the deliveries of women with later fear were spontaneous vaginal deliveries, as compared to 81% of those of the controls. The vaginal labor of women with fear had lasted longer than that of controls both during the first (10.5 hours vs. 7.8 hours,  $P=0.016$ ) and second stage (62 minutes vs. 47 minutes,  $P=0.002$ ). The women who later expressed fear of childbirth had received epidural analgesia more often than the controls. There were no differences between the study groups in perinatal outcome.

When the women with fear of labor during their second pregnancy were asked to specify the reason for their fear, 44% could not define any specific cause, but considered the whole labor and delivery as horrifying. The other reasons mentioned were fear of tearing (19%), fear of intolerable pain (15%), fear of some risk to the fetus (12%), fear of unfriendly obstetric ward staff (4%), fear of heavy hemorrhage (3%), and fear of repeated emergency CS (3%).

In study II, 278 couples were interviewed by means of a questionnaire to analyze the association between pregnancy-related anxiety and fear of childbirth with certain personal characteristics and socio-economic background factors. In fact, both correlated highly with the woman's anxiety, neuroticism, vulnerability, depression, low self-esteem, dissatisfaction to partnership, and lack of social support. In regression analyses, the strongest predictor of pregnancy-related anxiety was the general anxiety of the woman, and for severe fear of childbirth it was dissatisfaction with partnership. The partner's dissatisfaction with life contributed to the woman's pregnancy-related anxiety and his dissatisfaction with partnership contributed to the woman's fear of childbirth.

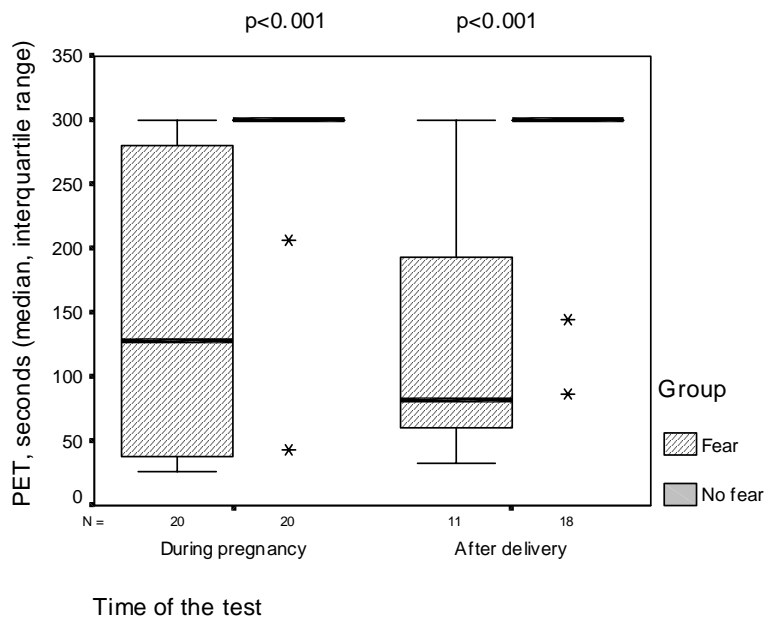
The woman's psychological variables correlated highly with each other, and also the variables of both genders correlated significantly with each other. Thence, certain psychological characteristics, such as depression, and dissatisfaction with partnership seemed to concentrate in the same families.

Of the socio-economic background factors, parity and unemployment of the woman contributed to the prediction of both pregnancy-related anxiety and fear of childbirth; unemployed women reported significantly more pregnancy-related anxiety and severe fear of childbirth. Further, those who already had children reported significantly less pregnancy-related anxiety than nulliparous women. However, if the partner already had children in previous partnerships the risk for the woman's severe fear of childbirth was increased.

## 5.2 Pain tolerance and hormonal reactions to pain in women with fear of labor (III, IV)

Women with fear of childbirth, irrespective of parity, tolerated CPT for a significantly shorter time than did women without fear both during pregnancy ( $154.8 \pm 109.9$  sec vs.  $282.5 \pm 60.1$  sec (mean  $\pm$  SD),  $P < 0.001$ ,  $n = 20$  in both groups), and in the postpartum period ( $128.6 \pm 111.7$  sec ( $n = 12$ ) vs.  $279.6 \pm 60.3$  sec ( $n = 18$ ),  $P = 0.002$ ) (Figure 3). Those with fear of childbirth experienced CPT as significantly more painful than did the controls both during pregnancy (VAS  $6.68 \pm 1.9$  vs.  $3.78 \pm 2.0$  (mean  $\pm$  SD),  $P < 0.001$ ) and after it (VAS  $7.73 \pm 1.5$  vs.  $5.92 \pm 3.0$ ,  $P = 0.04$ ) (Figure 4).

Figure 3. Pain endurance time (PET) during coldpressor test in women with and without fear of childbirth during late pregnancy and after pregnancy.



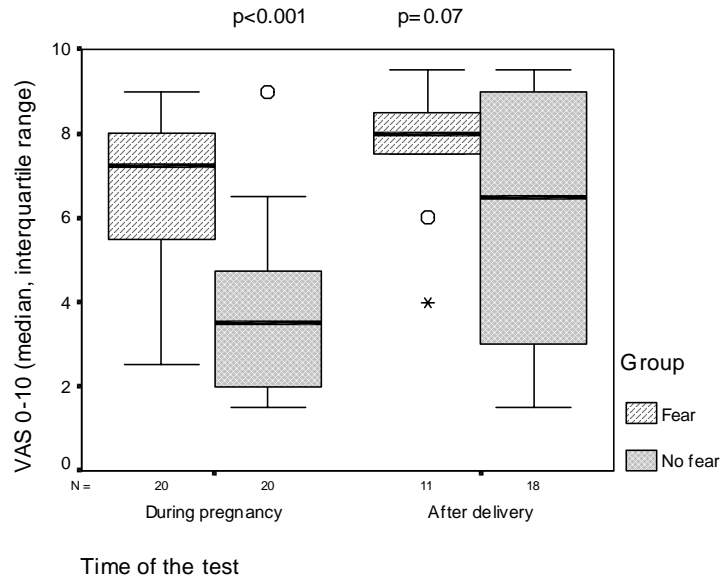


Figure 4. Severity of pain on Visual Analogue Scale (VAS) in women with and without fear of childbirth during late pregnancy and after pregnancy.

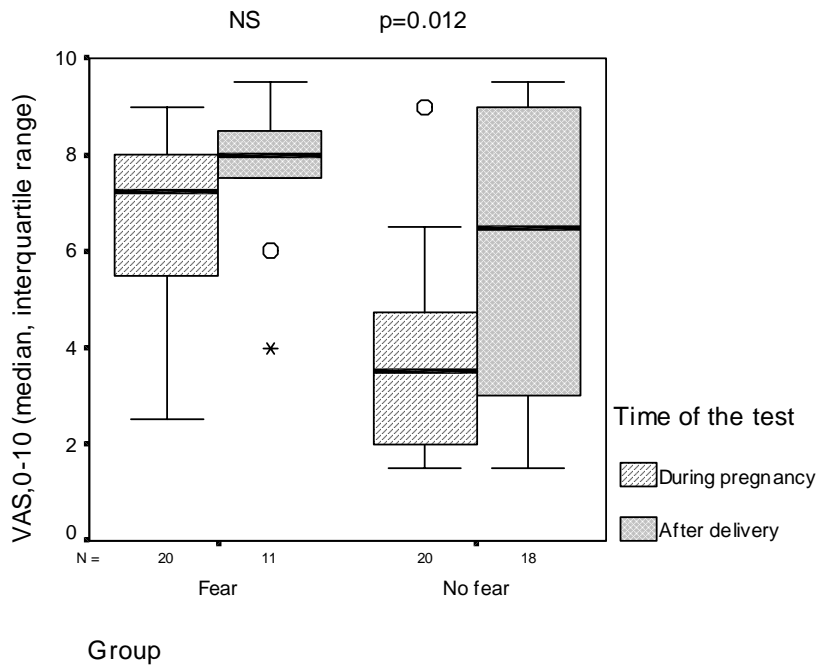
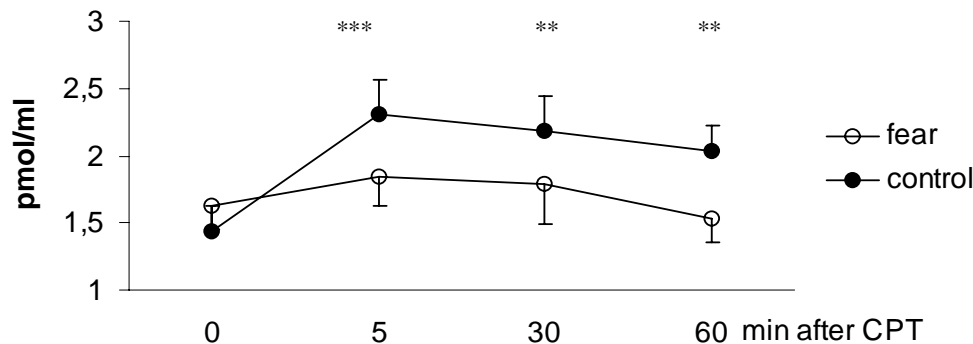


Figure 5. Severity of pain (VAS) during pregnancy and after it in women with and without fear of childbirth.

CPT was experienced more painful after delivery than during pregnancy (VAS  $6.60 \pm 2.6$  vs.  $4.87 \pm 2.4$ ,  $P=0.001$ ) when both groups were studied together (Figure 5).

Before CPT, the baseline levels of noradrenaline were elevated ( $p=0.068$ ) in women with fear during pregnancy ( $1.63 \pm 0.18$  nmol/l), but lower ( $P=0.064$ ) in women with fear after pregnancy ( $1.75 \pm 0.31$  nmol/l) when compared with controls ( $1.38 \pm 0.14$  nmol/l during, and  $2.31 \pm 0.26$  nmol/l after pregnancy). Noradrenaline response to CPT was 28% smaller in women with fear than in the controls during pregnancy ( $P=0.049$ )(Figure 6).

Figure 6. Levels of noradrenaline (mean  $\pm$ SE) 5, 30, and 60 minutes after CPT in pregnant women with (o) and without ( $\blacklozenge$ ) fear of childbirth,  $*=P<0.05$ ,  $**=P<0.01$ ,  $***=P<0.001$  in comparison with initial level.



Neither the baseline levels of ACTH, cortisol, and beta-endorphin, or their response to CPT showed any difference between the groups either during or after pregnancy.

Before CPT, pregnant women with fear had higher diastolic blood pressure than the controls ( $85.6 \pm 4.5$  mmHg vs.  $74.9 \pm 3.4$  mmHg,  $P=0.065$ ). During pregnancy women with fear did not respond to, but the controls responded to CPT with significant rises in heart rate (from  $74.3 \pm 2.4$  beats/min (mean  $\pm$ SE) to  $79.3 \pm 2.6$  beats/min,  $P=0.002$ ) and in systolic blood pressure (from  $112.1 \pm 4.2$  mmHg to  $125.4 \pm 3.2$ ,  $P=0.006$ ).

### 5.3. Satisfaction with childbirth and puerperal depression (V)

Satisfaction with the childbirth experience was studied in a sample of 211 women in an unselected low-risk population. The major predictors of disappointment with delivery were labor pain (increase in  $R^2=0.14$ , hierarchical regression analysis,  $P<0.001$ ) and emergency CS (increase in  $R^2=0.18$ , hierarchical regression analysis,  $P<0.001$ ). The more pain or inadequacy in pain relief the women reported, or if their labor and delivery ended in emergency CS, the more disappointed they were with the experience. Further, when the experience was evaluated most negatively (below 10<sup>th</sup> percentile), also depression in early pregnancy (adjusted OR 5.24, 95% CI 1.70, 16.19), fear of vaginal childbirth (adjusted OR 33.75, CI 1.24, 915.64), and self-estimation about the abnormal course of pregnancy (adjusted OR 6.84, CI 1.93, 24.33) had an impact on dissatisfaction with the childbirth experience.

The objective complications during pregnancy or childbirth did not contribute to puerperal depression. Depression was very constant, and it was a major predictor of puerperal depression, measured both at a mean gestational age of  $17.3 \pm 3.7$  (range 7-30) weeks ( $\beta=0.51$ , hierarchical regression,  $P<0.001$ ) or at  $36.3 \pm 2.0$  (range 30-40) gestational weeks ( $\beta=0.39$ , hierarchical regression,  $P<0.001$ ). Also personal characteristics (general anxiety, vulnerability, and neuroticism) contributed to the prediction of puerperal depression both in early pregnancy (increase in  $R^2=0.32$ , hierarchical regression analysis,  $P<0.001$ ) and later before childbirth (increase in  $R^2=0.04$ , hierarchical regression analysis,  $P<0.01$ ). Further, when examining the most depressed women during puerperium (score  $>90^{\text{th}}$  percentile), also pregnancy-related anxiety in late pregnancy (adjusted OR 19.03, 95% CI 2.19, 165.43) had an impact on puerperal depression.

The socio-economic background of the woman (parity, education, and age) contributed neither to satisfaction with delivery nor puerperal depression, even though in regression analyses they were entered into the equation as a first block.

#### 5.4 Treatment for fear of childbirth (VI)

Women (n=176) in the randomized trial of treatment for fear of childbirth were divergent from the unselected population of pregnant women, as their mean score for fear of childbirth (FDQ) was  $5.9 \pm 1.8$  as compared with  $2.1 \pm 2.1$  in study II. The difference between these two groups of women in their answers to individual questions in FDQ is seen in Table 7.

The treatment for fear of childbirth was successful, as 62% of women primarily requesting CS chose to deliver vaginally after either of the therapies (intensive (IT) or conventional (CT)). The poorest results were seen in women with low motivation to treatment, as assessed by not filling in the questionnaires included in the treatment. Of them, 57% chose CS as compared to 27% of women who filled them ( $P < 0.01$ ). Multiparous women requested CS more often (in 74%) than nulliparous women (59%,  $P = 0.003$ ). In a loglinear model, the parous women in the CT group chose CS for a psychosocial reason more often than expected (Table 13). The final mode of delivery according to treatment group and parity is shown in Figure 7. As altogether 36% of women showed low motivation to treatment as defined above, this can be seen as the major problem in the treating these patients.

Table 13. Loglinear analysis for choosing CS for psychosocial reasons (VI).

Group	Parity		CS observed cases	CS expected cases	Standardized residual
IT	Nulli-	Participants	3	7.05	-1.526
		Non-participants	6	3.95	1.032
	Multi-	Participants	6	7.05	-0.396
		Non-participants	5	3.95	0.529
CT	Nulli-	Participants	3	7.05	-1.526
		Non-participants	4	3.95	0.026
	Multi-	Participants	8	7.05	0.357
		Non-participants	9	3.95	2.542 *

\*  $P < 0.05$

Birth-related concerns decreased in the IT group, but increased in the CT group (linear interaction between the group and birth-concerns  $F(2.85) = 5.37$ ,  $P = 0.022$ ). During the treatment the mean score for fear of labor pain (Question 4 in PAS) decreased significantly in the IT group (from  $4.7 \pm 0.6$  to  $4.4 \pm 1.0$ ) as compared with the CT group (increase from  $4.4 \pm 0.9$  to  $4.5 \pm 1.1$ , linear interaction between group and time in two-way repeated ANOVA  $F(1.104) = 4.262$ ,  $P = 0.041$ ).

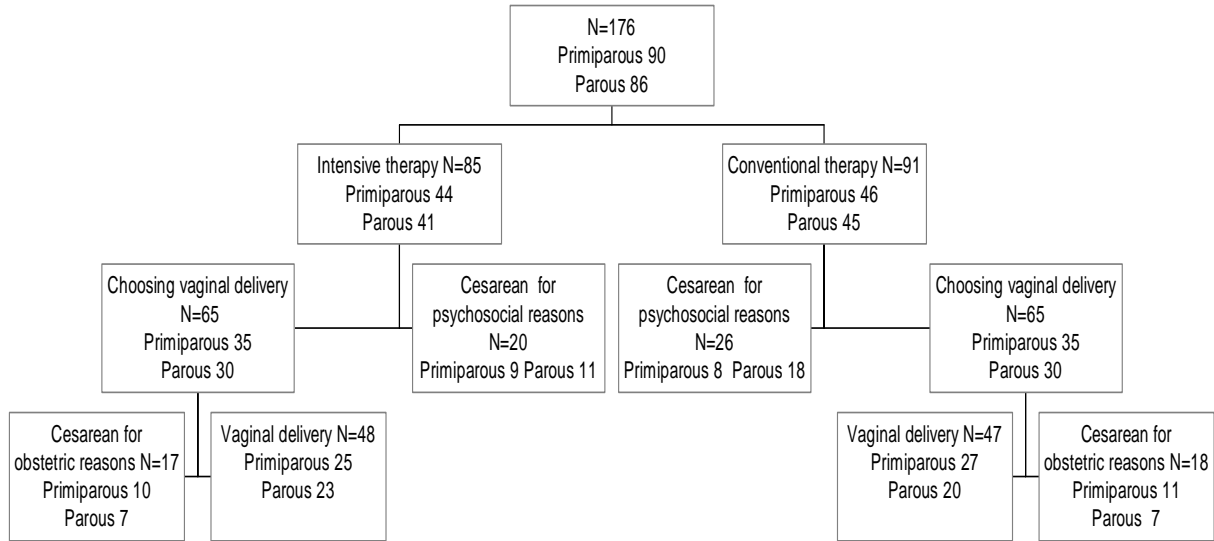


Figure 7. Final mode of the delivery according to randomized treatment group and parity.

Labors were shorter in the IT group (mean  $6.8 \pm 3.8$  (SD) hours) than in the CT group ( $8.5 \pm 4.8$  hours, t-test,  $P=0.039$ ). There was no difference between the groups in the use of epidural analgesia (used in 85% of vaginal deliveries in IT and in 82% in CT group).

Satisfaction with childbirth, and the incidence of puerperal depression were equal in both groups. The logistic regression analysis showed that the risk of puerperal depression (score above the 90<sup>th</sup> percentile) was highest among those with earlier depression, both in early pregnancy (adjusted OR 4.14 (95% CI 1.23, 13.91) and later before childbirth (adjusted OR 34.12 (1.73, 671.81)), when parity, age, the fear of delivery score, pregnancy-anxiety, satisfaction with delivery, and the mode of delivery were all controlled. Overall, childbirth was experienced quite positively (mean score  $3.9 \pm 1.3$  from the scale of 1 to 5, when the same score in unselected population (V) was  $4.3 \pm 0.7$ .)

## 6. DISCUSSION

The birth of a child into a family is both an individual maturing process for the parents-to-be, pivotal to their marital relationship, and further, a family crisis, aiming at incorporating the new member into the family.

Fear of vaginal childbirth is not uncommon, and the number of women requesting CS because of their fear is increasing (Ryding 1991, Mould, et al. 1996, Eftekhar and Steer 2000). Although many professionals agree with the woman's right to choose the mode of delivery, the FIGO committee for the Ethical Aspects of Human Reproduction and Women's Health recommends obstetricians not to perform CS without medical indication (Schenker and Cain 1999). Little is known about the background factors leading to fear of natural vaginal delivery, and a request for CS. The request itself may be the woman's last attempt to control the situation if she is left alone with the fear and anxiety. This study on obstetric, social, and psychological background factors, and on pain sensitivity of women with fear of childbirth, aimed at gaining new insight into the reasons for requesting CS and the possibilities to help fearful women in coping with the fear and proceed to a natural childbirth without fear.

Unselected and selected pregnant populations were followed up longitudinally from early pregnancy to 3 to 6 months after delivery and their fear of childbirth was analyzed. In addition, a representative material consisting of women with secondary fear of childbirth was studied together with a large sample from a carefully selected and matched control group. The fear of childbirth was assessed similarly in all studies, either with the request for CS as the mode of delivery or with the FDQ (Areskog, et al. 1982).

### 6.1. Obstetric, social, and psychological factors associated with fear of delivery (I, II)

Previous complicated childbirth is known to be one of the most important risk factors for fear of childbirth in a subsequent pregnancy (Ryding 1991, Sjögren 1997, Ryding, et al. 1998b, Jolly, et al. 1999). The fear in parous women is more severe and more resistant to treatment than that of primiparous, and the request for CS is more common (Areskog, et al. 1982, Ryding 1991, Ryding 1993). At the Helsinki University Central Hospital the first delivery ending up in emergency CS was the most important predictor of fear of childbirth during the second pregnancy (study I). Although

there were no differences in the use of epidural analgesia among those who later developed fear of childbirth and those who later delivered without fear, 15% of fearful women stated the intolerable pain during their first childbirth as the main reason for their fear, and further 19% were scared of tearing. These results reflect the difficulties to estimate and treat pain because of its subjectivity and individual differences in pain sensitivity.

In this study, a history of sexual abuse, domestic violence, or other traumatic events were not examined. This can be considered a limitation when generalizing the findings of this study, as all of these predispose to fear of childbirth. However, as this study is based on questionnaires without meeting the patients, asking such intrusive questions was considered too hazardous. In accordance with studying the above-mentioned possible causes for fear, it would have been interesting to examine, how many of those women suffered from PTSD. Unfortunately, the literature concerning childbirth and PTSD is so recent, that it was not possible to include PTSD in these studies.

In Finland, most of the women work outside the home and are economically independent. Unemployment can threaten security, and thus cause fear of the forthcoming childbirth (II). Previously, young age, low social class, and a low level of education were shown to be risk factors for fear of childbirth (Standley, et al. 1979, Rofe, et al. 1993), probably reflecting the lack of knowledge and difficulties in finding it. As these factors were not associated with fear of childbirth in this study, it can be assumed, that the overall knowledge about pregnancy and childbirth, and its availability through the public maternity health care are good in Finland. In addition, the mean age of first-time parturients is quite high in Finland (27.6 years in 1999) (Statistics Finland 2000) and the number of adolescent pregnancies is low (2.7% of all parturients were younger than 20 years in 1999)(Statistics Finland 2000).

Fear of childbirth is not an isolated problem but associated with the woman's personal characteristics and close relationships. Women's personal characteristics, mainly general anxiety, low self-esteem, and depression, contributed most significantly to the prediction of pregnancy-related anxiety and severe fear of childbirth (II). The results showed also that pregnancy-related anxiety and fear of childbirth were predictable not only from the women's personality traits, but also from psychosocial factors such as dissatisfaction with their partnership and lack of support.

Interestingly, it was found that fear of childbirth is a problem for the whole family, as also the partners of women with fear had a certain pattern of low psychological well-being, resulting in low life-satisfaction, dissatisfaction with partnership, and depression (II).

These findings may be associated with other findings suggesting that general well-being and personal characteristics play an important role in how the individual developmental environment is chosen, including the selection of a partner (Caspi and Moffitt 1993). In our study, the couples seemed to resemble each other in that they were both depressed and dissatisfied with life, and thus supported each other's anxiety.

## **6.2. Individual pain tolerance and hormonal reactions to laboratory pain (III, IV)**

Fear of pain and a self-suspected low pain tolerance are the most common reasons for fear of childbirth. Yet, the possible association between fear of childbirth and altered pain sensitivity had not been studied before. Being unaware of any previous data on pain assessment in women with fear of childbirth, we collected groups of fearful and fearless pregnant women and subjected them to a standardized CPT (Chen, et al. 1989), in order to learn whether women with fear of childbirth experience pain more severely. Both during and after pregnancy, patients with childbirth-related fear tolerated cold-induced pain in CPT for a significantly shorter time and experienced it more painful than the controls did (III).

One report states that 55% of healthy male volunteers tolerate CPT for up to 5 minutes (Chen, et al. 1989). Of the 40 pregnant women in our study, 23 (58%) were able to tolerate CPT for the maximal 5 minutes, but this frequency was higher in women without fear (90%) than in women with fear of childbirth (25%).

In stressful situations, the stimulation of sympathetic nervous system results in the release of noradrenaline, and in the pituitary-adrenal axis ACTH, cortisol (Rose 1985), and endorphins rise (Laatikainen 1991). Because no previous data existed on these stress-hormones in women with fear of childbirth, we studied these variables before and during CPT in pregnant and non-pregnant women with and without fear of childbirth. The basal levels, or the responses of noradrenaline, ACTH, cortisol, and beta-endorphin did not correlate with PET or VAS during CPT performed during or after pregnancy (VI).

CPT elicits significant rises in catecholamines (up to 1.5-2 fold), heart rate, and blood pressure in healthy non-pregnant women and men (Bouloux, et al. 1989, Marasini, et al. 1991, Costa, et al. 1993, Jacob, et al. 2000). Noradrenaline responded significantly to CPT in both of our groups. However, during pregnancy the fear group showed a lower response in noradrenaline than the control group (VI). The levels of noradrenaline in pregnant fearful women were higher than those in controls and no pregnancy-induced fall in noradrenaline was seen, although such a fall normally happens during a normotensive pregnancy (Kaaja, et al. 1999, Wang, et al. 1999). This was, however, seen in our control women. These findings suggest an increase in catecholamine output in pregnant women with fear of childbirth. This may have blunted the response of noradrenaline to CPT. However, interpreting the general sympathetic nervous activity from plasma levels of noradrenaline is difficult, because of the rapid turnover and regional release of noradrenaline (Esler, et al. 1985).

The usual rise in heart rate and blood pressure during CPT was not seen in women with fear, instead only in the controls, irrespective from PET or VAS during CPT. This supports the explanation of stimulated sympathicus activity in women with fear, as already somewhat elevated basal levels of noradrenaline may have blunted the response to CPT. The elevated diastolic blood pressure in these women fits in also with the high basal noradrenaline levels.

Neither the baseline levels of ACTH, cortisol, and beta-endorphin, or their response to CPT showed any difference between the groups either during or after pregnancy (IV). Thus, women with and without fear of childbirth responded similarly in ACTH, cortisol, and beta-endorphin levels during CPT. Thus, our data suggest that these hormones are probably not involved in the development of, or do not reflect in anyway, fear of childbirth. These data can be seen as evidence that women with fear of labor do not have such underlying aberration which would affect the pituitary-adrenal axis or the endorphin system. Non-pregnant volunteers responded controversially during CPT in ACTH and cortisol levels, thus both significant and lacking responses have been reported (Bouloux, et al. 1989, Costa, et al. 1993, Pascualy, et al. 2000).

### **6.3. Satisfaction with the childbirth experience and puerperal depression (V)**

The adverse effects of prenatal anxiety and fear of childbirth are well known, but the effect of fear of childbirth on satisfaction with a later delivery experience and on puerperal depression has rarely been reported. In this study, most of the psychosocial predictors of disappointment with the

childbirth experience and puerperal depression differed from each other. The only unifying factor between them was depression during pregnancy (V). Thus, in addition to the risk of continued depression after childbirth, negative emotions were shown to have an influence already in early pregnancy on the later childbirth experience. Depression is very constant and correlates highly with the woman's other personal characteristics. Depression, however, is often denied by a patient and therefore lies undiagnosed and untreated. Probably, fear of childbirth could be regarded as a sign of hidden depression, the diagnosis of, and therapy for which, would most likely improve the quality of life of the patient and her partner.

In an unselected population, the factors related to the objective course of delivery were the most important predictors of disappointment with the experience, mainly intolerable pain and/or inadequate pain relief, and ending up in an unanticipated CS (V). These results confirm earlier results from the same area (Newton and Hunt 1984, Reading and Cox 1985, Thune-Larsen and Moller-Pedersen 1988, Jolly, et al. 1999). Fear of childbirth added to the disappointment in a group of the most disappointed 10 percent of the 211 longitudinally followed women. Also earlier, fear of childbirth has been considered a major risk factor for disappointment with the childbirth experience (Areskog, et al. 1984, Knight and Thirkettle 1987).

Puerperal depression was mostly predicted by depression during pregnancy (V), a major risk factor also in earlier studies (Thune-Larsen and Moller-Pedersen 1988, O'Hara, et al. 1991, Demyttenaere, et al. 1995, Beck 1996, Nielsen Forman, et al. 2000). Deficient support of the partner has shown to be closely associated with puerperal depression (Thune-Larsen and Moller-Pedersen 1988, Beck 1996, Brugha, et al. 1998), although in this study its impact was not highly significant after controlling depression during pregnancy (V). However, strategies aimed at decreasing puerperal depression should take into account the important role of the support from the partner. Neither in this study (V) nor in earlier reports (Nielsen Forman, et al. 2000) objective events during pregnancy or delivery (complications during pregnancy, pain in labor, or mode of delivery) predicted puerperal depression. The way a woman estimates her childbirth through feelings of fulfillment, exceeds the importance of objective incidents during pregnancy and delivery (V). Antenatal focus on psychosocial well-being, mainly depression, may help to identify women at risk of postpartum depression.

#### **6.4. Treatment for fear of childbirth**

The aim of the treatment for fear of childbirth is to help the fearful woman to control her pregnancy and childbirth and related anxiety, in a way that she can feel being respected for her emotions and can accept the future childbirth with its uncertainties. Actually, everyone who meets a pregnant woman can treat her fear and anxiety by accepting her feelings and by listening to her emphatically. The importance of the fear to be treated lies in the well-being of the mother both during and after pregnancy, the proceeding of the normal vaginal delivery, and the proper development of the early mother-infant relationship (attachment).

Regarding childbirth preparation, the simple distribution of information has proven to be inadequate in relieving anxiety about the psychological incapability of giving birth (Klusman 1975, Crowe and von Baeyer 1989). To improve the woman's confidence in her ability to personal control, methods of relaxation and coping with pain should be developed (Crowe and von Baeyer 1989, Jenkins and Pritchard 1993, McCrea and Wright 1999). The level of support given by the companion both during preparation and childbirth is also of special interest. Although many studies have demonstrated the great value of a companion (Wolman, et al. 1993, Scott, et al. 1999), the support given by the fathers does not appear to produce similar benefits as the presence of a doula (Scott, et al. 1999). As obvious fear of childbirth is related to neuroticism and thence to the woman's disability to deal with new life events (MacDonald 1995), the possible benefit from the adequate support from her partner would be significant in helping her overcome her anxiety about pregnancy and childbirth. Consequently, strategies on how to develop antenatal care should also take into account the role and significance of the partner (Sjögren 1998). This could also be an acceptable way to discuss the future parenthood.

Since 62% of women requesting CS as the mode of delivery finally withdrew their request, the treatment can be seen as successful. The percentage of those withdrawing their request was smaller in previous Swedish studies (Ryding 1993, Sjögren and Thomassen 1997), even though the study protocol in Sweden was more laborious.

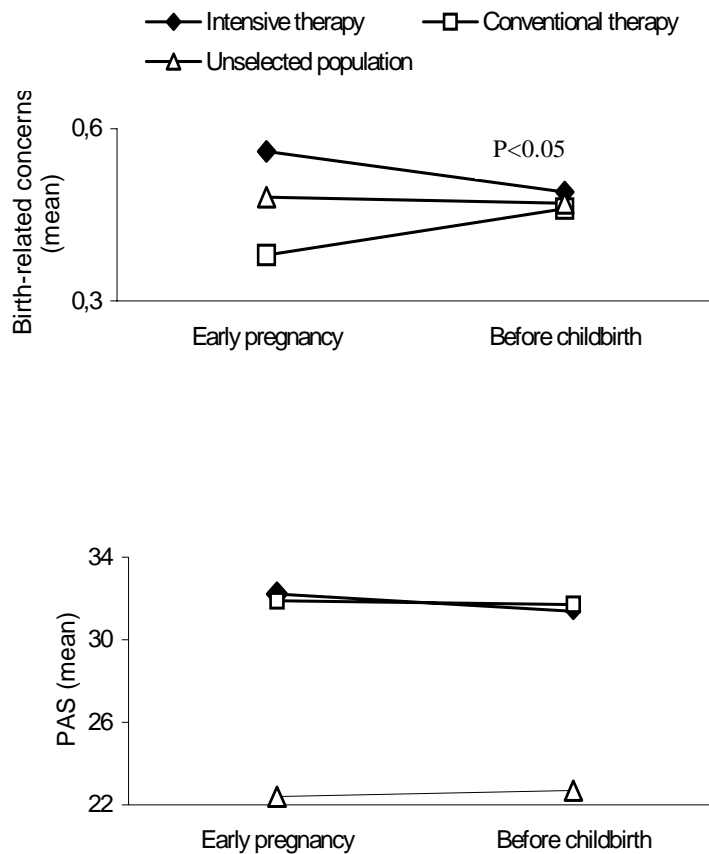


Figure 8. Changes in the amount of birth-related concerns and in Pregnancy-related Anxiety-Scale (PAS) during intervention and among unselected population (change in birth-related concerns significant at  $P < 0.05$ , two-way repeated analysis of variance).

Relaxed and self-confident women have better possibilities for shorter and successful labors (Triolo 1987, Jenkins and Pritchard 1993). This was seen also in this study as birth-related shorter concerns and pregnancy-related anxiety tended to decrease in the IT group, where also labors were shorter (VI). In the CT group birth-related concerns increased, which can be seen as a natural course of birth-related concerns with advancing pregnancies, since the similar pattern was seen also in the unselected population (II, V, unpublished data, Figure 8).

The great amount of withdrawals of CS requests also shows the need for this kind of treatment. In the majority of women entering our study the request for CS implied a lack of ability and possibilities to deal with the feelings towards the forthcoming childbirth, in spite of the known risks of an operation. It can be assumed that the anxiety of the women who could not accept the treatment (VI) was the highest, and thus delivery by CS in these cases can to some extent be accepted (Hofberg and Brockington 2000). However, the rate of CS was higher than expected (in loglinear model) among those multiparous women with low motivation who were randomized to the CT group and thence had fewer appointments than otherwise similar women in the IT group (VI). Treatment in the CT group differed from that in the IT group mostly by the lesser number of sessions and, because of that, by lacking possibilities to deal with fear and related feelings in greater detail. Thence, it can be assumed that more vigorous intervention among these women could have been more successful, if the withdrawal of request for CS was the main outcome.

Anxious primiparous women can also be treated in small groups, where both concerns about childbirth and future parenthood can be discussed. Training of relaxation and information about pain relief can be joined in with these sessions. We have very promising results of this kind of childbirth preparation (unpublished data).

Another important factor influencing the results is the motivation to treatment, which has been poor in one third of the patients also in Swedish studies (Ryding 1993, Sjögren and Thomassen 1997). As observed in our hospital, women with a low motivation to treatment tend to cancel the appointments, and change to another obstetrician or hospital in order to avoid deeper evaluation. Unfortunately it is very difficult to help these women because of their reluctance to open up, and strategies on how to promote motivation would be valuable (Miller 2000).

Parous women with fear of delivery may suffer from PTSD or intrusive stress reaction, which both have recently been described after painful childbirth and emergency CS (Wijma, et al. 1997, Ryding, et al. 1998c, Czarnocka and Slade 2000). Anxiety and depression are common with patients with PTSD. Long-lasting therapy is needed for the treatment of PTSD, and the treatment should be initiated already before a new pregnancy. PTSD or related symptoms should be recognized at the antenatal outpatient clinics. The prevention of PTSD is also possible; on the one hand by paying

more attention to the reasons for and consequences of unanticipated CS or operative vaginal delivery during childbirth preparation classes, and on the other hand by closely monitoring the emotional state of the woman already at the maternity ward and later at the community maternity clinic. If needed, a thorough discussion about the childbirth should be arranged, most preferably with the midwife and obstetrician who were on duty at the time of the childbirth. In Finland, both community maternity and children health clinics are usually situated close together, and the women who have recently given birth are easily reached from the children's clinic.

Midwives and nurses, as well as general practitioners and obstetricians need education on how to meet and treat women with fear of childbirth. Training should not only include the skills to recognize women with fear of childbirth, depression, PTSD after previous childbirth or other traumatic events, but also lessons about psychoeducation and cognitive or other short-term therapy. According to the PLISSIT-model (Table 4, page ), treatment should be individualized based on the woman's situation. One should not forget the importance of consultation and the tutorial system. Health care personnel also needs up-to-date knowledge about the methods of pain relief, attitudes towards CS and the induction of labor at the district maternity hospital. All this calls for cooperation between different groups of personnel (doctors, psychologists, nurses etc.) and at all levels of health care.

## 7. Conclusions

Being afraid of normal pregnancy and vaginal childbirth is related to the woman's general anxiety, dissatisfaction with life, and disability to deal with new and demanding life events. Psychologically, childbirth and maternity raise the question how a woman is able to deal with separation and being separated. Also the partner's satisfaction with life and their mutual relationship has a significant impact on fear and anxiety about childbirth experienced by the woman. Anxiety during pregnancy and fear of delivery are thus not isolated problems, but are closely associated with the whole psychosocial network of the woman. Evidently, these findings reflect the need for more psychological support, obstetric guidance and education than pregnant women need in general. To enable this psychological support to be given from early pregnancy on, these patients should be identified early enough, e.g. by using special questionnaires (the Pregnancy Anxiety Scale and the FDQ), at outpatient maternity clinics, both at the general and specialized health care levels. The recommended time for distributing the questionnaires could be in early mid-trimester, but also whenever a pregnant woman talks about her fear. Most women feel ashamed of experiencing fear of childbirth, and it demands courage to grasp this topic.

Emergency CS and vacuum extraction during the first childbirth were shown to be associated with fear of the next childbirth and request for CS. When a planned labor ends in operative delivery, frustration and depression might ensue as a reaction to disappointment with the unsuccessful vaginal delivery. Exposure to a threatening situation such as emergency CS can lead to posttraumatic stress disorder. However, because emergency operative deliveries can not be avoided, the prevention of secondary fear of childbirth might require more patient education, postpartum intervention, and emphasis on aiming at natural childbirth during the subsequent pregnancy.

Patients with fear of childbirth were characterized by pain intolerance also in circumstances other than labor, and labor fear may thus be one manifestation of reduced pain tolerance. Poor pain tolerance can imply an enhanced sensitivity to pain-causing mechanisms, which may be associated with a poor release of endogenous opioids found in cases of phobic fear. Thence, it may be possible that non-pharmacological methods aiming at the reduction of anxiety can prevent and alleviate pain, also during labor. However, also pharmacological pain relief should be individualized and patients with fear of childbirth should be informed of the different types of pain relief methods available. Their wishes related to pain relief should be attached to their records and obeyed whenever possible.

In spite of the reduced pain tolerance, pregnant and non-pregnant women with fear of childbirth are characterized with normal levels of ACTH, cortisol, and beta-endorphin before and during CPT. Thus pituitary-adrenal dysfunction is hardly a factor in fear of childbirth, but the stimulation of the catecholamine output may be present in pregnant women with fear of childbirth.

Unnecessary CSs can be reduced by treatment, more so in nulliparous women and in women with a high motivation to participate in treatment. With intensive treatment for fear of childbirth labors were even shorter, but puerperal depression, especially in women with previous depression, still remains a major risk after childbirth. Fear of childbirth can be regarded as a sign of hidden depression, which impairs the quality of the patient's and her partner's life. Further focus on depression during pregnancy is needed. Strategies on how to develop treatment for fear of delivery should take this into account. An undiagnosed and untreated depression may underlie a low level of motivation. In addition, the recognition of PTSD in the context of childbirth is necessary.

The treatment of fear of childbirth aims at reducing anxiety during pregnancy, increasing the self-confidence and relaxation, supporting the transition to parenthood, and preventing low post-natal well-being. It can be organized in different ways and planned according to individual needs. It can consist of individual or groups psychoeducation, given either by a doctor, nurse, or psychologist, at either general health care level or at specialized clinics.

## 8. Summary

1. The mode of the first delivery differed significantly among those who requested CS (n=100) during their second pregnancies as compared with those who delivered their subsequent children without fear (n=200). The adjusted OR for previous emergency CS was 26.9 (95% CI 11.9, 61.1) and for previous vacuum extraction 4.5 (2.2, 9.3). There were no differences in the use of epidural analgesia.
2. In an unselected, less than 30 weeks pregnant population in the Helsinki capital area (n=278) both fear of childbirth and pregnancy-related anxiety were predicted from the woman's psychosocial background. The more the woman reported general anxiety, depression, neuroticism, vulnerability, low self-esteem, dissatisfaction with partnership, and lack of social support, the more they also reported pregnancy-related anxiety or fear of childbirth. Of the socio-economic factors, only unemployment showed a significant impact. The partner's dissatisfaction with life or with partnership contributed to the woman's pregnancy-related anxiety and fear of childbirth.
3. Women with fear of childbirth (n=20) tolerated cold-induced pain in CPT for a significantly shorter time than women without fear (n=20), both during and after pregnancy. They also estimated the experienced pain as more severe than did the controls.
4. In CPT during pregnancy, the response in noradrenaline was 28% smaller in women with fear of childbirth than in controls, whereas the responses of ACTH, cortisol, and beta-endorphin were similar between the groups, both during and after pregnancy. Baseline levels of noradrenaline in the pregnant fear group were higher than in controls. Thus, pregnant women with fear of labor were characterized by changes in noradrenaline, but not in ACTH, cortisol, or beta-endorphin, before or during CPT.
5. In an unselected population from the Helsinki capital area (n=211), women who were disappointed with their childbirth or suffered from puerperal depression, were depressed already during early pregnancy. The strongest predictors of disappointment with childbirth were

intolerable pain or inadequate pain relief during labor and emergency CS. The strongest predictors of puerperal depression were the following: depression during pregnancy, general anxiety, vulnerability, neuroticism, measured both in early and late pregnancy, and pregnancy-related anxiety in late pregnancy.

6. During intervention for fear of childbirth (n=176), which started on average at the 25<sup>th</sup> gestational week, birth-related concerns decreased in the intensive treatment group, but increased in the conventional treatment group. Labors were shorter in the IT group when compared with the CT group. After intervention, 62% of those primarily requesting CS chose to deliver vaginally, equally in both groups. In the loglinear model especially those parous women from the CT group who refused to fill in the questionnaires chose CS more often than expected. There were no differences between the groups in satisfaction with childbirth, or in the incidence of puerperal depression.

## ACKNOWLEDGEMENTS

The present study was carried out at the Department of Obstetrics and Gynecology, Helsinki University Central Hospital during the years 1996-2001. My deep gratitude is due to the Heads of the Department of Obstetrics and Gynecology, Professor *Olavi Ylikorkala*, and Professor *Markku Seppälä*, and to the Administrative Head of the Department of Obstetrics and Gynecology, Docent *Maija Haukkamaa*, for providing me the excellent working facilities, and for their interest in my research.

I wish to express my warmest gratitude to all the following:

Above all, my supervisor, Docent *Erja Halmesmäki*, MD, PhD not only for suggesting this topic to me in the first place, but also for her advice and support throughout the study. Her admirable, unprejudiced attitude towards research on novel areas in obstetrics, and faith in me when I started both this research and the clinical work on this unexplored side of women, have made this thesis possible. Time and again she pulled me up from moments of despair by unstintingly giving me her time to supervise my work preparing this thesis. I am also grateful to her for her everlasting patience, as well as for helping me practically in many ways, not least with arranging research facilities to my disposal.

Professor *Olavi Ylikorkala*, MD, PhD, with whom I have been privileged to collaborate with, for his enthusiastic and experienced advice on scientific thinking and writing.

Docent *Katariina Salmela-Aro*, PhD, for sharing most parts of this project with me, first as the designer of studies II, V, and VI, then as co-worker at the time of gathering and saving the enormous amount of data, and further as co-author. I also owe special gratitude to Kata for teaching me most that I have ever known about how to perform statistical analyses, and for friendship.

Professor *Jari-Erik Nurmi*, PhD, who was the inspirer for the studies II, V, and VI, also for valuable criticism and stimulating discussions during the completion of the manuscripts. He also tried to teach me an understanding on statistics, and succeeded too, to some extent.

Docent *Risto Kaaja*, MD, PhD, for guiding me into the mysterious world of hormonal reactions to stress. His warm and experienced advice on studies III and IV was indispensable.

*Satu Helske*, MD, for performing the beta-endorphin assays in study IV.

Docent *Ulla Ekblad*, MD, PhD, and Docent *Maija Tulppala*, MD, PhD, the official reviewers of this thesis, for their positive attitude and constructive comments. They sacrificed some of the hottest days last summer to review this thesis which greatly improved after their contribution.

*Suvi Rapola*, M.Sc.(Econ.), for prompt and skillful revision of the English language of this thesis.

Professor *Kari Teramo*, MD, PhD, the former head of the out-patient maternity clinic at Helsinki University Central Hospital, and my teacher in obstetrics, for support and flexibility, while I performed the clinical part of study VI. Docent *Vilho Hiilesmaa*, MD, for his statistical help in Study I, and for later statistical advice, as well.

My dear friends and colleagues *Anne Vakkuri*, MD, PhD, *Anneli Piironen*, MD, PhD, and *Satu Rapola*, MD, PhD, who all completed their theses in 2000-2001, for endless support, immeasurable practical help, and, above all, for excellent examples of hard work. You have made my path along the road of research much less bumpy.

Ms. *Teija Könönen*, Ms. *Anna Sandelin*, and Ms. *Pernilla Stenbäck*, all magnificent midwives at Helsinki University Central Hospital delivery ward, for helping me so in many ways. Teija shared with me the treatment of women with fear of childbirth, and simultaneously taught me a lot. Anna sacrificed her time by helping me with the data in Studies I and VI, and Pernilla shared the implementation of the experiments in studies III and IV with me.

Ms. *Laila Selkinen*, for irreplaceable help in all possible situations, at all possible times, Ms. *Raili Alanne*, for her excellent librarial assistance, and Ms. *Leena Vaara*, for non-stop practical help with the graphics.

My colleagues at Helsinki University Central Hospital and the personnel of the out-patient clinic, the antenatal ward, and the delivery ward, for enthusiasm for my topic, and for support when I struggled both with the heavy clinical work load with my patients and with this research. Special thanks to *Eija Tuutti*, MD, and *Riikka Toivanen*, Lic.Ps. for your pleasant collaboration, and for friendship.

My dear friends outside the field of this study, especially the *Muitti*-girls, and many others, for laugh and joy which have helped me relax and reminded me of the outside world during these laborious years, and for support and advice on maternity and life in general.

*Seija* and *Antti Yrjölä*, my parents-in law, and *Satu Yrjölä*, my sister-in-law, for helping our family in various ways, especially by taking good care of our children when both their parents have been devoted to their work.

My dear parents, *Kaarina Jokinen* and the late *Jarkko Saisto*, and my brother *Ilkka Saisto* for caring and encouraging me throughout my life. I only wish my father could have been with us today.

My husband *Pekka Yrjölä* for his love and understanding. His unshakeable calmness, patience, and practicality have helped me combine family, scientific, and everyday work. Without the love and happiness he and our lively and lovely sons *Mikko*, *Tuomas* and little *Juho* have brought into my life, this thesis would have never come true.

This study was supported by grants from the Jalmari and Rauha Ahokas Foundation, Signe and Ane Gyllenberg Foundation, Emil Aaltonen Foundation, Finnish Foundation of Gynecology and Obstetrics, Clinical Research Institute of Helsinki University Central Hospital, the Research and Development Project at Helsinki University Central Hospital, and Helsinki University Central Hospital.

Espoo, September 2001

Terhi Saisto

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