

**Becoming fathers: adverse childhood experiences, partner attachment
and mental health before childbirth as related to later perception of their
own children**

Philosophiae doctor (PhD) thesis

Thomas Skjøthaug



BUP-vest, Diakonhjemmet Hospital

Regional Centre for Child and Adolescent Mental Health, East and South

Department of Psychology

Faculty of Social Sciences

University of Oslo

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SUMMARY

This dissertation is based on a prospective longitudinal study of fathers' adverse childhood experiences, partner attachment style, anxious and depressive feelings during pregnancy, and experience of parenting stress in their own children's first year of life. The study followed becoming fathers during pregnancy into fatherhood when the children were 6 and 12 months old. It is part of a Norwegian population based project, the Little in Norway (LiN) study, starting early in pregnancy. There is still a dearth of research on paternal mental health and attachment during pregnancy and in the transition to fatherhood.

Norwegian fathers participate more actively in caregiving of their infants than former generations of fathers did, and their influence is important for children's development. This underscores the importance of investigating paternal characteristics at an early point of time.

The present dissertation is to the author's knowledge one among few population based studies to focus specifically on the fathers during pregnancy and child infancy in relation to fathers' mental health in the transition to fatherhood.

Aims

The main aim of the study was to provide information about paternal mental health and developmental trajectories during pregnancy into fatherhood postpartum. For this purpose we used a prospective design comprising 878 prospective fathers and 1036 prospective mothers who contributed with data.

First, we assessed the fathers' social background and adverse childhood experiences and investigated how these factors were related to anxious and depressive feelings during pregnancy. *Second*, we studied prenatal predictors of perceived paternal stress in relation to how the fathers perceived their children's behavioral characteristics when the child was 6 months old. *Third*, we expanded the number of possible prenatal antecedents of stress at child age 12 months by adding prenatal partner attachment style. Further, we assessed the stability of such parenting stress between child age 6 and 12 months.

Results

We found (in paper I) that the number of adverse childhood experiences was significantly related to higher depressive and anxious feelings at several time points in pregnancy among the becoming fathers. We also showed (paper II) that fathers' non-optimal mental health and adverse childhood experiences as measured during pregnancy predicted

parenting stress in the child domain at six months postpartum, suggesting a negative perception of the children's behavioral characteristics. We concluded (in paper III) that fathers' adverse childhood experiences and partner attachment style did not significantly predict parenting stress in the child domain at 12 months postpartum directly, however, indirect associations via mediated pathways such as spousal disharmony were found. Furthermore, we documented some measure of stability of negative perception of child behavior from child age 6 to 12 months.

Conclusions

The overall findings add to the extant knowledge that fathers' own childhood experiences, mental health and their partner attachment style before fatherhood are concordantly associated and further associated with their experiences of parenting stress after birth. Also, the findings show that spousal disharmony after child birth contributed to paternal stress and a negative perception of the child's behavioral characteristics.

Fathers participate more actively in caregiving for their infants than fathers did formerly, underscoring the importance of considering fathers' background in terms of risk factors when providing support to prospective families and later, after the child is born. This work shows that early predictors are associated with postpartum spousal disharmony, which in turn influences parenting stress and how fathers perceive their child's behavior in infancy. Family interventions ought to take place right on in pregnancy in order to prevent later parenting stress.

LIST OF PAPERS

Paper I:

Skjothaug, T., Smith, L., Wentzel-Larsen, T., & Moe V. (2014). Prospective fathers' adverse childhood experiences, pregnancy-related anxiety, and depression during pregnancy. *Infant Mental Health Journal*, 00(0), 1-8. <http://dx.doi.org/10.1002/imhj.21485>.

Paper II:

Skjothaug, T., Smith, L., Wentzel-Larsen, T., & Moe V. (2018). Do fathers' prenatal mental health bear a relationship to parenting stress at six months? *Infant Mental Health Journal*, 00(0), 1-13. 1-13. <http://dx.doi.org/10.1002/imhj.21739>.

Paper III:

Skjothaug, T., Smith, L., Wentzel-Larsen, T., Stänicke, E., & Moe V. (2018). Antecedents of fathers' perception of child behavior at child age 12 months. Submitted to *Infant Mental Health Journal*.

1.0. INTRODUCTION

Traditionally, the responsibility for rearing children has largely been left to mothers and parents have had more differential roles in participation with their children than today (Cabrera, Tamis-LeMonda, Bradley, Hofferth & Lamb, 2000). Social changes promote fathers as caregivers and new social trends and ideals force a re-conceptualizing of the traditional view of fathers as breadwinners and mothers as primary caregivers. Hence, young fathers currently participate more actively in caregiving of their infants than former fathers have done, and the role of fathers as attachment figures for young children highlights the importance of employing fathers as participants and informants in research and caregiving. Fathers of today are more active in child care and household work and go far beyond portrayals of men as “rough and tumble” playmates; they interact more as caregivers during their children’s infancy (Shannon, Tamis-Lemonda & Cabrera, 2006), and their influence in caregiving is commonly considered to be important for children’s development in infancy and early childhood (Cabrera & Peters, 2000).

The understanding of paternal contributions has mainly focused on an instrumental or breadwinning role in the family (Lamb, 2010). Older research emphasized on how mothers would talk, cuddle, and play with toys with their child, and how fathers would do rough and tumble play, especially with boys (Fitzgerald, 1977; Power, 1981). In the same tradition, fathers were often excluded as informants in infant and child studies, and researchers focused more on mother–child than father–child interaction (Campbell & Gilmore, 2009). Further, previous research on fathers often focused more upon how they might contribute to adverse developmental outcomes in their children, such as by being absent from the household or neglecting financial support, instead of focusing upon favourable outcomes (Lamb, 2010). Other examples allude to fathers who are high in antisocial behavior and how their children perform poorly on measures of emotion regulation and receptive vocabulary/verbal ability. This research also focused on topics such as heightened family conflict, parental distress, and poor father–child relationships (Fitzgerald, McKelvey, Schiffman, & Montenez, 2004).

Many contemporary fathers do not have their own fathers as models as the roles are changing from a former breadwinner to today’s caregiver. This is not the case for present time mothers, because they were usually cared for by their mothers (Fägerskiöld, 2006). More recent research shows that men’s childhood experiences with their parents, their current relationship with their partners and demographic factors can all influence fathers’ involvement during pregnancy (Flykt et al. 2009). It has also been shown that there is a

relationship between prospective fathers' involvement in pregnancy and subsequent engagement with the child after birth (Shannon et al., 2006), and that a better partner relationship is likely to contribute to more involvement with the child (Shannon, Tamis-LeMonda, & Margolin, 2005). For example, Cabrera, Fagan & Farrie (2008) found a stable association between fathers' prenatal involvement and their postnatal engagement with the children at age 1 and 3. Thus, it is important to understand which factors are operating in fathers' capacity to be emotionally and practically involved with their children. However, there is still a dearth of studies that aim to investigate how this capacity develops.

The evaluation of paternal feelings and experienced stress, and whether such factors can be traced back to their own childhood, is important for health-care services (Fletcher, Matthey, & Marley, 2006) in order to provide proper aid and care when needed.

The present work is focused on investigating *antecedents* of mental health in pregnancy by assessing retrospectively reported adverse childhood experiences in fathers, as well as studying their internal working models as measured by partner attachment style. We then examined how these measures were associated with fathers' experience of parenting stress postpartum and the perception of their own children's behavior at 6 and 12 months.

1.1. Adverse childhood experiences

Adverse childhood experiences (ACEs) are rather common. They are related to many public health problems later in life such as heart disease and cancer (Anda, Butchart, Felitti, & Brown, 2010), autoimmune diseases (Dube et al., 2009) as well as depressive (Chapman, et al., 2004) and anxious states (Felitti, 2009). ACEs are also often associated with emotional turmoil (Chapman et al., 2004). In sum, ACEs represent increased risk for the development of health maladies and social problems (Anda et al. 2010), stress in adulthood (Opacka-Juffry & Mohiyeddini, 2012) and depression (McEven, 2010) several decades after their occurrence (Chapman et al., 2004).

Previous research has shown that negative life events may influence parental perceptions and behaviors, thereby resulting in experienced stress (Webster-Stratton, 1990). It has further been demonstrated that adverse childhood experiences may influence later quality of life. The lasting effects of childhood abuse, neglect and maltreatment are well recognized (Glaser, 2014), with research supporting the link between childhood trauma and pathological dissociation later in life (Liotti, 2004).

Studies of the predictors of prenatal paternal depression and anxiety have previously not been given as much attention as prenatal maternal depression and anxiety. However, Wee, Skouteris, Richardson, MacPhie, and Hill (2015) reported that fathers' heightened levels of anxiety early in pregnancy predicted heightened levels of stress and depression later in pregnancy, but they (ibid) did not include ACE.

In the present study we included ACEs in order to investigate how such adverse experiences might possibly influence prospective fathers' mental health during pregnancy and parenting stress after child birth.

1.2. Partner attachment style

Bowlby (1969) proposed that early experiences of care from attachment figures shape feelings, beliefs and expectations of relationships across the lifespan, a phenomenon he described as "internal working models" (IWMs). He suggested that early attachment experiences prevail over time and influence later attachment relationships, such as the attachment relationships to romantic partners. Moreover, he thought that the adult's IWMs were related to the individual's own childhood experiences (Hazan & Shaver, 1987; Fox, Platz, & Bentley, 1995; Nelson-Coffey, Borelli, & River, 2017). In the same line of reasoning, it has been proposed that reported infant behavioral characteristics may be partly related to parental perceptions, rather than being true judgements of the child's character (Pauli-Pott, Mertesacker, Bade, Haverkock, & Beckmann, 2003). This implies that both parents' representations of their infant may be present even before the child is born and that such representations are related to parental interpretations of child characteristics and behavior after birth (Benoit, Parker, & Zeanah, 1997). This notion highlights the objectives of the present work; i.e. that such perceptions may be rooted in and expressed via the father's own early exposures in childhood and his attachment experiences, rather than purely expressing the child's actual behavior.

Bowlby (1969) further noted that parents yearn to be bonded to their baby during pregnancy, and that this desire includes being psychologically close to their unborn child. He also proposed the concept of parenting alliance, which refers to the unique and specific component of the marital relationship that concerns parenting (Weissman & Cohen, 1985), a process that usually begins before birth (Luz, George, Vieux, & Spitz, 2007). Several studies suggest that a caregiver's own bonding experiences are associated with the quality of the child-caregiver attachment (Van IJzendoorn, 1995; Ward & Carlson, 1995). It is commonly

assumed that the emotional relationship between parents and the child begins during pregnancy, and that it continues into the postpartum period (Goulet, Bell St-Cyr, Paul, & Lang, 1998). Consequently, in two-parent families children simultaneously form attachment relationships with *both* their mother and their father (Easterbrooks & Goldberg, 1987).

When meeting first-time parents, it is especially important that the health services pay attention to both partners and their child bonding qualities. Research has shown that insecure adult attachment styles during pregnancy negatively predict parenting alliances 6-months postpartum (Bouchard, 2014). The parenting alliance has also been found to be associated with child adjustment (Belsky, Woodworth, & Crnic, 1996) and parental involvement (McBride & Rane, 1998).

1.3. Anxiety and depression

Preparing for fatherhood includes going through a transformation of emotions (Finnbogadóttir, Svalenius, & Persson, 2002). This process starts early in pregnancy with a mental preparation for fatherhood, which may lead to feelings of anxiety (Teixeira, Figueiredo, Conde, Pacheco & Costa., 2009). Moreover, among prospective fathers high levels of anxiety and depression are probably more prevalent in pregnancy than during the postpartum period (ibid). Heightened levels of anxiety among fathers-to-be seem to be associated with a lack of information about pregnancy, forthcoming childbirth and poor social support (Condon, Boyce & Corkindale, 2004).

Other research has pointed out that the course of men's anxiety from the prenatal to the postnatal period tends to be stable, with a potential to decrease after birth (Leach, Poyser, Cooklin, & Giallo, 2016). Also, there is an association between age and depressive symptoms among first-time fathers; younger fathers seem to be more vulnerable than older ones to develop depressive symptoms (Bergstrom, 2013).

Even though there are fewer studies of the mental health of fathers as compared with mothers, it has been shown that during pregnancy depressed fathers may experience similar symptoms as reported by depressed mothers (Field, Diego, Hernandez-Reif, Schanberg & Kuhn, 2004; Field et al., 2006). In a metastudy, Paulson & Bazemore (2010) found that 10.4% of the fathers (both pre- and postnatally) evinced depression, which is equivalent to the prevalence of women's depression. Other studies report a higher rate of depression among women than in men, during pregnancy as well as 3-months after birth (Figueiredo and Conde, 2011). In the same line of research, Luoma et al. (2012) examined 194 fathers and mothers

right after birth and found that 21% of the fathers and 24% of the mothers scored above the cut-off point for depressive symptoms, suggesting that depressive feelings may affect fathers as well as mothers.

Detecting depressive feelings in pregnancy among fathers-to-be is important since it has been found that paternal depression during pregnancy predicts fathers' subsequent depression postpartum (Matthey, Barnett, Ungerer, & Waters, 2000). Less attention has been given to the relations between fathers' depression and child development outcomes (Ramchandani and Psychogiou, 2009; Ramchandani, et al., 2008). This is the case even though fathers' mental health in the postnatal period is associated with children's early behavioral and emotional development (Ramchandani, Stein, O'Connor, & the Alspac Team, 2005; Ramchandani, et al., 2008).

Some researchers have compared mothers' and fathers' mental health, whereas others have focused on how parents may influence each other. For example, Field et. al. (2006) reported that fathers living with depressed mothers had significantly higher depression and anxiety scores than those living with non-depressed mothers. It has also been shown that men with poor partner relationships are at risk for depression as much as women during the transition to parenthood (Matthey, Barnett, Ungerer, & Waters, 2000).

Research has shown that depressive symptoms in men are associated with poor relationship satisfaction, low social support (Wee, Skouteris, Pier, Richardson, & Milgrom, 2011), and being unemployed (Ballard & Davies, 1996). Depression in men is also associated with unplanned pregnancy (Schumacher, Zubaran, & White, 2008). For example, in a study of mediating factors, it was found that paternal depression and child outcomes were associated with and mediated through interparental conflict and maternal depression (Gutierrez-Galve, Stein, Hanington, Heron, & Ramchandani, 2015). It has also been shown that depression and anxiety mediate between parenting stress and parental dyadic adjustment at infant age 12 months (Rollè et al., 2017).

Recent research suggests that mothers' and fathers' depression may have differential effects on child development. Specifically, Fredriksen, von Soest, Smith & Moe (2019) found that parenting stress plays a mediating role in the prediction of early child development from both parents' perinatal depressive symptoms. More specifically, Fredriksen et al. reported that fathers' (but not mothers') prenatal symptoms of depression were associated with child language development at 18 months (ibid).

In order to prevent psychological maladies in children, it is important to detect and treat fathers in need of aid. Untreated prenatal depression among prospective fathers is a warning of later child behavior problems (Ramchandani et al., 2013). Hence, a depressed father may be more withdrawn, and display less verbal and behavioral stimulation during interaction, and thus have a negative impact upon the child (Sethna, Murray, Netsi, Psychogiou, & Ramchandani, 2015).

1.4. Fathers' stress and perceived child behavior.

Along fathers' journey from becoming a father in pregnancy towards fatherhood in child infancy, some individuals experience stress in the parenting role. Stress in the parent-child system during the first three years of life is especially important to consider in relation to the many facets of child-parent characteristics, family context and life stress events. Some factors are important to consider in the study of parenting stress, such as negative life events, marital discord, social isolation, anxiety and depression, low income, daily hassles and single parenthood (Webster-Stratton, 1990).

Abidin (1995) defined parenting stress as the discrepancy between the resources required for the parental role and the perceived resources available to meet those requests. Further, he specified various determinants of parenting stress, such as how parents *perceive* their child's behavioral characteristics, which tap into child temperamental characteristics of long-term predictive power (Abidin, 1982; Korn, 1984). It has been found that parental developmental history as well as negative life events influence parental child perceptions and child behaviors, thereby resulting in experienced parental stress (Belsky, 1984; Webster-Stratton, 1990).

1.5. Theoretical and developmental framework

This study was conducted within the theoretical framework of developmental psychopathology and the transactional model of development. There exists a variety of developmental paths and combinations of risk factors that contribute to atypical mental health. Much of the variation one sees in developmental outcomes is related to the cumulative effects of risk and protective factors (Sameroff, Seifer, Zax & Barocas, 1987). Furthermore, atypical mental health is often a result of a continuous transactional mismatch between the environment and the individual's phenotype over time, so that the young child is prevented from organizing life in a healthy way (Sameroff, 2009).

This present work highlights cumulative risk and developmental adversity, which constitute significant elements in the transactional model. It is well known that when the number of risk factors in a child's background increases, the individual becomes more vulnerable to later psychiatric disorder (Rutter, 2006). In order to understand how paternal characteristics influence an infant's course of development from pregnancy, birth, and during the early years, it is important to focus on the accumulation of risk and protective factors in addition to taking the individual child's constitution into consideration (Sameroff & Fiese, 2000).

1.6. Relevance for society

There is a need for more detailed information about the implications of deviance in children's mental health and their developmental paths, and in their quality of life and that of their caretakers. Specifically one needs more knowledge about fathers and their role in child development. The consequences of delayed detection, and lack of intervention and early prevention of mental deviance, can be hazardous. Information about fathers' characteristics as caregivers lay the ground for improved knowledge of prevention, detection, treatment and intervention strategies for the children and their families at an early point of time in the children's lives.

In order to gain more knowledge about "becoming fathers", we have investigated patterns of mental health during pregnancy and predictors of stress postpartum as related to fathers' characteristics and experiences measured in pregnancy, and again at six and twelve months postpartum. This study was carried out in close connection to and within the framework of general and clinical practice, emphasizing the importance of fathers' influence on mothers in pregnancy and on children in infancy, investigating the impact of paternal mental health and stress. Despite current knowledge that fathers contribute importantly to their children's emotional, social and cognitive development, more emphasis has often been placed on the mothers in research as well as in clinical practice.

Further, early intervention efforts to prevent adversity are important. It is well known that untreated mental health deviance in young children often lead to adverse personal, clinical and economic consequences. Numerous studies have documented high incidences of anxiety and depression among young children, along with other severe forms of mental illness, often combined with scant social support (Espinoza, Beckwith, Howard, Tyler & Swanson, 2001; Savonlahti et al. 2005). Parenting stress and caretaking casualty (e.g. related

to postpartum depression or high parenting stress) constitute environmental risks for developing social-emotional problems in young children. Early detection in families of cumulative risks factors in order to plan for effective preventions is of major importance.

1.7. Limitations of previous studies

Research aimed at fathers' involvement and their early expectations towards parenthood is still scarce (Cabrera & Peters, 2000; Flykt et al. 2009). The failure to include data related to fathers is probably due to difficulties in enrolling them in studies. Consequently, many previous studies in this area of research have not used fathers as independent informants, resulting in reports of fathers' experiences via mothers as informants (Shannon, Tamis-LeMonda & Cabrera, 2006). Importantly, one should be aware of possible discrepancies since there is often little agreement between reports based on fathers versus mothers (Ehrlich, Cassidy, & Dykas, 2011). In support of the need to investigate fathers' mental health is evidence that fathers' (not only mothers') heightened levels of anxiety early in pregnancy predict increased levels of stress and depression later in pregnancy (Wee, Skouteris, Richardson, MacPhie & Hill, 2015) and that paternal anxiety may also increase the risk of developing depression (Iliadis et al., 2015).

One knows little about why men want to be fathers and the possible relations between intendedness and fathers' long-term investments in their children (Cabrera & Peters, 2000). Nevertheless, it has been shown that fathers' behaviors during pregnancy and birth predict their presence and involvement in their children's lives years later (Shannon et al., 2006). Hence, one still needs more knowledge about fathers' specific role for infants' mental health and developmental pathways. It has been shown, however, that boys growing up without fathers are especially prone to develop problems in the areas of sex-role and gender-identity, school performance, psychosocial adjustment, and self-control (Hetherington & Stanley-Hagan, 1986). Girls are also affected by father absence; girls growing up without a father are at risk for early sexual activity and adolescent pregnancy (Ellis et al. 2003). The importance of encouraging researchers, educators, and practitioners to examine all aspects of fathering has been underscored, including why men want to become fathers, the nature of father-child involvement, the barriers to involvement, and the design of effective policies and programs to include fathers (Tamis-LeMonda & Cabrera, 1999).

2.0. THE PRESENT STUDY

This study used data from a larger project entitled; *A longitudinal population study of infant vulnerability and plasticity from pregnancy to age 18 months (in Norwegian called “Liten i Norge”, for short the LiN-study)*. LiN aims to assess a wide array of environmental stressors, including biomedically and environmentally mediated stressors as well as parent-reported stress factors. A main objective of the LiN-study is to investigate mothers’ and fathers’ mental health and stress in the transition to parenthood, as well as how very young Norwegian children fare in the sensory-motor and social-emotional domains, and children’s susceptibility to stressors and potentially benefit from promoting factors.

So far, the LiN-study has followed a large group of mothers and fathers and their children from pregnancy to child age 36 months. Data collection started in September 2011 and was finished in 2016 and the fathers participating in this project were recruited and participated with the mothers at all data collection points.

The present work used data from pregnancy to child age 12 months.

2.1 Aims and objectives

The aim of this work was to increase extant knowledge of fathers’ relational experiences, mental health and feelings of stress during pregnancy and early in the child’s life. The overarching aim was to investigate *if* and *how* fathers’ background characteristics assessed during pregnancy could predict anxious and depressive feelings during pregnancy (paper I), as well as paternal stress at child age six and twelve months (papers II & III). More specifically, the research objectives were:

1. In pregnancy; to examine the association between fathers’ adverse childhood experiences and pregnancy related anxiety and depression, and see if this association varies (paper I).
2. To examine the association between fathers’ adverse childhood experiences and mental health during pregnancy and see if such adverse experiences predict perceived stress at child age six months (paper II).
3. To elaborate and expand the findings from paper II to examine the association between fathers’ adverse childhood experiences, partner attachment style and mental health during pregnancy, and see if these factors predict perceived stress when the child is older, at 12 months. Additionally, we examined the stability of

fathers' perceived stress during the child's first year, from 6 to 12 months (paper III).

2.2. Design and procedures

The study employed a prospective longitudinal design; using data collected from fathers and mothers at five time points in pregnancy (T1: Weeks 8–34, T2: Weeks 20–25, T3: Weeks 26–31, T4: Weeks 32–34, T5: Week 36). The planned timings were week 22 for T2, week 26 for T3, week 32 for T4, and week 36 for T5 (paper I, II & III).

The participating fathers were enrolled at nine well-baby clinics from municipalities across the four Norwegian health regions: north; mid, west and south-east. Information from the participating fathers included their social background (parity, age, education, income and ethnicity), retrospectively reported adversity in their own childhood, partner attachment style, depressive and anxious symptoms, spousal harmony and fathers' perception of their child's behavioral characteristics at child age 6 (T8) and 12 (T9) months. Outcome data were anxious and depressive symptoms during pregnancy (paper I) and fathers' perception of their child's behavioral characteristics at child age 6 (paper II & III) and 12 months (paper III).

3.0. MATERIALS AND METHODS

3.1 Participants and enrollment

The enrolment of the participants was done by midwives at the local well baby-clinics. The midwives informed prospective parents about the project, encouraged the parents to participate, and handed out an information brochure. The midwives kept records of who received the information, and the mothers were asked to inform the fathers about participation if they did not come along. The recruitment started in September 2011 and lasted until October 2012. 1041 mothers were originally enrolled in the study. They could choose to withdraw or to have their data deleted at any time. Among these, five families later withdrew their consent and we were left with 1036 women participating in the study. The partners of the pregnant women were also invited to participate with their own data; and at T1, 884 partners contributed. Three partners had missing data on the ACE Scale (Anda, et al., 2010), leaving us with 881 partners who contributed with data to the first study in the present thesis (paper I). Among the included families, six consisted of same-sex couples with two women. The co-mothers were excluded in the analyses of paternal influences (paper II & III), as gender differences might be confounded with being the non-pregnant parent. After birth, some

families did not consent to participate further, and some fathers had missing values on the outcome variables, leaving us with 835 fathers who actually contributed with data to the next two studies (paper II & III).

As mentioned above, the data collection in the LiN-study comprised up to five time points in pregnancy: T1 – T5. T6 consisted of birth records. Postnatal data collection waves were at 6 weeks postpartum (T7), and again at 6 months (T8), 12 months (T9), and 18 months (T10), all with a range of ± 2 weeks. The enrollment package at T1 was completed by all participants ($n = 884$, for partners, 778 fathers and six co-mothers). In contrast, T2 – T4 had limited time windows relative to gestational/child age for valid participation. This means that a sizeable proportion of the participants was not enrolled in time to take part in the early data collection points during pregnancy (T1-T4), but the full sample contributed at T5.

Hence, the numbers of participants vary between the different time points. For example, those who were enrolled at T1 (Week 26) only answered outcome questionnaires after that time point [i.e., Weeks 32 (T4) and 36 (T5)], and not at time points before Week 26 (i.e., Weeks 22 and 16). The present work used data from the prenatal data collection waves (T1 – T5), and from 6 and 12 months postpartum (T8 and T9), respectively.

The participants reported their highest obtained educational level, which was coded by four categories; education at the university level, four years in college, high school level or lower. Also, we gathered information about their occupation; whether they lived together with the child's mother or not, as well as age, income, parity and ethnicity.

3.2. Ethics

The LIN-project was supported by the Research Council of Norway (project # 196156). The main project was approved by the Ethical Committee (REK no. 2011/560) and included the present work. The study complied with the Declaration of Helsinki ethical principles for research involving human participants. Troubled infants and their parents received treatment at the collaborating clinics, but follow-up of possible treatment effects was not part of the present study. The participants were informed about the aims of the study and that they had the option to withdraw from the study at any time.

3.3. Statistical methods

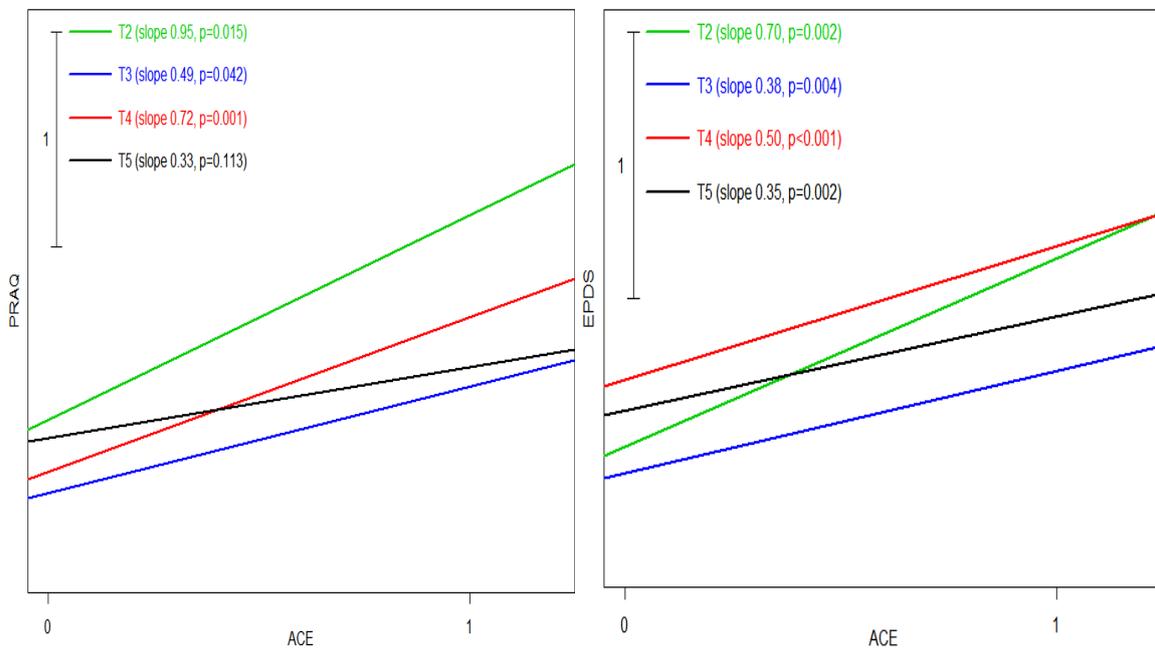
The specific analyses are more thoroughly described in each specific paper, and will not be fully repeated here. A summary of the analyses will be presented in this section. *In paper I*, analyses were done by means of bivariate correlations between the predictor variable adverse childhood experiences and 16 other variables more thoroughly described in the paper. Spearman and Pearson correlation coefficients were computed to investigate the relationships between the sociodemographic variables age, parity, education, income, marital status, ethnicity (enrollment covariate variables), all of which were completed at enrollment, and pregnancy related anxiety questionnaire (The PRAQ-R) and depressive symptoms, measured with the Edinburgh postnatal depression scale (The EPDS) during pregnancy.

Next, we estimated mixed effects models and, in addition, the associations between the enrollment covariate variables and paternal EPDS and the PRAQ-R at five assessments points during pregnancy were computed. The relationships between the ACE scale, the PRAQ-R, and the EPDS were adjusted for covariates and computed, with 569 prospective fathers included. The analyses were performed by linear mixed effect models to assess the relationship between scores on the paternal EPDS and the PRAQ-R with time during pregnancy and the ACE Scale, including a time by ACE interaction in a hierarchical setup, adjusted for baseline paternal variables (age, parity, education, income, marital status, and ethnicity), maternal PRAQ-R and EPDS scores, respectively, as well as deviations from the intended timing of the T2 to T5 responses.

The models included both within- and between person random effects. Valid versus missing values for the PRAQ-R and the EPDS scores during T2 to T5 were analyzed by logistic regression via generalized estimating equations with unstructured correlations to account for clustering with the same covariates as described above. The mixed effects analyses used the R (The R Foundation for Statistical Computing, Vienna, Austria, 3.0.0 package nlme; Pinheiro, Bates, DebRoy, Deepayan, & The R Development Core Team, 2013) and gee was used for the logistic regression analyses; the baseline correlation used SPSS Version 20 (IBM SPSS Statistics 20).

Unfortunately, we discovered that six co-mothers were included in the first paper. We re-ran the analyses in order to correct and compare the analyses without the co-mothers. The analysis showed only marginal differences that were hardly visible in the figures (see figure 3). Without the co-mothers the difference in EPDS between T3 and T4 was now significant at ACE=0 also ($p=0.045$ compared with 0.056 when including co-mothers), but as

shown in Figure 3 below, the actual difference is almost unchanged. Figure 3 shows the estimates when the six co-mothers were excluded, as compared with the results published in paper I.



For both *paper II & III*, the analyses were first done with linear regression and path-analysis modeling (SEM) between the variables age, parity, education, income, PRAQ-R, EPDS and ACE, with the parental stress index (The PSI) child domain as outcome at child age 6 (paper II) and at 12 (paper III) months' postpartum. In paper III, we additionally included partner attachment measured with the expericenses in close relationship scale (the ECR) as a predictor of the PSI child domain. Also we assessed change in perceived stress between 6 and 12 months by employing a mixed effects model of child behavior over time by estimating the stability of reported child behavior by intraclass correlation (ICC) based on a mixed-effects model. Thereafter, we conducted several analyses by using depressive symptoms and spousal disharmony, instead of perceived stress, as an outcome variable at 6 and 12 months postpartum. Subsequently, we compared these alternative models with our primary models, presenting alternative modeling of causal direction (Shrum, Lee, Burroughs, & Rindfleisch, 2011; Hayes, 2013) to outcome. All measures and self-reported variables were coded on Likert scales (Judd, Smith, & Kidder, 1991), from "lower" to "higher" levels of stress.

For *papers II & III*, we evaluated the appropriateness of the path analysis models (SEM) by the root mean square error of approximation (RMSEA), the comparative fit index

(CFI) and the Tucker-Lewis index (TLI). Values of RMSEA below 0.05 and values of CFI and TLI above 0.95 were considered to denote a well-fitting model (Browne & Cudeck, 1992; Hu & Bentler, 1999), even though Awang (2012) suggests a more liberal level of acceptance; that CFI and TLI ought to be higher than .90.

We also estimated measurement models for reported ACE, the EPDS, as well as the PSI spousal domain reported 6 and 12 months' postpartum. In case of mediated relationships, confidence intervals were computed as bootstrap bias-corrected intervals based on 10,000 replications which are considered more reliable, compared to p-values based on a normal approximation for mediated effects (Hayes, 2013). Significant results were determined by $p < .05$.

At first, the models applied at 6 (paper II) and 12 months (paper III) did not converge properly. The EPDS scales used postpartum left us with zero cells, which made the models unstable. The technique of parceling, following the recommendations from Little (2013), was therefore used in both papers, leaving us with five sum scores, instead of the 10 original item for the two latent variables. Specifically, items were ordered by their item-total correlation, and iteratively, remaining items with the highest and lowest item to total correlations were parceled together, thus resulting in good internal reliability of the composite score on both variables. Also, the variables derived from the child domain with latent variables assessed at 6 and 12 months postpartum made the model unstable, we therefore decided to use them as a composite sum scores instead.

Lastly, the main model analyses in paper III showed that the model had an adequate estimated model fit assessed with RMSEA, combined with a lower CFI and TLI than expected, suggesting that there is room for improvement.

The regression analyses in paper II and III were performed with SPSS Version 22 (IBM SPSS Statistics 22) and 24 (IBM SPSS Statistics 24). The path analyses in paper II and III used the Mplus program, Version 7.2 and version 8, respectively, using a robust weighted least squares (WLSMV) estimation (Muthén & Muthén, 1998–2017; (Muthén & Muthén, 2015). The intraclass correlation (ICC) in paper III based on the mixed effects analyses, used the R (The R Foundation for Statistical Computing, Vienna, Austria, 3.0.0 package nlme (Pinheiro, Bates, DebRoy, Deepayan, & The R Development Core Team, 2013).

3.4. Missing data

Missing values of the dependent variable were assumed to be missing under the missing at random assumption (MAR) in all papers (Schafer & Graham, 2002), but were

handled differently. In paper I, we used mixed effects models that give valid inference under this condition. In the next two papers using SEM, we employed the full information maximum likelihood (FIML) missing handling procedure. In all papers, where there were missing values on the independent variables, the cases were excluded from the analyses.

3.5. Sample size considerations

The number of participants was relatively high. An advantage of doing analyses with a large number of participants is that we could control for several other variables that may have influenced our findings. Large samples give higher statistical power, but low estimated effects may be statistically significant, even though they may be clinically irrelevant. Therefore, a careful interpretation of estimated effects may be particularly important in large samples.

3.6. Project management and design

The LIN-study was carried out in collaboration with the Centre for Child and Adolescent Mental Health Eastern and Southern Norway and the Department of Psychology, University of Oslo. The regional centres in all four health regions agreed to collaborate and a network of co-investigators was established.

Associate Professor and specialist of clinical psychology Vibeke Moe, served as the Ph.D. residents' main project supervisor. Supervision of the project was also conducted by senior researcher/professor emeritus Lars Smith, who also served as the Phd-resident's associate supervisor. Statistician Tore Wentzel-Larsen at the Regional Center for Child and Adolescent Mental Health, East and South in Oslo served a co-worker, especially devoted to statistical issues.

Associate Professor and specialist of clinical psychology Erik Stänicke was initially a projectleader at the Diakonhjemmet child- and adolescent psychiatric hospital (BUP-vest). Later, when at the Department of Psychology, UiO, he also served as an associate supervisor. Head of BUP-vest and specialist in clinical psychology Kari Tenmann facilitated the economic and clinical aspects of the work during the PhD period as the resident worked part-time as a clinical specialist in clinical psychology and part-time with this dissertation.

The following collaborating international partners should also be mentioned: Professor Hiram Fitzgerald at the Michigan State University and Professor Arnold Sameroff

at the University of Michigan. The PhD resident has also collaborated with three other PhD students- and one post doc. student, all affiliated with the LIN-study.

4.0. MEASURES

The measures used in the present work are depicted in Figure 1. They are thoroughly described below including when they were applied (see 4.2.-4.5). The fathers were employed as main informants at all assessment points. Data collection was carried out by nine research assistants, partly supported by PhD- and post-doc-students.

Figure 1: Measures used from pregnancy until 12 months postpartum

Time	Pregnancy					Infancy	
	T1	T2	T3s	T4	T5	T8	T9
Parity	X						
Age	X						
Salary	X						
Education	X						
Ethnicity	X						
ACE	X						
ECR	X						
PRAQ-R	X	X	X	X	X		
EDPS	X	X	X	X	X	X	X
PSI						X	X

*ACE=Adverse childhood experiences, ECR=Experiences in close relationships, PRAQ-R=Pregnancy related anxiety questionnaire, EPDS= Edinburgh Postnatal Depression Scale, PSI=Parental stress index.

Mothers' scores on the PRAQ-R and EPDS served as control variables in article I on each time point in pregnancy. Fathers answered the questionnaires at the well baby clinic at T1 and T3, and submitted forms from home at week T2, T4 and T5. After birth, the research assistant made an appointment with the parents to bring the baby to the public health center; both were encouraged to participate (T8; 6 months, and T9; 12 months postpartum).

Data that were collected prenatally

At time of enrolment the participants were asked to provide background information about their age, education, income and parity. In addition they completed a questionnaire package.

Questionnaires in pregnancy

- Adverse Childhood Experiences (ACE).
- Experiences in close relationships (ECR).
- Pregnancy-related anxiety questionnaire-revised (PRAQ-R)
- Edinburgh Postnatal Depression Scale (EPDS).

Questionnaires collected at 6 and 12 months postpartum

- Edinburgh Postnatal Depression Scale (EPDS).
- Parenting Stress Index (PSI) full version, including the spousal and child domain of the PSI

4.1. The adverse childhood experiences questionnaire (The ACE scale)

The ACE scale is a parent self-report questionnaire designed to identify possible difficult childhood experiences retrospectively. Adverse childhood experiences have an impact on a broad range of physical and mental health and social outcomes in adulthood (Dube, Williamson, Thompson, Felitti & Anda, 2004). The ACE questionnaire was completed at enrollment early in pregnancy (T1: Weeks 8–34 in pregnancy). It is based upon the participants' recollected memories of their own childhood experiences. The scale is designed to identify possible adverse childhood experiences. It consists of 10 questions, each scored 0 or 1, thus yielding a composite score ranging from 0 to 10 (Anda et al., 2010). The questionnaire contains questions about recurrent physical and emotional abuse, such as “Did a parent or other adult in the household often swear at you, insult you, put you down or humiliate you?”, or “Did a parent or other adult in the household often push, grab, slap or throw something at you?”. In the first article, we used ACE as a composite score, while in the last two articles it was used as a latent variable. The ACE has been used in studies of possible lasting negative effect on physical health (Anda, et al., 2006), brain development (McEven & Gianaros, 2010) and mental health (Maughan, Cicchetti, Toth & Rogosch, 2007).

4.2. Experiences in close partner relationships (The ECR)

Experiences in Close Relationship Questionnaire (ECR) is a 36 item self-report measure of adult partner attachment relationship. It was originally constructed by a factor analysis of 60 variables represented by 482 items extracted from a literature search of previous studies of attachment measures. From this survey, an instrument was constructed based upon the two primary dimensions of *avoidance of intimacy* and *anxiety with abandonment*. Each dimension consists of 18 claims, each scored 1 (“not true”) to 7 (“true”), yielding a mean score ranging from 1 to 7 (Brennan, Clark & Shaver, 1998). The questionnaire contains questions such as “I prefer not to show a partner how I feel deep down” (avoidance), and “I worry about being abandoned” (anxiety). Elevated scores on these dimensions reveal avoidance and discomfort with closeness (ECR-avoidance), as well as anxiety, jealousy and fear of rejection (ECR-anxiety) (ibid). Previously ECR has been used to show that adult romantic attachment is a prenatal determinant of parental attachment and parenting alliance (Luz et al., 2017). The ECR was collected at T1 (Weeks 8–34 in pregnancy).

4.3. Anxious and depressive symptoms (The PRAQ-R & The EPDS)

The Pregnancy-related Anxiety Questionnaire-Revised (The PRAQ-R; Huizink, Mulder, Robles, Visser & Buitellar, 2004) is a short form of the Pregnancy Related Anxiety Questionnaire (PRAQ). It is a 10-item form designed to measure ongoing anxiety related to the current pregnancy and the forthcoming birth. The instrument was originally used to measure specific fears and worries related to pregnancy in women. It comprises three subscales of anxiety specific to pregnancy: fear of giving birth, fear of bearing a handicapped child and pregnancy-related concerns about one’s appearance (not applicable for fathers). For example, the questionnaire contains statements such as: “I am worried that the child is mentally retarded or has brain damage.” When the scale is used for fathers, it is reduced by three items to make it more suitable to assess fathers’ possible anxiety-related stress. Questions related to anticipated pain in the process of birth, change in body perception after birth and fear about gaining weight were removed. Thus, the PRAQ-R score was based upon seven items administered to the fathers instead of 10.

The Edinburgh Postnatal Depression Scale (The EPDS) is a maternal self-report measure developed by Cox, Holden and Sagovsky (1987) that has been validated in Norway (Eberhard-Gran & Slinning, 2007). Postpartum depression is the most common complication

of childbearing. The 10-question EPDS is a valuable and efficient way of identifying women at risk for postnatal depression. Originally, the scale was developed to assess women's postnatal depression (Luoma et al., 2012), but it is also considered to be a reliable and valid method to assess perinatal depression in fathers (Cox & Holden, 2003; Matthey, Barnett, Kavanagh, & Howie, 2001) and to identify women and men at risk for postnatal depression (Edmondson, Psychogiou, Vlachos, Netsi, & Ramchandani, 2010). The scale measures mood problems, using questions such as "In the past seven days, have I felt sad or miserable?" and "In the past seven days, have I been so unhappy that I have been crying?".

These questionnaires were used at all data collection waves during pregnancy. EPDS was used again at 6 and 12 months postpartum. In article I, both PRAQ-R and EPDS were used as composite scores at five points of time during pregnancy, whereas in articles II & III both questionnaires comprised fathers' maximum score calculated from the distribution of scores at the five time points during pregnancy. For control purposes, the analyses were also performed using mean scores, which yielded similar results compared with maximum scores. The questionnaires, especially EPDS, are based upon the person's current subjective experience within the last week.

4.4. Parenting Stress Index (The PSI)

Paternal parenting stress was assessed with the questionnaire *The Parenting Stress Index* (PSI; Abidin, 1995), long version. It is a 101-item Likert-type parent self-report questionnaire, each item rated on a 5-point scale (strongly agree to strongly disagree). It consists of a *Parent domain*, with 54 parent-focused items and a *Child domain* with 47 child-focused items. Both domains were developed in response to needs for a measurement tool to assess salient child and parental characteristics, family context and the parent-child system (Abidin, 1986).

The child domain focuses upon how parents perceive their child's behavioral characteristics, and taps into temperamental characteristics with long-term predictive power (Korn, 1984). It is designed to reveal stressors arising from the way parents perceive their child and consists of the following six dimensions: Distractibility/hyperactivity, adaptability, reinforces parent, demandingness, mood and acceptability. High scores on the child domain are associated with children displaying qualities that make it difficult for parents to fulfill their parenting roles (Abidin, 1992). Higher scores in this domain indicate lacking emotional and active support of the partner in child management (Webster-Stratton, 1989), lower scores

are typical of children with parents experiencing more satisfying caretaking. In article II & III, the child domain total sum score was used as an outcome variable, which was denoted as perceived stress. Higher scores on this variable indicate more experience of stress, denoted as more *negatively perceived child behavior*.

The Parent domain consists of seven sub-scales: depression, attachment, role restriction, sense of competence, social isolation, relationship with spouse and parental health. A sub-scale in the parent domain used in article II & III; *The spousal domain* (or “relationship with spouse”), consists of seven items. Elevated scores in this domain are typical of parents who lack the expected emotional and active support in the area of child management (Russ, 1988; Webster-Stratton, 1989). This reflects a more negative relationship (Abidin, 1995; Beckman, 1991); negative marital quality is also associated with higher levels of parental stress (Lavee, Sharlin, & Katz, 1996). It captures relational negativity and a lack of parental mutual support, which are considered to be symptomatic of a dysfunctional relationship (Biernat & Wertman, 1991). This variable was denoted *spousal disharmony* in articles II & III and was also used as a latent variable. It was generally used as a self report measure of parental stress, collected at t8 and t9 (month 6 and 12 postpartum).

5.0. SUMMARY OF PAPERS

5.1. Paper I:

Prospective fathers’ adverse childhood experiences, pregnancy-related anxiety, and depression during pregnancy.

Aim: This paper aimed to investigate how paternal adverse childhood experiences relate to anxious and depressive feelings during pregnancy.

Method: A total of 981 fathers consented to participate in the study, of which 881 had valid data for adverse childhood experiences. Data collection comprised five time points during pregnancy: Time 1 (T1; Weeks 8–34) and four follow-up points; Time 2 (T2: Weeks 20–25), Time 3 (T3: Weeks 26–31), Time 4 (T4: Weeks 32–34), and Time 5 (T5: Week 36).

Results: Fathers with higher ACE scores reported more pregnancy-related anxiety than did fathers with lower scores at all time points in pregnancy, except at T5 (36 weeks), while also reporting more depressive feelings during pregnancy.

Conclusion: Health providers and community centres should pay more attention to fathers’ mental health during pregnancy, as the whole family system needs to be considered

during pregnancy to provide optimal healthcare. Adverse childhood experiences among fathers-to-be may increase depressive and anxious feelings during pregnancy.

5.2. Paper II:

Do fathers' prenatal mental health bear a relationship to parenting stress at six months?

Aim: This study aimed to explore fathers' mental health and retrospectively reported adverse childhood experiences during pregnancy and various pathways predicting self-reported stress at six months postpartum.

Method: A total of 835 fathers contributed data to the study. Data collection comprised five time points during pregnancy and one at six months postpartum. The main analyses were performed using linear regression and SEM path analyses.

Results: Linear regression analyses showed that paternal anxiety symptoms during pregnancy predicted stress scores in the PSI child domain at six months. First, path analyses showed that depressive symptoms during pregnancy predicted parenting stress in the child domain, mediated by spousal disharmony at six months postpartum, Second, adverse childhood experience scores predicted parenting stress in the child domain by two different pathways: one mediated by anxiety symptoms in pregnancy and the other by depressive symptoms in pregnancy and experienced spousal disharmony at six months postpartum.

Conclusions: The findings suggest that fathers' symptoms of anxiety and depression during pregnancy as well as adverse childhood experiences predict paternal stress and a negative perception of child behavior at six months postpartum. Health providers should be attentive to fathers' mental health during pregnancy and retrospectively reported adverse childhood experiences in order to understand fathers' stress postpartum.

5.3. Paper III:

Antecedents of Fathers' Perception of Child Behavior at Child age 12 months.

Aim: To assess if fathers' partner attachment style and adverse childhood experiences during pregnancy predict perception of their children's behavior 12-months postpartum. We then asked whether fathers' mental health and spousal disharmony mediated this association. In addition, we investigated the stability of fathers' report of perceived stress during the child's first year, from 6 to 12 months.

Method: Data collection comprised five time points during pregnancy and two time points postpartum at 6 and 12 months. The main analyses included linear regression, path-analysis and intraclass correlation based on mixed effects modelling.

Results: Linear regression analyses showed that adverse childhood experiences and attachment style did not significantly predict the outcome. Next, path analyses showed that more insecure partner attachment style (especially avoidant attachment) and adverse childhood experiences measured early in pregnancy strongly predicted paternal stress, mediated by mental health symptoms during pregnancy and spousal disharmony postpartum. Finally, intraclass correlation analyses showed that paternal stress evidenced substantial stability between 6 and 12 months postpartum.

Conclusion: The findings suggest that family interventions ought to be started early in order to prevent parenting stress in infancy, since predictors obtained during pregnancy are associated with postpartum spousal disharmony, which in turn influences parenting stress and how fathers perceive their child's behavior in infancy. The role of fathers as attachment figures for young children highlights the importance of employing fathers as participants and informants in research and caregiving.

6.0. METHODOLOGICAL CONSIDERATIONS

6.1. Recruitment of participants

Even if this study included a fairly large sample of fathers, we did not succeed in including as many fathers as we hoped for. A sample consisting of almost 1,000 participants may still be too small if one wants to analyze special subgroups. In addition, based on voluntary participation we may have oversampled well-functioning participants. The lower recruitment of becoming fathers is unfortunately one of the main obstacles in research on fathers (Cabrera & Peters, 2000; Flykt et al., 2009). There is much need for future studies that includes fathers as autonomous informants during pregnancy, instead of having only mothers reporting for fathers. It should be noted that there may be discrepancies and poor agreement between reports based on fathers and mothers, respectively (Ehrlich, Cassidy, & Dykas, 2011). This has especially been found in clinical samples. Observational and self-report measures between mothers and fathers show weak or moderate correlations (Alderfer et al. 2008), which casts doubt on the practice of using mothers as informants, instead of employing fathers themselves.

6.2. Continuous versus categorical variables

In the present work we used dimensional variables, instead of categorical ones with cut-offs, in order to improve statistical power and lessen residual confounding. Using categorical variables instead of continuous ones leads to loss of statistical information and might also hamper research replicability (Harrell, 2015). Our main interest was to gain knowledge of the phenomena in scope along a continuum, given an increase/decrease in each area of interest. We did not aim to make conceptual or categorical distinctions in order to study individual differences among fathers. Rather, we aimed at investigating matters of degree, rooted in the assumption that we studied a non-clinical sample and that we were not concerned with clinical diagnoses, only symptoms thereof.

We are aware that researchers sometimes convert continuous variables into categorical ones by grouping values into categories. There are many reasons for not grouping variables; one is that the use of a data-derived so-called ‘optimal’ cutpoint leads to bias. Sometimes, converting dimensional variables into categories is done in order to make the analysis and interpretation of the results simpler, easier to interpret and easier to present. Such simplicity is gained at a high cost and may generate new questions (Royston, Altman & Sauerbrei, 2006). Much information may be lost, so that the statistical power to reveal a relation between predictors and outcomes is reduced. When groups are created with artificial cut-points, measurement precision and statistical power can be compromised (Roisman, Fraley & Belsky, 2007). Also, with artificial cut-points, one might increase the risk of creating false positive results and underestimating differences. The use of groups highlights a non-linear relationship between variable and outcome, even though such non-linearity does not exist. There are also arguments about where the proposed cutoff should be, yielding doubts about adapting the cutpoints used in previous research. The usage of an “optimal” cutpoint may be risky due to spuriously significant results, overestimating the difference between the outcome groups (Altman & Royston, 2006).

6.3. The use of the Edinburgh postpartum depression scale (EPDS) with male responders

Questionnaires and self-report measures of depression, specifically the use of the EPDS for men, have been criticized because men tend to use “externalizing” strategies when depressed that are not accounted for in the EPDS questionnaire. Such strategies include drug and alcohol abuse, road rage, aggression, suicide, risk-taking behaviors, cynicism, avoidance

of social situations and having affairs (Brownhill, Wilhelm, Barclay, & Schmied, 2005; Melrose, 2010). The EPDS may be a general measure for assessing men's distress, rather than depression (Matthey, 2008; Massoudi, Hwang, & Wickberg, 2013). In the present work, the EPDS scores of prospective fathers during pregnancy were rather low, indicating that the participants may have reported more on general distress than on actual depression (Matthey, 2008). We therefore encourage further research in which higher risk fathers participate.

6.4. Latent and composite variables.

In both the second and third paper of this work, we used structural equation modeling (SEM) with Mplus. When performing the analyses, we basically used latent variables, but at some stages we met challenges with model convergence. Specifically, the ACE and EPDS scales left us with zero cells, which made the models unstable. The technique of parceling was therefore used for the EPDS in both paper II and III and at both points of time (6 & 12 months postpartum), leaving us with five sum scores for both latent variables instead of the originally 10 original items. Parceling is a well known method for handling such problems, following the recommendations of Little (2013). These recommendations suggest that variables should be ordered by their item-to-total correlation, and, iteratively, that remaining items with the highest and lowest item to total correlations should be parceled together, thereby resulting in a good internal reliability of the composite score.

Another challenge with model convergence was that for both outcome variables, perceived child behavior from the child domain assessed by means of latent variables, the models did not converge and became unstable. We therefore decided to use both variables with composite sum scores instead. Using them as such, we were vulnerable to measurement error, even though internal reliability (Cronbach alpha) was high for both variables. It should be noted, however, that the questionnaires contained many items, which in many cases decrease measurement error.

6.5. Single-informant bias

Previous research has found discrepancies and poor agreement between reports based on fathers and mothers, respectively (Erlich, Cassidy, & Dykas, 2011). In the present study all the information reported by the fathers stemmed from their independent autonomous reports. Usually, fathers' experiences are expressed via mothers' report, not by the fathers

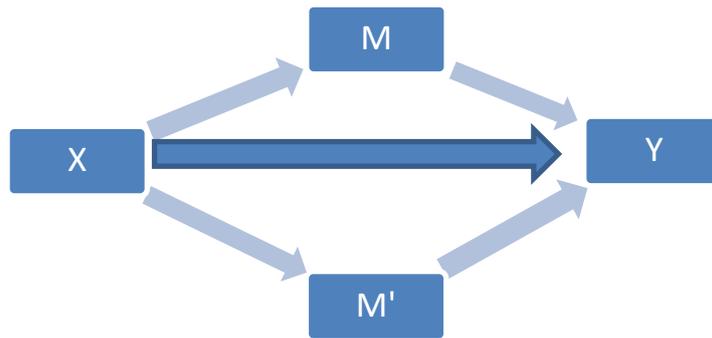
themselves. However, using multiple informants and methods ensures better validity (Shadish, Cook, & Campbell (2002), and the use of multiple informants is always an advantage. The employment of fathers only as informants in our work lessens the validity of the findings and may imply that one cannot assume causal relationships between risk and outcome. Shared method variance among parents, when they report on their own symptoms, as well as their children's, may represent a threat to validity, as their report may also represent the respondent's own characteristics (Najman et al., 2001).

Further, it has been shown that observational and self-report assessment correlate only weakly to moderately (Alderfer et al., 2008). After birth, traditional models of psychiatric epidemiology often assume that the relationship between individuals and their environments is unidirectional, from environment to person (Kendler & Baker, 2007). This is unfortunate and underscores the need of assessing multiple informants; it is currently widely accepted that individuals both *impact on* and are *impacted by* their environments (Wachs & Plomin, 1991).

6.6. The causal steps approach and mediation analyses

An important goal of social science research is the analysis of causal mechanisms. The goal of mediation analysis is to investigate alternative causal mechanisms by examining the roles of intermediate variables situated in the path between predictors and the outcome. The majority of published mediation analyses have previously been based on the logic of the causal steps approach, inspired by an article published by Baron & Kenny (1986). According to their approach, in order for M to be considered to be a mediator of the effect of X on Y, one must first establish that there is a significant effect from X on Y. If there is such an effect, one might proceed to the next step (mediation analysis). If there is no such significant effect, according to Baron & Kenny's approach, one does not proceed with the analysis.

There are several reasons for abandoning the causal steps approach. In our papers (especially paper II & III), we found few significant direct associations between predictor and outcome. According to the causal steps approach, we ought to stop further mediator testing, due to non-significance, based upon the belief that an effect that does not exist, can not be mediated.



X predicts Y directly. X also predicts Y via M and/or M'.

As shown in the figure, by proceeding with our mediator analysis we found that the predictors, adverse childhood experiences and attachment style, exerted their effects on perceived child behavior via the mediators mental health and spousal disharmony, but not directly. As shown in the figure above, the total effect of X on Y is the direct one plus the sum of all the other effects. This means that there are multiple pathways that may exert effects on Y. If we suppose that X only exerts effect on Y via M and M', and they may have about equal magnitude but different signs, then the total effect may be close to zero, meaning about no net effect. In such a case, this means that further analysis should stop, according to the causal steps approach. If so, we might end up underanalyzing our data.

The estimation of causal effects has allowed researchers to explore whether a predictor affects outcome, while it cannot tell us how and why such an effect arises. Importantly, the required identification of causal mechanisms is considered to be a limitation for testing competing theoretical explanations of the same causal effect. Hayes underscores that the causal steps approach belongs to old and less valid research methodologies and that future research ought to abandon this approach (2013 pp.166). The same view is supported by Imai, Tingley & Keele (2010), although their approach, casual mediation analysis, has important differences compared to the procedures developed by Hayes.

7.0. DISCUSSION

The present work led to several findings. *First*, elevated levels of adverse childhood experiences were significantly related to higher depressive and anxious feelings during pregnancy (paper I). *Second*, fathers' anxious symptoms directly predicted more negatively perceived child behaviors at 6 months postpartum. *Third*, adverse childhood experiences and non-optimal mental health measured prenatally predicted perceived parenting stress in the

Child Domain 6 months postpartum via mediated pathways (paper II). *Finally*, the work also shows that adverse childhood experiences and insecure attachment style measured early in pregnancy predicted negatively perceived child behaviors at 12 months postpartum, and that this prediction was mediated by mental health symptoms during pregnancy and spousal disharmony postpartum (paper III). *Additionally*, intraclass correlation analyses showed that perceived child behaviors had substantial stability over a six month period.

The specific findings that emanate from this study are discussed in each specific paper. Other important themes will be more thoroughly elaborated in this section. More specifically; the validity of reporting adverse childhood experiences in retrospect, the triangle between father, child and mother, fathers' involvement in childcare and their partner relationships, and the importance of biology and hormones in fatherhood. An alternative to Mary Ainsworth's "gold standard" of measuring attachment security, based on the activation relationship theory (Barrows, 2004) will also be discussed.

7.1. Retrospective reporting of adverse childhood experiences

In this study it was found that adverse childhood experiences (ACEs) as retrospectively reported, were significantly related to depressive and anxious feelings during pregnancy. One may argue that the validity of such retrospective reports, submitted by depressed individuals, might be questioned, since negative reporting bias may be associated with depression. Depression status has been found to affect reporting of the number of past depressive episodes and past traumatic events, and it is possible that the memory of a past negative event may be more accessible and reported more easily during a depressive episode (Schraedley, Turner & Gotlib, 2002). However, even though mood-congruent reporting may lead to retrieval biases and cognitive distortions of past experiences, longitudinal follow-up studies of adults whose childhood abuse has been documented through records and interviews, have consistently shown that retrospective reports of childhood abuse were likely to underestimate, rather than to overestimate, the actual occurrence of abuse (Femina, Yeager, & Lewis, 1990; Williams, 1995).

Several studies have found that proximal predictors of parenting (e.g. current depression) are less powerful than a parent's report of the way in which he or she was parented in childhood (Caspi & Elder, 1988). Shannon, Tamis-LeMonda & Cabrera (2006) have shown how men's childhood experiences with their parents influenced their involvement during infancy with their own child. Other studies have shown that parents with a history of

high cumulative ACEs evidence greater challenges in modulating their own stress responses (Szilagyi et al., 2016). In line with this research, we found that elevated ACE scores predicted heightened stress in the child domain indirectly 6 and 12 months postpartum. It should be noted that in the present study we investigated fathers' adverse childhood experiences during pregnancy, before child-birth, hence the fathers were not influenced in their reporting by child exposure.

Moe, von Soest, Fredriksen, Olafsen & Smith (2018) suggested that severe adversity experienced in childhood may contribute to the shaping of insecure attachment styles, through internal working models. These authors reported that mothers' own ACEs predicted postnatal parenting stress, and that attachment style operated as a mediator of this association. Even though this research was mainly carried out with mothers, it probably has transfer value to the present findings based on fathers. Thus, there are many studies that highlight and support the link between reported childhood trauma and pathological dissociation (Liotti, 2004).

7.2. The couple relationship, the mother-father-child triangle and paternal involvement in childcare

The understanding of the mother as the primary caregiver for a young baby has been underscored in numerous former writings. Among these, Winnicott (1971) stated that a child's play and positive development presuppose *potential space*, which can be understood as the gradual separation between child and mother in an area between fantasy and reality. In this context, Green (2000) included fathers and how they may "break up" the dyadic relationship and form a triadic one, promoting the development of potential space.

Other researchers have also given due weight to the father's contribution to the family system, such as Chiland (1982, p. 377): "*The concept of a purely dyadic relationship between infant and mother is now as unacceptable as the concept of a stage of normal autism*", emphasizing the importance of including the father in the relationship. The importance of including fathers and focusing upon the triad, compared with the dyad only, has also been highlighted by more recent research. Barrows (2004) describes how the infant, already from birth, has to deal with numerous relationships. It is the characteristics of the parental couple that the child encounters which, above all else, will be of importance for the infant's future mental health. Barrows maintains that our internal representations (including ghosts from the past) may be reenacted within the current relationship in the heat of the

moment (i.e. stress), replaying scenarios from our own childhood that may have persisting influence across generations (Barrows, 2004).

In the present study, fathers' perceived child behavior was highly stable during the second half-year of life. Barrows stated that it is not so much whose ghost it is that counts, whether it belongs to the father or the mother, but rather the nature of the interaction that ensues between the parents, and how this interaction affects the infant. He (ibid) further states that a united couple is deeply reassuring for the infant and lays the foundation for its future emotional well being, a notion that supports the importance of having fathers included in a mother-father-child triangle. He claims that more critical for the developing infant's future mental health than the father's individual role, is the nature of the parental couple relationship (ibid), conveying the notion that the emotional climate within which the infant is born is of utmost importance.

This view is supported by previous research showing an association between unsatisfying marital relationships and parental stress (Grych & Clark, 1999; Saisto, Salmela-Aro, Nurmi & Halmesmäki, 2008). In the present work spousal disharmony was found to have a mediating role; specifically we showed that elevated anxious and depressive symptoms, more adverse childhood experiences and less optimal partner attachment styles were associated with more spousal disharmony postpartum and less positive perceived child behavior. Of course, we cannot be certain about how these fathers, based upon their perceptions, actually interacted with their children. , But we may surmise that the caregivers' adverse experiences and mental health in childhood influenced the interactional quality with their children.

As shown in paper II & III, perceived child behavior was significantly predicted by the same variables (adverse childhood experiences, partner attachment style, and anxious and depressive symptoms) as was spousal disharmony. Other studies lend support to our findings concerning stress and spousal discord. Reliable and active backing from one's partner seems to improve a parent's psychological and relational satisfaction, thus enhancing parenting ability (Vismara et al., 2016). Vismara's conclusion is also in line with our findings that depressive feelings predict negative perception of one's child, via the experience of spousal disharmony. Hence, fathers seem to be consistently more involved in interaction with their infants when both they and their partners have supportive attitudes to paternal involvement. Thus, Lundy (2002) reported that marital dissatisfaction adversely affected paternal

synchrony, and thus the security of infant–father attachment, underscoring the need of preventing spousal discord in order to prevent child unfortune.

Our findings of how partner attachment style in pregnancy (paper III) was associated with negatively perceived child, as mediated by spousal disharmony, underscores the need to further investigate parents’ attachment patterns and how these may be linked with each other in order to prevent a negative family climate that the child consequently might ensue.

In paper III, we showed that insecure partner attachment style assessed in pregnancy predicted negatively perceived child behavior at 12 months postpartum, as mediated both by anxious and depressive symptoms during pregnancy and by spousal disharmony postpartum. Lamb, Pleck, Charow & Levine (1985) introduced the pillars that must be present for fathers to be involved with their children. These workers emphasized the importance of fathers’ interest to participate in direct interaction with their child during play and leisure activities when they were together, that they share experiences, and that the father takes responsibility for caregiving and play with the child. For this to be possible, the child must be accessible to the father, and the father must take responsibility for the child, with an understanding and an accommodating attitude towards the child’s needs, participation in the planning and organization of the child’s life. When fathers are actively engaged in caregiving activities, there are few differences between child–mother and child–father relationships (Parke & Asher, 1983).

Probably a main indicator of fathers’ engagement and involvement with their children from an early age is *couple satisfaction*. For example, Lundy (2002) reported that marital dissatisfaction adversely affected paternal synchrony and the security of infant–father attachment. In the present work we found that supportive spouses are important in order to experience less stress. This “couple indicator” stresses the importance of addressing the spousal relationship, not only the relationship between father-child or mother-child to trace engagement or involvement. It has been demonstrated that fathers interact more frequently with their children when they and their partners have supportive attitudes about the father’s involvement (Lundy, 2002). The bond between the parents is vital to consider because a disharmonic spousal relationship negatively affects the quality of interaction with the child, as well as the level of security in the father–child connection (ibid). Research should therefore include the spousal relationship in order to understand matters that are important for child well-being and when measuring the climate that ensues in the triad between child and parents (Barrows, 2014).

Fathers participate currently more actively in caregiving of their infants than former generations of fathers have done. Men's childhood experiences with their parents, their current relationship with their partners and demographic factors can all influence fathers' involvement during pregnancy (Flykt et al., 2009) and in their child's infancy (Shanon, et al., 2006). There is a relation between involvement in pregnancy and engagement with the child at age 1 and 3 (Shannon et al., 2006; Cabrera, Fagan & Farrie, 2008), suggesting stability of dedication over time. Studies have shown how highly engaged fathers contribute to more favorable outcomes; their children often have better cognitive development, better emotion regulation, better empathic understanding toward peers (Radin, 1994) and score higher on intelligence tests (Gottfried, Gottfried, & Bathurst, 1988). Nevertheless, there is still a lack of prospective studies on father involvement that begin in the prenatal or early infancy period, and research on paternal expectations during pregnancy, paternal transitions into fatherhood and fathers' roles as caregivers for infants is still scarce (Cabrera & Peters, 2000; Flykt et al. 2009).

One political suggestion for getting fathers more involved in childcare and preventing mothers from labour drop-out, is paternal leave. In 1993, paternal leave was introduced in Norway with a total of 4 weeks exclusively reserved for the father. Today, Norwegian fathers have a paternal leave for a total of 15 weeks (<https://familie.nav.no/om-foreldrepenger>). This arrangement, which is currently politically debated, is part of the Norwegian public policy for promoting father involvement. Consequently, young Norwegian fathers participate more actively in infant caregiving than fathers formerly did.

Cabrera & Peters (2000) underscore that there is little research that directly evaluates the effectiveness of existing social policies and programs targeted to increase father involvement. They emphasize the importance of mapping and tracking how new social trends influence children's development. The role of fathers as attachment figures for young children highlights the importance of employing fathers as participants and first hand informants in research and caregiving. Hence, both healthcare providers and researchers need to be more attentive to fathers in clinical encounters and in research settings, especially during pregnancy and in child infancy.

7.3. Biology, hormones and fatherhood

It has sometimes been argued that fathers lack a "maternal instinct," understood as an inborn quality that supposedly makes mothers more sensitive to their babies than fathers

(Solantus & Salo, 2005). In the same biological way of argumentation, there is more research that highlights biological changes with motherhood, compared with similar research concerned with fatherhood.

To the knowledge of the author, relatively few studies have investigated how prospective fathers in pregnancy and fathers of newborns are influenced by hormonal changes. A hormone that is related to *attachment* and *bonding* is oxytocin; most research with oxytocin has been done with mothers (Jolanta & Mohiyeddini, 2012). With relevance to article II & III, research has shown that adverse childhood experiences, depressive symptoms and trait anxiety are all negatively associated with oxytocin system activity in adulthood (Opacka-Juffry & Mohiyeddini, 2012). Studies of multiple attachments throughout life demonstrate that the extended oxytocin system provides the neurohormonal substrate for parental, romantic, and filial attachment in humans and shows stability over time within individuals (Feldman, 2012).

Some research has shown that more stimulating parents (both fathers and mothers) have comparable oxytocin levels during the first few months after their child is born (Gordon, Zagoory-Sharon, Leckman, & Feldman, 2010a), and that more stimulating fathers and more affectionate mothers have greater oxytocin level after child interactions than less responsive parents (Feldman, Gordon, Schneiderman, Weisman, & Zagoory-Sharon, 2010). Other findings of oxytocin in fathers show that exhibiting high levels of stimulatory contact leads to an increase in oxytocin levels. Specifically, higher oxytocin levels in parent and child are related to greater affect synchrony and infant social engagement in dyadic interaction (Feldman, Gordon & Zagoory-Sharon, 2010). Considering the present work, the bonding hormone (oxytocin) and time spent together lead to better bonding between father and child, supposedly lending arguments to the notion of men's sensitivity and "paternal instinct" as an inborn bonding quality.

Other research has been concerned with the steroid hormone cortisol, which has been called a "stress" hormone. This also sheds light on article II & III and our stress findings, since it has been shown that higher levels of cortisol are associated with parental responsiveness (Wingfield & Sapololsky, 2003). Especially, men reporting 'concern' about their emotional responses to infants' cues (child crying) have been reported to show enhanced cortisol levels in the perinatal period (Storey, Delahunty, & McKay, 2007). It should be noted that cortisol levels increase from early to late pregnancy in both mothers and fathers and then declines postpartum (Storey, Walsh, Quinton & Wynne- Edwards, 2000).

Other biological studies of fathers in infancy have focused upon the elevation of hormones associated with father–child interaction; such as testosterone and prolactin (Cabrera & Tamis-LeMonda, 2013). Among steroid hormones, primarily estrogen (females), progesterone (females), testosterone (males), oxytocin (both) and cortisol, all are implicated in parental behavior (Cabrera & Tamis-LeMonda, 2013). Specifically, lower testosterone levels have been linked to greater paternal responsiveness to their child (Alvergne, Faurie & Raymond, 2009), greater participation by fathers in direct health care, heightened affectionate contact and better interactional attunement with their children (Sarma, Kuo, Bechayda, Kuzawa & Gettler, 2018).

7.4. Father–child attachment and the activation relationship theory

Less research during the past 40 years has been done on father–child attachment, compared with mother–child attachment (Lamb, 2010). Older studies highlighted the different roles parents have in parenting, such that mothers talk, cuddle and play with toys, whereas fathers do rough and tumble play, especially with boys (Fitzgerald, 1977; Power, 1981); and that mothers teach babies about inner control and that fathers add a play dimension, which is an arousal dimension suited to teach babies how to get back in control (Yogman, 1982). Researchers often use the same attachment instruments and procedures when measuring father–child and mother–child attachment, respectively. More recent studies have suggested that the attachment between child and father works differently than that between child and mother. I will in the following present some of these newer studies.

A study of Dumont & Paquette (2013) offers new insights into father-child attachment. These workers compared two attachment procedures; the Ainsworth Strange Situation (Ainsworth, Blehar, Waters and Wall, 1978), which is the classic gold-standard method of assessing attachment quality, and a newer method; the Risky Situation (Dumont & Paquette, 2013). The strange situation measures a kind of parent-child attachment in which the parent takes on the role of comforting the child. Dumont & Paquette suggest that father–child attachment operates in a way that is different from merely comforting the children. According to Dumont & Paquette’s activation theory, the child–father relationship consists of two dimensions; stimulation and discipline. Fathers encourage their children to *explore* the world as well as being safe while doing so. They emphasize that the the risky situation is a better predictor of children’s social-emotional development than the strange situation, even

after controlling for paternal involvement. This view represents an alternative to classical attachment theory and conventional soothing practices.

This method may be linked to the important “world exploration” conception of father-child attachment, i.e. that fathers do rough and tumble play, especially with boys (Fitzgerald, 1977). This notion underscores the differential contribution of both parents, by comparing their quality of parenting. Today, we envisage that fathers have elevated levels of the attachment hormone oxytocin when playing with their children (Feldman, 2010), an elevation, presumably, not exclusively dedicated to mothers’ bonding experiences with their child. The fact is that, generally speaking, infants today usually do not grow up in a dyadic family context. From birth they are part of a much broader matrix and already have to deal with numerous relationships (Barrows, 2004).

8.0. CLINICAL IMPLICATIONS

The findings and conclusions that emanate from this dissertation may be relevant for psychologists, health nurses and doctors affiliated with well baby clinics, other professionals who work in the mental health services, and health providers in the first line services who are concerned about children and families. Health providers should focus on treating the whole family, including the father, since we now realize that children’s wellbeing is dependent on both parents and that they are better off with parents who communicate and cooperate.

The present work formulated its objectives in accordance with an overarching aim: to find out more about fathers’ mental health trajectories during pregnancy and during the child’s first year of life. We tried to do this under the assumption that increased knowledge of paternal mental health early on in pregnancy will inform intervention efforts aimed at supporting mothers and fathers in the potentially stressful transition period around childbirth. Knowledge of paternal attributes as caregivers is supposed to provide a basis for better understanding of prevention, detection, treatment and intervention strategies for the children and their families at an early point of time. In order to understand how paternal attributes can impact on child development and mental health in the whole family, one should focus on the accumulation of risk and protective factors, in addition to taking the individual child’s characteristics into consideration (Sameroff & Fiese, 2000).

The coordination Reform (2009) and the research strategy (2008-2012) of the Health South-East region in Norway highlight how the municipalities should be rewarded for investing in prevention and research in order to reduce the need for specialist health care

services. The reform and research strategy emphasize the importance of achieving better systems for resource analyses with respect to where and how assets should be invested in the chain and coordination of prevention, early intervention efforts, diagnostic work, treatment and rehabilitation. This is underscored by the goal of Norway's welfare model: equal access to good, equitable and balanced health and care services.

Healthcare providers need to motivate prospective fathers in their role as caregivers early in fatherhood. Fathers must be viewed as equal to mothers as caregivers, especially in child infancy. By providing qualified and updated information about the transition of a man to a father, by highlighting the importance of maintaining a harmonic spousal relationship, and by providing guidance of how fathers' can evaluate their fatherhood on their own premises, one may improve the quality of life for developing children. Specifically, we must focus upon fathers' mental health in pregnancy, especially since men seldom attend mental health services when needed. Parenting stress and caretaking casualty (e.g. related to postpartum depression or high parenting stress) constitute environmental risks for developing socio-emotional problems in young children.

Insights from motherhood research show that during interaction with their children, depressed mothers often show less reciprocity and synchronicity, and that they often fluctuate between being disengaged and intrusive (Luthar, D'Avanzo & Hithes, 2003); these factors are related to the children's developmental outcome. This insight has transfer value to fathers interacting with their children, underscoring the need of treating couples and families, not only mothers, with their child individually, especially since mental health symptoms covariate between partners and influence their children. One should also use fathers as autonomous respondents (as in the present work), as parents' subjective reports are not necessarily were highly correlated . For this reason, healthcare providers need to be more attentive to fathers' emotional health during pregnancy and to be more receptive to fathers in clinical encounters, including early in pregnancy. Knowledge of appropriate interventions and assistance in preparing for fatherhood may be seen as a public health responsibility (Fletcher et al., 2006).

9.0. FUTURE DIRECTIONS

The findings of this work contribute to increased knowledge of father background attributes in pregnancy, their mental health and how fathers perceive their child's behavior in infancy. We encourage replication studies that include cross-cultural research in order to explore fathers in infancy in different cultures, and we also encourage research that comprises

clinical subgroups of fathers. In the present work we may have oversampled well functioning participants.

Further, future studies should focus on the whole family system during pregnancy and postpartum, because a new family's capacity to form a triadic relationship may be crucial for a successful childhood and parenthood. We need to know more about how fathers cope and how they actually behave in their role as fathers, not only how they perceive their child or interpret themselves as caregivers. In the same way of thinking, more knowledge of the dynamic aspects of how fathers perceive and manage stress in parenthood is needed.

Adding the dimension of behavioral observation to parents' self-reports is needed as the correlations between behavioral observation and self-report measures are only weak to moderate (Alderfer et al. 2008). In addition, future studies should strive to assess diverse methods to measure attachment security, not only by assessing soothing quality, as in the Ainsworth classic gold-standard method of evaluating child attachment quality, but also by employing newer methods, such as the Risky Situation method (Dumont & Paquette, 2013).

The present work controlled for the effect of parity, but did not analyze the child's gender in separate analyses. Future studies may address this issue, especially since research has shown that child gender may be related to parenting quality. There is also evidence that parents are more sensitive to their girls than to their boys (Lovas, 2005). It may be that fathers perceive more stress with girls than with boys; with same gender child it may be easier to recognize the needs of the child due to the parent's own experiences (Lam, McHale, & Crouter. 2013). Hallers-Haalboom et al. (2014) reported, however, that among 389 families with children between the age of 1 and 3, the child's gender was not related to parenting in any of the analyses. They suggested that parent gender is more salient than child gender in the prediction of parenting practices in early childhood.

Finally, it should be noted that Van Holland De Graaf, Hoogenboom, De Roos & Bucx (2014) suggested that fathers' parenting behaviors are associated with paternal and child characteristics as well as with contextual factors in ways similarly to how these factors are associated with mothers' parenting behaviors.

10.0. CONCLUSIONS

In the present study we found that adverse childhood experiences are significantly associated with symptoms of anxiety and depression at different points in pregnancy (paper I), and that adverse childhood experiences and partner attachment style predict negative paternal

perceptions of the child (paper II & paper III), thereby inducing experienced stress (Webster-Stratton, 1990).

The results add to extant knowledge about various paternal dynamic trajectories to mental health, partner attachment, spousal relational quality and the attribution of the child's behavior during the early parenthood period. Antecedent factors present already before the child is born, influence fathers' mental health during pregnancy and how a father perceives his child's behavioral characteristics in infancy, showing that such attributions are mediated and prevail over time.

The findings further suggest that family interventions ought to be started early, since a father's negative perception of the child's behavior can be predicted early on in becoming a father. Taken together, the findings point to the importance of addressing fathers' mental health in the early fatherhood period in order to provide proper aid when needed, even before the child is born. Especially, adverse childhood experiences, partner attachment style, mental health and spousal harmony seemingly act in concert to shape paternal perceptions of their infants, which again may affect child development, and also the whole family, over time,

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