Fathers' mental health and child development

The predictive value of fathers' psychological distress during pregnancy for the social, emotional and behavioral development of their
children

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Contents

Scientific environment

The research and writing of this thesis were performed from 2011 to 2014 at the Section of Mental Health Research, Department of Psychiatry, Helse Fonna HF, Norway, in collaboration with the Bergen Group for Treatment Research, Department of Clinical Psychology, University of Bergen, Norway. The research and the thesis were supervised by Eva Biringer, Helse Fonna HF; Børge Sivertsen, Norwegian Institute of Public Health, Bergen/Uni Health, Uni Research, Bergen/Helse Fonna HF; and Odd E. Havik, University of Bergen. This research also involved cooperation with Paul Ramchandani, Imperial College, London; Jürg Assmus, Haukeland University Hospital, Bergen; Malin Eberhard-Gran, Norwegian Institute of Public Health, Oslo/Akershus University Hospital; and Oddbjørn Hove, Helse Fonna HF.

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Abbreviations

ALSPAC—Avon Longitudinal Study of Parents and Children

ASQ−Ages and Stages Questionnaire

BSI−Brief Symptom Inventory

CBCL-R−Child Behaviour Checklist Revised

CES-D−Epidemiologic Studies Depression Scale

CI−Confidence interval

CD−Conduct disorder

DC 0-3−Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood

EPDS−Edinburg Postnatal Depression Scale

DSM−Diagnostic and Statistical Manual of Mental Disorders

GP−General practitioner

ICD−*International Classification of Diseases*

ITSEA−Infant Toddler Social and Emotional Assessment

MoBa−Mother and Child Cohort Study (Den Norske mor og barn-undersøkelsen)

MBRN−Medical Birth Registry of Norway

MSS−Marital Satisfaction Scale

OR−Odds ratio

ODD−Oppositional defiant disorder

PCA−Principal component analysis

SCL-5−Symptom Checklist-5

SCL-90 (R)−Symptom Checklist 90 Revised

SDQ–Strengths and Difficulties Questionnaire

WHO – World Health Organisation

Abstract

Background

While the effect of mothers' mental health on children's development is well documented, studies of the predictive value of psychological distress in fathers for their children's early psychosocial and behavioural development are still scarce. Most studies in this field have investigated the effect of fathers' postnatal depression on children's development. Two longitudinal population cohort studies on the predictive value of fathers' mental health during pregnancy for early child development found an association between expectant fathers' psychological distress and their children's development. However, further investigation of this association is warranted.

Objectives

The overall aim of this thesis was to investigate if and to what extent expectant fathers' mental health presents a risk factor for their children's development.

Paper I: To examine the association between symptoms of psychological distress in expectant fathers and the social, emotional and behavioural outcomes in their children at 36 months old and, given the existence of such an association, to assess the strength of this association of psychological distress in fathers with subsequent developmental difficulties in their children

Paper II: To investigate whether high levels of psychological distress in expectant parents are a risk factor for their children's development and to evaluate the predictive value of high level of psychological distress during pregnancy in fathers, mothers and both parents for their children's development

Paper III: To assess the prevalence of physically aggressive behaviour, defined as hitting others, in a large preschool-age child population and to investigate the association between expectant fathers' psychological distress and children's physically aggressive behaviour at 5 years old

In all three studies, the associations between psychological distress in fathers and children's development were controlled for a large number of potentially confounding factors.

Methods

This study was based on data from 31,663 children participating in the Norwegian Mother and Child Cohort Study (MoBa) (Magnus et al., 2006). Data on fathers' and mothers' prenatal psychological distress were obtained through the self-report Symptom Checklist-5 (SCL-5) at week 17 or 18 of gestation. Information on children's social, emotional and behavioural development was obtained from mothers' reports, using selected parts of the Strengths and Difficulties Questionnaire (SDQ), Infant and Toddler Social and Emotional Assessment (ITSEA) and Child Behavioural Checklist Revised (CBCL-R) (Achenbach & Ruffle, 2000; Carter, Brigg-Growan, Jones, & Little, 2003; R. Goodman, 1997, 2001). Linear and logistic regression analyses were performed to assess the predictive value of fathers' psychological distress for their children's subsequent development.

Results

Of the fathers, 3% had high levels of psychological distress, defined as scoring higher than 2.00 on the SCL-5. We found small but consistent associations between fathers' psychological distress and children's behavioural difficulties, emotional difficulties and social functioning. In addition, a high level of psychological distress in fathers was associated with an almost doubled odds ratio (OR) for emotional difficulties in their children at 36 months old.

The frequency of a high level of psychological distress in both mothers and fathers in this sample of expectant parents was 3.6%. When one or both parents reported a high level of psychological distress during pregnancy, the OR for emotional problems in their children at age 3 was significantly higher than among children whose parents did not report a high level of psychological distress during pregnancy. The risk of emotional difficulties in the child was higher when only the mothers reported a high level of psychological distress than when only fathers reported an elevated level of distress. The risk of emotional difficulties for children was highest when both parents presented high levels of psychological distress, indicating an additive effect from parents' psychological distress on their children's development.

Earlier research findings reported that persistent physically aggressive behaviour from early childhood on is a risk factor for poor social adaption throughout childhood and adolescence. In this sample, 16% of the children still displayed physically aggressive behaviour (hitting others) at age 5. Boys hit others significantly more often compared to girls at 18 months old and at 3 years old but not at age 5. Children of fathers with high levels of psychological distress, as measured by the SCL-5, had an increased risk of

hitting others at age 5. However, when the sample was stratified for gender, this effect of expectant fathers' high level of psychological distress on hitting was found in girls but not in boys.

Conclusions

There are small but consistent associations between expectant fathers' psychological distress and subsequent social, emotional and behavioural developmental problems in their children. The findings of this study suggest that an increased risk of future developmental problems can be identified during pregnancy. Additionally, the results indicate that parents' psychological distress has an additive effect on their children's development: When high levels of psychological distress were observed in both parents, the OR for developmental problems in their children was higher than when only one parent suffered from such distress.

The population-based study adds knowledge to the field of early onset behavioural difficulties in childhood, with the findings that approximately 16% of the preschool-aged children in the population-based sample still performed physically aggressive behaviour (hitting) in their interactions with others and that psychological distress in fathers was a risk factor for physically aggressive behaviour in their 5-year-old daughters. Based on earlier studies, the finding that fathers' psychological distress was a risk factor for hitting behaviour in only girls was unexpected. Further studies are needed to explore these gender differences in physically aggressive behaviour, along with fathers' psychological distress as a risk factor in their children's behavioural difficulties.

List of publications

The thesis is based on the following papers, which are referred to by their Roman numerals:

I.   Kvalevaag, A. L., Ramchandani, P. G., Hove, O., Assmus, J., Eberhard-Gran, M., & Biringer, E. (2013). Paternal mental health and socio-emotional and behavioural development in their children. *Pediatrics*, *131*(2), e463–9.

II. Kvalevaag, A. L., Ramchandani, P. G., Hove, O., Eberhard-Gran, M., Assmus, J., Havik, O. E., Sivertsen, B., & Biringer, E. (Submitted 2014). Parents' prenatal mental health and social, emotional and behavioural development in their children.

III. Kvalevaag, A. L., Ramchandani, P. G., Hove, O., Eberhard-Gran, M., Assmus, J., Havik, O. E., Sivertsen, B., & Biringer, E. (Submitted 2014). Does paternal mental health in pregnancy predict physically aggressive behaviour in their children?

1. INTRODUCTION AND THEORETICAL FRAMEWORK

1.1 Fathers and child psychopathology

Relatively few studies have addressed fathers' influence on child and adolescent psychopathology, but there has been growing awareness that fathers play a role in normative developmental processes (Phares, 1992; Phares, Lopez, Fields, Kamboukos, & Duhig, 2005) and influence their children in ways very similar to those of mothers (Lamb, 2012). The amount of time fathers spend with their children is increasing in the Western world (Ramchandani & Psychogiou, 2009). In Norway, for instance, changes in parental leave policy since 1993, including extending paternity leave from four weeks in 1993 to 12 weeks in 2011, have given fathers opportunities to spend more time with their children. Four years after the extended parental leave was implemented, 75% to 80% of new fathers used it (Grambo & Myklebø, 2009). With fathers' increasing involvement in early childcare in the West, growing awareness of their role in normative child development and a relative lack of studies on their influence on childhood psychopathology, it has become important to gain insight into and empirical evidence on the effect of fathers' mental health on child development.

A review of 577 articles on child psychopathology from 1984 to 1991 found that 26% of the studies involved both parents who were analysed separately, 25% involved parents without specifying their sex, 48% involved only the mother, and 1% involved only the father (Phares, 1992). A 2005 review found that fathers continued to be absent in research on developmental psychopathology: Of the 508 articles, 45% included only mothers, 2% included only fathers, 25% included both mothers and fathers and analysed them separately, and 28% included both mothers and fathers but did not analyse them separately or note the parent's sex (Phares et al., 2005). There are several possible explanations of why there is less research on the role of fathers' mental health in their children's development. Phares (1992) indicated that mothers are

more frequently available for research projects involving their children than fathers (Phares, 1992). As well, due to historical differences in labour force participation by men and women, fathers have not been expected to be available for research and so have been invited to participate to a lesser degree. Researchers seem less willing to design research in a way that enables fathers' participation. It has been argued that the way research is conducted affects fathers' willingness to participate; for example, home visits have been shown to increase fathers' participation rate. Another possible explanation for fathers' underrepresentation in child psychopathology studies is the differences in the forms of maternal and paternal psychopathology. For instance, fathers have a lower prevalence of depression and higher rate of externalisation and substance abuse than mothers, which might affect participation rates. However, men and women's willingness to participate in research studies seems to differ in general, with studies involving men generally having higher non-participation rates than those with female respondents (Phares 1992).

This thesis uses data from the Norwegian Mother and Child Study (MoBa), a longitudinal cohort study following families from pregnancy onwards in order to create a database for research on diseases in mothers and children and causal pathways for diseases and developmental difficulties. Fathers were also invited to participate in MoBa, making it possible to investigate the relationship between expectant fathers' psychological distress and early child development.

1.2 Developmental psychopathology

Developmental psychopathology, as presented by Cicchetti (2006), provides a broad, integrative framework for the three studies presented in this thesis, which have the common goal of understanding the association between fathers' mental health and children's subsequent

development. As a research approach, developmental psychopathology draws upon both developmental and psychopathological perspectives to study differences in child development. In the developmental approach, it is important to investigate both normal and pathological development and to distinguish between situation-specific behaviours and pervasive psychiatric disorders (Rutter, 1988; Rutter & Sroufe, 2000). As well, in understanding the pathway of causal processes in development, it is assumed that a single risk factor can have diverse consequences (multifinality) and that a single disorder outcome can arise by a variety of routes (equifinality) (Cicchetti, 2006). Developmental psychopathology refers to the interplay among the biological, psychological and social contextual aspects of normal and abnormal development across the life span (Cicchetti, 2006). Developmental variations can be examined through differences in time of onset, incidence, prevalence and remission as the approach also takes into consideration the developmental appropriateness of behavioural patterns and continuities in psychopathology from childhood to adulthood. The goals of developmental psychopathology are to understand psychopathological development across childhood, the reasons why some children develop psychological difficulties and others do not and the risk and protective mechanisms involved in order to prevent psychological problems and develop interventions for children and families suffering from them. To do so, both normal and abnormal development across the life span needs to be explored.

1.3 The transaction model and child development

The transaction model is an etiological model in which both biological and environmental factors are assumed to continuously interact and influence each other over time (Sameroff & Chandler, 1975). In the transactional model of child development, four domains of factors additively and interactively contribute to the emergence and persistence of developmental difficulties: 1) parent–child interaction and attachment; 2) children's characteristics such as

temperament and cognitive abilities; 3) parental characteristics such as personality and psychological distress such as depression; and 4) contextual characteristics such as socioeconomic and demographic factors, partner relationships and stressful life events (Smeekens, Riksen-Walraven, & H.H.A., 2007). In this model, parents' and children's characteristics are of equal importance, and both parents and children are understood as active contributors in the relationship. Parenting is influenced by children's characteristics such as temperament, which can contribute to the qualitative and quantitative aspects of the parent–child interaction. In the same way, the parents' characteristics, such as their personality and psychological distress, contribute to the interaction. Both negative parenting behaviour and a lack of positive parenting behaviour can affect children's developmental problems. Negative parenting behaviours such as harsh discipline, hostility and intrusiveness have been related to increased risk for externalising problems. As well, a lack of parental sensitivity, warmth, involvement and positive guidance are related to externalising problems in preschool-aged children (Smeekens et al., 2007).

Furthermore, when children are exposed to negative developmental events, biological self-correcting processes might start. The children are undergoing active, dynamic developmental processes and move into more complex functioning as they acquire new cognitive, emotional, behavioural and social abilities. In early childhood, biologically based maturation also plays an important role (Smith, 2010). The transactional model of child development acknowledges both risk factors and protective factors. Resilience is a dynamic, adaptive developmental process. Children who have been exposed to adverse or threatening circumstances can still adapt and develop in a positive way (Luthar, 2006). For instance, children exposed to the same parental distress sometimes adapt and develop differently (Borge, 2010).

In this thesis, we investigate the association between fathers' psychological distress and children's early social, emotional and behavioural development in the framework of

developmental psychology and the transactional model. Fathers' psychological distress can affect children's environment from pregnancy onwards, and fathers' and mothers' psychological distress and marital relationship can affect their parenting style and the interplay between parents and children. In this framework, both parents and children contribute to their interaction.

1.4 Mechanisms for the transmission of risk

This thesis examines fathers' mental health during pregnancy as a risk factor for children's subsequent social, emotional and behavioural functioning. In general, risk transmission can be divided into three groups: genetics, environment and the interplay of genetics and environment (Ramchandani & Psychogiou, 2009; Rutter, Moffitt, & Caspi, 2006). The genetic influence commonly does not result from a single-gene mechanism but, rather, the interaction of many genes, each exerting a small effect on the development of mental disorders (Rutter et al., 2006). The environmental mechanisms in risk transmission include differences in child care, parents' involvement, socioeconomic hardship, parents' interaction and marital conflict, parents' mental health and traumatic experiences (Ramchandani & Psychogiou, 2009). Due to gene– environmental interaction, some risk factors, such as exposure to fathers' mental health problems, might affect only children with particular genetic endowments. Traumatic and environmental experiences throughout childhood can influence these epigenetic development processes in which genetic, neural, behavioural and environmental factors are all at play.

1.5 Children's mental health problems

Mental health researchers have exhibited reservations about exploring psychological distress and mental health problems among children under 3 years old, and we find relatively few

population-based studies on psychological difficulties among young children before 2000 (Mathiesen et al., 2007). These reservations were based partly on the argument that psychological problems in young children have relatively low stability and that normal, transient developmental problems are at risk of being aggregated with more persistent mental health problems (Mathiesen et al., 2007; Mathiesen & Sanson, 2000). It is also possible that normal diversity of development and maturation in infancy can be misclassified as psychopathology and abnormal development. It has been argued that it is difficult to measure developmental problems in a valid and reliable way in children younger than 4 years old. Children age 4 and older exhibit mental health symptoms more like those seen later in childhood and adolescence, and diagnostic tools based on the major diagnostic classification systems—*International Classification of Diseases* (*ICD*) and *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*)—are usually available from that age onwards. However, a new diagnostic classification system for children under age 4, *Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood* (*DC 0-3*), has been developed to better describe behaviour problems in infancy, as well as the child–parent relationship (Martinsen, 2009; Zeanah, 1997).

In general, psychological distress in the young children reveals itself in difficulties adapting to family routines and activities, such as problems related to sleep, eating and playing, and in regulating the level and expression of emotions, such as aggression and sadness (Mathiesen et al., 2007). Trivsel og Oppvekst, Barndom og Ungdomstid (TOPP), a longitudinal Norwegian population study started in 1993 (N=934) (Mathiesen et al., 2007; Mathiesen & Sanson, 2000), aimed to investigate the early signs, trajectories and causes of psychological distress in early childhood at 18 months, 2.5 years old and 4.5 years old; in late childhood between 8 and 9 years old and between 12 and 13 years old; and in early adolescence between 14 and 15 years old. The study concluded that problems can be reliably identified in children from 18 months

onwards. The study identified four characteristics of infant behavioural problems: overactive–inattentive, social adjustment, emotional adjustment and regulation. In the study, 15% of the children had emotional or behavioural difficulties at 18 months old. At 2.5 years old, the problems persisted in 56% of the children with previous symptoms of developmental difficulties (Mathiesen et al., 2007; Mathiesen & Sanson, 2000).

1.6 Prevalence of mental health problems in children

A review by the Norwegian Institute of Public Health (2009) found the prevalence of mental health problems in preschool-aged children (0–5 years old) to be between 6% and 15%. Of children 1.5 to 16 years old, 10% to 16% had symptoms of anxiety, depression or eating problems severe enough to affect their daily life. The prevalence of emotional and behavioural problems was slightly under 6% in the Norwegian studies, somewhat lower than the 10–16% reported in international studies (Mathiesen et al., 2007; Martinsen, 2009).

In another Norwegian population-based study of 4-year-old children, Trygg i Trondheim, the estimated population rate for any mental health disorder was 7.1%. The prevalence rates for the most frequent, single disorders were as follows: attention deficit hyperactivity disorder, 1.9%; oppositional defiant disorder (ODD), 1.8%; conduct disorders (CD), 1.8%; anxiety disorder, 1.5%; and depressive disorder, 2.0% (Wichstrøm et al., 2011).

Another review by the Norwegian Institute of Public Health (Skogen & Torvik, 2013) of 56 studies estimated the prevalence of diagnosed behavioural disorders in children and adolescents under age 18 to be 1.7% for CD and 1.8% for ODD. Both these conditions presented gender differences, with an overrepresentation of boys. However, the review gave no prevalence estimates for children under age 4.

So far, published studies reporting prevalence rates of mental health problems in infancy in Norwegian populations are scarce, and the early signs, trajectories, prevalence and causes of mental health problems in the youngest children still need to be explored.

1.7 Fatherhood and fathers' involvement

The role of fathers in children's development has been described by several authors (Bögels & Phares, 2008; Lewis & Lamb, 2003; Pruett, 1998; Ramchandani & Psychogiou, 2009). A review by Bögels and Phares (2008) concluded that, in the Western world, fathers have a different role in childcare than mothers. Furthermore, they state that paternal involvement is characterised as active, exiting and unpredictable, as rough and tumble play and that fathers' role is to help the child get out in the world. Fathers' involvement seems important for children's development of autonomy (Bögels & Phares 2008). In another review, Pruett's (1998) most robust finding is that it is the quality, not the quantity, of interaction between father and infant that facilitates children's social competence. Fathers use shorter, staccato bursts of language and physical stimulation in verbal and nonverbal communication with infants, whereas mothers' communication is more modulated and predictable. Play by itself is an important component of the father–infant relationship. Children respond positively to playful interaction with their fathers, seeking and reinforcing it (Pruett, 1998). Men's patterns of interaction with their children are more boisterous, playful and unpredictable than those of women, whose care is more smoothing, containing and restrictive; however, research conducted over the past four decades has demonstrated that both mothers and fathers are significant and important in their children's development (Lamb, 2012).

1.8 Fathers' mental health and children's development

1.8.1 Prevalence of fathers' mental health problems

In the three studies of this thesis, fathers' mental health was operationalised as their psychological distress (i.e. fathers' self-reported symptoms of depression and anxiety on questionnaires) instead of clinical conditions diagnosed by specialists in structured diagnostic interviews. In earlier studies described later in this thesis, prevalence estimates vary depending on the operationalisation of mental health problems, type of sample (high-risk or population-based sample), sample size, measures used, time of assessment (pre- or postnatal), and whether the men included were first-time fathers. The prevalence of depression is somewhat higher in parents with small children than in the total population; for instance, Paulson, Keefe and Leiferman (2009) found that the prevalence of depression among fathers of infants in the Western world was 6% to 12%, compared to 3% to 4% in the general population (Paulson et al., 2009). In a community sample using the self-rating Edinburg Postnatal Depression Scale (EPDS), 4% of fathers had depressive symptoms postpartum (Ramchandani, Stein, Evans, & O'Connor, 2005). Another study using a short form of the Center for Epidemiologic Studies Depression Scale (CES-D) found symptoms of depression in 10% of fathers at 9 months postpartum (Paulson, Dauber, & Leiferman, 2006). A recent meta-analysis reported estimated pre- and postnatal depression rates of 10.4% among fathers, with this highest prevalence seen at 3 to 6 months postpartum (Paulson & Bazemore, 2010). These meta-analysis estimated rates for fathers were lower than the meta-analysis estimated rates for mothers (23.8%). Another study found that 50% to 67% of fathers who experienced depressive symptoms prenatally also did so at a later assessment point during the first year after birth, indicating a relatively high stability of symptoms (Matthey, Barnett, Ungerer, & Waters, 2000).

1.8.2 Postnatal depression in fathers and children's development

Data from earlier population-based studies documented that fathers' self-reported depressive problems in the postpartum period predict developmental problems in their children (Davé, Sherr, Senior, & Nazareth, 2008; Hanington, Ramchandani, & Stein, 2010; Ramchandani et al., 2005). These studies found associations between fathers' depression and social, emotional and behavioural problems in their children: Fathers' self-reported depressive symptoms (EPDS, cut-off >12) during the postnatal period were associated with adverse emotional and behavioural outcomes in their children at age 3.5 (N= 10,024), as measured by mothers' reports on the Rutter Revised Preschool Scale (cut-off: top 10% of the scores) (Ramchandani et al., 2005). That study also found an increased risk of conduct problems in boys but not girls at the same point. In other studies, a greater likelihood of pre-social behavioural and peer problems in 4- to 6-year-old children (N=3,659) was associated with fathers' self-reported depressive symptoms (Davé et al., 2008), and children' temperament issues were shown to be associated with parents' mental health problems (Hanington et al., 2010). Parents' self-reported depression (CES-D) at 6 to 8 months after birth predicted temperament issues in their children at 21–24 months old, including greater difficulties with regulation of emotions, activity and attention (Hanington et al., 2010).

These findings indicate that fathers' postnatal depression might have a different effect on boys and girls; specifically, boys are more vulnerable than girls when exposed to paternal mental health problems (Hanington et al., 2010; Ramchandani, O'Connor, et al., 2008; Ramchandani et al., 2005). Behavioural difficulties and hyperactivity, but not emotional difficulties, were found more frequently in boys than girls in families where the father suffered from depression (Ramchandani, O'Connor,et al., 2008, Ramchanani et al ., 2005). Hanington et al. (2010) reported gender differences in the relationship between parents' depression at 6–8 months of the child's age and a difficult temperament in children at 21–24 months old. In that study, boys

in families with depressive problems had more difficulties than girls, suggesting that gender might act as a moderator in the association between fathers' mental health and children's early development.

1.8.3 Fathers' prenatal mental health and children's development

Most studies of fathers' mental health and child development have focused on the association between fathers' postnatal depression and children's development. To the best of our knowledge, only two previous studies have investigated the predictive value of prenatal paternal mental health for children's development. The population-based, cohort Avon Longitudinal Study of Parents and Children (ALSPAC) (N=14,541) found an association between fathers suffering depression (self-reported on the EPDS, cut-off >12) in the pre- and postnatal periods and behavioural disorders in their children at 3, 5 and 7 years old (maternal reports on the Rutter Revised Preschool Scales, cut-off: top 10% of the sample) (Ramchandani, Stein et al., 2008). By comparing children with depressed fathers grouped into three categories (only depressed prenatally, only depressed postnatally and depressed at both times) to those children whose fathers had not been depressed, this study found higher rates of total problems on the Rutter scale for all groups of children with depressed fathers (prenatally, postnatally and at all times) (Ramchandani, O'Connor et al., 2008). The effect found for each category remained significant after adjusting for potential confounding factors (maternal depression, paternal education, marital status and other children in the family). An association between fathers' prenatal mental health problems and developmental difficulties in their children was confirmed in another prospective population-based study: Depressive symptoms in fathers measured by the Brief Symptom Inventory (BSI) at 20 weeks of pregnancy were related to excessive crying (as reported by the parents) in 2-month-old infants (N=4,426) (van den Berg et al., 2009).

Taking these studies together, it seems reasonable to conclude that the empirical evidence on the association between fathers' prenatal mental health and children's development remains scarce, and there is a need for further studies.

1.8.4 The effect of fathers' mental health on parenting

Knowledge and empirical documentation of the content and quality of the father–child relationship, the risk transmission between fathers and their children and the effect of fathers' mental health on their parenting are of importance for the development of evidence-based preventive healthcare. A review of paternal psychiatric disorders and their effect on children's psychosocial development found that most psychiatric disorders affecting fathers are associated with an increased risk of behavioural and emotional difficulties in their children, similar in magnitude to the effect found for maternal psychiatric disorders (Ramchandani & Psychogiou, 2009). A mediating factor in the association between fathers' mental health and child development was the fathers' parenting style (Ramchandani & Psychogiou, 2009). Depressive symptoms such as a depressed mood, irritability, hopelessness and reduced energy in parents seemed to affect their ability take care of their children.

Additionally, it was shown that parents' depressive symptoms reduced their participation in positive activities with their children (Paulson et al., 2006). The parenting style of fathers with depressive symptoms was characterised by fewer positive activities, such as reading, singing and hugging, and a higher level of conflict in the relationship with the child. The effect of fathers' mental health problems, especially depression, on their parenting is well documented in a meta-analysis of 28 publications, which found that depressed fathers were less involved in positive activities and more involved in negative activities in their parenting (Wilson & Durbin, 2010).

1.9 The interaction between paternal and maternal psychological distress and children's development

A longitudinal survey with cross-sectional data of children ages 3 to 12 years (N=822) living with both parents found elevated levels of behaviour problems in children when mothers or both parents reported psychological distress but not when only fathers reported high level of psychological distress (Kahn, Brandt, & Whitaker, 2004). The authors concluded that the most severe problems for children's development occurred when both parents had poor mental health (Kahn et al., 2004).

A recent meta-analysis showed that indicators of paternal depression were positively correlated with indicators of maternal depression and that an increase in depression in one partner could led to an increase in the depression in the other (Paulson & Bazemore, 2010). In addition, a review of 26 empirical studies found that men suffering from depression both during their partner's pregnancy and the postpartum period more frequently reported having a depressed partner, poor relationship between father and mother and low social support in daily life (Wee, Skouteris, Pier, Richardson, & Milgrom, 2011).

Children's emotional, cognitive and physical development has been found to be affected by the mothers' mental health during pregnancy (Hollins, 2007; Moses-Kolko & Roth, 2004). Additionally, attention has been drawn to fathers' mental health during pregnancy and the mechanism for transmission of risk, specifically genetic transmission of risk and how fathers' mental health affects pregnant mothers' mental health (Field, Diego, & Hernandez-Reif, 2006). The prospective association between fathers' prenatal mental health and children's development was confirmed in two earlier studies (Ramchandani, O'Connor, et al., 2008; van

den Berg et al., 2009). These studies reported that indicators of fathers' mental health were related to the child's development problems after controlling for the mothers' mental health.

It is well established that the children of mothers with high level of psychological distress have an increased risk of developmental difficulties, including social, emotional and behavioural problems such as attachment insecurity, difficulties with emotional regulation and poor cognitive development (Goodman & Gotlib, 1999). In a model for the transmission of risk to the children of depressed mothers, Goodman and Gotlib (1999) also show how fathers can moderate, i.e. increase or decrease, the possible consequences of inadequate parenting by depressed mothers.

However, most of these studies looked at the effect of parents' mental health problems on parenting in the postnatal period. The question of whether and how the co-existence of paternal and maternal prenatal mental health problems affects their children's development still requires exploration. Another question that needs investigation is which covariates affect or explain the association between expectant fathers' and mothers' psychological distress and child development.

1.10 Prevalence and trajectories of physically aggressive behaviour in young children

Earlier studies looked at the frequency and trajectories of physically aggressive behaviour in young children. A population-based study (N=572) identified three trajectories of the frequency of physically aggressive behaviour, such as biting, hitting, kicking, bullying and fighting, in children at 17, 30 and 42 months old (Tremblay et al., 2004). The largest group (58%) followed a developmental trajectory of a moderate level of aggressive behaviour. The second largest group of children (28%) displayed little or no physical aggression during all three observations,

and the third and smallest group followed a trajectory of increasing high-level physical aggression (14%). Additionally, a longitudinal study (N=271) by Alink et al., (2006) found that physically aggressive behaviour occurred in 12 month olds, increased significantly in 24 and 36 month olds and then declined after the third year of life. The importance of these findings lies in their demonstration that persistent hitting after age 5 predicts externalising and internalising problems and the development of mental disorders later in life (Cote, Vaillancourt, LeBlanc, Nafin, & Tremblay, 2006). Cote at al. (2006) found that, in a group of children ages 2 and 11 (N=10,658), 17% of the sample followed a high and stable trajectory of physical aggression. Boys from disadvantaged families were overrepresented in this sample (Cote et al., 2006). Findings from the Behavior Outlook Norwegian Development Study (BONDS) on the developmental course of physical aggression from 8 to 26 months (N=1,159) showed patterns of aggressive trajectories similar to those reported in Tremblay studies (Tremblay et al., 2004) described earlier (Nærde, Ogden, Janson, & H.D., 2014). The development of physically aggressive behaviour was nonlinear with a peak in frequency at 20 to 22 months, followed by a decline towards 26 months.

Based on these findings by (Alink et al., 2006; Nærde et al., 2014; Tremblay et al., 2004), physically aggressive behaviour in infancy such as hitting can be seen as a common way of expressing anger. Most children learn to regulate this behaviour during their preschool years. Among a majority of 3-year-old children, however, hitting is still a frequent behaviour. At age 5, most children have learned to control their physically aggressive behaviour and to use other conflict resolution strategies (Tremblay et al., 2004). Only a small group of children, an estimated 4%, continue to use physically aggressive behaviour throughout childhood (Nærde, Ogden, Zachrisson, & Janson, 2012). Other studies have found that, in some children (17%), high and stable physically aggressive behaviour persists into adolescence (Cote et al., 2006). We, therefore, should focus on how children learn to inhibit physically aggressive behaviour,

instead of the process of learning how to act aggressively (Alink et al., 2006; Tremblay, 2010). We also need more knowledge about why physically aggressive behaviour persists from early childhood into adolescence in some children but not in others (Nærde et al., 2012) in order to prevent development of mental health problems later in life (Cote et al., 2006).

1.11 Predictors of persistent physically aggressive behaviour in preschool-aged children

The factors associated with persistent physical aggression during early childhood still need investigation as studies on fathers' mental health as a risk factor for physically aggressive behaviour are scarce. Some argue that both genetic and environmental factors influence physically aggressive behaviour (Dionne, Tremblay, Boivin, Laplante, & Perusse, 2003;. Tremblay, 2010). Studies focusing on genetic influences have found that half of the variation in aggressive behaviour, behaviour disorders and crime can be attributed to genetics (Rhee & Waldman, 2002). Environmental factors, such as coming from a low-income family and having parents with serious problems living together, are related to high trajectories of physical aggression in children (Tremblay et al., 2004). Other studies have found an association between expectant fathers' mental distress and children's behavioural, emotional and social functioning (Ramchandani, O'Connor et al., 2008). In addition, disengaged interaction between fathers and their 3-month-old children predicted behaviour problems when the children reached 1 year old (Ramchandani et al., 2013). A high risk of physically aggressive behaviour was predicted by the presence of a same-age sibling, maternal and paternal mental distress and difficult child temperament (Nærde et al., 2014).

Physically aggressive behaviour and persistent aggressive behaviour (behaviour that seems unaffected by others' reactions to it) can have great negative consequences for the individual

child across the life span (Campbell, Spieker, Burchinal, & Poe, 2006). In addition, persistent physically aggressive behaviour in children has been related to less social competence, fewer friendships, lower school performance and increased criminal behaviour in adolescence, especially among boys (Broidy et al., 2003).

Early indicators of later persistence of aggressive behaviour can be identified, so methods for early focused preventive interventions can be established, reducing the negative consequences for the individual child, families, peers and society. In this thesis, we explore the relationship between fathers' psychological distress and physically aggressive behaviours in children at age 5.

2. RESEARCH AIMS AND QUESTIONS

The overall aim of this thesis was to study the predictive value of fathers' psychological distress during pregnancy for their children's social, emotional and behavioural development.

Aim of Paper I

The aim of this study was to examine the prospective association between symptoms of psychological distress in expectant fathers and the social, emotional and behavioural outcomes in their children at 36 months old. This investigation employed both a continuous and a categorical approach to fathers' psychological distress and children's outcomes.

Aim of Paper II

The aim of this study was to examine the relation of expectant parents' psychological distress with their children's development at 36 months old. We assessed the predictive value of high level of psychological distress in fathers and mothers, both separately and simultaneously, for their children's development at 36 months old.

Aims of Paper III

The aims of this study were firstly to investigate psychological distress in expectant fathers as a risk factor for children's physically aggressive behaviour (defined as hitting others) at age 5. Secondly, the aim was to assess the prevalence of hitting in a large population of participants at 18 months old, age 3 and age 5. Finally, we aimed to explore whether there are gender differences in the prevalence of hitting among children and whether expectant fathers' psychological distress acts differently as a risk factor for hitting at age 5 for boys and girls.

3. METHODS

3.1 Design

3.1.1 Cohort studies

Health surveys based on general population samples are designed to obtain information about the prevalence of diseases and probable risk factors for a given disease. Cohort studies are useful epidemiological tools for evaluating the strength of associations between exposure and outcomes and investigating factors that might confound or moderate these associations. In cohort studies, multiple exposures measured at baseline and related outcomes of interest can be explored over a long period of time (Prince, Stewart, Ford, & Hotopf, 2009). The primary purpose of a cohort study is to produce findings that can be generalised to the population of interest. In the context of this thesis, the strength of the prospective population cohort study is the ability to obtain important empirical knowledge about children's developmental trajectories, risk factors for children's development and the importance of paternal and maternal mental health for children's social, emotional and behavioural development. A

limitation of cohort studies in general, however, is the risk of selection bias arising from self-selection and loss to follow-up.

3.1.2 The Norwegian Mother and Child Cohort Study

In 1999, the Norwegian Institute of Public Health launched the Norwegian Mother and Child Cohort Study (*Mor og Barn undersøkelsen*, or MoBa) to investigate the causes of disease in mothers and children (Magnus et al., 2006). Pregnant women in Norway were invited to participate through a postal invitation sent after they had scheduled a routine ultrasound examination at their local hospital. The project recruited women from all parts of Norway (except two hospitals: Rikshospitalet University Hospital and University Hospital North Norway). During the recruitment period (1999–2008), 38.5% of the invited women consented to participate (Magnus et al., 2006). As of 2010, the MoBa cohort consisted of 108,000 children, 90,700 mothers and 71,500 fathers.

The longitudinal design of the MoBa study makes it possible to explore children's development from birth through early childhood. By testing the association between expectant fathers' psychological distress and their children's development in a large population sample, most selection biases commonly found in clinical studies are avoided. In addition, the large sample size gives sufficient statistical power to detect very small effects which might be clinically relevant. The study's prospective design can provide evidence for parent–to–child directionality and makes a child–to–parent effect less likely to be the cause of the effects found.

3.1.3 Time points of measurement and questionnaires in the Norwegian Mother and Child Cohort Study

The women who agreed to participate received three self-administrated questionnaires by mail during pregnancy (weeks 17, 22 and 30 of gestation), and the participating fathers received one self-administrated questionnaire in week 17 or 18 of gestation. The mothers also received new questionnaires when the children were 6, 18 and 36 months old and 5, 7, 8 and 12 years old. Table 1 describes the data collection process in the MoBa.

Table 1

Data collection process in the Norwegian Mother and Child Cohort Study (MoBa)

Time point	Events in the data collection process
Weeks 10–14 Before ultrasound	Names and addresses of pregnant women sent weekly from general practitioners (GP) to the Medical Birth Registry of Norway (MBRN) Copy of list sent from the MBRN to MoBa Information sent from MoBa to pregnant women
Week 17 Ultrasound examination Ultrasound Questionnaire 1 Fathers' questionnaire	Mothers invited to participate Blood samples taken from mother and father and urine samples from a subsample of mothers Information about this and earlier pregnancies Mothers' general health, medication, diet, education, profession, living conditions and lifestyle Fathers' general health, profession, environmental exposures, lifestyle and diet
Week 22 Questionnaire 2	Mothers' questionnaire about diet
Week 30 Questionnaire 3	Mothers' health in pregnancy, working conditions and lifestyle

Birth	Blood samples from mother and umbilical cord
Age 6 months	
Questionnaire 4	Birth, diet, health and development in the child's first months
Age 18 months	
Questionnaire 5	Mother and child's health and diet and child's development
Age 3 years	
Questionnaire 6	Mother and child's health and diet and child's development
Age 5 years	
Questionnaire five years (since 2010)	Child's health with emphasis on language and communication
Age 7 years	
Questionnaire 7	Child's health, diet and lifestyle
Age 8 years	
Questionnaire (from 2011)	Child's behaviour and language development and mothers' mental health and lifestyle
Age 12 years	
Questionnaire (from2013)	Child's health and psychological development

*Based on information on MoBa's website (http://www.fhi.no/studier/den-norske-mor-og-barn-undersokelsen)

3.1.4 Inclusion criteria and participants in the study sample

The present study used version V of the quality-assured data files released from MoBa for research in 2010. The first two studies (Paper I and Paper II) included only those participants who completed the fathers' and mothers' questionnaires at 17 or 18 weeks of gestation and the

mothers' report when the children were 36 months old. The last study (Paper III) also included participants who completed both the fathers' and the mothers' questionnaires at 17 or 18 weeks of gestation and mothers' questionnaire when the children were 18 months old, 3 years old and 5 years old. This means that missing data were not replaced, and the study sample was comprised only of dyads and triads of fathers, mothers and children with completed data (list-wise deletion) (Widaman, 2006). This treatment of missing values was selected due to the large sample size with relatively low missing rates. The missing data rates for the predictor variables were 1% (n= 205) for fathers' SCL-5, 0.3% (n= 8) for mothers' SCL-5 and 9% (n= 2,777) for the summary scales of child development (total for the three scales). Table 2 shows the number of participants in the total sample (total number of children in the quality-assured files, version V /2010) and the study samples (comprise of dyads and triads of fathers, mothers and children with complete dataset) for Papers I, II and III.

Table 2

Total number of children and study samples in Papers I, II and III

	Total			Study		
	Sample	Fathers	Mothers	Samples	Boys	Girls
Paper I	31,663	31,458	31,647	28,703	14,662	14,041
Paper II	31,663	31,458	31,647	28,695	14,660	14,035
Paper III	20,155	20,002	20,148	19,580	9,988	9,592

*The discrepancy between children in the total sample and fathers and mothers in Table 2 is due to fathers and mothers having more than one child participating in the MoBa.

3.2 Ethics

3.2.1 Participants' consent in in the Norwegian Mother and Child Cohort Study

The participants (both mothers and fathers) in MoBa gave their written informed consent in accordance with the Health Research Act (July 1, 2009). All participants were informed that participation in the research study was voluntary and that, following article 16 of the Health Research Act, participants could withdraw their consent at any time without having to give a reason. Participants were also informed that their child would be informed of the study at age 15 and, at age 18, asked to give consent to further participation.

The parents invited to participate in MoBa provided broad consent to participate (§14, Health Research Act), which entitled them to receive information about the project at a regular basis. MoBa shares information about research projects and findings from its data through newsletters and on its homepage (http://www.fhi.no/studier/den-norske-mor-og-barn-undersokelsen).

3.2.2 Ethical approval

The MoBa study was given approval to collect and maintain health information before the project started in 1999 under old legislation (licensed by the Datatilsynet, the Norwegian Data Protection Authority, and approved by the Regional Committee for Medical and Health Research Ethics). This present study was approved by the Regional Committee for Medical and Health Research Ethics, Health Region South-Eastern Norway on 18 February 2011.

3.3 Measures

3.3.1 Instruments

The MoBa questionnaires are comprised of selected parts of several standard, well-researched and internationally known questionnaires. Here, we review only those questionnaires used in the present three studies. Table 3 shows the instruments used in Papers I, II and III, which collected information about expectant mothers' and fathers' self-reported psychological distress and mothers' reports of children's social, emotional and behavioural development. As MoBa included only selected items from each original child development instrument, the reported psychometric properties could not be taken into account, and the structure and reliability of the selected items had to be re-operationalised in the present studies.

Parental psychological distress

Symptom Checklist-5 (SCL-5): The SCL-5 is an indicator of global psychological distress and has been used as a screening measure for psychological distress in several studies (Holm, Tyssen, Stordal, & Haver, 2010; Tambs et al., 2009). The selected items from the SCL-5 are items 2, 30, 31, 33 and 54 from the SCL-90 (Derogatis, 2010). The SCL-5 correlates highly with SCL-25 (r=0.92) (Tambs & Moum, 1993). The SCL-5 was found to have 68% sensitivity and 96% specificity when using the Medical Health Index (MHI-5) as the criterion and the SCL-5 as the test variable (Strand, Dalgard, Tambs, & Rognerud, 2003).

The checklist primarily screens for the intensity of symptoms of anxiety (items 1, 2 and 5) and depression (items 3 and 4) during the preceding 14 days (Tambs & Moum, 1993): (1) feeling fearful (item 33 in the SCL-90-R); (2) internal nervousness or shakiness (item 2 in the SCL-90-R); (3) feeling hopeless about the future (item 54 in the SCL-90-R); (4) feeling blue (item 30 in the SCL-90-R); and (5) worrying too much about things (item 31 in the SCL-90-R). Participants' rated their answers to these five items on a scale of 1 to 4: 1 = not bothered, 2 = a

little bothered, 3 = quite bothered and 4 = very bothered. In the present valid sample, the Cronbach's alpha for the SCL-5 was 0.79 for fathers and 0.80 for mothers. To identify clinically relevant cases of psychological distress, the SCL-5 total scale was dichotomised at a raw score of 2.00 for both fathers and mothers (Strand et al., 2003).

Marital Satisfaction Scale (MSS): The MoBa questionnaire contained five items from the MSS (total items 48) (Blum & Mehrabian, 1999; Roach, Frazier, & Bowden, 1981): (1) My partner and I have problems in our relationship; (2) I am very happy in my relationship; (3) My partner is usually understanding; (4) I am satisfied with my relationship to my partner; and (5) we agree about how children should be raised. Each item was scored on a 6-point scale: 6 = totally agree, 5 = agree, 4 = slightly agree, 3 = slightly disagree, 2 = disagree and 1 = totally disagree. The negatively worded item (N= 1) in the MSS is inverse scaled, and a summary scale is calculated by adding the item scores. Higher scores on the summary scale indicate a more positive spousal relationship. Both parents completed this self-report instrument in week 17 or 18 of gestation. Internal consistency, as estimated by the Cronbach's alpha in the MSS, was 0.71 for fathers and 0.77 for mothers in the present study.

Child development

Strengths and Difficulties Questionnaire (SDQ): The SDQ is a parent-report questionnaire assessing mental health in children (Goodman, 1997, 2001). The original SDQ has 25 items. MoBa included the following five pro-social items which all make positive statements about the child: (1) considerate of other people's feelings; (2) shares readily with other children (treats, toys, pencils); (3) helpful if someone is hurt, upset or feeling ill; (4) kind to younger children; and (5) often volunteers to help others (parents, teachers, other children). The SDQ items were rated on a 3-point scale: 0 = not true, 1 = somewhat true and 2 = very true/often true. Inter-item consistency as measured by the Cronbach's alpha in the present study sample was 0.77 for these selected items.

Infant Toddler Social and Emotional Assessment (ITSEA): The ITSEA is a parent-report measurement of socio-emotional problems and competencies in 1- to 3-year-old children (Carter et al., 2003). Of the ITSEA's 166 items, 44 are included in the MoBa questionnaires (Cronbach's alpha = 0.60 for these selected items) (e.g. becomes aggressive when he/she is frustrated, mood varies greatly from day to day, wakes up several times during the night). Items were rated on a 3-point scale: 0 = not true/rarely true, 1 = somewhat true/sometimes true and 2 = very true/often true.

Child Behavioral Checklist Revised (CBCL-R): The CBCL-R is an instrument used to assess mainly behavioural and emotional developmental difficulties in children from 1.5 to 5 years old (Achenbach & Ruffle, 2000). Of the CBCL-5 100 items, 26 are included in the MoBa questionnaires (e.g. gets into many fights, is defiant, cannot concentrate, too fearful or anxious). The items were rated on a 3-point scale: 0 = not true, 1= somewhat or sometimes true and 2 = very true/often true. Inter-item consistency as measured by Cronbach's alpha in the present study was 0.77 for the selected items.

The Ages and Stages Questionnaire (ASQ): This screening instrument for child development from 4 to 60 months old is based on parents' report (Squires, Bricker, & Potter, 1997). It contains 30 items scored on a 3-point scale: 1 = yes, 2 = a few times and 3 = not yet. The present analyses used two items assessing language development: (1) Without giving him/her help by pointing or using gestures, will your child to 'Put the shoe on the table' and 'Put the book under the chair'. Does your child carry out both of these directions correctly? (impressive language skills); and (2) Can your child tell you at least two things about an object he/she is familiar with? If you say, for example, 'Tell me about your ball', will your child answer by saying something like 'It is round, I can throw it, it is big'? (expressive language skills).

Table 3

Instruments used in Papers I, II and III

	Instrument	Paper I	Paper II	Paper III
Predictor variable	SCL-5, fathers' and mothers' psychological distress, all 5 items included	X	X	X
	MSS, marital satisfaction, 5 items from a total of 48 items		X	X
Outcome variable	SDQ, pro-social developmental problems, 5 items included in MoBa from a total of 25 items	X	X	
	ITSEA, social and emotional competences, 44 items included in MoBa from a total of 166 items	X	X	
	CBCL-R, mainly behavioural developmental difficulties, 26 items included in MoBa from a total of 100 items	X	X	X
	ASQ, developmental mile-stones, language skills, 2 items from a total of 30 items			X

*Symptom Checklist-5 (SCL-5), Marital Satisfaction Scale (MSS), Strengths and Difficulties Questionnaire (SDQ), Infant Toddler Social and Emotional Assessment (ITSEA), Child Behavioural Checklist Revised (CBCL-R), Ages and Stages Questionnaire (ASQ)

3.3.2 Operationalisation of outcome variables—children's social, emotional and behavioural development

As stated, several questionnaires in MoBa included only a few items, and the wording of some items was changed. Consequently, the items could not be added to produce the standard total or subscales of the instrument. Therefore, the available outcome measures were operationalised

based on 1) a priori theoretical assumptions of the underlying constructs in the original instruments, 2) exploration of factor structure and 3) assessment of internal consistency between items. The operationalisation of the summary scales, representing dimensions of children's development, was based on the selected items from the SDQ, ITSEA and CBCL-R. Items were reverse scored when necessary so that all measures had scaling in which higher scores represented higher levels of psychological distress.

3.3.2.1 Explorative factor analysis

Seventy-five items from the SDQ (5 items), ITSEA (44 items) and CBCL-R (26 items) were entered into a principal component analysis (PCA) with Varimax rotation. Eighteen factors with eigenvalues =>1 emerged initially. Together, these factors explained 48% of the total variance in variables. However, based on an evaluation of the scree plot, eigenvalues and theoretical and empirical considerations concerning constructs underlying the outcome variables, the PCA was re-done with the number of factors set to 3. These factors all had eigenvalues =>2.8 and together explained 21% of the item variance. The following factors emerged: 1) behavioural difficulties; 2) emotional difficulties; and 3) social functioning.

3.3.2.2 Computing of summary scales

Three summary scales representing constructs presumed to underlie the previously mentioned factors were calculated by adding the weighted standardised items within each factor. The weighted scores were computed by multiplying the standardised scores for each item with their respective weights derived from a 1-factor PCA performed on the raw scores in each dimension. The 'alpha if item deleted' reliability procedure was performed, and items with a negative 'corrected item—total correlations' were excluded, leaving altogether 48 items in the

three final summary scales. As measured by Cronbach's alpha, the resulting summary scales had moderate internal consistency: 1) Behavioural difficulties (21 items) had a Cronbach's alpha of 0.65; 2) emotional difficulties (19 items) had a Cronbach's alpha of 0.62; and 3) social functioning (8 items) had a Cronbach's alpha of 0.72. (Appendix 1 presents the items from each instrument used in the three scales).

The three final summary scores did not show normal distributions, so they were log transformed and then standardised again (z-scores with mean=0 and SD=1). These three summary scales were used as outcome measures in the inferential analyses discussed later. As in other studies, the three summary scales of children's development were dichotomised at the 90th percentile, as scores higher than cut-off presumably indicate problems with clinical relevance (Kane & Garber, 2004).

3.3.3 Covariates

The covariates used to control crude associations for the relationship between fathers' psychological distress and their children's development were selected after a review of the available literature, the previously introduced theoretical models of child development and the available variables in the MoBa questionnaire.

A review by the Norwegian Institute of Public Health presented risk factors associated with mental health problems in the general population: socioeconomic risk factors, such as level of education, profession, income and unemployment; lifestyle factors, such as use of alcohol, cigarettes and physical activity; and relationship problems and social isolation (Mykletun & Knutsen, 2009). Based on this review, earlier studies by (Ramchandani, O'Connor et al., 2008; van den Berg et al., 2009) and the availability of demographic and lifestyle variables in MoBa,

the following variables were used to control for possible confounders: age, education, marital status, somatic health condition, physical activity and use of alcohol and cigarettes (Table 4).

In all papers, we controlled for mothers' self-reported psychological distress, as earlier studies found that maternal mental health problems are associated with an increased risk of social, emotional and behavioural difficulties in children (Goodman & Gotlib, 1999; Moses-Kolko & Roth, 2004). As well, marital satisfaction (MSS) was controlled for in the adjusted models in Papers II and III, as other researchers have found that marital conflict has an impact on children's outcomes and partially mediates the relationship between parental mental health and child development (Hanington, Heron, Stein, & Ramchandani, 2012; Lamb, 2012; Wee et al., 2011). Additionally, children's language skills (ASQ) were controlled for in the adjusted model in Paper III, as language development is reported to have high comorbidity with a variety of disruptive behaviours in preschool-aged children (Alink et al., 2006; Dionne et al., 2003). Further, the number of siblings was also controlled for in Paper III as other studies have found that a higher frequency of physically aggressive behaviour in preschool aged children in families with more than one child (Ramchandani, O'Connor et al., 2008; Tremblay et al., 2004). Whether the child was living with the father was included as covariate in the analysis in Paper III as earlier studies found that the time fathers spend with their children has an impact children's development (Bögels & Phares, 2008; Lamb, 2012; Mezulis, Hyde, & Clark, 2004; Ramchandani & Psychogiou, 2009). The variables controlled for in the adjusted models are presented in Table 4.

Table 4

Control variables in the analyses in Papers I, II and III

Control Variables	Paper I	Paper II	Paper III

Fathers' age	X	X	X
Mothers' age		X	
Marital status	X	X	X
Fathers' education	X	X	X
Mothers' education		X	
Mothers' SCL-5	X		X
Fathers' somatic condition in pregnancy	X	X	X
Mothers' somatic condition before pregnancy		X	
Fathers' MSS		X	X
Mothers' MSS		X	X
Fathers' cigarette smoking	X	X	X
Mothers' cigarette smoking during pregnancy		X	
Fathers' use of alcohol	X	X	X
Mothers' use of alcohol during pregnancy		X	
Fathers' physical activity	X		
Pregnancy planned		X	
Children's language skills			X
Siblings			X
Living with father			X

*Symptom Checklist-5 (SCL-5), Marital Satisfaction Scale (MSS)

3.4 Statistical methods

In Paper I, a linear regression model was employed to analyse the level of paternal psychological distress as measured by the SCL-5 and the three summary scales of behavioural difficulties, emotional difficulties and social functioning which represented children's development. Fathers' SCL-5 total scale was the predictor variable, and the three summary scales of children's functioning were the outcome variables. To investigate whether high levels of psychological distress in fathers is associated with developmental problems in their children, logistic regression analyses were performed with the SCL-5 total scale dichotomised at the raw score ≥ 2.00 (Strand et al., 2003) as the independent variable and the three summary scales of children's development dichotomised at the 90th percentile (Kane & Garber, 2004) as the dependent variables.

In Paper II, logistic regression models were used to investigate the relationship between parents' mental health during pregnancy (parents' SCL-5 dichotomised with the cut-off set to 2.00) and children's behavioural, emotional and social functioning at age 3.

Tests in both Papers I and II were two-tailed with the significance level set at $p < 0.001$ in order to avoid Type I errors due to the multiple comparisons performed.

To explore the predictive value of fathers' psychological distress during pregnancy for physically aggressive behaviour (hitting) in their children at 5 years old, a multinomial logistic regression model was employed in Paper III. The predictor variable in this model was fathers' SCL-5 dichotomised at the cut-off ≥ 2.00 and children's hitting as an outcome variable with three levels as the reference category (stopped hitting before age 5, hitting at age 5 and never hitting). The tests in Paper III were two-tailed with the significance level set at $p < 0.05$. All analyses were conducted using Statistical Product and Service Solutions (SPSS) Predictive Analytics Software (PASW) 18.0 for Microsoft Windows.

4. RESULTS AND SUMMARY OF THE PAPERS

In accordance with the overall research aims of this thesis, the findings of the three papers consistently supported the hypothesis that social, emotional and behavioural development in children is related to expectant fathers' psychological distress. In addition, psychological distress in both parents had an additive effect on their children's development, as the highest risk for children's subsequent problems in social, emotional and behavioural development at age 3 was found when both parents reported high levels psychological distress during pregnancy. Fathers' psychological distress was found to be a risk for hitting by their daughters at age 5. Finally, 16% of the children in this Norwegian population still used physically aggressive behaviour (hitting others) at age 5.

4.1 Findings in Paper I

Paper I examined the association between symptoms of psychological distress in expectant fathers and their children's social, emotional and behavioural outcomes at 36 months old. Three percent of the fathers had high levels of psychological distress, defined as scoring above 2.00 on the SCL-5. In the linear regression analysis, we found a small but consistent positive association between fathers' psychological distress and children's behavioural difficulties, emotional difficulties and social functioning. The associations did not change substantially when controlling for relevant confounders, specifically fathers' age, education, marital status, somatic conditions, fathers' use of alcohol, cigarette smoking, physical activity and mothers' mental health. In the logistic regression model analysing the three summary scales of

behavioural, emotional and social functioning with the cut-off set at the 90th percentile as the outcome variables and high levels of psychological distress in the expectant fathers as the predictor variable, only the fully adjusted model with emotional difficulties as the outcome remained significant. High levels of psychological distress in expectant fathers' almost doubled the risk of emotional problems in children at 3 years old.

4.2 Findings in Paper II

In Paper II, we examined the combined effect of high-level psychological distress in expectant fathers and mothers as a risk factor for their child's social, emotional and behavioural development. Children in such families had a significantly higher OR for emotional difficulties compared with families in which the parents did not report a high level of psychological distress. As well, the OR was higher when only mothers, rather than only fathers, had a high level of psychological distress. The highest OR for children's development was found when both parents reported high levels of psychological distress, indicating that parents' psychological distress has an additive effect on their children's development. Controlling for fathers' marital satisfaction (MSS) caused the greatest attenuation of OR in these models. However, the OR for emotional difficulties remained statistically significant after adjustment for all covariates in the model.

4.3 Findings in Paper III

Paper III investigated expectant fathers' psychological distress as a risk factor for persistent physically aggressive behaviour, defined as hitting others, in their children at age 5. Further, the prevalence of hitting behaviour in a population-based sample at 18 months old, 3 years old and 5 years old was investigated. At age 5, 16% of the children in this sample still showed

physically aggressive behaviour, according their mothers' report. Compared with the girls, the boys in this sample hit others significantly more frequently at 18 months old and 3 years old but not at 5 years old. Compared with children who never hit others, the risk of hitting at age 5 was higher in children whose expectant fathers had a high level of psychological distress (cut-off 2.00 on the SCL-5). When this population-based sample was stratified for gender, expectant fathers' level of psychological distress was found to be a risk factor for physically aggressive behaviour in girls but not boys at the age 5. When controlling for relevant confounders in the model, children's language skills at age 5 increased the OR for hitting others, suggesting that language functioning had a suppressor effect in the relationship between expectant fathers' psychological distress and children's hitting. As well, controlling for whether the father lived with the child led to a decrease in the OR for the risk that expectant fathers' high level of psychological distress represented for children hitting others at age 5.

5. DISCUSSION

5.1 Main findings

Three per cent of the fathers had high levels of psychological distress, defined as scoring above 2.00 on the SCL-5. We found a small but consistent association between fathers' psychological distress and children's behavioural difficulties, emotional difficulties and social functioning. Additionally, a high level of psychological distress in fathers was associated with an almost doubled OR for emotional difficulties in their children at 36 months old. The risk of emotional difficulties in children was higher when only mothers reported a high level of psychological distress than when only the fathers did, but the risk of emotional difficulties in children was

highest when both parents presented high levels of psychological distress. These trends indicate an additive effect of parental psychological distress on children's emotional difficulties. In this sample, 16% of the children still displayed physically aggressive behaviour (hitting others) at age 5. Boys hit others significantly more often than girls at 18 months old and age 3 but not at age 5. Children of fathers with a high level of psychological distress according to the SCL-5 had an increased risk of hitting others at age 5. However, when the sample was stratified for gender, this effect of expectant fathers' high level of psychological distress on hitting was found in girls but not boys.

5.1.1 Expectant fathers' mental health and child development

The findings in Paper I suggest that psychological distress in expectant fathers represents a risk of future child developmental difficulties. Two earlier prospective population-based studies investigating the association between expectant fathers' mental health and their children's development found such an association to be significant (Ramchandani et al., 2008; van den Berg et al., 2009). These findings are in accordance with our main finding that the prenatal psychological distress of fathers predicts later social-emotional and behavioural problems in their children. However, these two studies and our study present several differences. Van den Berg et al.'s (2009) study (N=4,426) had only one outcome measure for behavioural or emotional problems (excessive crying, i.e. crying > 3 hours for > 3days), whereas Ramchandani, O'Connor et al.'s (2008) study (N= 13,586) used the Rutter Revised Preschool Scales (cut-off: top 10% of the scores) for emotional and conduct problems and hyperactivity in children. As well, these three studies employed different instruments for fathers' self-reported mental health problems; the two earlier studies used the Brief Symptom Inventory (calculated sum scores) and the EPDS (cut-off >12), whereas our study used the SCL-5 (cut-off >2.00). The times of outcome measurement also differed: 2 months old and 3.5 years old in the earlier

studies and 3 years old in our study. Despite these different measurements, all three studies reported strong associations between fathers' psychological distress and children's development, supporting the significance of fathers' psychological distress as a factor in their children's development.

5.1.2 Mechanisms of risk transmission

A number of possible mechanisms can account for the association between fathers' psychological distress and children's development. First, a prenatal effect of paternal psychological distress, in contrast to a postnatal effect, might more accurately reflect a genetically transmitted risk (Velders et al., 2011). Whilst a genetically transmitted risk might partially account for the association seen in our study between fathers' psychological distress and children's development, other mechanisms are also possible explanations of our findings. For instance, the transmission of risk could be mediated by emotional and behavioural changes in fathers as a result of psychological distress during pregnancy. Depression in expectant fathers has been shown to have a negative impact on the mental health of their pregnant partners, thereby exerting an indirect, negative influence on the foetus (Field, Diego, & Hernandez-Reif, 2006). Additionally, fathers' mental health is likely to be stable from the prenatal period to the postnatal period (Matthey et al., 2000). Depressive moods, irritability, hopelessness and reduced energy in depressed fathers are likely to affect their ability to care for their children, and depressed fathers' parenting could be a mediating factor in the associations between paternal psychological distress and child development (Ramchandani & Psychogiou, 2009).

5.1.3 Paternal and maternal psychological distress in pregnancy and child development

Previous studies have documented that high levels of postnatal maternal and paternal psychological distress represent a risk factor for children's development (Field, Diego, Hernandez-Reif, et al., 2006; Goodman & Gotlib, 1999; Ramchandani, O'Connor et al., 2008). The present study concludes that parents' prenatal psychological distress also represents a risk factor for children's development, thus contributing new findings to the field.

In line with our findings, a previous study showed that the most severe problems for children's development arise when both parents have poor mental health (Kahn et al., 2004). In this longitudinal survey with 822 families (children ages 3–12), behavioural difficulties in children ($\geq$ 90th percentile for the cohort) were worse if both parents reported poor mental health than if parents did not report such difficulties (Kahn et al., 2004). Kahn et al. (2004) found that, if only the mother reported poor mental health, the risk for behavioural difficulties in the children increased, but no such relationship was found if only the father reported poor mental health. Children with emotional difficulties also exhibited a similar pattern in that study (Kahn et al., 2004). However, in our study, we found that the parents' prenatal psychological distress (dichotomised with cut-off $\geq$ 2.00) only predicted emotional problems in their children when the children's development was operationalised using the 90th percentile as the cut-off. We also found that fathers' psychological distress in pregnancy predicted children's emotional difficulties, but the effect size for this relationship was smaller than the effect size of the relationship between mothers' psychological distress and children's emotional difficulties.

In our Norwegian cohort study, we found a significantly higher risk of emotional problems (cut-off $\geq$ 90th percentile) but not behavioural or social problems (cut-off $\geq$ 90[th]percentile) when fathers reported high level psychological distress. Our findings thus conflict with earlier findings showing that fathers' mental distress is associated mainly with conduct problems and

social problems (Ramchandani, O'Connor et al., 2008). However, a population survey comparing mental disorders among children in Norway and Britain (Heiervang, Goodman, & Goodman, 2008) found that Norwegian children had lower SDQ scores than British children on all problem scales (emotional, behavioural, hyperactive and peer relationship) as reported by parents and teachers. Heiervang et al. (2008) concluded that the lower Norwegian questionnaire scores for externalising problems appear to reflect real and substantial differences between the two countries. Lower questionnaire scores for emotional problems, though, seemed to reflect under-reporting or under-recognition (rater bias) by Norwegian adults, not a genuinely lower prevalence of emotional disorders, which can be regarded as a Norwegian blind spot for emotional difficulties (Heiervang et al., 2008). One interpretation of these findings is that Norwegian parents and teachers take a more normalising view of emotional symptoms (but not of externalising problems) when filling out screening questionnaires. This might also be the case in our study. If present, this culturally dependent bias would affect the prevalence of reported developmental problems and weaken the strength of the relationships between expectant parents' psychological distress and their children's emotional difficulties found in our study.

5.1.4 Prevalence of psychological distress in parents

Three per cent of the fathers and 5.1% of mothers in our cohort had high levels of psychological distress, defined as scoring above 2.00 on the SCL-5 (SCL-5 scores above cut-off). This might not equate precisely to depression, but scores above the cut-off indicate symptoms of clinically significant anxiety and depression (Tambs & Moum, 1993). In a large cohort study, Ramchandani, O'Connor et al. (2008) reported that 2.3% of fathers suffered from depressive symptoms in the prenatal period at week 18 of gestation as measured by the EPDS (with a cut-off >12), in line with our findings. In general, questionnaires and structured

interviews generate different prevalence estimates. In an earlier study, for instance, the prevalence reported from questionnaires was 10%–12% but 4.9% from structured interviews (Paulson & Bazemore, 2010). The study by Ramchancani, O'Connor et al. (2008) and ours both used self-reported questionnaire data and reported lower prevalence rates than in the American sample of Paulson and Bazemore's (2010) study. However, our findings are in line with reported estimates of depressive symptoms in the general population (3%–4%) (Paulson et al., 2009).

In a meta-analysis of 43 studies involving 28,004 participants from 1980–2009, Paulson and Bazemore (2010) found an 10% estimated prevalence of paternal depression during the prenatal and postpartum periods.

Earlier studies have also shown that the most common correlate of paternal depression is having a spouse with elevated levels of depressive symptoms (Matthey et al., 2000). We found that, in our sample of parents reporting high levels of psychological distress, the prevalence of the co-existence of high levels of paternal and maternal psychological distress was 3.6% (0.3% of the total sample of participating parents in our population-based sample), but we did not find significant correlation between fathers' and mothers' psychological distress as measured by the SCL-5 in week 17 of gestation (Paper I).

5.1.5 Expectant fathers' mental health and physically aggressive behaviour in their children

We need to understand why physically aggressive behaviour persists from early childhood to adolescence in some children but not others. However, there is limited knowledge about the risk factors for the persistence of physically aggressive behaviour in children (Nærde et al., 2012). Our study points to fathers' psychological distress as one risk factor for persistent

physically aggressive behaviour in young children (girls). This finding contributes new knowledge to the research on behavioural problems in children, as very few studies have investigated this association, and no population-based study has found such an increased risk of aggressive behaviour in girls with expectant fathers who suffer psychological distress.

In Paper III, we found that the effect of high levels of distress in expectant fathers on children's regulation and control of physical aggression was apparent only at age 5, at the stage in which most children have learned to control their aggressive behaviour and use other conflict resolution strategies. An earlier study, however, found modest support for a psychosocial hypothesis of risk transmission, particularly for boys, by comparing the behavioural adjustment in children of whose fathers were prenatally depressed, postnatal depressed, depressed throughout the perinatal period or not depressed (Ramchandani et al., 2008). The findings in that study suggest that environmental mechanisms might partly mediate the increased risk of later conduct problems, especially in the sons of depressed fathers (Ramchandani, O'Connor et al., 2008). Yet another study pointed to the influence of both genetic and environmental factors on physically aggressive behaviour (Dionne et al., 2003). In a review, Tremblay (2010) reports that the mechanisms that lead to deficits in using socially accepted behaviours are strongly intergenerational based on complex genetic and environmental contributions, including epigenetic mechanisms. In our study, the prenatal effect of parental psychological distress, as opposed to the postnatal effect, might also, in part, reflect such a genetically transmitted risk to the child.

5.1.6 Prevalence of physically aggressive behaviour in children

In our study, the frequency of children still exhibiting physically aggressive behaviour (hitting others) at age 5 was 16%. The proportion of children never hitting others was 65% at 18

months old, 62% at 3 years old and 83% at 5 years old in our population of preschool-aged children (N = 19,580), whereas in a Canadian population-based sample (N=572), only 28% of children displayed little or no physical aggression from 17 to 42 months old (Tremblay et al., 2004). As the MoBa participants are healthier (Nilsen et al., 2009) and somewhat more educated than the Norwegian general population (Rosand, Slinning, Eberhard-Gran, Roysamb, & Tambs, 2011), this inclusion bias might explain the somewhat lower frequency of hitting in our sample than in the sample studied by Tremblay et al. (2004). However, it is difficult to compare findings across studies because of different definitions and operationalisation of aggressive behaviour. Additionally, there are the issues of children's intent and whether it is possible to consider children's intentions in research on the physically aggressive behaviour of young children. Tremblay (2004) states that intent is not necessary in defining physically aggressive behaviour in young children. In our study, we chose to operationalise physically aggressive behaviour as hitting others, because it is a concrete and specific behaviour that should be relatively easy for parents to discern and quantify. Alink et al. (2006, p. 956) defines physically aggressive behaviour in young children as 'behaviour that can cause harm to people, animals, of objects', and Tremblay et al. (2004) viewed physically aggressive behaviour as hitting, kicking, biting, bullying and fighting others. This broader and more inclusive definition of aggressive behaviour might explain the higher prevalence in the study by Tremblay et al. (2004) than ours.

Cultural differences can also affect the prevalence of physically aggressive behaviour in children and could explain some differences in the prevalence in Tremblay's (2004) Canadian sample and our Norwegian sample. Additionally, in another Norwegian population-based study of 2,475 4-year-old children, Wichstrøm et al. (2011) found that the estimated prevalence of any psychiatric disorder in 4-year-old children was 7.1%. The estimates in the study by Wichstrøm et al. (2011) were lower than those of previous studies on preschool

psychopathology in the United States, which found the reported prevalence of any psychiatric disorder to be 16% (Egger & Angold, 2006; Kristensen, Henriksen, & Bilenberg, 2010). Wichstrøm et al. (2011) state that there is reason to suspect that the overall prevalence of psychiatric disorders in children is lower in Scandinavia than in the United States.

5.1.7 Gender issues in child development

In Paper I, we found a consistent association between fathers' psychological distress in pregnancy and children's behavioural, emotional and social functioning at 3 years old. When stratified for gender, the effect sizes in the two strata of boys and girls were almost the same; in other words, no effect from gender was present in the association between fathers' psychological distress and children's behavioural, emotional and social functioning. Other studies have found that boys might be more vulnerable than girls to the effect of paternal depression in early childhood (Ramchandani et al., 2005). In a population-based study of 3.5-year-old children (N=10,024), Ramchandani et al. (2005) found an increased risk of conduct problems in boys, and gender apparently moderated the effect of paternal depression on child development.

However, there seems to be evidence of small differences in physically aggressive behaviour in the youngest children (under 2 years old) and gender differences, with boys more aggressive from age 2 onwards (Nærde et al., 2012). Additionally, earlier studies have found that gender differences in externalising behaviour emerge between ages 4 and 5 years, with higher rates of externalising behaviour among boys than girls (Broidy et al., 2003; Keenan & Shaw, 1997). By school entry, boys tend to exhibit a rate of externalising problems up to 10 times that of girls (Cote et al., 2006). Keenan and Shaw (1997) tested two hypotheses about mechanisms that might explain the gender differences in problem behaviour emerging between the ages of 4 and

5. The researchers found moderate support for the hypothesis that the gender differences result from different, gender-specific socialisation practices but also for the hypothesis that girls undergo a more rapid change in biological, cognitive and social development than boys and thus learn to inhibit aggressive behaviour earlier in childhood than the boys (Keenan & Shaw, 1997). However, a population-based sample of 17-month-old children (N= 2,940) found no support for the socialisation hypotheses; 5% of boys but only 1% of girls frequently manifested physically aggressive behaviour (Baillargeon et al., 2007). This study found no support for a change in magnitude of these differences between 17 and 29 months old (Baillargeon et al., 2007).

In Paper III, the boys in our population-based sample hit others significantly more often than girls both at 18 months old and 3 years old but not at 5 years old. Our finding that the frequency of aggressive behaviour in children declined from age 3 to age 5 was expected, as it is in line with two earlier population-based studies (Alink et al., 2006; Tremblay et al., 2004). However, the lack of differences in hitting behaviour at age 5 between boys and girls in our sample was unexpected given the earlier findings. One can speculate whether our results can be explained by cultural differences in parenting and socialisation, for instance in kindergarten, because gender equality and equality in parenting of boys and girls have gain ascendance in Norwegian culture over the past 30 years. As well, parental leave and involvement in early childcare can have an impact on parenting and gender issues in early childhood development.

Surprisingly, when the sample was stratified for gender, fathers' mental health was found to be a significant risk only in girls' hitting behaviour at age 5. This finding conflicts with earlier findings (Ramchandani et al., 2005) that boys are more vulnerable to the effect of paternal depression than girls. However, other studies have also found that a lack involved parenting by fathers has an impact, especially on girls as they reach adolescence (Flouri & Buchanan, 2003). These findings are more in line with our finding of a prospective association between

psychological distress in fathers and increased hitting in girls at age 5. These divergent findings of gender differences in the impact of paternal psychological distress on children's development warrant further investigation.

5.2 Methodological issues

5.2.1 Participation rate and selection bias

An obvious weakness in the MoBa study is the modest participation rate of 39% (Magnus et al., 2006), as non-participation and loss to follow-up are the most important sources of bias in cohort studies. In cohort studies, the challenge is to maximise the participation of all those eligible and to ensure that the relevant outcomes are determined for as many study subjects as possible. In general, the participation rates in large cohort studies have decreased over the past 3 decades, from around 80% to 30%–40% (Hartge, 2006; Nohr, Frydenberg, Henriksen, & Olsen, 2006). This decline is a potential problem because in the Western world, these studies provide much of the evidence on preventable causes of diseases. Differences in response rates in birth cohort studies might reflect variations in the data collection (e.g. mailed surveys, telephone interviews, posted paper questionnaires), the burden of participation in the study (e.g. the number of items in the questionnaires) and the extent and demand of the requested biological tests. Recruitment methods and the promotion of the study can also influence potential subjects' willingness to participate. In the MoBa study, the questionnaires are both extensive and comprehensive, ranging from 38 paragraphs in the father questionnaire to 135 in questionnaire 1. The length and detailed nature of the MoBa questionnaire might affect the rate of willing participants. It might also affect who and how many participants are willing to answer the follow-up questionnaires over a long time period (when the children are 6, 18 and 36 months old and 5, 7, 8 and 12 years old). In our study, only informants who completed the

questionnaires at all points of measurement (at week 17 or 18 of gestation and age 3 in Papers I and II and at 18 months old, 3 years old and 5 years old in Paper III) were included in the analyses.

Selection biases are systematic errors that arise because not all potential subjects for a cohort study agree to participate or some participants are lost to follow-up. Earlier research showed that participants in research studies are likely to differ from nonparticipants in ways that are not random with respect to risk exposure. The decision to participate might correlate with social, educational and health conditions, which in turn correlate with risk factors for the outcomes under study. Thus, some selection bias cannot be ruled out. In MoBa, Nilsen et al. (2009) demonstrated that the prevalence estimates of exposure and outcome but not the exposure–outcome associations were biased due to self-selection. Nilsen et al. (2009) studied differences in prevalence estimates and association–measures between MoBa participants (N= 73,579) and all women giving birth in Norway (N=398,849) using 2000–2006 data from the Medical Birth Registry of Norway (MBRN). Nilsen et al. (2009) found a strong underrepresentation in MoBa of younger women (< 25 years old) and those living alone. The MBRN has only limited information about fathers, so the study was limited to mothers and their outcome variables.

However, it is reasonable to expect that selection bias due to self-selection also affected the sample of fathers in our study. Furthermore, not all fathers were willing to participate although the mothers had consented to. Of the 90,700 mothers who agreed to participate in MoBa, only 71,500 fathers did so also, even though there was only one questionnaire for fathers. It is reasonable to believe that the sample of fathers might be biased in the same way as the sample of mothers with regards to demographic variables and that expectant fathers with psychological difficulties or drug problems were less likely to participate. For instance, this phenomenon was evident in the Tromsø Health Study which had 20% lower participation rates by men and women with psychiatric illness (Hansen, Jacobsen, & Arnesen, 2001). The authors concluded

that these lower rates might have led to an underestimation of the prevalence of psychiatric conditions in the population (Hansen et al., 2001). In our study, the psychological symptom load of fathers and mothers as measured by the SCL-5 (Strand et al., 2003) was low compared to other studies (Paulson & Bazemore, 2010). In other words, parents with high levels of psychological distress might be underrepresented in our study. Self-selection, therefore, might have affected the prevalence of psychological distress in our study, and this presumably affected the effect estimates of the associations found in Papers I and II, thus weakening the association between fathers' psychological distress and their children's emotional and behavioural development.

5.2.2 Errors of measurement

Information bias arises doe to errors in measurements and/or data collection (Prince et al., 2009). Such bias can lead to over- or underestimates of the strengths of the associations studied. In the MoBa study, the measures of the predictor variables were self-reported, and the outcome variables of children's development were also based on mothers' reports, presenting a possible weakness in this study. The use of self-report scales can be affected by rater bias; in this case, fathers and mothers might over- or underreport their symptoms of psychological distress, affecting the validity of the study. Additionally, the outcome variables of children's development were based on mothers' reports, and the mothers' mental health problems could influence their reports about their children's developmental (Østberg & Hagekull, 2013). This rater bias in mothers might have affected the findings of Paper II: The stronger associations with mothers' psychological distress compared to fathers' psychological distress could be due in part to the child's outcomes being reported by the mothers. However, previous studies have shown that parental reports on children are highly reflective of genuine problems (Filipek et al.,

2000; Glascoe, Foster, & Wolraich, 1997), providing support for the findings in the present study.

It should also be noted that, in the operationalising of the outcome variables (from the CBCL-R, ITSEA and SDQ) into three summary scales of behavioural, emotional and social functioning, the internal consistencies of the summary scales were found to be moderate. This could have an effect on the internal validity of the findings, which might make the observed associations appear weaker than they are in reality.

5.2.3 Confounding factors

In confounding, the measured effect between the predictor and outcome variable is altered by the influence of one or more external factors independently associated with the risk factor and the outcome variable. Consideration of confounding factors is important in the assessment necessary before determining whether the associations found are true and in approaching the possible causal pathways by which the associations arise (Prince et al., 2009).

In all the models studied, controlling for mothers' psychological distress measured by the SCL-5 as a possible confounding variable led to only minor changes in the effect sizes for the relationship between fathers' psychological distress and children's development. In most models, the crude relationships remained statistically significant after controlling. These results suggest that mothers' psychological distress does not mediate the relationship between fathers' psychological distress and children's development in this study.

In Paper I, the associations did not change substantially after controlling for fathers' age, marital status, somatic condition, use of alcohol, cigarette smoking and physical activity. In contrast with the findings of Lung, Chiang, Lin and Shu (2009), our findings did not confirm that fathers' education had an effect on the association between their psychological distress and

their children's development. As well, we did not find that children's gender had an effect on the associations, in contrast to findings of previous studies that, more than girls, boys with fathers who have mental health problems developed conduct and social problems (Paulson & Bazemore, 2010; Ramchandani, O'Connor et al., 2008; Wee et al., 2011). The effect sizes for the relationship between fathers' psychological distress and children's development in the two strata of fathers' education level (high or low) and in the two strata for boys' and girls' development were quite similar in magnitude in our study (Paper I). This suggests that gender and education did not moderate the effects found in our study.

Marital satisfaction

In our study, controlling for fathers' marital satisfaction caused the greatest attenuation of the effect sizes for the relationship between high levels of paternal psychological distress and emotional difficulties in children (Paper II). This aligns with the work of (Kouros, Papp, & Cummings, 2008), who found that the higher the level of marital conflict, the stronger the negative relationship between marital satisfaction and depressive symptoms in parents. A review by Wee et al. (2011) also found that poor relationship satisfaction and having a spouse with elevated levels of depressed symptoms predicted psychological distress in the spouse. Additionally, in Paper III, controlling for fathers' marital satisfaction reduced below 1.00 the OR for the risk that expectant fathers' high levels of psychological distress represented for children hitting others at age 5. This suggests that fathers' marital satisfaction is a strong confounder in the relationship between fathers' psychological distress and hitting; in other words, the crude relationship between fathers' psychological distress and children's physically aggressive behaviour was partly explained by the effect of fathers' report on the MSS. This follows the work of Hanington et al. (2010), who also found that antenatal parental depression and marital conflict have a negative impact on child behavioural outcomes. In the study by Hanington et al. (2010), marital conflict acted as an independent risk for adverse outcomes and

partly mediated the relationship between postnatal depression in both mothers and fathers and children's outcomes. The attenuation of the effect of paternal psychological distress on children's hitting by fathers' high marital satisfaction in our study (Paper III) suggests that marital satisfaction also has a strong, possibly independent effect on children's hitting behaviour. Similarly, Tremblay et al. (2004) found that parents who had problems while living together had an increased risk of physically aggressive children. Additionally, earlier studies found that high levels of depressive symptoms in parents were associated with higher levels of inter-parental conflicts and internalising and externalising symptoms in children (Fera et al., 2009).

We believe that, taken together, these findings concerning the relationship between parents and their marital satisfaction are important for parenting and children's wellbeing and should guide future investigations concerning preventive healthcare for expectant parents. Our findings suggest that parents' relationship satisfaction is a third variable mediating the relationship between fathers' psychological distress and children's development.

Language skills

In Paper III, we also found that, when controlling for language skills in the association between fathers' psychological distress and children's physically aggressive behaviour (hitting), the OR increased, suggesting that children's language function had a suppression effect on the relationship between fathers' psychological distress and children's hitting behaviour. Here, suppressor effect means that the predictive power of fathers' psychological distress during pregnancy for hitting behaviour in children actually was stronger in the adjusted analysis than observed in the crude analysis. The finding that language skills have an impact on hitting behaviour is not surprising and in line with earlier studies that found that language skills influenced physically aggressive behaviour in children (Alink et al., 2006; Dionne et al., 2003).

Dionne et al. (2003) demonstrated a high comorbidity between problems in language development and a variety of disruptive behaviours in preschool-aged children.

After considering these potential confounding factors, we conclude that these studies offer evidence that expectant fathers' psychological distress is a risk factor for their children's development. Fathers' marital satisfaction seems to be a mediating variable in the relationship between expectant fathers' psychological distress and children's early development. Possibly, marital satisfaction can have an independent effect on child outcomes. Additionally, children's language skills seem to have a suppressor effect on the relationship between expectant fathers' psychological distress and children's physically aggressive behaviour and might also have an independent effect on children's physically aggressive behaviour.

5.2.4 Validity

In the MoBa study and in this project, the question of construct validity is vital. Construct validity refers to the degree to which the construct that the measures seek to address is a coherent entity (Prince et al., 2009). A central question is the extent to which the constructs central to the present research questions are successfully operationalised and appropriately measured by the instruments used in the studies.

The main predictor for fathers' mental health was defined as psychological distress, as measured by the self-report SCL-5 (5 items from SCL-90). As well as the longer scale, SCL-25, the SCL-5 measures joint symptoms of anxiety and depression, r=0.92 (Tambs & Moum, 1993). However, the SCL-5 has not been validated specifically for use in pregnancy (Adams, Eberhard-Gran, Hofoss, & Eskild, 2011), which might raise questions about its validity for assessing expectant fathers' and mothers' mental health. It has also been argued that men tend to underreport symptoms when assessed by self-report measures specifically targeting

depression, but the use of general symptom measures of stress, anxiety and depression, such as the SCL-5 in the present study, might provide a more accurate picture of fathers' mental health (Giallo et al., 2012). When evaluating validity and interpreting the findings of our study, it is also important to consider that the SCL-5 is only a screening tool for anxious and depressive symptoms and cannot be used for diagnostic purposes (Adams et al., 2011).

The outcome variables in the MoBa questionnaire came from items developed in validated instruments, but as they are only selections from the original instruments, the psychometric properties of the complete instruments could have been lost, which would affect the construct validity and interpretation of the findings. Therefore, we re-operationalised a range of items (75 items) referring to children's social, emotional and behavioural problems (48 items) from the relevant MoBa instruments into three scales in a PCA. However, as so many indicators were used and as this operationalisation procedure was based on a priori theoretical assumptions about the underlying constructs, the exploration of factor structure and the assessment of internal consistencies within scales, we argue that the three summary scales representing children's emotional, behavioural and social functioning have acceptable construct validity (see Appendix 1 for the items and instruments used in the three summary scales).

5.2.5 Generalisability of findings

Generalisability is the degree to which the findings of a study can be extrapolated from the study population to other populations of interest (Prince et al., 2009), in other words, the extent to which we can we generalise from the research sample and setting to the populations and settings specified in the research questions. A low participation rate might have an effect on the internal validity of findings and also often is a serious challenge to the generalisability of findings (Prince et al., 2009). In our study, whether the findings generated by this sample

representing 39% of the total available population of parents can be generalisable to the rest of the Norwegian population of expectant parents and their children and to populations in other Western countries must be discussed in light of the following factors.

The somewhat low participation rate affects the generalisability of the prevalence rates of psychological distress found in our project (Nilsen et al., 2009). When the prevalence of the reported psychological distress found in this study is relatively low, it reduces the variance of this predictor variable and weakens the effect size of the relationship between the fathers' psychological distress and children's outcomes.

However, one can argue that, even so, the associations found can also be representative for the general population because, when there are weak associations between predictors and outcomes in a sample of healthy, well-educated participants with low variance among the variables studied, the effect size presumably will be higher, and the associations found will be stronger in a population with a complete distribution (i.e. larger variance) of these variables. Additionally, a representative sample is important when the scientific goal is to describe the total population but, as in this study, is not essential when the goal is to report estimates of risk factors, instead of prevalence estimates (Nilsen et al., 2009). The large sample size and the recruitment of participants from across the country, however, make these findings more generalisable.

5.3 Further strengths and limitations of Papers I, II and III

An obvious strength of these studies is the large sample size - N= 28,703 in Paper I, N= 28,695 in Paper II and N= 19,580 in Paper III (Table 2) - which has sufficient statistical power to detect even the small effects of associations. As well, by testing associations between paternal and maternal psychological distress and children's social, emotional and behavioural

development in a large population sample, the serious selection biases commonly found in clinical studies can largely be avoided.

A limitation of this study, however, is the lack of information about factors present in the postnatal period that might confound the observed associations between expectant fathers and their children's development. For instance, the MoBa study does not provide information on fathers' postnatal psychological distress. Without such information, an advantage of longitudinal data is lost, limiting the ability to draw causal inferences about the effects of fathers' prenatal psychological distress on their children's social, emotional and behavioural development.

The lack of postnatal information also reduces the ability to investigate the interplay between children and their parents. For example, it was not possible to explore whether the children's developmental problems affected the fathers' psychological distress. In the transactional model, the associations between parental and child psychopathology are known to be bidirectional (Sameroff & Chandler, 1975), but the prospective design used in this study limits the findings to evidence for the parent–to–child directionality and makes a child–to–parent effect less likely to be the cause of the effect found.

5.4 Discussion of findings in a theoretical framework

The general view in current developmental psychological models, supported by empirical investigations (Smeekens et al., 2007), is that multiple factors from various domains additively and interactively contribute to the emergence and maintenance of developmental problems in children. As discussed, these factors are parent–child interaction and children's, parents' and contextual characteristics (Smeekens et al., 2007). In the transactional model, developmental problems are assumed to emerge and stabilise or change through children's continuous

interaction with their immediate environment, especially in interaction with their parents (Sameroff & Chandler, 1975). In our study, we found that parents' psychological distress represented a risk factor for their children's development. According the transactional model of child development, the parents' characteristics and psychological distress can have an impact on their interaction with their children, but the children's characteristics also can play a crucial role in the quality of interaction between children and parents. For instance, in our study (Paper III), we found that 16% of the children still used physically aggressive behaviour at age 5, which might have an impact on father–child interaction.

As well, in the transactional perspective, children's characteristics, parents' characteristics, parent–child interaction and environmental factors can also contribute to positive development, despite the parents' psychological difficulties. To identify which children are at risk for developing behavioural problems and which children will display resilient development, we need to explore the protective factors, as well as the risk factors. Characteristics of both children themselves and their environment can be protective factors in a resilient developmental process (Borge, 2010). For example, healthy, warm, reliable parents and a stable, socially accepted environment of friends and family can be such positive protective factors. For example, we found that, when fathers reported positive marital satisfaction, there was a reduction in risk for their children's development in families where the fathers reported high level of psychological distress. The children's cognitive capabilities, temperament, emotional regulation, flexibility and pro-social behaviour are also factors that regulate their ability to handle stress, conflicts and negative influences in their environment (in our study, parents' psychological distress and marital conflicts). For instance, in Paper III, we found that the child's language skills had an suppressor effect on the relationship between fathers' psychological distress and children's physically aggressive behaviour (in the regression model with children's hitting as the outcome variable, this variable increased the predictive value of

fathers' psychological distress). Children's language skills thus seemingly are an independent variable affecting child outcomes in this model.

In this thesis, we found that children with parents reporting psychological distress during pregnancy are at greater risk for subsequent developmental problems, but from a developmental psychopathological perspective, this is a probabilistic risk, as every child with a father or mother who has psychological distress will not exhibit developmental difficulties or mental disorders. In a developmental psychopathological perspective, the focus is just as much on the individuals at high risk for developmental difficulties who do not manifest them over time (resilience) as on the individuals who experience developmental problems. This perspective is not explored further here, but studies on this perspective of child development are warranted and needed.

The probabilistic, as opposed to deterministic, nature of the developmental psychopathological perspective on child development offers knowledge to the field of prevention and early intervention in healthcare. For instance, a child with persistent physically aggressive behaviour at age 5 can still adapt to life circumstances or be assisted by health interventions to develop in healthy ways.

This thesis contributes new knowledge about early childhood development that can guide further research and perinatal healthcare. As the developmental psychopathology perspective examines continuities and discontinuities over the span of time (Rutter, 1988) and, as stated, the longitudinal design of the population-based MoBa study sample enables studying children's development over a period of time to obtain information about normative child development and risk factors in child development, this thesis adds knowledge to the theoretical framework of the developmental psychology.

6. IMPLICATIONS, DIRECTIONS FOR FUTURE STUDIES AND CONCLUSIONS

6.1 Clinical implications and generalisation of findings

The findings of this thesis suggest that risk for future childhood emotional and behavioural problems can be identified during pregnancy. Therefore, the results are of importance for health professionals and policymakers planning perinatal healthcare. All expectant parents in Norway consult with midwives and physicians, providing an avenue for preventive interventions aimed at reducing children's risk when their fathers have mental health problems. Other studies have found that fathers' involvement in healthcare interventions (as well as mothers') are of importance for children's outcomes and that increased engagement by fathers is associated with a range of positive outcomes in boys and girls, such as fewer behavioural and psychological problems and enhanced cognitive development (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003; Magill-Evans, Harrison, Benzies, Gierl, & Kimak, 2007; Sarkadi, Kristiansson, Oberklais, & Bremberg, 2008).

By exploring parents' mental health issues during pregnancy and offering early interventions to families where fathers, mothers or both parents suffer psychological distress or psychiatric illness, it might be possible to prevent the development and burden of emotional, behavioural and social difficulties in children.

6.2 Directions for future studies

Over the past 10 years, family structures have changed as fathers have spent more time with their children. Fathers' and mothers' roles in childcare have altered, both in Norway and in

other Western countries. In particular, fathers are more involved in care of new-borns. Future studies on the association between parents' mental health and children's development should include both fathers and mothers and explicitly investigate the effects of paternal and maternal mental health on child development and psychopathology.

There is a need for longitudinal population-based studies of fathers and children, with or without psychological distress, in order to further explore the associations found in this study between fathers' psychological distress and child development and the role of mediating and moderating factors in these associations. Longitudinal studies that obtain both pre- and postnatal information on fathers, mothers and early child development could draw causal inferences about the effects of fathers' prenatal mental health on their children's social, emotional and behavioural development. Associations between parental and child psychopathology are known to be bidirectional, and studies investigating the interplay between children and their parents are needed. As well, every child with a father or parents who have psychological distress will not exhibit developmental difficulties or psychiatric illness, so more studies on resilience are also needed.

In this thesis, the findings point to the possibility of early detection of risk and preventive intervention in families where fathers, mothers or both parents suffer from psychological distress. In Norway, there is an ongoing discussion about screening all pregnant women for psychological distress in order to offer early interventions and assistance in the perinatal period, thereby preventing the effect of maternal distress on the foetus and new-born child. Based on the findings of the present study, we cannot give any directions regarding this important question; this study was not designed to provide evidence on this issue. However, the prevalence of high levels of distress in fathers and mothers were low and comparable with estimates of such distress in the general (non-pregnant) population, which means that one criterion for wide screening in the population likely is not met (World Health Organisation's

(WHO) Principal Guidelines for Screening, 1968). However, the findings in this thesis emphasise that it is important to explore both expectant parents' mental health. Further studies on the prevalence of mental distress and illness in the population of expectant parents are also needed to guide policymakers and health professionals in considering whether early interventions in expectant families should be implemented. There is also a need for studies on the intervention of choice for expectant parents with different mental health issues.

6.3 Conclusions

There has been a lack of attention to fathers' role in early child development, but knowledge in this field of research is growing. Most studies have explored the postnatal period and the effect of fathers' mental health on parenting and child development. We found only two earlier studies exploring the relationship between expectant fathers' mental health and children's development; thus, the findings of this thesis add to this field. We found a small but consistent association between expectant fathers' psychological distress and their children's subsequent social, emotional and behavioural development. Additionally, the results point to an additive effect from parents' psychological distress on their children's development: When high levels of psychological distress were observed in both parents the risk for emotional difficulties in their children was higher than when only one parent suffered from such distress, which is of relevance to perinatal health care. This study showed that a risk of child developmental problems can be identified during pregnancy. The field of early onset behavioural difficulties in childhood gains new knowledge from findings that approximately 16% of the preschool-aged children in this population-based study still used physically aggressive behaviour in interactions with others and that fathers' psychological distress represents a risk for this behaviour in their 5-year-old daughters.

Fathers have been underrepresented in child and adolescent psychopathology research. The finding of this thesis that expectant fathers' mental health is important for their children's development, therefore, is an important contribution to perinatal health care, bringing fathers' role in their children's development into focus. Fathers and mothers have different roles in childcare, but both parents are important for children's development in early childhood.

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8. APPENDIX

Appendix 1. Items and instruments used to produce summary scales of children's development representing behavioural difficulties, emotional difficulties and social functioning

Item	Instrument	Factor Loading	Outcome Variable (Summary Scale)
Demands must be met immediately	CBCL	0.50	Behavioural difficulties
Quickly shifts from one activity to another	CBCL	0.47	Behavioural difficulties
Can't stand waiting, wants everything now	CBCL	0.54	Behavioural difficulties
Gets in many fights	CBCL	0.51	Behavioural difficulties
Finds it difficult waiting for his/her turn	ITSEA	0.53	Behavioural difficulties
Doesn't seem to listen when being spoken to	ITSEA	0.47	Behavioural difficulties
Becomes aggressive when frustrated	ITSEA	0.52	Behavioural difficulties
Is disobedient or defiant (e.g. refuses to do anything you ask)	ITSEA	0.53	Behavioural difficulties
Gets into everything	CBCL	0.43	Behavioural difficulties

Punishment doesn't change his/her behaviour	CBCL	0.43	Behavioural difficulties
Tests other children to see whether they get angry	ITSEA	0.42	Behavioural difficulties
Defiant	CBCL	0.47	Behavioural difficulties
Does things he/she is not allowed to do to attract attention from adults	ITSEA	0.50	Behavioural difficulties
Is extremely noisy, shouts and screams a lot	ITSEA	0.55	Behavioural difficulties
Hits others	CBCL	0.48	Behavioural difficulties
Hits, shoves, kicks and bites other children (not including siblings)	ITSEA	0.42	Behavioural difficulties
Can't concentrate or pay attention for long	CBCL	0.50	Behavioural difficulties
Can't sit still, is restless or hyperactive	CBCL	0.55	Behavioural difficulties
Your child gets upset or sad easily	ITSEA	0.42	Behavioural difficulties

Your child is always on the go	ITSEA	-0.43	Behavioural difficulties
Your child reacts intensely when upset	ITSEA	0.47	Behavioural difficulties
Your child cries easily	ITSEA	0.38	Emotional difficulties
Mood can vary greatly from day to day	ITSEA	0.40	Emotional difficulties
Sudden changes in moods or feelings	CBCL	0.34	Emotional difficulties
Your child takes a long time to warm up to strangers	ITSEA	-0.41	Emotional difficulties
Clings to adults or too dependent	CBCL	0.47	Emotional difficulties
Disturbed by any change in routine	CBCL	0.39	Emotional difficulties
Wakes up in the night and needs help to get back to sleep	ITSEA	0.37	Emotional difficulties
Doesn't eat well	CBCL	0.40	Emotional difficulties

Doesn't seem to be happy eating food (not including sweets)	CBCL	0.37	Emotional difficulties
Afraid to try new things	CBCL	0.39	Emotional difficulties
Is extremely passive, needs help to get going	ITSEA	0.33	Emotional difficulties
Too fearful or anxious	CBCL	0.47	Emotional difficulties
Doesn't want to sleep alone	CBCL	0.33	Emotional difficulties
Gets too upset when separated from parents	CBCL	0.38	Emotional difficulties
Wants things to be clean and tidy	ITSEA	0.36	Emotional difficulties
Gets distressed when you go out and he/she will be looked after by a family member or a babysitter he/she knows	ITSEA	0.34	Emotional difficulties
Wakes up several times during the night	ITSEA	0.35	Emotional difficulties
Is very fussy when it comes to food	ITSEA	0.39	Emotional difficulties

Is very anxious about getting dirty	ITSEA	0.37	Emotional difficulties
Your child is considerate of other people's feelings	SDQ	0.56	Social functioning
Your child is kind to younger children	SDQ	0.48	Social functioning
Your child pays careful attention when you try to teach him/her something new	ITSEA	0.45	Social functioning
Your child shares readily with other children (treats, toys, pencils, etc.)	SDQ	0.47	Social functioning
Your child is very sociable	ITSEA	0.60	Social functioning
Your child likes to be with people	ITSEA	0.50	Social functioning
Your child is helpful if someone is hurt, upset or feeling ill	SDQ	0.57	Social functioning
Your child often volunteers to help others (parents, teachers, other children)	SDQ	0.56	Social functioning

10. ERRATA

In chapter 3.3.1

Page 39 "Of the CBCL-5 100 items," is replaced with "Of the CBCL-R 100 items,"

In chapter 3.4

Page 45 "and children's hitting as and outcome variable with three levels as the reference category (stopped hitting before age 5, hitting at age 5, and never hitting)." is replaced with "and children's hitting as outcome variable with three levels; stopped hitting before age 5, hitting at age 5, and never hitting (as reference category)."

In chapter 5.2.3

Page 61 "Consideration of confounding factors is important in the assessment necessary before determining whether the associations found are true and in approaching the possible causal pathways by which the associations arise (Prince et al., 2009)." is replaced with "Consideration of confounding factors is important in the assessment necessary before determining whether the associations found are true in approaching the possible causal pathways by which the associations arise (Prince et al., 2009)."

In chapter 5.2.3

Page 62 "This follows the work of Hanington et al. (2010), who found that antenatal parental depression and marital conflict have a negative impact on child behavioural outcomes. In the study by Hanington et al. (2010), marital conflict acted as an independent risk for adverse outcomes and partly mediated the relationship between postnatal depression in both mothers and fathers and children's outcome." is replaced with "This follows the work of Hanington et

al. (2012), who found that antenatal parental depression and marital conflict have a negative impact on child behavioural outcomes. In the study by Hanington et al. (2012), marital conflict acted as an independent risk for adverse outcomes and partly mediated the relationship between postnatal depression in both mothers and fathers and children's outcome."

In chapter 7

References page 74 "Fera, J. M., Champion, J.E., Reeslund, K. L., Forehand, R., Colletti, C., Robeerts, L. & Compas, B.E. (2009)" is replaced with "Fear, J. M., Champion, J.E., Reeslund, K. L., Forehand, R., Colletti, C., Roberts, L. & Compas, B. E. (2009)"