

Title

The influence of paternal depressive symptoms on fathers' parenting, father-child attachment and children's outcomes during pre-school and school years

Submitted by Selina Nath to the University of Exeter

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Abstract

Background: Understanding of child development is predominantly based on maternal influences on children's emotional, behavioural and cognitive outcomes. Although there has been an increase in research focus on fathers in recent years suggesting that fathers are important in the development of their child, there is still a shortage of research on fathers in the literature. Research has shown fathers negatively impact on their children's emotional, behavioural and cognitive development, but there is a lack of understanding regarding the specific mechanisms through which paternal depression influences their children. The aim of the current PhD is to address this gap in the literature and this is done by: a) investigating the prevalence of depressive symptoms among fathers of children (aged 9 months – 7 years) and their associated risk factors; b) investigating the association between paternal depressive symptoms and different aspects of parenting such as warmth, conflict and involvement; c) testing whether fathers' parenting mediated any association between paternal depressive symptoms and children's emotional, behavioural and cognitive outcomes; and d) investigating the association between paternal depression/depressive symptoms and insecure father-child attachment.

Methods: There are two methods employed for this PhD. One is secondary data analysis of the large and representative Millennium Cohort Study (MCS) (investigating a, b and c) and the other is primary data analysis of the Fathers-in-Focus (FIF) study using interview and observational methods to investigate (d).

Results: Paternal depressive symptoms peak during the first year of children's lives and then gradually decline between the first year and 7 years old (a). These depressive symptoms across the first 7 years of fatherhood were consistently associated with maternal depressive symptoms, relationship conflict and unemployment (a). Moreover, depressive symptoms in the first year were associated with father-child conflict, but not father-child warmth or involvement in parenting activities (b). Father-child conflict mediated the association between paternal depressive symptoms and children's emotional and behavioural outcomes (c). Finally, father's depressive symptoms were not associated with father-child attachment or children's cognitive development (c and d).

Conclusion: The key finding of this PhD is that father-child conflict is an important factor that may be associated with the risk transmission of paternal depressive symptoms and children's emotional and behavioural outcomes. Therefore, it may be beneficial for service providers and clinicians to target interventions with depressed fathers' and at-risk families.

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The candidate's contribution to all papers (SN):

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Data

Secondary analysis data (Chapters 2 – 5)

I would like to acknowledge that the data analysis for the three papers was of the Millennium Cohort Study (MCS). I would like to thank the MCS participants and team for all their assistance.

Primary data (Chapter 6)

Data used in Chapter 6 was collected alongside the Fathers-in-Focus (FIF) follow-up time 2 study. SN recruited participants via GP record searches and community groups, attended training for the attachment related measure (administration and coding), trained other staff members on the attachment measure, collected data towards the project and conducted analysis on the data included in Chapter 6.

Abbreviations

ALCPAC	Avon Longitudinal Study of Parents and Children
CES-D	Centre for Epidemiological Studies Depression Scale
CLPM	Cross-Lagged Panel Modelling
CTS	Carey Temperament Scales
ECLS	Early Childhood Longitudinal Study
ECLS-B	Early Childhood Longitudinal Study – Birth Cohort
EPDS	Edinburgh Postnatal Depression Scale
FFCW	Fragile Families and Child Well-being study
FIF	Fathers in Focus
FITS	Father Involvement with Toddlers Study
HAPPI	Health Attachment Promotion for Parents and Infants
HRV	Heart Rate Variability
IWM	Internal Working Model
LCSVC	Longitudinal Cohort Study of Valencian Community
LGM	Latent Growth Mediation
LSAC	Longitudinal Study of Australian Children
MCAST	Manchester Child Attachment Story Task
MCS	Millennium Cohort Study

MCS1	Millennium Cohort Study Sweep 1
MCS2	Millennium Cohort Study Sweep 2
MCS3	Millennium Cohort Study Sweep 3
MCS4	Millennium Cohort Study Sweep 4
MCS5	Millennium Cohort Study Sweep 5
NHS	National Health Service
NSAH	National Study of Adolescent Health
PHQ-2	Patient Health Questionnaire – 2
PHQ-9	Patient Health Questionnaire – 9
SCID	Structural Clinical Interview
SDQ	Strengths and Difficulties Questionnaire
SEM	Structural Equation Modelling
SES	Socio-Economic Status
SLT	Social Learning Theory
SSP	Strange Situation Procedure

Chapter 1 Introduction

1.1 Why focus on fathers?

Until the last decade, there was limited research exploring paternal influences on children's development (Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000). This was partly due to the emphasis in the child development literature on the maternal role during the early child developmental stages (Bowlby, 1982b). This may have been justifiable in the past as most mothers were the primary caregiver, often staying at home to attend to childcare while most fathers were the working bread-winners and were comparatively less involved with their children. However, gender roles have shifted and the role of fathers in the family has been changing (Lamb, 2010). Fathers are now more involved in childcare and take an active role in parenting their children (Cabrera et al., 2000; Dette-Hagenmeyer, Erzinger, & Reichle, 2014). This is partly due to the increased entry of women into the workforce and the effects this has had on the family structure, leading to fathers having a more equal parenting role (Buckley & Schoppe-Sullivan, 2010; Pleck, 2010).

The importance of fathers in children's development has been increasingly highlighted in the literature (Cabrera et al., 2000; Lamb, 2010; Ramchandani & Psychogiou, 2009; Sarkadi, Kristiansson, Oberklaid, & Bremberg, 2008), which coincides with an increase in research investigating paternal influences on children. There is currently limited theory and research on the understanding of fathers' role in children's development. Understanding the role of fathers in children's developmental outcomes will enable researchers to investigate

whether mothers and fathers have differential roles in their children's development and this can lead to better understanding of risks between children and parents (Psychogiou & Parry, 2014).

This PhD aims to investigate whether paternal depressive symptoms are associated with fathers' parenting, father-child attachment and children's emotional, behavioural and cognitive problems. The current chapter will give a review of relevant literature and identify key gaps in the current literature. It will start off with a review of paternal depression prevalence rates, followed by literature linking paternal depression to child outcomes, fathers' parenting and father-child attachment. This will be followed by a proposed model of attachment and parenting related risk of transmission based on the literature presented. The chapter will conclude with an outline of the methods used to answer the research questions.

1.2 Literature review

1.2.1 Depression in fathers: Prevalence and risk factors

1.2.1.1 Epidemiology of depression in fathers

Depression is characterised by low mood, loss of pleasure and interest in activities, poor appetite, sleeping disturbances (over-sleeping, lack of sleep), low energy, feelings of worthlessness, lack of concentration and suicidal thoughts (American Psychiatric Association, 2000). Such symptoms can

negatively impact on an individual's day-to-day functioning and quality of life (Hirschfeld et al., 2000). The World Health Organisation (WHO) has predicted that by 2020 and 2030 depression is going to be the second biggest global burden in terms of disease affecting the UK population (Brown, 2001; Mathers & Loncar, 2006; Murray & Lopez, 1997). In England during the year 2000, approximately 2.6 million individuals were suffering with depression (Thomas & Morris, 2003). An increase in cases is notable from the age of 25 years old, which is during common child-rearing years (Thomas & Morris, 2003). There are a number of risk factors in life that influence the development of depression, and having a child is a major one. Although females are more likely to suffer from depression compared to males, there is growing evidence showing that both mothers and fathers experience depression during the post-natal period (Fletcher, Freeman, Garfield, & Vimpani, 2011; Thomas & Morris, 2003). Like mothers, fathers also undergo significant changes in their lives after the birth of a child, experiencing symptoms of depression such as irritability, exhaustion and sleeping problems, which can negatively impact on their ability to care for their child and themselves (Deater-Deckard, Pickering, Dunn, & Golding, 1998; Solantaus & Salo, 2005). Better understanding of parents who experience depression is important because of the impact of depression in this group has on other aspects, which include economic costs and effects on children's behavioural, emotional and cognitive outcomes (Edoka, Petrou, & Ramchandani, 2011; Fletcher et al., 2011; Ramchandani & Psychogiou, 2009).

The cost of depression in England during the year 2000 was calculated at approximately £9 billion, placing a huge burden on the National Health Services (NHS) and society (Thomas & Morris, 2003). Mothers suffering with post-natal

depression have been reported to cost the healthcare system significantly more compared to non-depressed mothers during the post-natal period (Petrou, Cooper, Murray, & Davidson, 2002). The economic impact of paternal depression has been reported as similar to maternal depression, which suggests that depressed fathers cost the healthcare system significantly more compared to non-depressed fathers (Edoka et al., 2011). However, there is still a focus on care for mothers during the post-natal period while fathers' mental health is predominantly neglected.

In the past, paternal depression was considered to be uncommon and mothers were the focus of post-natal care (Lane et al., 1997), resulting in paternal depression being unrecognised, undetected and leaving depressed fathers without support. There is now a growing body of literature that acknowledges the presence of post-natal depression among fathers and highlights the importance of addressing it (Edward, Castle, Mills, Davis, & Casey, 2014; Schumacher, Zubaran, & White, 2008; Wee, Skouteris, Pier, Richardson, & Milgrom, 2011). The post-natal period has been considered a sensitive period during which paternal depression may influence children's development (Fletcher et al., 2011). Fletcher et al. (2011) found depressive symptoms in fathers during the first year of fatherhood negatively influences their children's emotional and behavioural development at 4 - 5 years old, even after controlling for fathers' subsequent depressive symptoms and maternal depressive symptoms during the first year. Therefore, there has been an increase in literature investigating paternal depressive symptoms during the post-natal period. There are, however, variations in the rates of paternal depressive symptoms reported during this period. It is important to first establish the rates

of paternal depressive symptoms before moving forward, which will enable researchers and health care practitioners to gain better knowledge about the prevalence of fathers affected by depression. The following sub-sections will review literature investigating paternal depressive symptoms in the first post-natal year. This is followed by the limited literature on paternal depressive symptoms beyond the post-natal year. Literature from these two sub-sections will be followed-up in Chapter 2.

1.2.1.2 Paternal depression in the post-natal period

Studies investigating the rates of paternal depression have reported different estimates during the post-natal period up to 1 year post-partum. In an integrative review of 20 studies using community samples, Goodman (2004) reported a wide range of estimates from 1.2% to 25.5% during the first post-partum year. Most of the studies included in this review were based on self-report measures; only one used a qualitative interview and only five were based on clinical interviews. A meta-analysis of 43 international studies reported 10.4% of fathers to suffer with depression between the first trimester to 1 year post-partum, with highest estimates (25.5%) when infants were 3 – 6 months old (Paulson & Bazemore, 2010). The majority of these studies were based on self-report questionnaires, with only three using clinical interviews and the studies included predominantly Caucasian participants. Therefore, the varied prevalence rates found from these previously published studies and two reviews were more indicative of depressive symptoms rather than depressive episodes.

Studies using estimates from large cohort datasets have suggested that the levels of paternal depressive symptoms lies within the lower range of the estimates quoted above (1.2% - 25.5%) (Goodman, 2004; Paulson & Bazemore, 2010). Fletcher et al. (2011) reported 1.3% of fathers to score above the clinical cut-off point (12+) on the Kessler 6 scale during the first post-partum year using the Longitudinal Study of Australian Children (LSAC, Australian). Using the Edinburgh Post-natal Depression Scale (EPDS), 4% of fathers were reported with high depressive symptoms at 8 weeks after birth and 1 year post-partum according to the Avon Longitudinal Study of Parents and Children (ALSPAC, UK) (Ramchandani, Stein, Evans, & O'Connor, 2005) and the Longitudinal Cohort Study of Valencian Community (LCSVC, Spain) (Escribà-Agüir & Artazcoz, 2011). Finally, using data from the Early Childhood Longitudinal Study (ECLS, USA), 10% of fathers were found to report high depressive symptoms at 9-months post-partum measured with the Centre for Epidemiologic Studies Depression Scale (CES-D) (Paulson, Dauber, & Leiferman, 2006).

Variations in the estimates of paternal depression in previous studies were largely due to differences in sampling selection and methodology used to assess depression or depressive symptoms (Paulson & Bazemore, 2010; Schumacher et al., 2008). Although the studies span many countries, the samples were predominantly Caucasian and not generalisable to fathers from other ethnic minority backgrounds. Different self-report measures have been used for different studies by applying slightly varying cut-off points which creates an issue of non-comparable data (Goodman, 2004; Paulson & Bazemore, 2010). Some studies have used liberal cut-off points resulting in an

over-representation of mild depressive symptoms in the clinical range. Other studies using clinical interviews might under represent depression due to strict criteria in meeting a clinical diagnosis and reduced participation rates caused by participant burden in taking part in such interviews (Goodman, 2004; Paulson & Bazemore, 2010; Spitzer, Williams, Gibbon, & First, 1990).

1.2.1.3 Paternal depression beyond the post-natal period

Estimates regarding paternal depression beyond the first post-partum year are limited in the literature. In order to identify critical time-points for interventions, literature on the prevalence of depression across the early years of children's development is needed. Giallo et al. (2012) investigated rates of paternal depressive symptoms in a sample of Australian fathers, using the first 3 waves of the LSAC study when children were 0 - 12 months (wave 1), 2 - 3 years old (wave 2) and 4 - 5 years old (wave 3). Depressive symptoms were measured using the Kessler-6 questionnaire (Cairney, Veldhuizen, Wade, Kurdyak, & Streiner, 2007). The prevalence of depressive symptoms was found to be relatively stable over time for resident fathers, 1.9% (0 - 12 months), 1.4% (2 - 3 years old) and 2.2% (4 - 5 years old). Fathers who reported depressive symptoms during the post-natal period (34.5%), continued to report depressive symptoms when their children were 2 - 3 and 4 - 5 years old. Giallo, D'Esposito, Cooklin, Christensen, and Nicholson (2014) extended their analysis by adding wave 4 data from the ALSAC study when children were 6 - 7 years old. Depressive symptoms were highest in the post-natal period (wave 1) and gradually decreased during toddlerhood, preschool and early school years (wave 2 - 4), suggesting that the prevalence of paternal depressive symptoms

were higher in the first year but still present during childhood. Although these findings are informative, the LSAC studies consisted of socio-economically advantaged fathers, and therefore are not representative of socio-economically disadvantaged fathers. Using a more representative sample of fathers, Garfield et al. (2014) reported different findings with a cohort of 2,739 resident fathers from the National Longitudinal Study of Adolescent Health (NLSAH). Paternal depressive symptoms were found to significantly increase from child birth, peaking at 5 years old and then declining from 5 - 10 years old. Given that the age of 5 years is an important developmental period when children start school in many cultures, this seems like an important period to target. Taken together, these findings suggest that paternal depressive symptoms are present during the early years of a child's lives and clarification is needed on whether there are critical or sensitive periods during which paternal depression prevalence is highest, which may impact on children's development. In addition to this, these studies are only indicative of depressive symptoms rather than a clinical episode of depression. Therefore, studies are needed to investigate depression using clinical diagnostic measures in order to measure depressive episodes, rather than depressive symptoms.

Dave, Petersen, Sherr, and Nazareth (2010) used primary care records from general practices across the UK to identify 86,957 fathers in order to run an analysis to investigate the trajectories of paternal depression over time from the postnatal period to 11 years old. Depression was measured according to general practitioner reports and inclusion criteria were fathers who were taking medication for depression or accessing psychological therapies. A significant number of fathers (21%) were reported to experience an episode of depression

during the 12 years follow-up and depression rates were higher in the first post-partum year and then reduced over time. However, the authors argued that although the strength of the study was that it was based on diagnosis of depression by the general practitioners (GPs) rather than relying on depressive symptoms screening questionnaires because the fathers were seen in the general practice the results might not be representative of community samples of parents in the general population. This is because the sample may have been dependent on fathers' willingness to seek help, and the GPs ability to recognise depression and to prescribe treatment for it. According to the National Collaborating Centre for Mental Health (2010), most GPs now rely on using standardised questionnaires such as the Patient Health Questionnaire (PHQ-9), and Beck Depression Inventory (BDI) to measure depression, which should increase the reliability of clinical diagnosis but again is indicative of depressive symptom rather than clinical depression as assessed by the standardised clinical interview.

1.2.2 Fathers' depression and children's outcomes

Extensive literature has shown that maternal depression has a negative impact on their children's emotional, behavioural and cognitive outcomes (Caplan et al., 1989; Cummings & Davies, 1994; Grace, Evindar, & Stewart, 2003; Kurstjens & Wolke, 2001; Murray & Cooper, 1997). Although research has acknowledged the importance of fathers in children's development (Lamb, 2010; Sarkadi et al., 2008), there is still relatively limited literature that investigates the influence of fathers' depression on children's emotional, behavioural and cognitive development. Behavioural and emotional problems have been the most researched in relation to paternal depression, followed by

cognitive development and there has been no published studies investigating the association between paternal depression and children's emotion regulation. This was determined by conducting a systematic search using the key terms 'paternal depression' and either 'children's behaviour', 'children's cognitive' or 'children's emotion regulation' of PubMed (83/10/0), Web of Science (134/29/0), ERIC (38/4/0) and google scholar (25,9000/30,1000/23,000). Other key terms were also used such as 'fathers' depression' which yielded similar findings. Not all hits were relevant and only directly relevant literature was included in the literature review. Literatures relating to these three areas are reviewed below.

1.2.2.1 Behavioural and emotional outcomes

Paternal depressive symptoms are significantly associated with emotional and behavioural problems in children aged 4 – 6 years old (Davé, Sherr, Senior, & Nazareth, 2008). Higher levels of depressive symptoms on the modified Patient Health Questionnaire were associated with pro-social, conduct and peer problems, but not with hyperactivity and emotional problems. A study of older children (5 – 17 years old) from the Medical Expenditure Panel Survey Study, Weitzman, Rosenthal, and Liu (2011) reported that paternal depressive symptoms were independently associated with emotional and behavioural problems after controlling for other maternal factors (depressive symptoms, smoking, education) and fathers' Socio Economic Status (SES) factors. Data from the Families, Children, and Child Care Study on 705 families suggest post-natal paternal depressive symptoms when infants were 3 months old were associated with children's emotional and behavioural problems (total difficulties using the Strengths and Difficulties Questionnaire; SDQ) when they were 4

years old (Smith, Eryigit-Madzwamuse, & Barnes, 2013). This association still remained after controlling for family SES and maternal depressive symptoms according to fathers' reports of child behaviour, but according to mothers' reports of child behaviour, controlling for family SES remained significant. However, after controlling for maternal depressive symptoms became non-significant. Therefore, reporter bias might have influenced the findings and perhaps maternal reports were more accurate. Child problems can vary according to informant and depression in parents has been reported to cause parents to over-estimate their children's problems (Collishaw, Goodman, Ford, Rabe-Hesketh, & Pickles, 2009).

Studies that have used reports predominantly by mothers (98%) and which have broken down the SDQ responses into the sub-scales (pro-social, hyperactivity, emotional, peer problems and conduct problems) have yielded mixed findings with regards to child gender and behavioural-emotional problems (Goodman, 2001). Using the ALSPAC dataset, Ramchandani and colleagues found that post-natal paternal depressive symptoms measured using the EPDS were associated with children's emotional and behavioural problems at 3 and 7 years old, with sons displaying higher conduct problems compared to daughters (Ramchandani et al., 2005; Ramchandani et al., 2008). However, according to findings from the LSAC study, depressive symptoms measured using the Kessler scale were associated with emotional and conduct problems with daughters, and hyperactivity and pro-social behaviour problems with sons (Fletcher et al., 2011). Therefore, the differential influence of paternal depressive symptoms according to child gender is not well understood. This will be explored further in Chapter 4.

1.2.2.2 *Cognitive outcomes*

Children's cognitive development impacts on later academic performance, behavioural problems and social development (Baker & Cantwell, 1987; Cook, Roggman, & Boyce, 2011; Eisenberg, Cumberland, et al., 2001), and therefore is an important factor to investigate. However, research investigating the influence of paternal depression on children's cognitive development is still limited. Language development has been tested as an important indicator of children's cognitive development, and links have been made between fathers' parenting and children's cognitive development (Cook et al., 2011; Malin, Cabrera, & Rowe, 2014; Nelson, 1998; Pougnet, Serbin, Stack, & Schwartzman, 2011; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004; Vygotsky, 1978). Using a sample of 4,109 families from the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B), Paulson, Keefe, and Leiferman (2009) found paternal depressive symptoms at 9-months were associated with their children's lower expressive language abilities at 2 years old. Mensah and Kiernan (2010) used the third wave of Millennium Cohort Study Dataset (MCS) when children were 5 years old and found a significant association between paternal depressive symptoms and children's communication, language and literacy skills. However, after adjusting for SES factors this association became non-significant. Finally, in a recent study of 80 fathers that participated in the Health Attachment Promotion for Parents and Infants (HAPPI) and Father Involvement with Toddlers Study (FITS), Malin et al. (2013) found paternal depressive symptoms were significantly associated with children's lower levels of grammatical complexity. Therefore, the limited literature provides mixed findings indicating a need for further research to investigate the influence of

paternal depressive symptoms on children's cognitive development, using a longitudinal dataset. This will be explored in Chapter 5.

1.2.2.3 *Emotion regulation*

Although there is a lack of consensus in the literature regarding the definition of emotion regulation, it is loosely defined as an individual's ability to adjust and manage their emotions according to external environmental demands, which consequently affects emotional reactions and behaviours towards social situations (Thompson, 1994). Self-regulation is the ability to respond adequately by internally dealing with emotions and dysregulation is a poorly regulated response to situations (Cole, Martin, & Dennis, 2004; Cole, Michel, & Teti, 1994). Impairments in emotion regulation have been associated with adverse outcomes in later development, internalising and externalising problems and psychopathology (Eisenberg, Cumberland, et al., 2001; Eisenberg, Spinrad, & Eggum, 2010; Southam-Gerow & Kendall, 2002). The emotion regulation literature has mostly focused on the effects of maternal depression and there is, to my knowledge, no literature investigating paternal depression in relation to children's emotion regulation. Therefore, literature on maternal influence will be discussed and applied to any potential associations that might exist with fathers and their children.

Children of depressed mothers show emotion regulation problems compared to children of non-depressed mothers (Hoffman, Crnic, & Baker, 2006; Maughan, Cicchetti, Toth, & Rogosch, 2007). Emotion regulation strategies in children of depressed mothers have mostly been investigated using observational methods

with behavioural tasks and physiological studies that record Heart-Rate (HR) which is later used to calculate Heart-Rate Variability (HRV) as an indicator of physiological emotion regulation (Kovacs, Joormann, & Gotlib, 2008; Porges, Doussard-Roosevelt, & Maiti, 1994; Silk, Shaw, Skuban, Oland, & Kovacs, 2006). Physiologically, children of depressed mothers are more likely to have lower HRV, suggesting that they are not physiologically adapting to external stressful demands by physiologically regulating their emotions (Bandon, Calkins, Keane, & O'Brien, 2008; Porges et al., 1994). Behaviourally, children of depressed mothers are more likely to engage in passive waiting while engaging with the source of distress, whereas children of non-depressed mothers are more likely to use active distraction strategies to appropriately regulate their emotions (Silk et al., 2006). Thus, the inability to behaviourally regulate emotions has been associated with having a depressed mother and the ability to physiologically regulate has been reported as a protective mechanism that might make children resilient to the effects of maternal depression (Bandon et al., 2008; Silk et al., 2006). Similar studies are needed to explore emotional regulation among children of depressed fathers. Perhaps children of depressed fathers are also not able to regulate, which can also be linked to their behavioural and emotional problems (Eisenberg et al., 2010). Currently, there is some literature acknowledging the importance of paternal influence on the development of children's emotion regulation, suggesting that fathers play an important role in their children's development of emotion regulation skills (Cabrera, Shannon, & Tamis-LeMonda, 2007; Malin, Cabrera, Karberg, Aldoney, & Rowe, 2014; K. Wilson, Havighurst, & Harley, 2014), but none, to my knowledge, investigating the influence of paternal depressive symptoms on children's emotion regulation abilities. This will be explored in Chapter 4.

1.2.3 Development of a theoretical/conceptual model involving parenting: Mechanism of risk transmission from father to child

1.2.3.1 The role of a theoretical/conceptual model in understanding the risk transmission from depressed fathers to children's outcomes

The potential mechanisms that might explain any associations between paternal depression and child outcomes are complex (Natsuaki et al., 2014). Therefore, conceptual models are needed to establish possible pathways that can be empirically tested and from which to build an understanding of influences on both children's outcomes and the risk factors of depression in parents (Baron & Kenny, 1986; Goodman & Gotlib, 1999). In order to do this, it has become important to test for mediation and moderation effects to develop models that can be empirically tested (Karazsia, Berlin, Armstrong, Janicke, & Darling, 2014; Rutter, 2009). The most widely used method for conceptualising and statistically testing mediation and moderation was proposed by Baron and Kenny (1986). Mediation refers to mechanisms that may explain any associations between paternal depressive symptoms and children's emotional, behavioural and cognitive outcomes. Whereas, moderation refers to factors for which the effects of paternal depressive symptoms on child outcomes might differ. For example, boys might be more affected by their father's depressive symptoms whereas girls might not.

Although there is much controversy in the literature regarding the most appropriate conceptualisation of mediation/moderation and differing views on the most appropriate statistical method (Emsley, Dunn, & White, 2010; Rucker, Preacher, Tormala, & Petty, 2011; Selig & Preacher, 2009), the current thesis will adopt the Structural Equation Modelling (SEM) method based on the traditional and widely used Baron and Kenny (1986) method (Greenland & Brumback, 2002; Holmbeck, 1997). The advantage of this method is that it simultaneously tests for direct (association between predictor and outcome), indirect (mediation/moderated mediation) and total effects (overall model effects) (Zhao, Lynch, & Chen, 2010). Researchers have also emphasised the importance of having a large sample size and longitudinal data when testing for mediation (Rucker et al., 2011; Selig & Preacher, 2009). Using a small sample size can lead to false positive results and longitudinal data analysis provides evidence of changes over time, i.e. exposure and outcome at separate time points could indicate possible direction of causality, which can be later tested experimentally. Therefore, in order to demonstrate mediation, there should be a moderately large sample size and mediation should be tested in the correct space of time longitudinally where the predictor, mediator and outcome variables are at different consecutive time-points.

Depression in mothers is a well-established risk factor for children to develop depression (Goodman & Gotlib, 1999, 2002; Goodman et al., 2011). Due to this, theoretical underpinning investigating the intergenerational transmission of risk from parents to child outcomes has predominantly been based on mothers (Goodman & Gotlib, 2002). Based on the Baron and Kenny (1986) mediation and moderation method, Goodman and Gotlib (1999) proposed a

developmental model outlining the mechanisms of risk transmission from maternal depression to children's outcomes. There were four mechanisms identified including a) genetic heritage suggesting that children of depressed mothers are genetically predisposed to develop depression, b) the child's innate neuro-regulatory mechanisms which are primarily a consequence of neo-natal exposure to their mother's depression (neuro-endocrine alterations, stress hormones, restricted blood flow) that causes abnormal foetal development, c) the child's experience of maternal depression that is affected by the mother's parenting, style of thinking (cognitions) and behaviours towards the child, and d) exposure to negative environmental factors associated with the mother's depression that the child is also exposed to, such as disadvantaged SES. In this model, fathers' mental health was conceptualised as a moderator.

Ramchandani and Psychogiou (2009) developed the integrated model of risk transmission to account for specific aspects related to fathers by adapting it to be applicable to the mechanisms of risk transmission from paternal depression to their children's outcomes. Four possible causal pathways, which might mediate any associations between parental depression and children outcomes, were proposed. They included a) genetic heritage suggesting that as with mothers, depressed fathers might pass on genetic predisposition to their children to develop depression, b) increased relationship conflict between parents negatively influencing the child, c) effects on maternal depression, which has been shown to be associated with children's outcomes, and d) negative parenting which has been shown to influence children's outcomes. The focus of this thesis is to investigate parenting as a key mechanism of environmental risk in the association between paternal depression and

children's outcomes. The following sub-sections will discuss the different links between paternal depression, father's parenting and children's outcomes.

1.2.3.1.1 The link between paternal depression and fathers' parenting

Depression in fathers has been associated with negative interactions with their children (Jacob & Johnson, 1997; Psychogiou & Parry, 2014). Fathers with higher levels of depressive symptoms have been reported to have lower positive and higher conflict relationships with their children (Kane & Garber, 2004; Malmberg & Flouri, 2011) and are more likely to implement harsher discipline practices such as smacking their children at age 1 and 3 years old in comparison to non-depressed fathers (Davis, Davis, Freed, & Clark, 2011; Lee, Perron, Taylor, & Guterman, 2011). This is supported by findings from a meta-analysis of 28 studies by Wilson and Durbin (2010), which found that paternal depression was associated with reduced levels of positive parenting behaviours and increased levels of negative parenting behaviours. Other studies have shown paternal depressive symptoms reduced fathers' involvement with their infants during parenting activities and play time (Bronte-Tinkew, Moore, Matthews, & Carrano, 2007; Paulson et al., 2006; Paulson, Dauber, & Leiferman, 2010). Fathers with high depressive symptoms are less likely to participate in father-child parenting activities such as book reading with their child at 1 years old (Bronte-Tinkew et al., 2007; Davis et al., 2011). Therefore, the literature indicates that paternal depression may be associated with fathers' parenting. This will be explored further in Chapter 3.

1.2.3.1.2 The link between father's parenting and child outcomes

Parenting has been extensively proposed as an environmental risk factor to explain children's emotional, behavioural and cognitive outcomes (Amato & Fowler, 2002; Baumrind, 1993; Campbell, 1995; Campbell, Shaw, & Gilliom, 2000; Garcia, Bagner, Pruden, & Nichols-Lopez, 2014), with interventions promoting positive parenting behaviours reporting a reduction of behavioural problems among affected children (Gardner, Burton, & Klimes, 2006; Gardner, Shaw, Dishion, Burton, & Supplee, 2007). In a review of relevant literature, DeKlyen, Speltz, and Greenberg (1998) reported lower positive parenting (warmth, involvement, engagement) and higher negative parenting (hostile, harsh) were associated with children's behavioural problems. Moreover, a recent study by Ramchandani et al. (2013) with 192 fathers found disengaged father-child interactions at 3 months old were associated with externalising behavioural problems at age 1.

Fathers' parenting styles also seems to influence their children's cognitive development. Fathers with higher scores on sensitive and positive cognitive stimulation during parent-child interactions had 2 and 3 year old children with higher language and cognitive abilities (Cabrera et al., 2007; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Another study showed fathers who were engaged and involved in quality reading with their children at 2 years old, have children with higher receptive language skills at 5 years old (Malin, Cabrera, & Rowe, 2014). Moreover, studies using longitudinal data from the National Child Development study have found higher paternal involvement to be associated with better cognitive development, higher educational attainment and fewer

mental health problems in later life (Flouri & Buchanan, 2003, 2004). And a systematic review of 24 studies reported that fathers' active engagement with their children promoted better behavioural, emotional, cognitive and social development outcomes (Sarkadi et al., 2008). Therefore, the literature indicates that fathers' parenting behaviours are important for children's emotional, behavioural and cognitive development.

1.2.3.1.3 Indirect influence: Parenting as a mediator between paternal depression and child outcomes

Behavioural and emotional problems

There are a few studies that have investigated parenting as a mediator of the association between paternal depressive symptoms and children's emotional and behavioural problems. Using data from the MCS, Malmberg and Flouri (2011) reported paternal depressive symptoms when infants were 9-months old, to be associated with children's behavioural problems at 3 years old mediated by lower levels of positive father-child relationships at age 3. A meta-analysis of 23 studies reported father-child conflict mediated the association between paternal depression and children's emotional problems (Kane & Garber, 2004, 2009). Another study using 2,025 biological fathers from the Longitudinal Study of Australian Children (LSAC), Giallo, Cooklin, D'Esposito, Nicholson, and Wade (2013) found reports of fathers' hostility towards the child at age 5 had a role in the association between parental depressive symptoms measured using the Kessler scale during the first year after infants' birth (3 - 12 months, mean

age 9 months) and child behavioural problems at age 5, measured using the SDQ. There was no significant association between paternal depressive symptoms and child behavioural problems mediated by fathers' reports of warmth towards child at these time points. The mediating role of hostile parenting still remained significant after controlling for fathers' current depressive symptoms and maternal post-natal depressive symptoms. And in another study of fathers with slightly older children aged 5 - 9 years old, Dette-Hagenmeyer and Reichle (2013) reported negative parenting practices, such as inconsistent discipline, to mediate the association between paternal depressive symptoms and hyperactivity. Child gender was found to moderate this relationship, with boys exhibiting higher hyperactivity compared to girls. Although all these studies partly consisted of a longitudinal design, none of them tested exposure, mediator and child outcomes at three different time-points, which would be more ideal for testing the associations between variables for mediation analysis (Rutter, 2009; Selig & Preacher, 2009).

Cognitive outcomes

The mechanisms through which paternal depression might influence children's cognitive development are not well understood. As depression in fathers negatively influences parenting abilities (Psychogiou & Parry, 2014), depression in fathers might influence their children's cognitive abilities via disrupted parenting behaviours and father-child interactions. Davis et al. (2011) found that depressed fathers are 50% less likely to read with their children than non-depressed fathers and a study by Paulson et al. (2009) reported reading duration to mediate the association between post-natal paternal depressive symptoms at 9 months and children's expressive language ability at 2 years old.

Malin et al. (2013) reported that quality of paternal language mediated the association between current paternal depressive symptoms and children's language development when they were 2 years old. Child directed speech has been found to promote learning and fathers with depression have been reported to use less infant directed speech compared to non-depressed fathers, which may impact on their children's cognitive development (Kaplan, Sliter, & Burgess, 2007).

Thus, fathers with high levels of depressive symptoms spent less time reading with their children and use less speech which may result in language and cognitive deficits in their children. However, the Paulson et al. (2009) study measured both fathers' parenting at the same time-point as when the child language development was assessed. Therefore, this needs to be tested longitudinally. Mothers and fathers have been reported to talk differently with their children and fathers' reading with their children was more important for language development than mothers reading (Paulson et al., 2009; Rowe, Coker, & Pan, 2004). Therefore, fathers' parenting activities, such as reading with children might be a key mechanism for risk transmission.

Emotion regulation

Cabrera et al. (2007) found fathers' parenting during observed parent-child interactions is associated with their 2 year olds' emotion regulation abilities. Fathers who were coded as showing high levels of sensitive responding, positive effect, stimulating their children cognitively and showed low levels of intrusiveness, had children who were reported to regulate their emotions better.

Given the literature on the influence of maternal depression on children's emotion regulation and the link between fathers' parenting and children's emotion regulation, there could be a possible link between paternal depression and children's emotion regulation mediated by fathers' parenting. Therefore, studies are needed in this area to investigate this further.

1.2.4 Development of a theoretical/conceptual model: Mechanism of risk transmission from father to father-child attachment

1.2.4.1 Attachment theory

Given that parent-child attachment develops in dyadic relationships, research on parenting has been associated with attachment theory (O'Connor & Scott, 2007). Parenting can influence the type of attachment children develop in relation to specific caregivers. Bowlby (1973) proposed that an infant and its mother requires a bond that keeps them psychologically connected and provides a safe and secure base for the child to facilitate optimal social and emotional development. The theory proposes that infants require at least one primary caregiver to whom they can form a secure attachment bond. This enables them to develop an Internal Working Model (IWM) of relationships, which later social interactions are based upon. Attachment theory was further developed by Mary Ainsworth and colleagues (Ainsworth, Blehar, Waters, & Wall, 1978). Using the Strange Situation procedure (SSP), infants were classified into attachment categories called secure (B), insecure-avoidant (A), or insecure-ambivalent (C). Secure attachment (B) was seen as the most ideal for

optimal development where the infant views its mother as a secure base to explore the environment, shows distress during separation but is comforted by a stranger, then exhibits pleasure when reunited with mother and feels safe enough to explore their environment again. In contrast, avoidant (A) infants showed no distress during separation or mothers' absence and avoided their mother at reunion. Infants with ambivalent (C) attachment exhibited distress during separation and at reunion switched between resistant angry behaviour or clingy preoccupied behaviour with its mother, reacting fearfully towards exploration of the room. Main and Solomon (1990) later classified children that lacked an attachment strategy as infants with disorganised (D) attachment style. These infants demonstrated contradictory behaviours of avoiding mother and approaching her when distressed but lacked a clear attachment strategy. Thus, attachment theory is primarily a product of work by Ainsworth and Bowlby (1991) which has been used to describe mother-child relationships, parenting and children's outcomes over the last four decades (Bretherton, 1992).

Attachment theory has also been extended to measure the classic attachment categories in older, post-infancy children based on children's representations of their parents as a method for assessing children's IWM (Rutter, Kreppner, & Sonuga-Barke, 2009). This can be done either by using photographs or dolls house play illustrating attachment-related stressful situations (e.g. injury/illness, parent leaving/lost or negative events) and coding the child's response to the situation (Bretherton, 1985; Bretherton, Prentiss, & Ridgeway, 1990; Green, Stanley, Smith, & Goldwyn, 2000; Slough & Greenberg, 1990). As the IWM is susceptible to change, it is important to measure children's attachment past

infancy. Attachment measure in pre-school and school-aged children will be discussed further in Chapter 6.

1.2.4.2 *Fathers in attachment theory*

Bowlby's work initially advocated the mother as the sole primary caregiver with whom infants formed lasting attachments, but in the reformulation of his attachment theory he started to acknowledge the involvement of fathers as "playmates" (Bowlby, 1982b). In the second edition of *Attachment and Loss: Attachment*, Bowlby (1982b) suggested that both parents are important as attachment figures – "A young child's experience of an encouraging, supportive, and cooperative mother, and a little later father, gives him a sense of worth, a belief in the helpfulness of others, and a favourable model on which to build future relationships. By enabling him to explore his environment with confidence, and to deal with it effectively, such experience also promotes his sense of competence" (Bowlby, 1982, p. 378).

However, it was the work of Michael Lamb (Lamb, 1976, 1977a, 1977b) that emphasised the role of father-child attachment as important in the literature. In a series of laboratory interactions involving both parents, he reported similar amounts of comfort-seeking and attachment related behaviours towards both parents, but that infants were more likely to direct friendly and socially positive behaviours (vocalising, smiling, offering toys) towards fathers (Lamb, 1976). These findings were replicated in a home assessment study with infants aged 7 - 13 months old (Lamb, 1977a) and when infants were 2 years old (Lamb, 1977b). Attachment related behaviours and positive gestures were more likely

to be directed towards fathers. This may be because fathers and mothers themselves may display different behaviours towards infants, resulting in different attachment behaviours to be reciprocated. Therefore, there may be different aspects underlying mother-infant and father-infant attachments. Fathers may be more physically reactive, therefore encouraging infants to display more socialising behaviours towards them (such as vocalising, smiling, offering toys). MacDonald and Parke (1986) found that fathers of pre-school children engaged in more physical play with their children compared to mothers.

Maternal depression has a negative impact on mother-child attachment, with meta-analytic reviews suggesting that the children of depressed mothers were more likely to be insecurely attached (Martins & Gaffan, 2000; Wan & Green, 2009). Attachment insecurity with mothers has been linked to internalising and externalising problems during childhood (Fearon, Bakermans-Kranenburg, Van IJzendoorn, Lapsley, & Roisman, 2010; Groh, Roisman, van IJzendoorn, Bakermans-Kranenburg, & Fearon, 2012).

To my knowledge, there are only four studies in the literature which provide some evidence for an association between paternal depression and father-child attachment, which will be discussed in more detail in Chapter 6 (Buist, Morse, & Durkin, 2003; Condon, 2006; Condon, Boyce, & Corkindale, 2004; Condon, Corkindale, Boyce, & Gamble, 2013; Ferketich & Mercer, 1995), but briefly using mostly questionnaire methods, these studies found paternal depressive symptoms were associated with insecure father-child attachments. There are currently no studies using observational methods to investigate father-child

attachment representation in pre-school/school aged children of depressed fathers. In order for future studies to determine whether insecure father-child attachment underpins the association between paternal depression and children's outcomes, it is important to first determine if there is an association between paternal depression, father-child attachment and fathers' parenting, before testing for mediation in these associations. This will be the aim of Chapter 6.

1.2.5 Associated risk factors

There are a number of risk factors associated with paternal depression that need to be considered when investigating the association between paternal depression and children's outcomes. Understanding of these risk factors will inform interventions for fathers who are at risk of depression and children who are at risk of their fathers' depression. This will enable researchers to build more inclusive theoretical models regarding parent and child associations in risk, clinicians to devise more targeted interventions and service providers to be aware of fathers that might be at risk of depression. Again, most of this literature is based on risk factors associated with the post-natal period (deMontigny, Girard, Lacharité, Dubeau, & Devault, 2013; Edward et al., 2014; Wee et al., 2011), with little evidence investigating paternal depression past the post-natal period (Garfield et al., 2014; Giallo et al., 2014; Giallo, D'Esposito, et al., 2013). It is important to be aware of other factors that might influence associations when investigating prevalence of depression rates over time and how it influences children and parents (Ford, 2008).

1.2.5.1 Family risk factors

Family systems theory suggests that when one member of the family is affected by anything, this has an indirect or direct influence on other members of the family (Klein & White, 1996). Depression causes dysfunction in interpersonal relationships and with family members being in such close proximity, they can have direct or indirect influences on the functioning of individuals. Therefore, maternal depressive symptoms, marital conflict and child temperament are key aspects of the family that might impact on paternal depression, paternal parenting and child outcomes, according to previous literature discussed below.

1.2.5.1.1 Maternal depression

In an integrative review of literature, Goodman (2004) found 24%- 50% of fathers reported depression if their partner were depressed and recent systematic review and meta-analytic studies have also consistently reported an association between paternal and maternal depression (Paulson & Bazemore, 2010; Wee et al., 2011). In addition to this, a recent study using a large cohort of fathers (n=3,219) reported maternal depressive symptoms during the first post-natal year measured using the Kessler 6 scale was significantly associated with symptoms of depressive symptoms among fathers, even after controlling for SES factors (Giallo et al., 2013). This suggests that mothers have an influence on fathers, either directly by influencing the father with her depression or that both parents are exposed to the same environmental risk factors associated with depression (Deater-Deckard et al., 1998). A recent study investigated paternal depressive symptoms past the post-natal period using data from the Medical Expenditure Panel Survey of 7,247 families and their 5 -

17 year old children, found maternal depressive symptoms measured using the Patient Health Questionnaire-2 (PHQ-2) was independently associated with paternal depressive symptoms after controlling for other maternal and SES factors (Rosenthal, Learned, Liu, & Weitzman, 2013). Therefore, maternal depression maybe an important factor to take into account when investigating paternal depression trajectories overtime.

There is extensive research showing that maternal depression has detrimental effects on children's emotional, behavioural and cognitive outcomes (Caplan et al., 1989; Cummings & Davies, 1994; Grace et al., 2003; Kurstjens & Wolke, 2001; Murray & Cooper, 1997). Therefore, maternal depression can have a direct influence on children's outcomes or indirect effect via effecting fathers' mood and parenting. Fathers with partners experiencing high depressive symptoms have been reported to experience problems bonding with their infant, have increased parenting stress, engage in negative parenting behaviours towards their child and were less likely to sing songs with their child (Connell & Goodman, 2002; Edhborg, 2008; Edhborg, Matthiesen, Lundh, & Widström, 2005; Paulson et al., 2006). A recent qualitative study interviewed partners of women who suffered with post-natal depression and found these fathers reported difficulties with parenting and stress surrounding their parents' depression (Beestin, Hugh-Jones, & Gough, 2014). Therefore having depressed partners may indirectly influence fathers' parenting as outlined by model of risk transmission (Ramchandani & Psychogiou, 2009) as well as having a direct impact on the child outcomes.

1.2.5.1.2 Marital conflict

Higher rates of marital conflict have been associated with depression (Rehman, Ginting, Karimiha, & Goodnight, 2010; Rehman, Gollan, & Mortimer, 2008) and Ramchandani and Psychogiou (2009) also proposed marital conflict as an environmental risk factor associated with paternal depression, fathers' parenting and child outcomes. There is literature on marital conflict that spans from child birth to yearly childhood. Starting with the post-natal period, a systematic review of literature on paternal post-natal depression reported relationship dissatisfaction to be commonly associated with fathers' depression (Wee et al., 2011). And recent studies using large samples of fathers during the post-natal year have reported relationship conflict to be independently associated with depression in the adjusted models controlling for other SES and child factors (deMontigny et al., 2013; Giallo et al., 2013).

Using a community sample of 235 families with nursery school children, Cummings, Keller, and Davies (2005) reported higher marital conflict to be associated with higher paternal depressive symptoms. Another study investigating paternal rates of depressive symptoms over time from 0 – 7 years old using the LSAC study, found relationship dissatisfaction was significantly associated with persistent depressive symptoms amongst fathers over the first 7 years of their child's life, even after controlling for other SES factors (Giallo et al., 2013). However, all these studies measured depressive symptoms rather than depression.

The only study found using a clinical sample of fathers was Ramchandani et al. (2011) which recruited participants from hospital maternity wards. The sample consisted of 54 depressed (past and current) and 99 non-depressed fathers with 3 month old infants. Depression was measured using the Structural Clinical Interview for DSM-IV (SCID) and it was found that compared to non-depressed fathers, depressed fathers reported increased relationship dissatisfaction. When the analysis was restricted to currently depressed fathers only (n=19), the findings still remained the same. Although the sample size for this analysis was low, the results are still informative and suggest that marital conflict is associated with depression as well as depressive symptoms.

1.2.5.1.3 Child temperament

Child temperament is defined as children's innate and stable characteristics over time to deal with novel situations and people (Thomas, Chess, Birch, Hertzig, & Korn, 1963). Difficult child temperament such as intense expressions of emotional reactions during the first post-natal year has been associated with psychopathology at 7 years old, predominantly for girls (Sayal, Heron, Maughan, Rowe, & Ramchandani, 2014). Children's temperament can also influence their parents' perception and interaction with them (Ramchandani & Psychogiou, 2009). Depressed fathers are more likely to perceive their infants as being difficult and distressing (deMontigny et al., 2013; Ramchandani et al., 2011). Therefore, interactions between children with difficult temperaments and depressed fathers may further enhance the depression in fathers, which may consequently maintain depression in fathers.

Longitudinal studies have shown that offspring's of parents with a history of clinical depression exhibit difficult temperament traits and difficult child temperament is a risk factor for children developing depression later in life (Bruder-Costello et al., 2007; Mufson, Nomura, & Warner, 2002). However, these studies did not differentiate findings according to parent gender, which makes it difficult to interpret maternal and paternal associations differently. In addition, as child temperament is assumed to be a stable trait (Thomas et al., 1963), it can be difficult to deduce a clear causal direction, i.e. does having a child with a difficult temperament contribute to paternal depression? Or do fathers who have experienced depression have children who are predisposed to having a difficult temperament, as they themselves have difficult temperaments? (Potapova, Gartstein, & Bridgett, 2014). Or does the irritability involved in both depression and difficult temperaments contribute to an increased number of negative interactions between the father and child?

There are only a few studies that have investigated paternal depressive symptoms and child temperament. In a pilot study of fathers, depressive symptoms were associated with difficult child temperament (Davé, Nazareth, Sherr, & Senior, 2005). Fathers with high depressive symptoms had infants that were reported as fussier. Another study using the Structural Clinical Interview for DSM-IV (SCID) to measure past episodes of depression found no associations between fathers' depression and their preschool children's temperament (Durbin, Klein, Hayden, Buckley, & Moerk, 2005). However, the sample size of fathers with depression (n=12) was small and therefore there might have not been enough power to detect an effect. The sample size of the pilot study was also small (n=19), therefore results need to be replicated with a

larger sample size. Using a large enough sample size to detect an effect, Hanington, Ramchandani, and Stein (2010) investigated the association between paternal depressive symptoms and child temperament using the ALSPAC data-set. Paternal depressive symptoms were measured using the EPDS and child temperament using the Carey Temperament Scales (CTS) (Carey & McDevitt, 1978). They reported paternal depressive symptoms when infants were 6 - 8 months old to be associated with difficult child temperament at 2 years old, especially for boys. But child temperament at 6 months old was not associated with paternal depressive symptoms at 21 - 24 months old. Although the authors attributed the direction of father on child as causal (Hanington et al., 2010), the two time points tested were so close together that it would suggest it to be almost cross-sectional. Therefore, claiming to have determined causal direction without experimentally testing it would not be appropriate. However, it can certainly be concluded that there is an association between paternal depressive symptom and child temperament.

1.2.5.2 Socio-economic factors

Socio-economic factors have been defined as including education level, employment, poverty, family income, housing and early parenthood (Bradley & Corwyn, 2002; Hobcraft & Kiernan, 2001; Kiernan & Mensah, 2011). In a study of 812 fathers with 3-month old infants, higher depressive symptoms were associated with concerns about their employment status, lower level of education and low household income (Bergström, 2013). Ramchandani et al. (2008) also reported lower education level to be significantly associated with paternal depressive symptoms in the post-natal period. Another study of 7,247

fathers with children aged 5 - 17 years old from the Medical Expenditure Panel Survey found higher paternal depressive symptoms were independently associated with family poverty level and fathers' unemployment (Rosenthal et al., 2013) and Davé et al. (2008) reported that unemployment status, lower education, and family housing was significantly different for fathers with high and low depressive symptoms. Thus, paternal unemployment appears to be a consistent factor associated with depressive symptoms amongst fathers and has been associated with the onset of major clinical depression (Jefferis et al., 2011). Younger fathers are also more likely to experience depressive symptoms during the post-natal period and when their children were 3 years old, and this has been linked to fathers' employment patterns (Bergström, 2013; Lee, Fagan, & Chen, 2012). Fathers in jobs with irregular pay were more likely to suffer from depressive symptoms.

SES has been associated with parenting and children's emotional, behavioural and cognitive outcomes (Bradley & Corwyn, 2002; Kiernan & Mensah, 2011). Stress on parenting due to lack of resources and parental availability, which are more common among families from low SES backgrounds may influence children's developmental outcomes (Bradley & Corwyn, 2002). In a study using the MCS dataset, Malmberg and Flouri (2011) modelled the associations between post-natal parental depressive symptoms, family SES, parenting and child behavioural problems at 3 years old, and found that they were all interrelated. Other studies have reported family income and paternal education to be associated with pre-school children's emotional regulation and cognitive development (Cabrera et al., 2007; Tamis-LeMonda et al., 2004).

1.2.6 Chapter Summary

This section starts with a brief summary of the literature reviewed in the previous sections to clarify the theoretical background and literature that led to the formation of the research questions that this PhD is addressing. At the end of this section there will be an outline of the research questions and methods used to address each question.

It is first important to establish the prevalence and trajectory of paternal depressive symptoms in order for clinicians and health-care practitioners to know when to target interventions. Most of the work investigating paternal depression has been done during the post-natal period as this is considered to be a sensitive period for development and in the maternal literature mothers are most at risk during this period. Research on paternal depressive symptoms during the post-natal period and beyond has shown a wide range of prevalence rates which need replication with more representative samples. Also studies need to incorporate clinical measures to measure depression rather than relying on studies measuring depressive symptoms.

After the acknowledgement of research on fathers' influence on children's developmental outcomes, researchers have started to investigate the direct influence of paternal depressive symptoms on children's outcomes. Most research has investigated behavioural-emotional problems reporting an association between paternal depression and children's behavioural-emotional problems, and mixed results have been found according to child gender (moderator effect). Some research has also found a direct effect of paternal

depression on children's cognitive outcomes, but there are currently no studies to my knowledge, which have investigated the association between paternal depression and children's emotion regulation outcomes. Therefore, studies need to investigate these associations further.

There are some studies indicating an association between paternal depression and fathers' parenting, and a number of studies indicated an association between fathers' parenting and child outcomes. Therefore, the association between paternal depression and children's outcomes may be mediated by fathers' parenting.

Literature on mothers has shown an association between maternal depression and mother-child attachment. However, there is currently no literature investigating the association between paternal depression, father-child attachment and fathers' parenting. If there is an association, this might explain variations in child outcomes. In order for future studies to determine whether insecure father-child attachment underpins the association between paternal depression and children's outcomes, it is important to first determine if there is an association between paternal depression, father-child attachment and fathers' parenting, before checking for mediation. Therefore, this is a key gap in the literature and linked to parenting, that needs to be investigated.

Theoretical model building is important for research development and to help clinicians to target preventative interventions, but such models regarding the

influence of paternal depression on children's outcomes are still in their infancy. The current thesis hopes to build an attachment and parenting-related model of risks transmission from paternal depressive symptoms to children's emotional, behavioural and cognitive outcomes. This will be done by testing elements of the model in each Chapter of this thesis (Figure 1).

1.2.7 Attachment and parenting related model of risk transmission

1.2.7.1 Proposed model

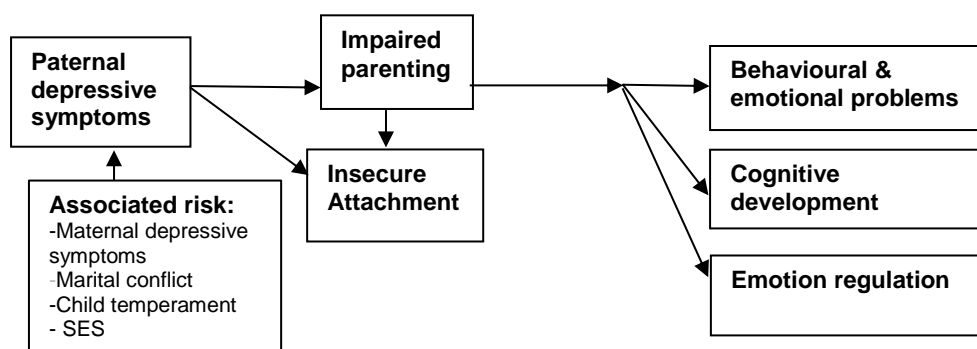


Figure 1: Proposed model on the risk of transmission via attachment related impaired parenting (Ramchandani & Psychogiou, 2009)

1.2.8 Research questions and aims

There are 6 research questions that the PhD will address.

1.2.8.1 Outline of research questions

1. What is the prevalence of depressive symptoms in fathers with young children? (Chapter 2)
2. What are the associated risk factors of paternal depression? (Chapter 2)
3. Is post-natal depression in fathers associated with their subsequent parenting? (Chapter 3)
4. Are post-natal paternal depressive symptoms associated with their children's behavioural, emotional and cognitive outcomes in school-aged children? (Chapter 4 and 5)
5. Does fathers' parenting mediate any associations in question 4? (Chapter 4 and 5)
6. Is paternal depression/depressive symptoms associated with children's insecure father-child attachment classifications? (Chapter 6)

1.2.8.2 Thesis structure

Chapter 2 will inform the first two research questions, Chapter 3 will answer the third research question, Chapters 4 and 5 will be for the fourth and fifth research questions and finally Chapter 6 will answer the sixth research question. Each Chapter deals with a different aspect of the Attachment and Parenting Related Risk Transmission Model (Figure 1). Chapters 2, 3 and 4 are three stand-alone manuscripts presented within the chapters, whereas Chapters 5 and 6 are

empirical chapters. Thus, all of the Chapters taken together will inform different elements of the model (Figure 1).

Chapter 2 investigates the prevalence of paternal depressive symptoms during the first 7 years of fatherhood and associated risk factors. Most literature in the area has focused on the post-natal period and there is limited literature investigating prevalence rates and trends in paternal depressive symptoms after the post-natal period using a UK sample of representative parents. Therefore, it is important to establish whether paternal depressive symptoms are persistent throughout children's lives up to school age and if these trends are comparable to maternal depressive symptoms. In addition to this, it is important to identify any potential risk factors associated with paternal depressive symptoms in order to gain a better understanding of whether there are groups of fathers who are at increased risk.

Chapter 3 moves onto investigating whether paternal depressive symptoms in the post-natal year are associated with fathers' subsequent parenting. Depression in fathers has been associated with impaired parenting (Jacob & Johnson, 1997; Psychogiou & Parry, 2014), with reduced positive parenting behaviours, increased negative parenting behaviours and decreased involvement in parenting activities with their child (Bronte-Tinkew et al., 2007; Paulson et al., 2006; Paulson et al., 2010; Wilson & Durbin, 2010). Therefore, the aim of the paper presented in Chapter 3 is to investigate if post-natal paternal depressive symptoms were associated with specific aspects of fathers' subsequent parenting, such as warmth, conflict or involvement in parenting

activities. Previous studies have shown all of these aspects to be related but none comparing if there is a specific aspect of fathers' parenting that is associated with his depressive symptoms. This is the gap in the literature that this Chapter addresses.

Chapter 4 builds on the findings of Chapter 3. It investigates whether post-natal paternal depressive symptoms are associated with children's emotional and behavioural outcomes 7 years old and whether fathers' parenting might mediate any potential associations. There are a number of studies that have found an association between paternal depressive symptoms and children's emotional-behavioural development (Davé et al., 2008; Fletcher et al., 2011; Ramchandani et al., 2005; Ramchandani et al., 2008; Smith et al., 2013). And a few studies that have investigated the mediating role of fathers' parenting in this association (Dette-Hagenmeyer & Reichle, 2013; Giallo et al., 2013; Malmberg & Flouri, 2011), but to my knowledge, none have investigated this association longitudinally using different time-points for the exposure, mediator and outcome with a large and representative cohort of fathers. Chapter 4 also investigates children's emotion regulation as an outcome, which as far as I am aware, has not been investigated in relation to paternal depressive symptoms.

Chapter 5 builds further on the findings of the Chapter 3 and 4 by investigating outcome variables of cognitive outcomes over a wider age range (5, 7 and 11 years old). There are some studies that have found a significant association between paternal depressive symptom and children's cognitive development (Malin et al., 2013; Mensah & Kiernan, 2010; Paulson et al., 2009) and aspects

of fathers' parenting such as reading and verbal exchanges with the child have been found to mediate the association between paternal depressive symptoms and children's language development (Malin et al., 2013; Paulson et al., 2009). However, again there is a gap in the literature investigating these mediating associations with variables at different time-points. There are also no studies investigating outcomes at different ages across childhood. This is the gap that Chapter 5 hopes to address.

Finally, the purpose of Chapter 6 is to explore the association between paternal depression/depressive symptoms and father-child attachment. It also examines other attachment-related factors that might explain any association between paternal depression and father-child attachment (paternal involvement in parenting activities and fathers' own attachment representations of his own parents). The MCS consisted of a measure of father-child relationship construct and although this has been associated with parent-child attachment, this does not directly measure the children's attachment representation to their fathers. The study in Chapter 6 uses an observational method to measure father-child attachment representation from the child's perspective, in order to provide a more detailed and valid picture of the father-child attachment than a self-report measure from fathers in the MCS. The data in Chapter 6 also incorporates the use of the clinical interview to measure depression, whereas the MCS data was constricted to solely rely on self-report measure of depressive symptoms. To my knowledge there are currently no studies that investigate father-child attachment and paternal depression in pre-school/school aged children. This is the gap that Chapter 6 will address.

1.2.8.3 Outline of research methods

Research questions are addressed using two methods. Questions 1 - 5 are addressed using secondary data analysis of the Millennium Cohort Study (MCS) using a large representative cohort of UK fathers and their children. This enables data analysis of a large sample of fathers which make the findings representative. The sample size of mothers and fathers in the MCS is presented in Table 1. The MCS consisted of mainly questionnaire data, with only one observational method of mother-child interaction during a cognitive task (Hansen, 2014; Johnson, 2012). Methods of the MCS are described later in the included manuscripts.

Table 1: Sample size of biological mothers and fathers across all sweeps in the Millennium Cohort Study

Parent	Sweep 1 (9-months old)	Sweep 2 (3 years old)	Sweep 3 (5 years old)	Sweep 4 (7 years old)	Sweep 5 (11 years old old)
	N	N	N	N	N
Mothers	18,497	14,645	12,792	12,175	12,912
Fathers	12,881	11,253	9,710	8,803	8,944

There is no data available on children's representation of father-child attachment in the MCS. Therefore, question 6 is addressed using primary data collection alongside the Fathers in Focus (FIF) project (described in detail in Chapter 6). This project uses an observational measure of father-child

attachment. In addition to this, the MCS only measure depressive symptoms using questionnaires; thus conclusions about depression as a diagnosed episode cannot be made. The FIF project uses clinical interview to assess depression, therefore leading to more in-depth data.

Chapter 2

The prevalence of depressive symptoms among fathers and associated risk factors during the first seven years of their child's life

Paper 1: Nath, S., Psychogiou, L., Kuyken, W., Ford, T., & Russell, G. The prevalence of depressive symptoms among fathers and associated risk factors during the first seven years of their child's life: findings from the Millennium Cohort Study. *Child: Care, Health and Development*

Manuscript was submitted for publication in September 2014.

2.1 Paper 1

Abstract

Background: Increasing evidence shows postnatal paternal depression to be associated with adverse emotional, behavioural and cognitive outcomes in children. Therefore, determining the prevalence of fathers' depressive symptoms during the first few years of their children's lives and associated risk factors is important. We estimated the prevalence and examined associated risk factors of paternal depressive symptoms in a nationally representative sample of fathers.

Methods: Secondary data analysis of the Millennium cohort study, when children were aged 9-months, 3 years, 5 years and 7 years old (n=5,155-12,396). Prevalence estimates and association with risk factors were derived at each age, with a longitudinal sub-analysis.

Results: Prevalence of paternal depressive symptoms was 3.6% at 9 months, 1.2% at 3 years, 1.8% at 5 years and 2.0% at 7 years. Paternal depressive symptoms were consistently associated with fathers' unemployment, maternal depressive symptoms and relationship conflict across all ages. In addition, paternal depressive symptoms were associated with fathers' education and housing tenure at 9 months, fathers' ethnic background at 5 years old and family income 5 and 7 years old.

Conclusions: Paternal depressive symptoms slightly decreased over the early years. Unemployment is an important predictor of paternal depression.

Introduction

Despite government policy and research acknowledging the importance of fathers in children's development, parenting programs and interventions are still primarily targeted at mothers (Lamb, 2010; McAllister, Burgess, Kato, & Barker, 2012). Growing evidence suggests that the postnatal period may be associated with higher prevalence of depression in fathers, as it is in mothers, and may also be associated with adverse emotional, behavioural and cognitive outcomes in children (Fletcher et al., 2011; Ramchandani & Psychogiou, 2009). To understand the influence of paternal depression on children's developmental outcomes in more depth, we need to determine the prevalence of fathers' depressive symptoms during the first few years of their children's lives and the associated risk factors. This might enable clinicians to identify when effective interventions can be implemented for the best developmental outcomes in children and to counter depression in adults, as well as indicating to what extent paternal depression maybe related to sensitive periods after birth. The aim of this article is to describe the fluctuation in paternal depressive symptoms within the first 7 years of their child's life and the associated correlates using a nationally representative sample of fathers.

Research on paternal depression has mostly focused on the first year after a child's birth as this is considered to be a sensitive period in which parental depression influences children's development (Fletcher et al., 2011). The prevalence of paternal depressive symptoms from the first trimester to 12-months after birth has been reported as 10.4 % from a meta-analysis consisting

of 43 studies (Paulson & Bazemore, 2010) and an integrative review of 20 studies gave a wide-ranging estimate between 1.2% - 25.5% during the postpartum period (Goodman, 2004). These variations are likely to be due to the use of differing assessment methods and populations in previous research (Goodman, 2004; Paulson & Bazemore, 2010). In addition, these studies used a sample of fathers that were predominantly Caucasian, so the findings may not be generalizable to other populations.

The Longitudinal Study of Australian Children (LSAC) estimated the prevalence of fathers in psychological distress (using the Kessler Scale) as 1.9% when children were 3 – 12 months, 1.4% when children were 2-3 years and 2.2% when children were 4-5 years (Giallo et al., 2012). Subsequent work showed paternal distress between the postnatal period and 7 years old decreased over-time (Giallo et al., 2014). However, the sample was not representative of socioeconomically disadvantaged fathers. Using a more representative sample of fathers participating in the Medical Expenditure Panel Survey from the USA, paternal depressive symptoms using the Patient Health Questionnaire-2 were reported at 6.19% in fathers with children age 5-17 years (Rosenthal et al., 2013). Another study from the USA, using the National Longitudinal Study of Adolescent Health, found that resident fathers' depressive symptoms increased from child birth till 5 years old, followed by a decrease between 5 – 10 years old (Garfield et al., 2014). The current study will build on this literature by investigating the trends in paternal depressive symptoms for fathers of children aged 9-months to 7 years old, using a large nationally representative sample of fathers from the UK (including ethnic minorities).

To gain a better understanding of potential prevention methods, we also need to determine associated risk factors. For family context factors, many studies have reported high correlations between maternal and paternal depressive symptoms with up to 50% of fathers likely to experience depressive symptoms if their partner is experiencing depression (Edward et al., 2014; Goodman, 2004; Paulson & Bazemore, 2010). Relationship conflict has also been identified as a significant risk factor for paternal depression (Cummings et al., 2005; Giallo et al., 2013; Rehman et al., 2010). In addition, child factors such temperament may influence paternal depression (Bruder-Costello et al., 2007; Hanington et al., 2010).

Socioeconomic factors have also been associated with paternal depression. Unemployment, poverty, younger age, low educational level, low income and ethnicity all have an effect (Bergström, 2013; Costello, Keeler, & Angold, 2001; Rosenthal et al., 2013). The UK recession that commenced in 2008-09 impacted many families and the resultant financial and social hardship may potentially have influenced the development of paternal depressive symptoms (Harkness & Evans, 2011; Jenkins et al., 2009). It is, therefore, timely to investigate the association of paternal depressive symptoms with socioeconomic variables in the UK.

Our primary objective is to estimate the changing prevalence and trend of depressive symptoms in the UK population of fathers over 7 years. We compare these prevalence and trends against mothers to investigate their comparability but the paper is primarily about fathers. In addition, we assess the association

between paternal depressive symptoms and family/socioeconomic risk factors. We hypothesise that paternal depressive symptoms would be higher immediately after birth and decrease over time and that paternal depressive symptoms would be strongly associated with maternal depressive symptoms, higher relationship conflict and difficult child temperament. We also predict that paternal depressive symptoms will be associated with lower Socio-Economic Status (SES).

Methods

Sample

Secondary data analysis was carried out using the first four sweeps of the Millennium Cohort Study (MCS) when children were 9 months, 3 years, 5 years and 7 years old. The MCS is a large-scale survey of infants ($n=19,519$) born in four constituent countries of the United Kingdom (Dex & Joshi, 2005). Full details of the survey, objectives, content of survey and sampling can be found in the documentation attached to the data deposited with the UK Data Archive at Essex University (UK Data Archive 2004 and 2006)(Hansen, 2012; Plewis & Ketende, 2006). The sample design allowed for over-representation of families living in areas with high rates of child poverty or high proportions of ethnic minorities. MCS had ethical approval and informed consent from participants (Hansen, 2012). Parents with higher depressive symptoms were significantly more likely to drop-out of the study at all follow-up Sweeps ; mothers drop-out statistics for each Sweep were S2 ($t=3.66$, $p<0.001$), S3 ($t=2.99$, $p<0.001$), S4 ($t=3.08$, $p<0.001$) and fathers were S2 ($t=6.11$, $p<0.001$), S3 ($t=4.97$, $p<0.001$), S4 ($t=4.04$, $p<0.001$).

Data preparation

Biological mothers were identified from main respondents interviewed and biological fathers from partner interviews. Step-fathers and part-time resident fathers were excluded as sample sizes were too small for meaningful analysis. The infants were approximately 9 months old at the first time point and may have had older and younger siblings which did not take part in the study. Twins and triplets in the sample were also excluded to avoid the need to include an extra level of analysis accounting for intra-family variability. Missing data was not included in analysis. More specifically, rates of depressive symptoms and trends over time were determined by using data from mothers and fathers that responded to depressive symptoms questions at all-time points (complete case analysis). Therefore, mothers and fathers with missing data at any time point were excluded from this analysis to enable comparison between time-points. All cross-sectional data analysis that investigated risk factors associated with paternal depressive symptoms used data from fathers that answered questions on all measures. Therefore, fathers that had any missing data were excluded from the analysis at each time point. Data was also not imputed as MCS weightings account for attrition, so adding the data back into the model whilst using weightings would have yielded inaccurate results. In addition to this, regression models are robust to missing data (Wolke et al., 2009).

Measures

Outcomes

Rutter's 9-item Malaise Inventory (sweep 1) was used as an indicator for depressive symptoms (Dex & Joshi, 2004). This is the shortened version of the Rutter's 24-item Malaise Inventory self-completion questionnaire (Rutter, Tizard, & Whitmore, 1970) measuring psychological distress. The 9 items selected

were based on items with the highest loading first principle factor and showed reliability of 0.71 for fathers and 0.75 for mothers using Cronbach's alpha coefficient (Johnson, 2012).

The Kessler 6 (K6) scale (sweep 2-4) (Kessler et al., 2003) was used as an indicator of current depressive symptoms in sweep 2, 3 and 4. Although the K6 measures symptoms of psychological distress, it has been reported to detect current depression and is comparable to clinical diagnosis of depression (Cairney et al., 2007). We used a strict cut-off of ≥ 13 commonly taken to indicate clinical levels of distress (Giallo et al., 2012). It has an internal consistency and reliability of 0.82 (S2), 0.84 (S3), 0.85 (S4) for fathers' and 0.87 (S2), 0.88 (S3), 0.89 (S4) for mothers using the Cronbach's alpha coefficient (Furukawa, Kessler, Slade, & Andrews, 2003; Kessler et al., 2003).

Family context factors

Maternal depressive symptoms (sweep 1-4) were measured using the Rutter Malaise and Kessler scales as above. Groups of mother with high versus low levels of depressive symptoms were derived by applying the same cut off.

Relationship conflict was measured at all sweeps using the modified version of the Golombok Rust Inventory of Relationship State (Rust, Bennun, Crowe, & Golombok, 1990). The original 28-item questionnaire had high content validity and reliability of Cronbach's alpha = 0.91 (men) and 0.87 (women). The MCS selected seven items at sweeps 1, 2 and 3, and three items at sweep 4. Higher

scores indicate higher levels of relationship conflict. The scale was standardised (Mean=0, SD=1).

Children's temperament was measured at sweep 1 using mothers' reports on the Carey Infant temperament scale (Carey & McDevitt, 1978). Fourteen questions from the original scale were used. On a 5-point scale (almost never/ rarely/ usually does not/ often/ almost always), higher scores indicated easier infant temperament and lower scores indicated more difficult temperament. All scores were on a continuous scale ranging from 14 – 70. The internal consistency of the scale is $\alpha=0.66$.

Socioeconomic factors

Paternal education and fathers' ethnic background were reported at sweep 1. Education was categorised into two groups: no qualification or school level, degree and higher, and response on ethnic background was captured in three categories: White, Indian, Pakistani & Bangladeshi and Afro-Caribbean.

Housing, family income, fathers' employment and paternal age were all reported at sweeps 1-4. Family housing was categorised as either rents accommodation or home owner. Equivalised family income was derived at each sweep (adjusted for the number of children per family). Fathers' responses to questions about work status were used to derive a variable stating whether respondent was in employment at each sweep. Paternal age was reported by fathers at each time point of the study.

Statistical analysis

As the sample was stratified, sampling weights were used in all analyses. This adjusted for the disproportionate number of ethnic minorities and low socio-economic participants initially recruited into the sample at sweep 1, making the sample representative of the UK population and accounting for the effect of attrition by sweep 4 (Plewis & Ketende, 2006). All analyses were conducted using Stata for Windows version 13.

Trends of depressive symptoms during the early years of childhood were assessed using scores from the Kessler and Rutter Malaise (percentages and mean scores). To make these scores comparable, the range of the Rutter Malaise scores were recalibrated from a 9-item scale to a 24-item scale to fit the Kessler scale, creating a continuous scale of depressive symptoms at each item point which ranged from 0-24. The continuous scales at each time point were split into dichotomous scales of high and low depressive symptoms using the Kessler clinical cut-offs to determine prevalence of depressive symptoms among mothers and fathers over time, with 0-12 to indicating low depressive symptoms and 13-24 to indicating high depressive symptoms. Biological parents who had complete data at all four time points and were full-time residents in household were used for analysis, totalling to 9,611 mothers and 5,220 fathers. Therefore missing data were not included in the estimates of prevalence.

A linear trend analysis was conducted for mothers and fathers to assess whether depressive symptoms increased or decreased over the first seven years of their children's lives. Further sensitivity analysis was used to explore

whether the linear trend in depressive symptoms was robust to the effect of birth of further children. Here, the linear trend analysis was conducted in the same sample, but limited to parents who did not have subsequent children. Therefore, these children had no younger siblings but may have had older siblings. This sub-sample comprised 5,612 mothers and 2,845 fathers.

The analysis of the risk factors: the influence of family context and socio-economic factors was determined from all fathers with available data (all data), rather than just those with complete scores at every sweep (complete cases). The number of fathers ranged from 3,782-12,396. A series of linear regressions was conducted using the continuous scale of paternal depressive symptoms scores as outcome, and family context and socio-economic factors as predictors, first in an unadjusted analysis. Predictors that were significantly associated with paternal depressive symptoms ($p < 0.01$) were taken forward into multivariable regression to test which covariates were independently associated using a cross-sectional analysis.

A further sub-analyse were conducted of risk factors that were consistently associated with higher rates of paternal depressive symptoms across all sweeps. This examined the association between the persistence of the risk factor across time (if risk factor present across all four sweeps) with paternal depressive symptoms as a continuous outcome at the final time point (longitudinal analysis).

Results

The prevalence of paternal depressive symptoms over time as defined by Kessler cut-off point was 3.6% at 9 months, 1.2% at 3 years, 1.8% at 5 years and 2.0% 7 years (Fig. 1).

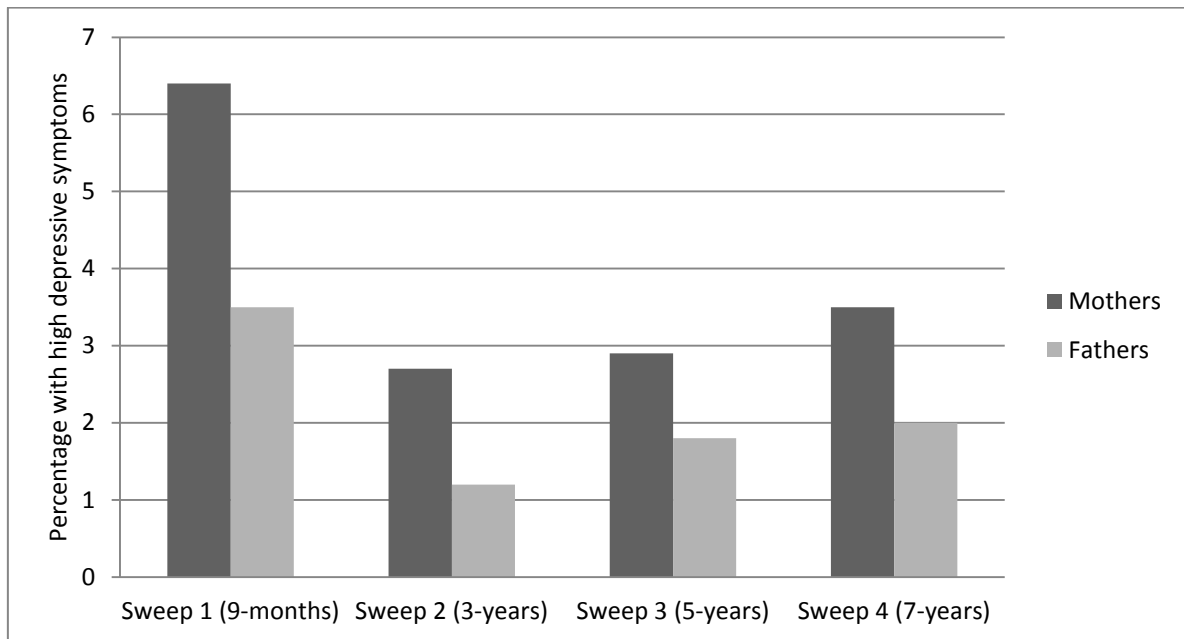


Figure 1 Percentage of mothers and fathers with high levels of depressive symptoms across time in the Millennium Cohort Study (full-cases and weighted) (n=9,611 mothers and 5,220 fathers)

Mothers' (4.09, 3.10, 2.95, and 3.01) and fathers' (3.27, 2.71, 2.77, and 2.89) mean scores on the depressive symptoms scales for each sweep were used to construct a linear trend. The linear trend showed a significant decrease over time for mothers' (beta = -0.19, 95%CI= -0.20- -0.17, $p < 0.001$) and a less pronounced decrease for fathers' (beta = -0.06, 95%CI= -0.08- -0.04, $p < 0.001$) (Fig.2). Among mothers, there was a clear postnatal peak in depressive

symptoms. Among fathers', this was less marked although the decrease was statistically significant according to a linear model.

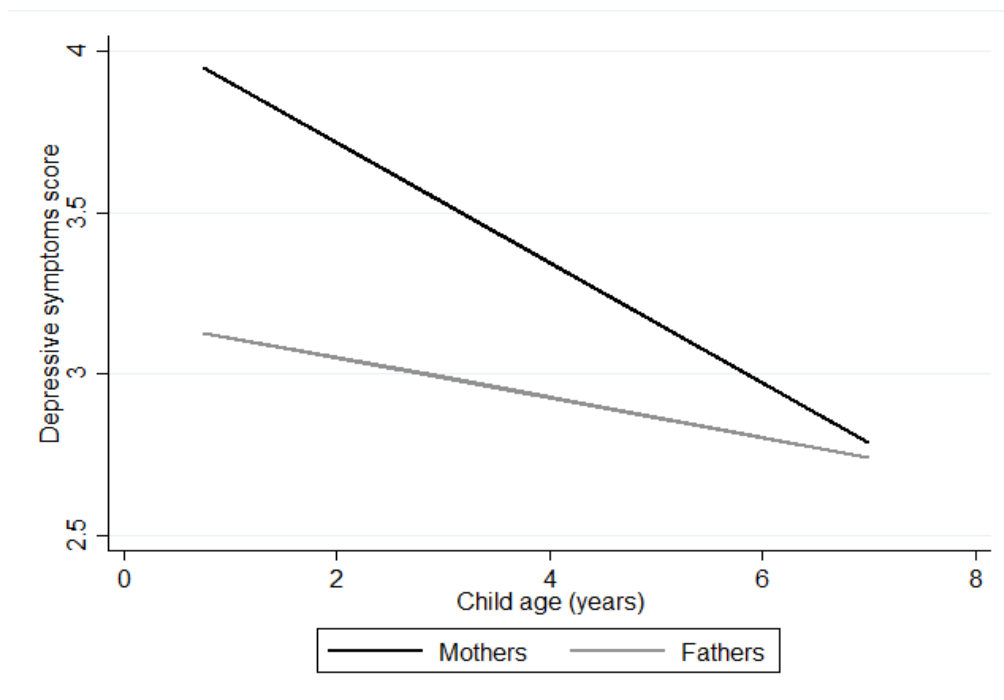


Figure 2 Depressive symptoms scores of mothers and fathers across time in the Millennium Cohort Study (full-cases and weighted)

The sensitivity analysis excluded children who had younger siblings (42%) (n=5,612 mothers and 2,845 fathers) to check whether the observed patterns were affected by subsequent births (Fig.3). The linear trend remained for both mothers' (beta = -0.21, 95%CI= -0.23- -0.18, $p < 0.001$) and fathers' (beta = -0.08, 95%CI= -0.08- -0.04, $p < 0.001$) with depressive symptoms significantly decreasing over time and slightly stronger than those with subsequent children. Therefore, the exclusion of subsequent births seemed to strengthen the linear trend, as subsequent births contributed to the maintenance of depressive symptoms over time.

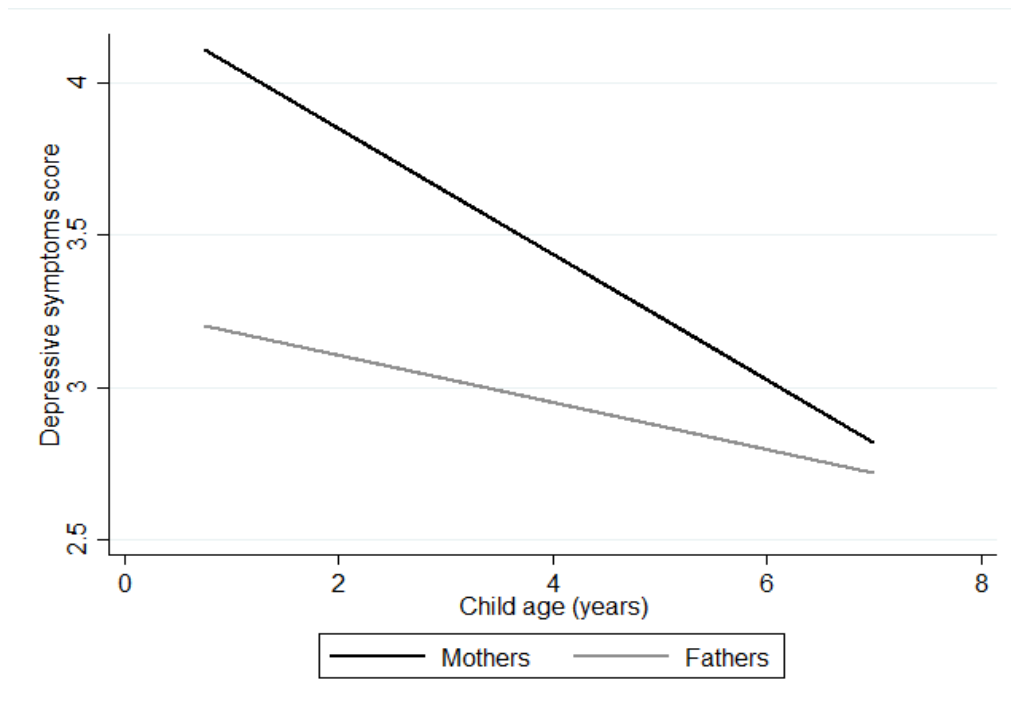


Figure 3 Depressive symptoms scores of mothers and fathers with no subsequent children across time in the Millennium Cohort Study (sensitivity analysis, full-cases and weighted)

Table 1 shows descriptive statistics for socio-economic and family risk factors. After adjusting for factors that were significantly associated ($p < 0.01$) with paternal depressive symptoms in a multivariable regression (Table 2), maternal depressive symptoms, higher relationship conflict and paternal unemployment were still significantly associated with higher levels of paternal depressive symptoms at all sweeps. When children were 9 months old (sweep 1), having no qualifications and living in rented housing were significantly associated with higher levels of paternal depressive symptoms. Indian, Pakistani and Bangladeshi ethnicity was associated with higher levels of paternal depressive symptoms compared to white fathers when children were 5 years (sweep 3). Finally, at 5 and 7 years, lower family income was associated with higher levels of depressive symptoms amongst fathers. The overall models fit R^2 values 13%,

18%, 19% and 16%, suggesting many unaccounted factors influence the levels of paternal depressive symptoms.

Finally, a sub-analysis investigated the association between the persistence of risk factors (maternal depressive symptoms, relationship conflict and employment status) over time with paternal depressive symptoms at sweep 4 (Table 3). This showed that maternal depressive symptoms (high depressive symptoms during most sweeps, early onset and late onset) were consistently associated with higher paternal depressive symptoms. High relationship conflict across all sweeps and relationship conflict within the last two sweeps were associated with higher depressive symptoms in fathers, whereas, early relationship conflict during sweeps 1 and 2, that was resolved by sweeps 3 and 4 was not associated with paternal depressive symptoms. Finally, fathers that were unemployed across all sweeps or unemployed during the last two sweeps reported higher depressive symptoms compared to fathers that were consistently employed at all sweeps. There was no significant difference in depressive symptoms between fathers that were consistently employed and those that were unemployed but subsequently found employment.

Table 1 Descriptive statistics of fathers with low and high levels of depressive symptoms at each Sweep from the Millennium Cohort Study

Predictors	Sweep 1 ^b		Sweep 2 ^c		Sweep 3 ^d		Sweep 4 ^e	
	Low depressive symptoms	High depressive symptoms	Low depressive symptoms	High depressive symptoms	Low depressive symptoms	High depressive symptoms	Low depressive symptoms	High depressive symptoms
Family context factors								
Partner								
Maternal depressive symptoms: Mean(SD)	3.96(4.3)	6.18(5.6)	2.82(3.2)	4.98(4.6)	2.62(3.2)	4.23(4.6)	2.57(3.2)	4.69(4.4) ^a
Relationship conflict: Mean(SD)	-0.04(1.0)	0.97(1.3)	-0.00(1.0)	1.38(1.3)	-0.01(1.0)	1.13(1.5)	-0.02(1.0)	1.02(1.5) ^a
Child								
Child temperament: Mean(SD)	57.44(6.1)	55.26(6.8)	57.49(6.0)	56.88(7.1) ^a	57.52(6.0)	56.44(6.8)	57.41(6.0)	55.45(6.7) ^a
Child gender (%)								
1. Boy	52	50	50	51	51	57	51	51
2. Girl	48	50	50	49	49	43	49	49
Socio-demographic factors								
Paternal education (%)								
1. No qualifications	14	31	12	29	12	37	12	27
2. School level, Degree or higher	86	69	88	71	88	63	88	73
Fathers ethnic background (%)								
1. White	93	91	94	89	95	92	94	89
2. Indian, Pakistani & Bangladeshi	5	7	5	8	4	8	4	10
3. Afro-Caribbean	2	2	2	3	1	0	2	1
Fathers' employment (%)								
1. Employed	92	74	94	74	95	63	95	61
2. Unemployed	8	26	6	26	5	37	5	39
Household employment (%)								
1. Both unemployed	5	22	4	23	4	28	3	32
2. At least one parent employed	95	78	95	77	96	72	97	68
Housing (%)								
1. Council or private rent	22	43	17	40	15	46	16	46
2. Home owner	78	57	83	60	85	54	84	54
Family income (£ per week): Mean(SD)	370.15(205.00)	290.92(197.10)	413.88(227.14)	291.21(192.93) ^b	439.95(222.63)	272.53(150.63)	474.08(229.37)	309.37(200.71) ^a
Poverty: (%)								
1. Below poverty line	16	36	15	43	14	48	12	45
2. Above poverty line	84	64	85	57	86	52	88	55
Paternal age (years): Mean(SD)	33.2(6.0)	32.7(6.6)	35.7(5.9)	34.7(6.5)	37.8(5.9)	37.6(6.2)	39.7(5.9)	38.7(6.3) ^a

^a SD were taken from data out of survey, as survey set in stata was giving inaccurate result of 0 SD's

^b Sample size range from 7,650-12,396, due to missing data

^c Sample size range from 5,491-8,897, due to missing data

^d Sample size range from 5,155-8,312, due to missing data

^e Sample size range from 4,612-7,382, due to missing data

Table 2 Adjusted associations between predictors and paternal depressive symptoms in the Millennium Cohort Study

Predictors	Sweep 1		Sweep 2		Sweep 3		Sweep 4	
	Coefficient (95% CI)	p	Coefficient (95% CI)	p	Coefficient (95% CI)	p	Coefficient (95% CI)	p
<i>Family context factors</i>								
Maternal depressive symptoms	0.11 (0.08-0.13)	<0.001	0.08 (0.05-0.12)	<0.001	0.08 (0.04-0.11)	<0.001	0.10 (0.05-0.15)	<0.001
Relationship conflict	1.12 (1.01-1.23)	<0.001	1.06 (0.95-1.17)	<0.001	1.08 (0.95-1.22)	<0.001	1.01 (0.85-1.16)	<0.001
Child temperament	-0.01 (-0.03- -0.00)	0.097	-0.01 (-0.02-0.01)	0.264	0.00 (-0.02-0.02)	0.922	-0.00 (-0.02-0.01)	0.754
Child gender								
<i>Socioeconomic factors</i>								
Paternal education		0.011				0.832		
No qualifications								
School level, Degree or higher	-0.45 (-0.79- -0.10)				0.04 (-0.36-0.44)			
Ethnic background				0.110		0.001		0.638
White								
Indian, Pakistani, & Bangladeshi			0.60 (0.03-1.18)	0.042	1.08 (0.44-1.72)	0.001	0.32 (-0.37-1.01)	0.368
Afro-Caribbean			-0.50 (-1.71-0.70)	0.410	-0.35 (-1.11-0.40)	0.359	-0.17 (-1.19-0.84)	0.733
Fathers employment	0.94 (0.41-1.46)	<0.001	0.99 (0.50-1.48)	<0.001	2.47 (1.67-3.26)	<0.001	2.48 (1.50-3.45)	<0.001
Housing tenure		<0.004		0.206		0.421		0.077
Council and private renting, % home owner, %	-0.41 (-0.69- -0.13)		-0.21 (-0.53- 0.11)		-0.16 (-0.55-0.23)		-0.40 (-0.84- 0.04)	
Family income (per £1000 p.a.)	-0.35 (-0.90-0.21)	0.219	-0.22 (-0.15-0.60)	0.238	-0.71 (-1.15- -0.27)	0.001	-0.58 (-1.05- -0.08)	0.022
Paternal age (Sweep 1)	-0.08 (-0.25-0.10)	0.395						

^a Sample size was 6831

^b Sample size was 4270

^c Sample size was 4158

^d Sample size was 3782

Table 3 Associations between paternal depressive symptoms and the persistence of risk factors (fathers' employment, maternal depressive symptoms and relationship conflict) in the Millennium Cohort Study

Predictors ^a	N	%	Outcome paternal depressive symptoms continuous outcome at S4	
			Coefficient (95% CI)	p
Maternal depressive symptoms ^b				<0.001
Low depressive symptoms most Sweeps	8,497	92%	Reference	
High depressive symptoms most Sweeps	82	1%	2.73(1.39-4.07)	<0.001
Early onset (recovered)	525	5%	0.96(0.44-1.47)	<0.001
Late onset	152	2%	2.23(0.66-3.81)	0.006
Relationship conflict ^c				<0.001
Low relationship conflict all Sweeps	1,228	54%	Reference	
High relationship conflict all Sweeps	656	30%	2.69(2.33-3.04)	<0.001
High late conflict after Sweep 2	261	12%	1.64(1.15-2.12)	<0.001
High early conflict up to Sweep 2	94	4%	0.61(-0.06-1.28)	0.074
Fathers' employment				<0.001
Employed in all Sweeps	7,141	95%	Reference	
Unemployed in all Sweeps	227	3%	2.68(1.69-3.68)	<0.001
Late unemployment after Sweep 2	82	1%	2.72(0.85-4.59)	0.005
Early unemployment before Sweep 2	55	1%	-0.82(-1.79-0.15)	0.099

^a Sample size range from 2,174 - 6,138, due to missing data

^b There was an insufficient sample size of mothers that reported high depressive symptoms at all Sweeps. Therefore, groups for maternal depressive symptoms were coded so that 1=low depressive symptoms at all Sweeps where mothers reported low depressive symptoms at all Sweeps. 2=high depressive symptoms at most Sweeps. There were mothers that reported high depressive symptoms during three consecutive Sweeps. 3=Early onset (mothers that reported high depressive symptoms during Sweeps 1 and 2 but low depressive symptoms later on. 4=late onset (low depressive symptoms at Sweeps 1 and 2, but high depressive symptoms later on.

^c A dichotomous scale for relationship conflict was created at each Sweep using a median split of the scale.

Discussion

Using a nationally representative sample of UK fathers, we found the prevalence of paternal and maternal depressive symptoms reduced over time, but the reduction was greater among mothers compared to fathers. These findings report prevalence at the lower end of the range compared to previous estimates that extend from 1.2% to 25.5% (Goodman, 2004; Paulson & Bazemore, 2010; Rosenthal et al., 2013). Our findings showed slightly higher paternal depressive symptoms compared to the LSAC study which used the same measure (K6) and cut-off making our results directly comparable (Giallo et al., 2012), and replicated the findings of Giallo et al. (2014) reporting that paternal depressive symptoms decreased over-time from the post-natal period to 7 years old. Taken together, the findings suggest that a small proportion of fathers experience significant levels of depressive symptoms throughout the first seven years of fatherhood, and like post-natal maternal depression, symptoms are most common in the first year after birth, but the peak is smaller and consequently the decline in depressive symptoms is less pronounced than seen amongst mothers. To our knowledge, this is the first study to investigate this trend in such a large and representative cohort in the UK.

The association of maternal with paternal depressive symptoms is consistent with previous literature and suggests that fathers are more likely to experience depressive symptoms if their partner also has depression (Goodman, 2004; Paulson & Bazemore, 2010). Relationship conflict was also associated with higher paternal depressive symptoms as predicted and consistent with previous literature (Cummings et al., 2005; Giallo et al., 2013; Rehman et al., 2010). However, child temperament was not significantly associated with paternal

depressive symptoms (Bruder-Costello et al., 2007; Hanington et al., 2010), which suggests that within the family context, mother's concurrent difficulties have a greater influence on fathers' depressive symptoms than child characteristics.

Paternal unemployment was strongly and consistently associated with paternal depressive symptoms. This is consistent with previous literature on adult men and findings from one large US cohort study of fathers with older children (Rosenthal et al., 2013; Wilson & Walker, 1993). Our findings suggest that unemployment is a significant risk factor for fathers' depressive symptoms. This strong association will be of interest to social policy makers and health care providers whose concern is prevention and treatment of depression in fathers.

Our study has a number of strengths. First, the data consisted of a representative sample size of the UK population with a good response rate. The study was unique in that it has data on such a large sample of fathers making them comparable to mothers and used well validated measures (Hansen et al., 2010; Johnson, 2012). Second, although sampling weights were used to account for attrition rates, research indicates that even when drop outs are considered, associations found in regression models are still robust with such large cohort studies (Wolke et al., 2009), suggesting our findings to be robust.

However, the study has some limitations. Depressive symptoms were measured differently in the first sweep to the later sweeps, but it was important to have an indicator of depressive symptoms within the first year of life.

However, there was no significant difference in depressive symptoms between sweep 1 and 2 and similar means scores of mothers and fathers depressive symptoms have been reported by other studies using the K6 questionnaires (Giallo, Cooklin, & Nicholson, 2014; Giallo et al., 2014) to those we obtained at sweep 1 using the Rutter Scales, suggesting that the recalibration of the scale was appropriate. As a questionnaire was used to indicate depressive symptoms, reference to clinical diagnoses of depressive episode could not be made. Although there are limitations with relying on self-report questionnaire measures to investigate depressive symptoms and it is arguably better to administer clinical interviews method, conducting clinical interviews with a large sample size would be costly, time-consuming and would impose burden on participants. (Cairney et al., 2007) compared the K6 questionnaire with clinical interview diagnosis of current depression and reported it to be an “excellent screening instrument, especially for current depression” (pg. 111). This suggests that the use of questionnaires such as the K6 in large epidemiological studies are informative of current depression and to some extent indicates impairments related to a clinical depressive episode.

The findings are limited to full-time resident fathers and cannot be applied to general population of fathers that are separated, divorced or non-resident. Research indicates that non-resident fathers have higher levels of depressive symptoms compared to resident fathers who are married or cohabiting (Giallo et al., 2012; Huang & Warner, 2005). Therefore, the current findings might underrepresent the prevalence of depressive rates amongst fathers in general. Although we were interested in investigating this, we were unable to due to the lack of data for non-resident fathers. Finally, although the study accounted for

attrition rates by using sampling weights, it did not impute missing data on depressive symptoms. As fathers with high depressive symptoms could be more likely to drop out and therefore missing at non-random. Thus, future research should conduct analysis on imputed data to see if the findings are replicated with a complete dataset of fathers.

Despite these limitations, our findings are timely and add to theoretical understanding of paternal depression. The next-step would be to take associated factors and test for causal relations by using experimental design and longitudinal data analysis to determine if associated factors caused paternal depression or proceed after paternal depression. This could inform better targeted interventions and treatment for fathers with depression. In addition to this, future work should account for other genetic and environmental risk factors associated with paternal depressive symptoms that could not be tested in the current study such as family history of depression, father's past depressive episodes and paternal substance abuse (Ramchandani & Psychogiou, 2009).

Currently in the UK, healthcare cost of depressed fathers is comparable to mothers but interventions are still primarily tailored for mothers (Edoka et al., 2011; Petrou et al., 2002). In light of our findings, we would recommend a more family centred approach (Field, 2010; Letourneau et al., 2012). Primary health care services, unemployment officers, job centres and couples therapy workers should be aware that unemployed fathers of young children are at high risk of depression. Provided suitable, accessible and effective services were available,

the systematic screening of new fathers could be implemented alongside the systematic screening of new mothers by health visitors.

Key Messages

- Paternal depressive symptoms have been associated with negative behavioural, emotional and cognitive outcomes in children.
- In order to design more effective interventions, prevalence and risk factors for paternal depressive symptoms need to be established throughout the early parenting years.
- The current paper adds to literature by finding that fathers' unemployment is consistently associated with higher rates of paternal depressive symptoms.
- Clinicians should be aware of unemployment as a potential risk factor for depressive symptoms in fathers during the early parenting years.
- Provided accessible services were available, policy makers should incorporate the systematic screening of new fathers for depressive symptoms alongside existing screening of new mothers.

Chapter 3

Is post-natal depressive symptoms in fathers associated with their subsequent parenting?

Paper 2: Nath, S., Russell, G., Ford, T., Kuyken, W., & Psychogiou, L. Postnatal paternal depressive symptoms associated with fathers' subsequent parenting: Findings from the Millennium Cohort Study (short report), *The British Journal of Psychiatry*.

Manuscript was submitted for publication in March 2014 in the British Journal of Psychiatry and is currently under review. The findings were informative but did not warrant a full original article; therefore a short report was submitted for publication.

3.1 Paper 2

Abstract

As impaired parenting may lie on the causal pathway between paternal depression and children's outcomes, identifying the specific influence of depression on fathers' parenting behaviours may highlight important potential targets for the development of improved interventions. This report uses data from the first four data points of the Millennium Cohort Study to investigate the association between paternal depressive symptoms and fathers' parenting (negative, positive and involvement). Findings suggest that postnatal paternal depressive symptoms are associated with fathers' negative parenting. This has implications for designing intervention programmes for parents with depression and young children.

Report

Impaired parenting has been proposed as a causal pathway between paternal depression and children's developmental outcomes (Ramchandani & Psychogiou, 2009). Therefore, it is important to understand which aspects of parenting behaviours are influenced by paternal depression. Some literature has categorised parenting behaviours as positive (warmth, closeness, sensitivity, responsiveness) and negative (hostile, intrusive, conflicted, detached) with parental involvement (time spent with child) also given importance (Wilson & Durbin, 2010). A meta-analysis of 28 studies reported paternal depression to be associated with reduced positive (such as reading with their child) and increased negative parenting behaviours (such as smacking) (Davis et al., 2011; S. Wilson & Durbin, 2010).

Using the Millennium Cohort Study (MCS), Malmberg and Flouri (2011) reported higher level of paternal depressive symptoms when the child was 9-months old to be associated with lower overall positive father-child relationship quality at 3 years old. Furthermore, a recent Australian study suggests that paternal depressive symptoms might influence fathers' negative parenting rather than positive parenting (Giallo et al., 2013). Postnatal paternal depressive symptoms were associated with hostility at 5 years old, but no association with warmth was detected. The current study aimed to test whether paternal depressive symptoms were independently associated with positive parenting (warmth), negative parenting (conflict) or amount of time participating in parenting activities (involvement), after controlling for a number of possible covariates, and to explore factors that may moderate any such association.

Methods

Secondary data analysis was carried out using the first four waves of the Millennium Cohort Study (MCS). This is a large-scale survey of infants (n=19,519) when they were 9 months (MCS1), 3 years (MCS2), 5 years (MCS3) and 7 years old (MCS4) (Dex & Joshi, 2005). Full details of the measures, survey, objectives, content of survey and sampling can be found elsewhere (Hansen, 2012; Johnson, 2012; Plewis & Ketende, 2006).

Measures

The predictor was paternal depressive symptoms at MCS1 using the *Rutter's 9-item Malaise Inventory* (shortened version) as an indicator for depressive symptoms (Dex & Joshi, 2004; Rutter et al., 1970). The outcome measure of fathers' parenting at MCS2 was assessed using the *Child-parent relationship Scale* which measured two constructs of father-child relationship based on father's report, warmth and conflict. Fathers' parenting activity (involvement) was measured at MSC3 and MSC4 using fathers' answers to the amount of parenting activities they undertook with their child such as reading, storytelling, playing music, drawing, physical activities and playing games. Items were summed to create a total score of fathers' parenting activity at both sweeps with higher scores indicating less involvement and lower scores indicating more involvement.

Covariates were *family context* (maternal depressive symptoms, child temperament, child gender, mothers parenting, and marital relationship) and

socioeconomic factors (paternal education, fathers' employment, family housing, family income and paternal age), which have been found to have an influence on fathers' depression (Bruder-Costello et al., 2007; Giallo et al., 2012; Malmberg & Flouri, 2011). All were all reported at MCS1 (9-months) apart from mother Child-parent relationship and parenting activities which were assessed in the same way as fathers' at MCS2 (3 years), MCS3 (5 years), and MCS4 (7 years).

Statistical analysis

Sampling weights were used in analyses, as the sample was stratified to make it representative of the UK population as a whole. Analyses were conducted using Stata 13.

Linear regressions were conducted to test the relationship of paternal depressive symptoms (predictor) association with father-child conflict/warmth relationship (outcomes at MCS2) and fathers' parenting activities (outcome at MCS3 and MCS4). To check whether family context and socioeconomic covariates were associated with the outcomes a series of linear regressions were conducted. Covariates that were significantly ($p < 0.05$) associated with fathers' parenting outcomes were taken forward into the adjusted multivariable regression model to test if paternal depressive symptoms (MCS1) was independently associated with father-child warmth/conflict relationship and fathers' parenting activities. Some covariates were tested for moderation effects (maternal depressive symptoms, child temperament, child gender, marital relationship, fathers' employment and paternal age).

Results

In the unadjusted univariate analysis, higher paternal depressive symptoms significantly predicted higher father-child conflict, lower warmth scores, and lower levels of involvement (Table 1). All covariates apart from fathers' employment status were significantly associated with fathers' parenting activities and all apart from education were also significantly associated with father-child conflict and warmth. After adjustment, higher paternal depressive symptoms were independently associated with higher father-child conflict relationship. The overall model explained 16% of the variance in father-child conflict ($R^2=0.16$).

Table 1: The association between paternal depressive symptoms at sweep 1 (9 months old) and fathers' parenting activity/relationship unadjusted and adjusted for family context and socioeconomic factors

Paternal depressive symptoms (MCS1) 9 months old	Father-child relationship				Parenting activities			
	Conflict (MCS2) ^a 3 years		Warmth (MCS2) ^b 3 years		MCS3 ^c 5 years		MCS4 ^d 7 years	
	Coefficient (95% CI ^e)	p	Coefficient (95% CI ^e)	p	Coefficient (95% CI ^e)	p	Coefficient (95% CI ^e)	p
Unadjusted	0.85(0.75-0.96)	<0.001	-0.12(-0.16-0.07)	<0.001	0.30(0.21-0.40)	<0.001	0.29(0.19-0.39)	<0.001
Adjusted ^f	0.68 (0.56-0.81)	<0.001	0.00 (-0.07-0.08)	0.929	0.09 (-0.04-0.22)	0.180	0.12 (-0.03-0.26)	0.109

^a Unadjusted sample size was 7,755 and adjusted sample size was 4,140

^b Unadjusted sample size was 7,663 and adjusted sample size was 4,052

^c Unadjusted sample size was 7,542 and adjusted sample size was 4,299

^d Unadjusted sample size was 6,621 and adjusted sample size was 3,806

^e 95% Confidence Intervals

^f Adjusting for maternal depressive symptoms, child temperament, child gender, marital relationship, fathers' employment, paternal age and mothers parenting.

Only maternal depressive symptoms (Coefficient=-0.11, $p=0.006$, 95%CI=-0.18- -0.03) and marital conflict (Coefficient=-0.12, $p=0.037$, 95%CI=-0.24- -0.01) appeared to moderate the association between paternal depressive symptoms and father-child conflict after adjustment. The influence of paternal depressive symptoms on father-child conflict scores was lower in families with low marital conflict and mothers that had low depressive symptoms, than with families with high marital conflict and mothers that have had low depressive symptoms.

Discussion

The findings show that paternal depressive symptoms may be associated with conflict in father-child relationship, which replicates previous findings (Giallo et al., 2013; Kane & Garber, 2004) and suggests that paternal depressive symptoms influence negative parenting, rather than positive parenting. Paternal depressive symptoms were not associated with paternal involvement, suggesting that the quality of parenting is influenced by depressive symptoms but duration of time spent with child is not altered. We also found that both maternal depressive symptoms and marital conflict moderated the association between paternal depressive symptoms and father-child conflict, whereas within-child factors did not. Maternal influence on fathers' parenting is in line with previous literature (Malmberg & Flouri, 2011).

Our study has a number of strengths. Firstly, the MCS collected data on a large sample of fathers' representative of the UK population. Secondly, the study used well validated measures and maintained a high response rate (Johnson,

2012). Finally, sampling weights were applied to account for attrition. Findings however, were based solely on self-report questionnaires from fathers'. Results could have been affected by shared method bias; that is fathers' with depressive symptoms may be more likely to report negative than positive behaviours. Additionally, no clinical diagnoses for depression were available. Secondary data analysis studies can inform future experimental and longitudinal studies in clinical samples that should include direct observation and structured diagnostic assessment. If our findings were replicated, parenting interventions for depressed fathers' should focus on the reduction of father-child conflict, as opposed to engendering warmth, or increasing parental involvement. Influence of mothers' depressive states and marital conflict will also need to be addressed.

Despite reports showing paternal depression to cost the economy as much as maternal depression, parenting interventions are still primarily targeted towards mothers (Edoka et al., 2011). Taking our findings into account, we advocate a more family centred approach (Letourneau et al., 2012) and provided that appropriate support and services are put in place, we would suggest routine screening for postnatal depression in fathers', as it currently is with mothers.

Chapter 4

Are post-natal paternal depressive symptoms associated with their children's behavioural and emotional outcomes at 7 years old?

Paper 3: Nath, S., Russell, G., Kuyken, W., Psychogiou, L., & Ford, T. Does father-child conflict mediate the association between fathers' postnatal depressive symptoms and children's adjustment problems at 7 years old?

Psychological medicine

Manuscript is in preparation to be submitted for publication in November 2014

4.1 Paper 3

Abstract

Background: Paternal depressive symptoms are associated with children's emotional and behavioural problems. Studies have identified negative parenting as a potential mediator of this link. However, there are two gaps in the literature. There is no research on the influence of paternal depressive symptoms on children's emotion regulation and limited literature investigating fathers parenting as a mediator in the pathway between paternal depressive symptoms and children's externalising and internalising problems. The aim of the current study was to investigate the mediating role of father-child conflict in the association between postnatal paternal depressive symptoms and children's emotional, behavioural and emotion regulation problems. We also examined whether the influence of paternal depressive symptoms were different for boys and girls.

Methods: Secondary data analysis was conducted on three sweeps of the Millennium Cohort Study, when children were 9-months, 3-years and 7-years-old (n=8,597). We used Structural Equation Modelling to estimate direct, indirect and total effects of paternal depressive symptoms on child outcomes, mediated by father-child conflict whilst adjusting for relevant covariates. Multi-group analysis was then conducted to determine the differential effect of paternal depressive symptoms by child gender. The model was additionally adjusted for fathers' concurrent depressive symptoms.

Results: Father-child conflict mediated the link between paternal depressive symptoms and internalising problems for girls and externalizing problems for boys.

Conclusions: Father-child conflict may mediate the association between postnatal paternal depressive symptoms and children's behavioural and emotional outcomes. Therefore, treating paternal depressive symptoms and father-child conflict resolution may be an important factor to target in preventative interventions.

Key words: Paternal depressive symptoms, parenting, father-child conflict, behavioural problems, emotion regulation.

Introduction

Postnatal depressive symptoms in fathers are associated with behavioural and emotional problems in children (Ramchandani et al., 2008; Ramchandani, Stein, Evans, & O'Connor, 2005; Weitzman, Rosenthal, & Liu, 2011), but there is limited understanding about the underlying mechanisms that explain these associations. Behavioural and emotional problems during childhood are associated with poor outcomes during adulthood, including academic underachievement, psychiatric problems, relationship difficulties, substance abuse and dependency on services (Caspi, Moffitt, Newman, & Silva, 1996; Fergusson, John, & Ridder, 2005). This causes considerable burden on public services and has huge costs on society (Scott, Knapp, Henderson, & Maughan, 2001; Snell et al., 2013). Improved understanding of how paternal depressive symptoms influences children's behavioural and emotional outcomes during childhood may improve theoretical understanding about the transmission of risk from parents to children and might provide targets for interventions involving fathers (Ramchandani & Murphy, 2013).

Although studies have found a link between paternal depressive symptoms and children's behavioural and emotional problems (Davé, Sherr, Senior, & Nazareth, 2008; Ramchandani et al., 2008; Ramchandani et al., 2005), there are mixed findings about the influence of paternal depressive symptoms on boys and girls. Postnatal depressive symptoms in fathers were associated with children's psychopathology at 3 and 7 years old in the UK Avon Longitudinal Study of Parents and Children (ALSPAC) (Ramchandani et al., 2008; Ramchandani et al., 2005). Sons of fathers with high depressive symptoms

were reported to display more conduct problems compared to daughters. In contrast, findings from the Longitudinal Study of Australian Children (LSAC) suggested that the daughters of fathers with high depressive symptoms were more likely to have emotional and conduct problems, whereas sons were more likely to exhibit hyperactivity problems and lower levels of prosocial behaviour (Fletcher, Freeman, Garfield, & Vimpani, 2011). Understanding the differential influences of paternal depressive symptoms according to child gender will enable us to identify whether girls or boys are more vulnerable to their fathers' depressive symptoms and this can help to narrow down effective targets for interventions. Moreover, it is important to explore gender-specific pathways that may help explain the possible father to child transmission of risk.

Evidence suggests that children's inability to regulate emotions is associated with increased externalising and internalising behavioural problems (Eisenberg, Spinrad, & Eggum, 2010). Difficulty with regulating anger and impulsivity (under-regulation) has been linked with externalising problems, whereas inability to control cognition and attention (over-regulation involved in rumination and negative bias) have been associated with internalising problems (Gross, 1998). Studies have mostly focused on the effects of maternal depression on children's emotion regulation, and have reported that children of depressed mothers have poorer emotion regulation compared to children of non-depressed mothers (Silk, Shaw, Skuban, Oland, & Kovacs, 2006). This may be due to the environmental influence of depressed mothers' inability to parent sensitively or children modelling mothers' maladaptive emotion regulation strategies (Eisenberg et al., 2001; Hoffman, Crnic, & Baker, 2006). Although there has been studies on the importance of fathers to the development of emotion

regulation among children (Cabrera, Shannon, & Tamis-LeMonda, 2007; Wilson, Havighurst, & Harley, 2014), to our knowledge there are no studies that examines the association between paternal depressive symptoms and children's emotion regulation.

One hypothesis proposes that paternal depressive symptoms may influence children's development via fathers' impaired parenting (Ramchandani & Psychogiou, 2009). Depression in parents has been associated with negative parent-child interactions (Jacob & Johnson, 1997; Psychogiou & Parry, 2013) and a meta-analysis of 28 studies reported paternal depressive symptoms to be associated with increased negative and decreased positive parenting behaviours towards children (Wilson & Durbin, 2010). One study found that fathers' disengaged parenting when their infant were 3-months old predicted externalising problems at 1 year in their sons, but not daughters (Ramchandani et al., 2013). Another meta-analysis consisting of 23 studies reported that father-child conflict mediated the association between paternal depressive symptoms and children's emotional problems (Kane & Garber, 2004). However, the studies in this meta-analysis included children with a wide age range from 3-14 years old and most studies were cross-sectional. To determine specific pathways using mediation analysis, exposure to paternal depressive symptoms, fathers parenting and child age when outcomes are measured needs to be studied longitudinally (Selig & Preacher, 2009).

Using longitudinal data from the Millennium Cohort Study (MCS), Malmberg and Flouri (2011) found that paternal depressive symptoms at 9 months old

predicted behavioural problems in children when 3 years old via lower quality of father-child relationship. Using another large cohort study (LSAC study), Giallo, Cooklin, D'Esposito, Nicholson, and Wade (2013) reported that paternal depressive symptoms during infancy were associated with children's emotional and behavioural problems at 4-5 years old, and the association was mediated via increased hostile parenting. Child gender did not appear to moderate this association. In both of these studies, fathers' parenting and child outcomes were measured at the same time-point, therefore causality cannot be assumed. Finally, a study of fathers with children aged 5-9 years old found inconsistent discipline practices mediated the association between paternal depressive symptoms and their sons' hyperactivity, but not their daughters (Dette-Hagemeyer & Reichle, 2013). Although there was a longitudinal element to this study, paternal depressive symptoms and parenting were measured simultaneously and the measure of child outcomes was collected 6-months later, making the analysis almost cross-sectional.

This study aims to address the above gaps in the current literature using a large representative sample of fathers from the MCS in the UK. The primary objective is to test the proposed model (Figure 1) and investigate whether father-child conflict mediates the association between paternal depressive symptoms and children's emotional and behavioural outcomes. The exposure of paternal depressive symptoms during infancy has been identified as a sensitive period where paternal depressive symptoms may influence children's later outcomes (Ramchandani et al., 2008). The mediator of father-child conflict was measured at 3 years old during preschool year when fathers' become more involved in parenting their children (Bruce & Fox, 1999; Grossmann, Grossmann,

Fremmer-Bombik, Kindler, & Scheuerer-Englisch, 2002; MacDonald & Parke, 1986). Previous literature has also associated father-child conflict with paternal depression and negative outcomes in children (Kane & Garber, 2004, 2009). Children's outcomes were measured at 7 years old. This is a developmentally challenging period as children learn new behaviour and emotion management skills and problems with adjustment at this age predict poor outcomes in adulthood (Fergusson et al., 2005; Pianta, Steinberg, & Rollins, 1995). Given that maternal depression, child temperament, child gender, and family socio-economic status may be associated with paternal depressive symptoms, fathers parenting and children's emotional and behavioural outcomes (Flouri, Midouhas, & Joshi, 2014; Goodman, 2004; Hanington, Ramchandani, & Stein, 2010; Kiernan & Huerta, 2008; Malmberg & Flouri, 2011), we controlled for these factors in our models. Our secondary objective was to test the moderating influence of child gender on any potential associations and investigate whether associations still remain after adjusting for fathers concurrent depressive symptoms which has been identified as an important factor to control for in such mediation models (Foster, Garber, & Durlak, 2008; Giallo et al., 2013). We predicted that father-child conflict at 3 years old would mediate the association between paternal depressive symptoms at 9-months old and children's behavioural-emotional outcomes at 7 years. We expected that child gender would moderate this mediation and associations to still remain after adjusting for concurrent paternal depressive symptoms.

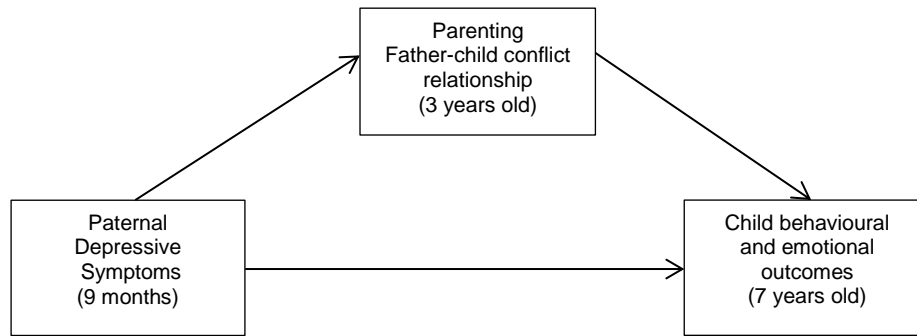


Figure 1 Proposed mediation modelling showing the effect of paternal depressive symptoms on child behavioural and emotional outcomes

Methods

Participants

This secondary data analysis was conducted using the first (S1), second (S2) and fourth (S4) sweeps of the Millennium Cohort Study (MCS), when children were 9 months, 3 years and 7 years old. The MCS is large-scale survey of infants ($n=19,519$) born in four constituent countries of the United Kingdom (Dex & Joshi, 2005). The sample design allowed for over-representation of families living in areas with high rates of child poverty or high proportions of ethnic minorities in England and the three smaller countries (Northern Ireland, Wales, and Scotland). Full details of the survey, objectives, content of survey and sampling strategy can be found in the documentation attached to the data deposited with the UK Data Archive and elsewhere (Hansen, 2014; Plewis & Ketende, 2006). MCS had informed consent from participants and ethical approval (Hansen, 2012). Our work was a secondary analysis of anonymised data that is publically available on the website

(<http://discover.ukdataservice.ac.uk/series/>) requiring no direct contact with the individual participants, so further ethical approval was not required.

The first wave (S1) of data was collected from 2001-2002 on 18,533 families, with a total of 18,819 infants aged between 9-11 months. The same sample were then invited to follow-up with 15,590 families in the second wave (S2) when the children were approximately 3 years old, 15,246 families in the third wave (S3) when children were approximately 5 years old and 13,857 in the fourth wave (S4) when children were approximately 7 years old. The current study uses data collected in Sweeps 1, 2 and 4.

The MCS collected data from main respondents (usually mothers) and partner respondents (fathers, step fathers, same sex partners). For the current study, the sample was limited to biological fathers (partner respondents) and mothers (main respondents). Fathers who were main respondents were excluded to simplify analysis as main and partner questions were not identical. Part-time resident and step-fathers were also excluded due to insufficient sample size. A small sample of twins and triplets were excluded to avoid the need to include an extra level of analysis that would have accounted for intra-family variability. Thus, only one child per family (the first cohort member) was studied.

Measures

Paternal depressive symptoms

Rutter's 9-item Malaise Inventory (S1) was used as an indicator for depressive symptoms in S1 (Dex & Joshi, 2004; Rutter, Tizard, & Whitmore, 1970). This is the shortened version of the Rutter's 24-item Malaise Inventory self-completion questionnaire measuring psychological distress (Rutter et al., 1970). The 9-item short form included items measuring symptoms of depression such as "feel tired most of the time", "feel miserable or depressed", and "easily upset or irritated" and have also been used in previous studies as an indicator of depressive symptoms (Kiernan & Huerta, 2008; Malmberg & Flouri, 2011). Using Cronbach's alpha (α) coefficient the internal consistency of the scale was 0.75 for mothers and 0.71 for fathers which is similar to previous validation studies on the scale (Rodgers, Pickles, Power, Collishaw, & Maughan, 1999).

The Kessler 6 (K6) scale (Kessler et al., 2003) was used as an indicator of concurrent depressive symptoms (S4). Although the K6 scale measures is well known to measure symptoms of psychological distress, it has been found to detect current depression and a score of ≥ 13 is comparable to clinical diagnosis of depression (Cairney, Veldhuizen, Wade, Kurdyak, & Streiner, 2007; Giallo et al., 2012). The scores from the MCS, had an internal consistency of $\alpha=0.85$.

Fathers' parenting: Father-child conflict

Fathers' parenting was measured using The Child-Parent Relationship Scale (CPRS; Short form, Pianta & Steinberg, 1992). This includes 8 self-report items

on a 5-point Likert scale (definitely does not apply, not really, neutral/not sure, applies sometimes, and definitely applies) and has been used by other studies as an indicator of parenting (Kiernan & Huerta, 2008; Kiernan & Mensah, 2011). The items originate from attachment theory, Attachment Q-set and literature on parent-child relationships to form a subscale looking at negative approach towards father-child relationship (conflict). Fathers' reports are comparable to mothers' reports and observational data on parent-child interactions has shown conflict ratings on the CPRS to correlate with observational coding of hostility (Driscoll & Pianta, 2011). Higher score on the scale indicated higher conflict in relationship. The scale had adequate internal consistency ($\alpha=0.73$).

Child behavioural and emotional problem

The Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001) reported by mothers was used to assess child emotional and behavioural problems (S4, 7 years old). The SDQ is validated for children aged 3-16 years old and was developed as a clinical tool to identify psychopathology. There are 25 items in total consisting of five subscales: emotional symptoms, conduct problems, hyperactivity, peer problems and prosocial behaviour. The scores for each subscale ranges between 0-10. All sub-scales were used in the analysis. Higher scores indicate greater problems on the emotional, conduct, hyperactivity, and peer problems, whereas higher scores on the prosocial scale indicated more prosocial behaviour. The internal consistencies from the MCS were: conduct problems $\alpha= 0.55$, emotional problems $\alpha=0.68$, hyperactivity $\alpha= 0.78$, peer problems $\alpha=0.59$ and prosocial $\alpha=0.71$. These are similar to internal

consistencies reported in other studies using non-clinical samples of children (Muris, Meesters, & van den Berg, 2003; Niclasen et al., 2012).

Child emotion regulation

Selected items from the Child Social Behaviour Questionnaire (CSBQ; Hogan, Scott, & Bauer, 1992) were used to generate three emotion regulation scales reported by mothers (self-regulation, emotion dysregulation and cooperation). The self-regulation and the reverse of emotion dysregulation scales were significantly correlated ($r=0.32$, $p<0.001$) and were summed to create an emotion-regulation scale for the analysis. Higher scores on the emotion regulation scale indicated more adaptive emotion regulation. The internal consistency of the scale was $\alpha= 0.72$.

Family context covariates

Maternal depressive symptoms (S1) were measured using the Rutter Malaise Inventory as above (Dex & Joshi, 2004; Rutter et al., 1970). Children's temperament (S1) was measured with mothers' reports on the Carey Infant Temperament Scale (Carey & McDevitt, 1978). Fourteen questions from the original scale were used in the MCS. Items were on a 5-point scale (almost never, rarely, usually does not, often, almost always). All scores were on a continuous scale ranging from (14 – 70) consisting of the total score of all items. Higher scores indicated easier infant temperament and lower scores indicated more difficult temperament. The internal consistency of the scale was $\alpha=0.66$.

Socioeconomic Status (SES)

Households were classed as living in poverty if their income was equal to or less than 60% of the median household income for the UK, the definition of poverty set by the UK government (Ketende & Joshi, 2008).

Statistical analysis

Structural Equation Modelling (SEM) using Stata for Windows version 13 was used to test the mediation model illustrated in Figure 1, i.e., whether father-child conflict (3 years) mediated the association between paternal depressive symptoms (9 months) and child outcomes at 7 years old (conduct problems, emotional problems, hyperactivity, peer problems, prosocial and emotion regulation). The model estimated standardised direct, indirect and total effects, as well as adjusting for a number of relevant covariates (maternal depressive symptoms, child temperament, child gender and SES) (model 1). Outcomes that were significantly associated with paternal depressive symptoms in model 1 were taken forward into a multi-group SEM analysis. This investigated whether child gender moderated the associations between paternal depressive symptoms and child outcomes mediated by father-child conflict while controlling for maternal depressive symptoms, child temperament and SES (model 2). Finally, the SEM mediation model was run again further adjusting for paternal concurrent paternal depressive symptoms (model 3).

As the sample was stratified, sampling weights were used in all analyses to adjust for the disproportionate number of participants from ethnic minority and

low socio-economic status backgrounds initially recruited into the sample at Sweep 1. Weights aimed to return the sample to the structure of the UK population and also to account for the effect of attrition and multi-stage cluster sampling strategy used by the MCS. The use of the weights is recommended by the MCS team and available with the dataset. Missing data were not analysed. Only data with complete cases on variables of interest across time-points were included in the analysis.

Results

Descriptive statistics

Table 1 shows descriptive statistics for the study measures. Overall, boys had more impairment on every outcome scale with the exception of emotional problems where girls had more impairment. The predictor, mediator and outcomes were significantly correlated, a necessary requirement for mediation to occur (Table 2).

Table 1 Sample size, means and standard deviations for all children, boys and girls

Variables ^a	All children N	All children mean (SD)	Boys N	Boys mean (SD)	Girls N	Girls mean (SD)
Paternal depressive symptoms(S1) ^c	12,396	1.35(1.53)	6360	1.37(1.52)	6036	1.32(1.54)
Father-child conflict(S2) ^c	8,597	18.09(5.50)	4349	18.26(5.54)	4248	17.92(5.45)
Child emotional problems SDQ(S4) ^c	12,972	1.56(1.79)	6580	1.52(1.82)	6392	1.58(1.73)
Child conduct problems SDQ(S4) ^c	13,000	1.45(1.58)	6593	1.59(1.67)	6407	1.27(1.44)
Child hyperactivity SDQ(S4) ^c	12,953	3.44(2.54)	6573	3.87(2.62)	6380	2.96(2.37)
*Child peer problems SDQ(S4) ^b	12,979	1.27(1.59)	6584	1.36(1.66)	6395	1.13(1.47)
Child prosocial SDQ(S4) ^c	13,004	8.55(1.67)	6597	8.28(1.80)	6407	8.85(1.45)
* Child emotion-regulation(S4) ^b	13,014	4.75(0.69)	6602	4.67(0.72)	6412	4.85(0.65)

^bHigher scores indicate less impairment

^cHigher scores more impairment

Table 2 Intercorrelations for predictor, mediator and outcomes used in model.

Variables	Paternal depressive symptoms (S1)	Father-child conflict (S2)
Postnatal paternal depressive symptoms (S1)		
Father-child conflict (S2)	0.24*	
Child emotional problems SDQ (S4)	0.09*	0.12*
Child conduct problems SDQ (S4)	0.12*	0.18*
Child hyperactivity SDQ (S4)	0.10*	0.16*
Child peer problems SDQ (S4)	0.09*	0.10*
Child prosocial SDQ (S4)	-0.05*	-0.10*
Child emotion-regulation (S4)	-0.11*	-0.20*
Concurrent paternal depressive symptoms (S4)	0.39*	0.25*

p<0.001=*

Mediation model

Figure 2a shows that after adjusting for relevant covariates (maternal depressive symptoms, child temperament, child gender and family SES), higher father-child conflict relationship mediated the association between high paternal depressive symptoms at 9-months and children's increased emotional problems, conduct problems, hyperactivity and emotion dysregulation at age 7 years old. The estimated total effects of paternal depressive symptoms on children's prosocial behaviour and peer problems were not significant and therefore were not included in Figure 2. Table 3 shows the coefficients for each outcome (Model 1).

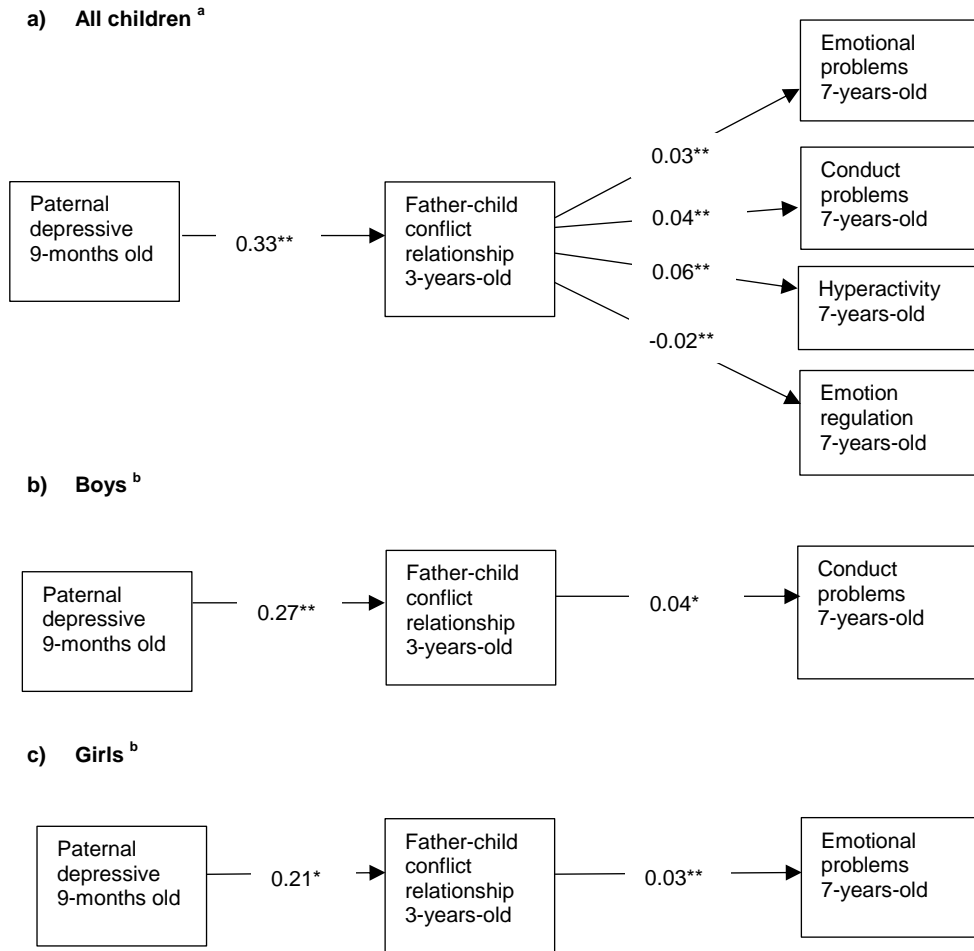


Figure 2 Pathways showing the effect of paternal depressive symptoms on (a) all children (b) boys' and (c) girls' behavioural and emotional outcomes via father-child conflict, after adjusting for covariates. Shown where $p < 0.05 = *$ or $p < 0.001 = **$.

^a Adjusting for maternal depressive symptoms, child temperament, child gender and SES

^b Adjusting for maternal depressive symptoms, child temperament, SES and concurrent paternal depressive symptoms

Moderation by gender

Model 2 tested for child gender moderator effects (Table 3). This model included significant outcomes from model 1 (emotional problems, conduct problems, hyperactivity, emotion regulation) and also adjusted for maternal depressive symptoms, child temperament and SES. Father-child conflict mediated the association between paternal depressive symptoms and boys conduct problems, hyperactivity and emotion regulation (Table 3, Model 2). No effects were found for girls, which suggest that paternal depressive symptoms may have an effect via conflict on conduct and hyperactivity in their sons but not daughters. Finally, we found the opposite effect for emotional problems, where father-child conflict mediated the association between paternal depressive symptoms and emotional problems for girls but there was no mediating influence for boys (Table 3, Model 2).

After adjusting for current paternal depressive symptoms at the same time as child outcomes (Model 3), father-child conflict still significantly mediated the association between postnatal paternal depressive symptoms and boys conduct problems (Figure 2b) and daughters emotional problems (Figure 2c) at 7 years old. Table 3 (Model 3) shows the standardised coefficients for each outcome.

Table 3 Adjusted mediation models showing the effect of paternal depressive symptoms at 9 months on children’s behavioural and emotional development at 7 years via father-child conflict at 3 years old

Model	Model 1 ^a		Model 2 ^b				Model 3 ^c			
	All children		Boys		Girls		Boys		Girls	
Outcome	Coef ^d (95% CI)	P	Coef ^d (95% CI)	P	Coef ^d (95% CI)	P	Coef ^d (95% CI)	P	Coef ^d (95% CI)	P
SDQ										
Emotional problems										
Direct	0.01 (-0.01 - 0.02)	0.291	-0.00 (-0.02 - 0.02)	0.929	0.02 (-0.01 - 0.04)	0.138	-0.02 (-0.02 - 0.01)	0.178	0.01 (-0.01 - 0.03)	0.154
Indirect	0.01 (0.02 - 0.02)	<0.001	0.01 (0.01 - 0.02)	<0.001	0.01 (0.00 - 0.01)	<0.001	0.01 (0.01 - 0.01)	<0.001	0.01 (0.00 - 0.01)	0.004
Total	0.02 (0.02 - 0.03)	0.007	0.01 (-0.01- 0.03)	0.230	0.03 (0.00- 0.05)	0.024	-0.01 (-0.03 - 0.02)	0.614	0.02 (0.00 - 0.04)	0.043
Conduct problems										
Direct	0.01 (-0.00 - 0.02)	0.121	0.02 (-0.00 - 0.04)	0.061	-0.00 (-0.02 - 0.02)	0.878	0.01 (-0.01- 0.03)	0.280	-0.02 (-0.04 - 0.00)	0.051
Indirect	0.01 (0.01 - 0.02)	<0.001	0.01 (0.01- 0.02)	<0.001	0.01 (0.01 - 0.02)	<0.001	0.01 (0.01 - 0.01)	<0.001	0.01 (0.00 - 0.01)	<0.001
Total	0.02 (0.01- 0.04)	<0.001	0.03 (0.01 - 0.06)	0.002	0.01 (-0.01- 0.3)	0.279	0.02 (0.00 - 0.04)	0.046	-0.01 (-0.03 - 0.01)	0.284

Hyperactivity/inattention

Direct	0.01 (-0.02 - 0.03)	0.611	0.02 (-0.02 - 0.05)	0.311	-0.01 (-0.03 - 0.02)	0.644	0.00 (-0.04 - 0.04)	0.879	-0.01 (-0.04 - 0.02)	0.582
Indirect	0.02 (0.01 - 0.02)	<0.001	0.02(0.01 - 0.03)	<0.001	0.01 (0.01- 0.02)	<0.001	0.02 (0.01 - 0.03)	<0.001	0.01 (0.00 - 0.01)	0.002
Total	0.02 (0.00 - 0.04)	0.022	0.04(0.01 - 0.08)	0.021	0.01 (-0.02 - 0.03)	0.553	0.02 (-0.02 - 0.06)	0.309	-0.00 (-0.03 - 0.03)	0.980

Peer problems

Direct	0.01 (-0.02 - 0.02)	0.439
Indirect	0.01 (0.00 - 0.01)	<0.001
Total	0.01 (-0.00 - 0.03)	0.066

Prosocial

Direct	0.01 (-0.00 - 0.02)	0.171
Indirect	-0.02 (-0.03 - -0.01)	<0.001
Total	0.00 (-0.01- 0.02)	0.757

Emotion regulation

Direct	-0.00 (-0.01 - 0.00)	0.430	-0.01 (-0.02 - 0.00)	0.285	0.00 (-0.01 - 0.01)	0.687	-0.00 (-0.01 - 0.01)	0.891	0.00 (-0.01 - 0.01)	0.813
Indirect	-0.01 (-0.01- -0.00)	<0.001	-0.01 (-0.01 - -0.01)	<0.001	-0.01 (-0.01 - -0.00)	<0.001	-0.01 (-0.01 - -0.00)	<0.001	-0.00 (-0.00 - -0.00)	<0.001
Total	-0.01 (-0.01 - -0.00)	0.002	-0.01(-0.02 - -0.00)	0.010	-0.00 (-0.01 - 0.00)	0.328	-0.01 (-0.02 - 0.00)	0.237	-0.00 (-0.01 - 0.01)	0.622

R²	0.29	0.21	0.19	0.25	0.22
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- ^a Sample size was 4,217
- ^b Sample size was 4,221
- ^c Sample size was 3,357
- ^d All coefficients were standardized

Discussion

As hypothesised, higher paternal depressive symptoms at 9 months were significantly associated with children's externalising, internalizing and emotion regulation problems at 7 years old, via higher father-child conflict when children were 3 years old. These findings extend previous studies investigating the association between paternal depressive symptoms, fathers' parenting and children's emotional and behavioural problems (Dette-Hagenmeyer & Reichle, 2013; Giallo et al., 2013; Malmberg & Flouri, 2011; Ramchandani et al., 2008; Ramchandani et al., 2005) and add to literature by using longitudinal data from key time points. This study is also the first to our knowledge that has investigated the association between paternal depressive symptoms and children's emotion regulation.

Sons of fathers with higher levels of depressive symptoms were reported to have more externalising problems (higher scores on the conduct and hyperactivity subscales) at age 7 years old, while daughters were reported to exhibit higher internalising problems (higher emotional problems). We also found sons' of fathers with higher levels of depressive symptoms were reported to have poorer emotion regulation. Previous studies have shown that maternal depression negatively impacts on their daughters' emotion regulation abilities but not sons' (Silk et al., 2006). As emotion regulation abilities are learnt from parents during early development, these results may indicate that same-gendered parents have a greater influence on their children in this process (Eisenberg et al., 2001). We also found that boys with poorer emotion regulation

abilities had higher externalising problems, which is also in line with previous research (Eisenberg et al., 2010).

Daughters of fathers with depressive symptoms were reported to exhibit higher levels of emotional problems, via higher father-daughter conflict. Although higher scores for internalizing problems are more common among girls than boys in the general population (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000), there is evidence to suggest that daughters of depressed fathers might be more vulnerable than girls whose fathers report low depressive symptoms. Depression in fathers has been linked to child neglect and harsher parenting (Lee, Perron, Taylor, & Guterman, 2011; Lee, Taylor, & Bellamy, 2012) and using the ALSPAC dataset, Culpin, Heron, Araya, Melotti, and Joinson (2013) reported that the daughters of absent fathers reported more depressive symptoms compared to sons. Taken together with previous findings, our results indicate that depressed fathers' may neglect their children and/or father-daughter conflict might make them unavailable parents, which could contribute to the higher levels of internalising (emotional) problems that were reported among daughters. Thus, our findings suggest that paternal depressive symptoms maybe differentially associated with their sons and daughters outcomes via higher father-child conflict.

When we controlled for concurrent paternal depressive symptoms, the mediating role of father-child conflict still remained significant in the association between paternal depressive symptoms and sons' externalising (conduct) difficulties and daughters' internalising (emotional) problems. It may be that

postnatal depressive symptoms in fathers have residual effects on their mood, and therefore these fathers struggle with conflict resolution with their toddlers, which later impacts on their children's behavioural-emotional development during early school years (Foster et al., 2008; Kane & Garber, 2009). As depressive symptoms in the postnatal period were independently associated with children's emotional and behavior outcomes, this may indicate a sensitive period in which it would be important to target interventions with fathers suffering from high depressive symptoms. Successful interventions with depressed fathers may prevent emotional and behavioural difficulties among their children during childhood, as well as alleviating distress among fathers.

The current study has a number of strengths. First, the MCS is a unique dataset with a large representative sample of UK fathers. Second, the MCS used well validated and reliable measures and we tested children's outcomes longitudinally. Third, our findings are further strengthened by child outcomes being reported from mothers, decreasing any variances produced by same informant reporter bias of predictors and outcomes. Finally, although research indicates that even when drop outs are taken into account, regression models with large cohort studies are still robust (Wolke et al., 2009), sampling weights were still used in our analysis to increase the representativeness and account for attrition rates that might have influenced results.

There were also some limitations. Firstly, we lacked data on clinical diagnoses of depressive episodes using interview methods, which some might argue would be more informative. Parenting was also measured using self-reports,

which might not be accurate due to biased reporting of positive parenting and inter-association with fathers reporting high depressive symptoms and higher conflict parenting. Parenting is being increasingly measured using observational methods of parent-child interactions (Aspland & Gardner, 2003). However, in both cases conducting studies using observational and interview methods with such a large sample size would be expensive, time-consuming, and impractical, while the study of the influence of depressive symptoms is useful as results can later be tested experimentally using smaller sample sizes of clinical populations. Secondly, the coefficient effect sizes of our associations were small. Previous studies investigating mediation effects using large cohort studies have also reported small effect sizes of maternal and paternal depressive symptoms on child outcomes (Giallo et al., 2013; Giallo, Cooklin, Wade, D'Esposito, & Nicholson, 2014; Malmberg & Flouri, 2011). Given that the MCS consisted of a normal population of fathers, clinically relevant high levels of depressive symptoms would have been underestimated due to the likelihood of depressed fathers being less motivated to participate and therefore might have resulted in small effect sizes. A smaller scale study consisting of a clinical sample of depressed fathers may yield larger effect sizes. This is something for future studies to investigate. However, given the huge challenges with recruiting depressed fathers to participate in research with their children (Garber, Ciesla, McCauley, Diamond, & Schloedt, 2011; Pilowsky et al., 2014; Sherr, Davé, Lucas, Senior, & Nazareth, 2006), the findings from large cohort studies such as ours offers useful insight into the possible associations in this field of limited literature.

We also assumed causal direction due to the data originating at different time points across the child's life. We are assuming linear relationships when in fact the interrelationships between parental mental health, parenting and children's development is likely to be complex and these factors may amplify and feedback on each other. Therefore, our findings need to be replicated experimentally to draw firm conclusion about causal direction. Finally, we acknowledge that there are more statistically advanced techniques for testing mediation using Cross-Lagged Panel Modelling (CLPM) and Latent Growth Mediation (LGM) Model (Selig & Preacher, 2009). These techniques account for autoregressive controls, reverse causality and trends (slopes and intercepts) between associations (Cole & Maxwell, 2003; Maxwell & Cole, 2007; Maxwell, Cole, & Mitchell, 2011). These methods have been used to investigate moderation and mediation in maternal depression, mothers' parenting and children's behavioural outcomes (Beauchaine, Webster-Stratton, & Reid, 2005; Belsky, Pasco, & Bell, 2007; Nancy Eisenberg et al., 2005). However, these statistical techniques require all variables to be available at all time-points (Selig & Preacher, 2009), which was not the case in the MCS, restricting the analysis method we could utilise. Thus, future research work could expand the statistical analysis of this paper by using longitudinal multivariate analysis with more statistically advanced techniques to build on the findings of this paper.

Despite some of the limitations, the findings of this study add to theoretical understanding of indirect effects of fathers' postnatal depressive symptoms to their children's outcomes. Postnatal paternal depressive symptoms were associated with boys' externalising (conduct) problems and girls internalising (emotional) problems at 7 years old via higher father-child conflict relationship at

3 years old. These associations still remained significant after accounting for maternal depressive symptoms, child temperament, SES and fathers' concurrent depressive symptoms. There are some specific implications that can be taken from the current study to inform parenting interventions. For example, parenting interventions could help with managing conflict parent-child relationships between depressed parents and their children. This may have potential to break the intergenerational transmission of risk. Parenting interventions involving fathers have been found to lessen behavioural problems in children mainly due to the change in fathers' parenting (Wilson et al., 2014), therefore involving depressed fathers in such interventions maybe beneficial. Studies have shown paternal depressive symptoms to cost as much as maternal depression (Edoka, Petrou, & Ramchandani, 2011), but intervention programs are still primarily targeted at mothers (Panter-Brick et al., 2014). In light of our findings we would encourage more research with fathers and involvement of fathers in parenting programs of depressed parents.

Chapter 5

Are fathers' depressive symptoms in the post-natal period associated with their children's cognitive outcomes at 5, 7 and 11 years old?

5.1 Introduction

Vygotsky (1978) defined cognitive development as a process of acquiring knowledge through social interactions through-out childhood and emphasised the importance of language development in this process. Deficits in cognitive development during the early years has been associated with a wide range of negative outcomes later in life, such as poor academic performance, behavioural problems, social development problems, unemployment and psychiatric problems (Baker & Cantwell, 1987; Batty, Mortensen, & Osler, 2005; Avshalom Caspi, Wright, Moffitt, & Silva, 1998; Cook et al., 2011; Eisenberg et al., 2001). Language skills are a key indicator of children's cognitive development and often used as a proxy variable (Nelson, 1998; Vygotsky, 1978). Many studies have shown post-natal maternal depression and poor quality of parenting to have a negative impact on children's cognitive development (Grace et al., 2003; Lugo-Gil & Tamis-LeMonda, 2008; Murray, Kempton, Woolgar, & Hooper, 1993). However, there is a lack of literature investigating the influence of paternal depression on children's cognitive development. The aim of this current chapter is to build on the work presented in Chapter 4, and investigates 1) if there is a link between paternal depressive symptoms and children's lower levels of cognitive development and 2) if father-child conflict may mediate this association.

Fathers' positive parenting and ability to cognitively stimulate their children during father-child interactions has been associated with improved cognitive development amongst their children (Cook et al., 2011; Malin, Cabrera, & Rowe, 2014; Pougnet et al., 2011; Tamis-LeMonda et al., 2004). Given that

depression is characterised by low mood, irritability and impairments in interpersonal relationships, fathers' ability to positively parent their children can be affected (Connell & Goodman, 2002; Edhborg, 2008; Edhborg et al., 2005; Paulson et al., 2006; Wilson & Durbin, 2010). Depressed fathers use less infant-directed speech with their infants and are 50% less likely to read with their children compared to non-depressed fathers (Davis et al., 2011; Kaplan et al., 2007; Sethna, Murray, & Ramchandani, 2012). Moreover, studies have found paternal depressive symptoms to negatively impact on their children's use of grammatically complex language and expressive language development (Malin et al., 2013; Paulson et al., 2009). Therefore, depressed fathers might have negative interactions with their children and might be unable to provide cognitively stimulating interactions to promote optimal cognitive development.

Only a few studies have investigated the mechanisms that might explain the association between paternal depressive symptoms and children's cognitive development. In a review of literature, Wanless, Rosenkoetter, and McClelland (2008) proposed that paternal depression might influence children's cognitive development in a comparable way to maternal depression, and hypothesised fathers' parenting would mediate any potential link between paternal depression and children's cognitive development. Paulson et al. (2009) used the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B) dataset to investigate the mediating role of fathers' reading behaviour with their children. It was found that reading duration mediated the association between post-natal paternal depressive symptoms at 9 months and children's expressive language development at 2 years old. These findings were compared to mothers and it was found that fathers' reading with their child at 2 years old was more

important for expressive language development compared with mothers' reading behaviours. Another study reported the quality of paternal language to mediate the association between current paternal depressive symptoms and children's language development at 2 years old (Malin et al., 2013). Parental language such as infant directed speech has been reported to facilitate and promote learning in infants and depressed fathers have been reported to utilise less infant-directed speech compared to non-depressed fathers (Kaplan et al., 2007). Thus, this may negatively impact on their children's cognitive development. However, these studies investigating the mediating role of fathers reading and quality of paternal speech towards children did not investigate the predictor, mediator and outcome variables longitudinally. The study presented in the current Chapter aims to address this gap in the literature.

Using the Millennium Cohort Study Dataset (MCS) when children were 5 years old, Mensah and Kiernan (2010) conducted a cross-sectional analysis and reported current paternal depressive symptoms to be significantly associated with children's lower scores on the communication, language and literacy skills measured using the Foundation Profile assessment. However, after adjusting for socio-economic factors this association became non-significant. In another study using the MCS, Violato, Petrou, Gray, and Redshaw (2011) found no significant association between a dichotomised scale of paternal depressive symptoms at 9 months and child cognitive development at 3 years and 5 years old using the British Abilities Scale to measure cognitive development. The study also found a non-significant effect of maternal depressive symptoms on children's cognitive development. Thus, these null-findings could be attributed

to the categorical rather than continuous measure of depressive symptoms used in these studies.

The current chapter builds on these previous studies by using the MCS dataset and using the British Abilities Scale and the Cambridge Neuropsychological Tests to measure cognitive outcome across the ages of 5, 7 and 11 years old (Elliott, Smith, & McCulloch, 1996; Hansen, 2014). These are different measures of cognitive outcomes compared to Mensah and Kiernan (2010). The current study also uses a continuous measure of depressive symptoms rather than dichotomous/categorical measure, which increases the power of finding an effect where there is one and reducing the risk of a type II error (Violato et al., 2011). Moreover, it extends the literature to older children by investigating cognitive outcomes at age 7 and 11 years old. It replicates the theoretical model in Chapter 5 by adjusting the outcomes to cognitive measures, but using the same predictor (paternal depressive symptoms), same mediator (father-child conflict) and the same covariates (maternal depressive symptoms, child temperament, and SES) to make the data comparable (Figure 1). Further analysis controlling for other important covariates, such as paternal and maternal education and parental involvement which have been associated with children's cognitive development were also conducted (Cabrera et al., 2007; Mensah & Kiernan, 2010; Mensah & Kiernan, 2011; Violato et al., 2011; Wanless et al., 2008). It was predicted that paternal depressive symptoms would be associated with lower cognitive scores in children at age 5, 7 and 11 years old and that this link would be mediated by higher father-child conflict at 3 years old.

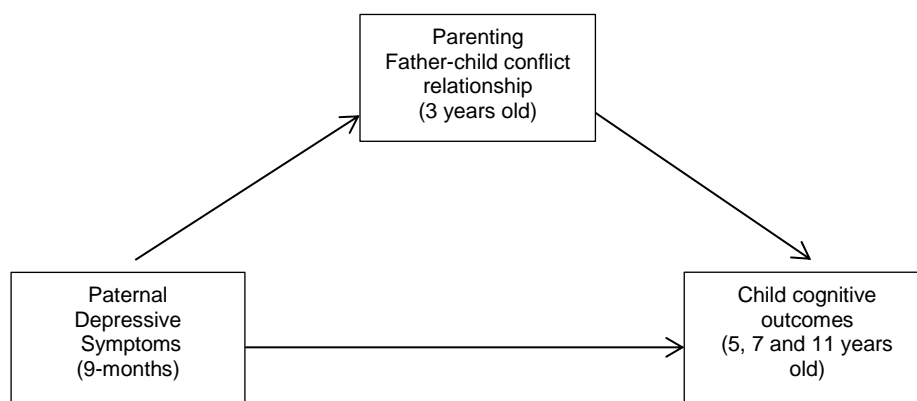


Figure 1 Proposed mediation model showing the effect of paternal depressive symptoms on child's cognitive outcomes

5.2 Methods

5.2.1 Participants

Secondary data analysis was conducted using all five sweeps of the Millennium Cohort Study (MCS). Information regarding the study design is presented in Chapters 2, 3 and 4. Full details of the content of survey and sampling strategy can be found in the documentation attached to the data deposited with the UK Data Archive at Essex University and elsewhere (UK Data Archive 2004 and 2006, (Hansen, 2012; Plewis & Ketende, 2006). At Sweep 1 (S1) the infants were aged approximately 9 months, at Sweep 2 (S2) they were approximately 3 years, at Sweep 3 (S3) 5 years old and at Sweep 4 (S4) they were 7 years old. Biological mothers and fathers were identified for the current analysis using the same method as stated in previous chapters. All children were included in the analysis. Therefore, they may have had older or younger siblings.

5.2.2 Measures

Exposure: Paternal depressive symptoms

The Rutter's 9-item Malaise Inventory (S1=9 months) was used to measure depressive symptoms where higher score indicates higher depressive symptoms (Dex & Joshi, 2004). This is the shortened version of the Rutter's 24-item Malaise Inventory self-report questionnaire (Rutter et al., 1970). The original questionnaire measures psychological distress, but this shortened version has been used by previous published studies, utilising the MCS as an indicator for depressive symptoms (Malmberg & Flouri, 2011). It includes 9 items measuring depressive symptoms according to the DSM criteria such as "feel tired most of the time", "feel miserable or depressed", and "easily upset or irritated" (American Psychiatric Association, 2000). Using Cronbach's alpha coefficient the reliability of the scale was 0.73 for mothers and 0.68 for fathers which is similar to previous validations studies on the scale (Rodgers et al., 1999).

Mediator: Father-child conflict relationship/parenting

The Child-Parent Relationship Scale (CPRS: Short form, (Pianta & Steinberg, 1992)) was used to measure father-child conflict relationship, which was found to be significantly associated with paternal depressive symptoms (Chapter 3). The questionnaire originates from attachment theory based on attachment Q-set and literature on parent-child relationship. The 8-item questionnaire is scored on a 5-point Likert scale (1=definitely does not apply, 2=not really, 3=neutral/not sure, 4=applies sometimes, and 5=definitely applies). The CRPS conflict ratings have been associated with observed hostility during parent-child

interactions (Driscoll & Pianta, 2011). Higher score on the scale indicate higher father-child conflict. The reliability of the scale is $\alpha=0.73$.

Outcomes: Child cognitive development

All cognitive assessments were administered by trained research assistants at the MCS, when children were 5 years (Sweep 3), 7 years (Sweep 4) and 11 years old (Sweep 5). British Abilities Scale Second Edition (BAS II) (Elliott et al., 1996; Hansen, 2012) was used to measure cognitive abilities at all the time-points and the Cambridge Neuropsychological Tests Automated Battery (CANTAB) was added at Sweep 5 (Hansen, 2014).

Sweep 3 (5 years old)

Data on three sub-scales were available when children were aged 5 years old (S3): 1) naming vocabulary measures expressive language skills by asking children to identify coloured pictures displayed to them; 2) picture similarities measures problem-solving abilities where children are shown 4 images and requested to place a fifth image with the most similar one; 3) pattern construction measures spatial skills during which children construct patterns using flat squares or solid cubes that have yellow and black designs on each side. The scores were averaged to indicate generalised cognitive ability and higher score indicate better ability (Elliott et al., 1996; Hill, 2005; Jones & Schoon, 2008).

Sweep 4 (7 years old)

When children were 7 years old (S4) two subscales of the BAS II were available: pattern construction which is the same as in S3 and word reading where children are requested to read words aloud that were displayed to them on a card. The words get increasingly difficult as the task progresses. These two scales were averaged to indicate cognitive ability at 7 years old.

Sweep 5 (11 years old)

At 11 years (S5), one sub-scale of the BAS II was available (Hansen, 2014): verbal similarities assessing children's verbal reasoning abilities. The child is verbally told three words and is asked if the words are similar. For the BAS Scales the standardised T-scores were used for analysis which adjusted for mean scores of the BAS scale normative sample and child's age. Children also took part in the CANTAB: Spatial Working Memory (SWM) task (Hansen, 2014). Children used touch-screen technology and were tested on their spatial and working memory. Children were presented with 4 – 8 random coloured boxes and asked to move tokens to a panel on the right hand side of the screen. Children were asked to remember that a token would never be found in a coloured box twice in a row. Therefore, children had to remember not to search in the sample boxes. The scores used for the analysis was the total number of errors e.g., the number of times children returned to an empty box, and a strategy score which indicates the use of a systematic search strategy by the child.

Covariates

Family context covariates

Maternal depressive symptoms (S1) were measured using the same method as paternal depressive symptoms using the Rutter Malaise as above. Child gender was taken from the main respondent (Mother) interview answers. Child temperament (S1) was measured using the Carey Infant temperament scale using mothers' reports (Carey & McDevitt, 1978). The questionnaire comprised of fourteen items rated on a 5-point scale (1=almost never, 2=rarely, 3=usually does not, 4=often, 5=almost always) which were summed to create a total temperament scale. Higher scores indicate easier child temperament and lower scores indicated more difficult temperament ($\alpha=0.65$). Mothers and fathers were asked the same 7 questions regarding their parenting activities with their child at Sweep 3. Each question was rated on a 6-point likert scale ranging from 1=every day to 6= not at all. Mothers' and fathers' answers were summed and two separate scales were created to indicate their involvement in parenting activities. Scores ranged from (7 to 42) with higher scores indicating less involvement. The internal consistency for mothers ($\alpha=0.71$) and fathers ($\alpha=0.73$) involvement were satisfactory.

Socio-Economic Status (SES)

SES was measured using the poverty indicator which classified households as living in poverty if their income was equal to or less than 60% of the median household income for the UK (Ketende & Joshi, 2008). Mothers' and fathers' education was taken from main (mother) and partner (father) interview questionnaires at Sweep 1 (9 months).

5.2.3 Statistical analysis

The first step of the data analysis was identical to the analysis presented in Chapter 4 where mediation model was tested to investigate the mediating role of father-child conflict in the association between paternal depressive symptom and children's emotional and behavioural outcomes at 5, 7, and 11 years old. For the current analysis, mediation model (Figure 1) was tested using Structural Equation Modelling (SEM) with Stata for Windows version 13. This model tested whether father-child conflict (S2) mediated the association between paternal depressive symptoms (S1) and children's cognitive outcomes (S3, S4 and S3). The model estimated the direct, indirect and total effects adjusting for a number of covariates (maternal depressive symptoms, child temperament, child gender and SES). This was followed up by a sub-analysis to investigate the findings further using an adjusted multivariable linear regression model that controlled for other covariates (maternal education, paternal education, maternal involvement and paternal involvement).

Sampling weights were used in all analyses. This accounted for attrition by Sweep 5 and adjusted for the over sampling of ethnic minorities and participants from low socio-economic background recruited at sweep 1 (9 months), making the sample representative of the UK population.

There are currently no standardised methods for conducting power analysis for mediation analysis using G*power or Stata, therefore a prior power analysis was done using the conventional method in G*power (Cohen, 1992; Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007; Faul

& Erfelder, 1992). Prior to analysis normality of all outcome variables were checked. All outcome variables looked normal by visual inspection and transformation did not improve shape or distributions, therefore were not incorporated in the analysis. Normality of residuals was also checked post-analysis.

5.3 Results

5.3.1 Descriptive statistics

Table 1 shows descriptive statistics for the measures of interest in the mediation models.

Table 1 Sample size, means and standard deviations for all children

Variables	All children N	All children M(SD)
Paternal depressive symptoms(S1)	12,396	1.35(1.53)
Father-child conflict(S2)	8,597	18.09(5.50)
Cognitive ability BAS ¹ (S3)	14,668	53.62(7.67)
Cognitive ability BAS ¹ (S4)	13,349	52.84(11.07)
Cognitive ability BAS ¹ (S5)	12,824	58.26(9.91)
Cognitive ability SWM ² error (S5)	12,423	35.69(18.77)
Cognitive ability SWM ² strategy (S5)	12,423	34.32(5.93)

¹ British Abilities Scale Second Edition (BAS)

² Spatial Working Memory (SWM)

Table 2 shows the association between paternal depressive symptoms at 9 months, father-child conflict at 3 years old and children's cognitive outcomes at 5, 7 and 11 years old. All variables were significantly correlated in the expected direction. The correlations of maternal depressive symptoms were correlated with outcome variables slightly higher than paternal depressive symptoms (See Table 2).

Table 2 Intercorrelations for study variables using in model

Variables	1	2	3	4	5	6	7	8
1.Paternal depressive symptoms (S1)								
2.Maternal depressive symptoms (S1)	0.19*							
3.Father-child conflict (S2)	0.11*	0.27*						
4.Cognitive ability BAS (S3)	-0.08*	-0.08*	-0.09*					
5.Cognitive ability BAS (S4)	-0.06*	-0.07*	-0.07*	0.52*				
6.Cognitive ability BAS (S5)	-0.05*	-0.07*	-0.07*	0.40*	0.28*			
7.Cognitive ability SWM error (S4)	0.04*	0.07*	-0.06*	-0.30*	-0.35*	-0.19*		
8.Cognitive ability SWM strategy (S4)	0.02*	0.04*	-0.04*	-0.20*	-0.22*	-0.14*	0.64*	

*P<0.001

5.3.2 Mediation models and linear regression

Table 3 presents the unadjusted and adjusted direct, indirect and total associations between paternal depressive symptoms (9 months) and children's cognitive outcomes at age 5, 7 and 11 years old, mediated by father-child conflict (3 years old). Paternal depressive symptoms were significantly associated with cognitive outcomes, mediated by father-child conflict in the unadjusted models (Table 3). However, after adjusting for maternal depressive symptoms, child temperament, child gender and family SES, all total effect associations became non-significant (Table 3). Interestingly, within the same models maternal depressive symptoms and poverty were directly associated with children's BAS cognitive scores at age 5, 7 and 11 years old. These associations were highly significant for poverty as a predictor (Table 3). Children of mothers with high depressive symptoms and in poverty had poorer cognitive abilities compared to children of mothers with lower depressive symptoms and not in poverty.

Table 3 Associations between paternal depressive symptoms and children’s cognitive outcomes at each time-point

Models with child Cognitive outcomes	Paternal depressive symptoms Unadjusted model^a		Paternal depressive symptoms Adjusted model^b		Maternal depressive symptoms Adjusted model^b		Poverty depressive symptoms Adjusted model^b	
	Coef (95% CI)	P	Coef (95% CI)	P	Coef (95% CI)	P	Coef (95% CI)	P
5 years old								
Bas								
Direct	-0.27 (-0.39 - -0.14)	<0.001	-0.05 (-0.20 - 0.10)	0.497	-0.29 (-0.42 - -0.16)	<0.001	-3.74 (-4.05 - -2.98)	<0.001
Indirect	-0.04 (-0.07 - -0.01)	0.014	-0.02 (-0.06 - 0.02)	0.289	-0.00 (-0.01 - 0.00)	0.307	0.00 (-0.01 - 0.01)	0.849
Total	-0.30 (-0.44 - -0.07)	<0.001	-0.07 (-0.22 - 0.08)	0.352	-0.30 (-0.43 - -0.16)	<0.001	-3.73 (-4.49 - -2.98)	<0.001
7 years old								
Bas								
Direct	-0.33 (-0.53 - -0.13)	0.001	-0.09 (-0.32 - 0.14)	0.449	-0.32 (-0.56 - -0.07)	0.011	-3.87 (-4.85 - -2.90)	<0.001
Indirect	-0.00 (-0.02 - -0.01)	0.403	-0.03 (-0.09 - 0.02)	0.245	-0.00 (-0.01 - 0.00)	0.354	-0.01 (-0.03 - 0.02)	0.553
Total	-0.38 (-0.58 - -0.18)	<0.001	-0.12 (-0.36 - 0.11)	0.300	-0.32 (-0.57 - -0.07)	0.010	-3.88 (-4.85 - -2.91)	<0.001
11 years old								
Bas								
Direct	-0.44 (-0.38 - -0.00)	0.047	-0.05 (-0.28 - 0.17)	0.633	-0.19 (-0.38 - -0.01)	0.041	-4.04 (-5.16 - -2.92)	<0.001
Indirect	-0.04 (-0.07 - 0.00)	0.058	-0.07 (-0.11 - -0.02)	0.006	-0.01 (-0.03 - -0.00)	0.047	-0.03 (-0.08 - 0.03)	0.339
Total	-0.23 (-0.41 - -0.04)	0.018	-0.12 (-0.35 - 0.10)	0.288	-0.21 (-0.40 - -0.02)	0.030	-4.07 (-5.19 - -2.94)	<0.001

CAMTAB

: Memory
task total
errors

Direct	0.71 (0.36 - 1.06)	<0.001	0.31 (-0.15 - 0.78)	0.189	0.00 (-0.00 - 0.01)	0.257	0.00 (-0.01 - 0.02)	0.022
Indirect	0.04 (-0.04 - 0.12)	0.351	0.03 (-0.06 - 0.13)	0.470	0.00 (-0.00 - 0.00)	0.946	0.00 (-0.00 - 0.00)	0.946
Total	0.75 (0.04 - 1.09)	<0.001	0.35 (-0.11 - 0.81)	0.137	0.00 (-0.00 - 0.01)	0.259	0.00 (-0.01 - 0.02)	0.710

CAMTAB

: Memory
task
strategy

Direct	0.09 (-0.03 - 0.21)	0.129	0.00(-0.14 - 0.15)	0.976	0.02(-0.12 - 0.16)	0.794	1.75(1.25 - 2.25)	<0.001
Indirect	0.01 (-0.01 - 0.04)	0.335	0.01(-0.02 - 0.05)	0.400	0.00(-0.00 - 0.01)	0.415	0.00(-0.01 - 0.02)	0.577
Total	0.10 (-0.01 - 0.22)	0.078	0.02(-0.13 - 0.16)	0.827	0.02(-0.12 - 0.16)	0.767	1.76(1.26 - 2.25)	<0.001

^a Sample size ranged from 6056 – 6982 due to missing data

^b Sample size ranged from 3838 – 4416 due to missing data

Findings were confirmed by an adjusted multivariable linear regression that found maternal depressive symptoms and poverty to be consistently associated with children's BAS scores at 5, 7 and 11 years old (Table 4). There were no significant associations with cognitive scores when children were aged 11 years old, with the exception of poverty which was associated with children's strategy use. Children's below the 60% median used fewer strategies compared to children's above the 60% median poverty indicator. Children whose parents were more involved in parenting activities had significantly better cognitive abilities at age 5 and 11 years old (Table 4). A post-hoc independent t-test compared mothers' and fathers' involvement with their child at age 5 years old; mothers ($M=19.83$, $SD=5.14$) were significantly more involved in parenting activities with their child compared to fathers ($M=21.80$, $SD=5.24$, $t(22.80)=389$, $p<0.001$).

Table 4 Adjusted multivariable linear regression with BAS cognitive scores at 5 (S3), 7 (S4), and 11 (S5) years old

Predictors ^d	BAS cog S3 ^a		BAS cog S4 ^b		BAS cog S5	
	Coefficient (95% CI)	p	Coefficient (95% CI)	p	Coefficient (95% CI)	p
<i>Paternal factors</i>						
Paternal depressive symptoms	-0.09 (-0.24-0.07)	0.291	-0.19 (-0.42 - 0.05)	0.118	-0.08 (-0.32 - 0.15)	0.499
Paternal involvement	-0.06 (-0.10- -0.01)	0.018	-0.01 (-0.09 - 0.06)	0.752	-0.10 (-0.17 - -0.03)	0.007
<i>Maternal factors</i>						
Maternal depressive symptoms	-0.25 (-0.39 - -0.12)	<0.001	-0.38 (-0.63 - -0.12)	0.004	-0.24 (-0.46 - -0.02)	0.032
Maternal involvement	-0.09 (-0.12- -0.02)	0.006	-0.06 (-0.14 - 0.02)	0.127	-0.07 (-0.15 - -0.00)	0.049
<i>Child factors</i>						
Child temperament	0.01 (-0.03 - 0.05)	0.513	-0.01 (-0.08- 0.07)	0.783	-0.08 (-0.13- -0.03)	0.001
Child gender	0.76 (0.33 - 1.17)	<0.001	0.26 (-0.39 - 0.92)	0.431	-0.59 (-1.19 - 0.02)	0.056
<i>Socioeconomic factors</i>						
Paternal education						
No qualifications	reference group					
School level, Degree or higher	2.12 (1.37- 2.88)	<0.001	2.16 (0.94 - 3.37)	0.001	2.36 (1.29 – 3.42)	<0.001
Maternal education						
No qualifications	reference group					
School level, Degree or higher	3.82 (2.85- 4.79)	<0.001	4.19 (2.54 - 5.83)	<0.001	4.97 (2.97 - 6.06)	<0.001
Poverty indicator						
Above 60% median	reference group					
Below 60% median	-2.59 (-3.37- -1.80)	<0.001	-2.53 (-3.62 - -1.44)	<0.001	-3.15 (-4.35 - -1.95)	<0.001

R² 0.08 0.04 0.08

^a Sample size was 4599

^b Sample size was 4228

^c Sample size was 4019

^d All predictors were entered into the adjusted regression model.

5.4 Discussion

Paternal depressive symptoms were significantly associated with children's cognitive outcomes at 5, 7 and 11 years old, and this relationship was mediated by father-child conflict. However, contrary to the initial predictions of this study, once controlling for maternal depressive symptoms, poverty, child gender and child temperament, paternal depressive symptoms were not independently associated with child cognitive abilities. One reason for this might be that proximal factors such as maternal depressive symptoms and poverty may lie on the causal pathway and may account for more of the variance in this association, therefore cancelling out more distal factors such as paternal depression. Fathers' involvement in parenting activities was associated with higher cognitive functioning at 5 and 11 years after adjusting for other covariates. However, fathers were less involved in parenting activities in comparison to mothers. Given that paternal depressive symptoms at 9 months were significantly associated with father-child conflict at 3 years old (Chapter 3), the results of this study indicate that father-child conflict may not influence children's cognitive development, whereas fathers involvement was found to be associated with children's cognitive outcomes. However, as paternal depressive symptoms were not significantly associated with fathers' involvement (Chapter 3), therefore this does not suggest a plausible pathway through which paternal depressive symptoms may influence children's cognitive development as others have previously hypothesised (Wanless et al., 2008).

The current findings replicate the previous studies using the MCS dataset that also found no association between paternal depressive symptoms and child

cognitive outcomes (Mensah & Kiernan, 2010; Violato et al., 2011), and maternal depressive symptoms and poverty were associated with children's cognitive development (Kiernan & Mensah, 2011; Mensah & Kiernan, 2010; Schoon, Jones, Cheng, & Maughan, 2012). Mensah and Kiernan (2010) and Hansen and Jones (2010) reported high levels of maternal depressive symptoms measured using the Kessler Scale and diagnosis of clinical depression to be significantly associated with children's poorer results on the BAS scores and Foundations Stage profile assessment testing communication, language, literacy and mathematic skills. Later studies by Kiernan and Mensah (2011) and Schoon et al. (2012) reported persistent poverty during a child's first 5 years of life or being classified as poor at 9 months or at least two time-points were significantly associated with poorer cognitive development at age 5. Therefore, the current findings extend these results regarding maternal depressive symptoms and poverty to age 7 and 11 years old. Given that the current study replicates previous findings on maternal depressive symptoms and poverty in the MCS dataset and other studies reviewed by Grace et al. (2003), it seems plausible to conclude that paternal depressive symptoms may not be an independent risk factor for children's cognitive outcomes.

These findings need to be interpreted in light of the limitations and strengths of the study. Firstly, the cognitive outcomes at each sweep are not comparable as different sub-scales of the BAS were available at each sweep. However, given the consistent findings of associations with maternal depressive symptoms and poverty, it seems that the scales were accurately measuring cognitive development at each sweep, albeit different aspects of it. In addition, the

analysis did not investigate change over time; therefore this limitation should not hugely effect the interpretations of the results. Secondly, due to the longitudinal nature of the study over five time-points, the attrition rate from those that took part in the study at sweep 1 (9 months) to sweep 5 (11 years old) would have gradually increase (Ketende, 2010). However, this was overcome by using sampling weights to account for attrition rates that might have affected the results. In addition to this, Wolke et al. (2009) reported that even with drop outs, associations reported by regression models were still robust within such large cohort studies. Finally, research has shown that having older siblings facilitates cognitive development in children (Azmitia & Hesser, 1993; Brody, 2004). However, the current study was unable to control for the influence of siblings in the analysis as the MCS study did not have data available on older biological siblings that were not resident within the household and there may have been older step siblings within the household that the mother may not have counted as the child's sibling. This is a limitation to the current study that future research should take into account.

The current study measured depressive symptoms rather than clinical episodes of depression, suggesting that the results of the current study might be presenting a diluted effect of paternal depression on children's cognitive development. Using the Schedule of Affective Disorders and Schizophrenia (SADS) interview to measure clinical episodes of depression in a large sample size of 1,329 mothers, Kurstjens and Wolke (2001) found chronic depression during the post-natal period characterised by multiple episodes of depression to be associated with impairments children's cognitive development, but only for

boy's living in socio-economically disadvantaged conditions. Thus, paternal depression, rather than paternal depressive symptoms might have an influence on their children's cognitive development depending on the family socio-economic status and there may be gender differences in susceptibility to this influence. This is something future research can address using clinical interviews to investigate the exposure of paternal depression which could confirm the findings and conclusions of the current study.

Despite these limitations the study has a number of strengths. Firstly, the MCS is a large representative sample of UK fathers making the findings of this study generalisable to the UK population. Secondly, it used well validated and reliable measures (Elliott et al., 1996; Hansen, 2014; Hill, 2005; Johnson, 2012). Third, despite the attrition rates, the study still retained a large sample size and sampling weights were used to account for attrition. Therefore, the study had strong statistical power to detect any significant effects.

The findings of this current study add to theoretical understanding of paternal depressive symptoms by suggesting that paternal depressive symptoms may not influence children's cognitive outcomes as initially hypothesised (Wanless et al., 2008). It confirms that maternal depressive symptoms and poverty have a strong influence on children's cognitive abilities (Mensah & Kiernan, 2010; Mensah & Kiernan, 2011; Schoon et al., 2012; Violato et al., 2011). As mothers and fathers interact with their children differently (MacDonald & Parke, 1986), it may be that mothers and fathers depressive symptoms influence their children's outcomes differently. Mothers spend more time with their children compared to

fathers and engage in more face-to-face cognitive stimulation, whereas fathers engage in more physical stimulation through play (MacDonald & Parke, 1986; Paquette, 2004). The differential influence of maternal and paternal depression on children's cognitive outcomes is something for future research to investigate.

There are some potential clinical implications that can be taken from the current findings. For example, service providers and clinicians can be aware that maternal depressive symptoms and family poverty are key aspects that negatively affect cognitive outcomes in children. As both parents' involvement has been associated with positive cognitive outcomes, such interventions can promote mothers' and fathers' positive engagement in parenting activities with their child, especially in low SES families with depressed mothers. It could be that fathers' higher involvement might buffer children from the influence of maternal depressive symptoms and poverty. Therefore, the involvement of fathers in such interventions with a family focused approach may be beneficial (Field, 2010; Letourneau et al., 2012). However, future studies are needed to confirm this.

In conclusion, the findings of the current study suggest that paternal depressive symptoms at 9 months were not independently associated with children's cognitive functioning at 5, 7 and 11 years old. This suggests that paternal depressive symptoms may be associated with children's emotional and behavioural problems (Chapter 4) but not cognitive development/functioning. Given that the current findings replicate other research findings on maternal depressive symptoms and poverty, it seems plausible to conclude that paternal

depressive symptoms may not be associated with children's cognitive development. If confirmed by future studies measuring clinical depression in fathers, this could imply differential effects of parental depression on children's cognitive development, suggesting mothers' may be more important for children's cognitive development. Interventions to improve children's cognitive functioning should perhaps target mothers rather than fathers and families living in poverty.

Chapter 6

The association between paternal depressive symptoms and father child attachment

6.1 Introduction

Attachment theory is one of the most dominant perspectives used to understand the intergenerational transmission of negative outcomes from parent to child (Fonagy & Target, 2005; Herring & Kaslow, 2002; Lamb, 2013; Sroufe, Carlson, Levy, & Egeland, 1999). Maternal depression has a negative impact on mother-child attachment, with meta-analytic reviews showing that children of depressed mothers were more likely to be insecurely attached and mother-child attachment insecurity has been linked to internalising and externalising behavioural problems during childhood (Fearon et al., 2010; Groh et al., 2012; Martins & Gaffan, 2000; Wan & Green, 2009).

According to attachment theory, infants develop Internal Working Models (IWM) of early attachment relationships, which form the building blocks for how they relate to others in social situations (Bowlby, 1982b; Johnson et al., 2010; Oppenheim & Waters, 1995; Waters, Rodrigues, & Ridgeway, 1998). IWM consist of mental representations of attachment figures that children have the ability to express verbally from as young as pre-school years, using attachment-related story stem tasks (Green et al., 2000; Oppenheim, 2006). According to attachment theory, children with parents who respond sensitively and warmly towards them develop a secure IWM of an available care-giver who provides a secure base (Ainsworth et al., 1978; Bowlby, 1978; Cicchetti, Rogosch, & Toth, 2006; Green, Stanley, Goldwyn, & Smith, 2009; Green et al., 2000). In contrast, children with unresponsive and insensitive parents develop insecure IWM of attachment figures.

Although research has started to recognise father-child attachment as a unique construct that influences children's development (Lamb, 2010, 2013) (see Chapter 1.2.4.1 for background on attachment theory and fathers in attachment theory), there is a gap in the literature investigating the association between paternal depression and father-child attachment. This chapter will attempt to address this gap in the literature. It will additionally, investigate if other parenting-related factors such as fathers' involvement and fathers' own attachment representation to his parents might mediate any associations between paternal depression and father-child attachment. The introduction will start with a review of the literature. This will be followed by an explanation of some attachment and parenting-related constructs discussed in the attachment literature which may explain any possible associations between paternal depressive symptoms and father-child attachment. It will end with the research questions that this chapter is going to address.

6.1.1 Studies investigating paternal depression and father-child attachment

As depression is characterised by low mood, irritability, and loss of interest in activities, it can affect parents' ability to respond sensitively (American Psychiatric Association, 2000; Cummings & Cicchetti, 1993). Lee et al. (2012) identified paternal depression as a risk factor for children aged 3 – 5 years old and found that depression in fathers affected their ability to supervise and interact positively with their children. Moreover, a recent study by Yago et al. (2014) reported that higher paternal depressive symptoms measured using the Centre for Epidemiologic Studies Depression Scale (CES-D) were significantly

associated with lower sensitive responding towards their child. Therefore, it can be seen how paternal depression could impact on the child's IWM representation of their father, which consequently influences the formation of father-child attachment.

A systematic search was conducted using the key terms 'paternal depression' and 'father-child attachment' using a number of databases including Web of Science (17), PubMed (15), ERIC (6) and google scholar (7,160). There were only four studies found in the literature which investigated the association between paternal depression and father-child attachment (Buist et al., 2003; Condon et al., 2013; Eiden, Edwards, & Leonard, 2002; Ferketich & Mercer, 1995). In a study of 79 experienced and 93 inexperienced fathers (fathers recruited soon after the birth of their first child), Ferketich and Mercer (1995) measured father-child attachment using a 10-item how I Feel About my Baby now (FAB) questionnaire (Leifer, 1977) and depressive symptoms were measured using the 20-item CES-D (Radloff, 1977). Paternal depressive symptoms were significantly associated with higher scores on the father-child attachment (FAB) questionnaire and inexperienced fathers reported higher depressive symptoms compared to experienced fathers. In a study with a sample of 251 inexperienced fathers, Buist et al. (2003) measured paternal depressive symptoms using the EPDS and father-infant attachment using the Paternal Postnatal Attachment questionnaire which had three sub-scales measuring quality of attachment, hostility and pleasure of interaction. Higher levels of paternal depressive symptoms at 1 and 4 months post-partum were associated with significantly lower father-infant attachment quality and

increased hostility towards child. However, there was no significant association between fathers with more depressive symptoms and less pleasure during interactions with their child. Finally, in a series of studies by Condon and colleagues using The First Time Fathers Study dataset consisting of a large sample size of inexperienced fathers (n=312), paternal depressive symptoms and father-child attachment were measured using questionnaires when infants were 3, 6 and 12 months old (Condon, 2006; Condon et al., 2004; Condon et al., 2013). Although the aim of these studies was not to examine the association between paternal depressive symptoms and father-child attachment, taken together the studies reported a bidirectional association between paternal depressive symptoms and father-infant attachment, suggesting that fathers' depressive symptoms influenced father-child attachment and father-child attachment influenced fathers' depressive symptoms.

From these three studies, there appears to be an association between paternal depressive symptoms and father-child attachment. However, both measures were tested via self-report questionnaires completed by the father that do not represent secure vs insecure attachment and may not as accurately depict the child's attachment style as observational methods such as the Strange Situation Procedure with infants aged 12-18 months (SSP; Ainsworth, 1964) and the Manchester Attachment Story Task with children aged 3 – 8 years old (MCAST; Green et al., 2000). Parent's perception of their attachment to their children may differ from the actual attachment representation that their child might hold of them in their IWM. These can be tested using observational behavioural tasks such as the SSP and MCAST, as they test behavioural engagements that the

child makes with the parent figure such as proximity seeking, exploratory play and reunion behaviour, either by direct observation of the child's behaviour (SSP) or by representations depicted in the doll's house play (MCAST) (Green et al., 2009; Johnson et al., 2010). Eiden et al. (2002) conducted a study that investigated father-infant attachment (SSP) in alcoholic families. Although the aim of this study was not to investigate the influence of paternal depressive symptoms on father-child attachment, the study included a measure of depressive symptoms using the CES-D. Higher levels of paternal depressive symptoms were not directly associated with insecure father-infant attachment, but were associated with more paternal alcohol problems. However, the findings of this study could be attributed to the fact that alcohol problems might have dominated or been a stronger predictor in the model and accounted for more of the relationship, and therefore cancelling out the influence of paternal depressive symptoms.

6.1.2 Potential attachment-related mediators

6.1.2.1 Paternal attachment representation of own parents and father-child attachment

An individual's own attachment representations of relationships to their caregivers (mothers and fathers) are an important influence on their parenting behaviours and attachment with their own children (Main, Kaplan, & Cassidy, 1985; van IJzendoorn, 1995). This IWM of their own parents' acts as a foundation model for their own parenting behaviours towards their children, which consequently influences the parent-child attachment style they form with their child (Main et al., 1985; van IJzendoorn, 1995). The Adult Attachment

Interview (AAI; George, Kaplan & Main, 1985) is a semi-structured interview technique that has been used to assess adults' attachment representations of their parents. In a meta-analysis of 14 studies using the AAI to measure parents' attachment representations and SSP (Ainsworth, 1964) to measure child's attachment representation, van IJzendoorn (1995) reported large effect size of parents with autonomous (equivalent to secure attachment) representations having infants with secure attachments ($d=1.09$, $r=0.48$) in comparison to parents with non-secure representations. However, only four of the studies included fathers, so the findings were more representative of mothers. In an attempt to resolve this issue, van IJzendoorn and De Wolff (1997) conducted an exploratory meta-analysis using 8 studies and reported fathers' attachment representation to have a weak effect on father-infant attachment ($r=0.37$, $n=198$). Therefore, there appears to be some evidence for an association between fathers' attachment representation of his parents and father-infant attachment, but this may be weaker than that with mothers.

Depressive symptoms in adults have been associated with insecure attachment representations of their parents (Bakermans-Kranenburg & van IJzendoorn, 2009). Depression in mothers of pre-school children has been independently associated with mothers' insecure representations of relationships with her own parents using the AAI (McMahon, Trapolini, & Barnett, 2008). In a study using a large sample of 111 mothers, McMahon, Barnett, Kowalenko, and Tennant (2006) found that mothers with clinical depression were more likely to have infants classified with insecure attachment using the SSP and this association was influenced by mothers' insecure attachment representations of her own

parents. There are currently no studies investigating the association between paternal depression/depressive symptoms, fathers' attachment representation of his parents and father-child attachment in pre-school/school-aged children. Given the previous literature on mothers, fathers' attachment representation of his parents may mediate any potential associations between paternal depression/depressive symptoms and father-child attachment.

6.1.2.2 Paternal involvement and father-child attachment

According to attachment theory, attachment bonds are formed in close relationships early in life and disruptions in the parent-child interactions negatively influences the formation of the secure attachment bonds (Bowlby, 1973, 1988, 1989). Fathers tend to be less involved in caregiving duties during infancy in comparison to mothers, and start becoming more involved with their children via play activities during pre-school years (Bruce & Fox, 1999; Grossmann, Grossmann, Fremmer-Bombik, Kindler, & Scheuerer-Englisch, 2002; Lamb, 1977a; MacDonald & Parke, 1986). Bruce and Fox (1999) measured fathers' involvement with their children using a self-report questionnaire regarding involvement in parenting activities ranging on a scale from 1 - 4. It was found that fathers with pre-school and school-aged children were significantly more involved in parenting activities (mean= 2.86 and 2.81) compared to fathers' with infants (mean=2.72). Moreover, in a study including 102 fathers of pre-school children aged between 2 – 5 years old, Newland, Coyl, and Freeman (2008) found fathers' positive involvement measured using a parenting activities scale was significantly associated with increased father-child attachment security. Therefore, fathers' involvement with their children

during pre-school years is an important construct for the development of the father-child attachment bond.

Using a large sample of 2,139 resident fathers who participated in the Fragile Families and Child Wellbeing study (FFCW), Bronte-Tinkew et al. (2007) reported paternal depressive symptoms to be associated with a decrease in father-child parenting activities at 1 years old. This association still remained significant after controlling for maternal depressive symptoms, marital status and other SES factors such as age, education, race, employment and family poverty indicator. Depressed fathers are also likely to read less with their children at 1 years old and employ harsher discipline such as smacking when their child is aged 1 and 3 years old (Davis et al., 2011; Lee et al., 2011). Another study using 569 non-resident fathers participating in the Early Childhood Longitudinal Study Birth Cohort (ECLS-B) found that paternal depressive symptoms were associated with reduced involvement with their 9 months old infants (Paulson et al., 2010). This association was mediated by fathers' relationship quality with the infant's mother. Given that non-resident fathers would need permission from the infant's mother to be involved in their child's life, it makes sense that involvement with their child would be mediated via their relationship to the infant's mother. Other research has also shown non-resident fathers to have higher rates of depression compared to resident fathers living with their children (Giallo et al., 2012; Huang & Warner, 2005). Taken together, preliminary research indicates that fathers with depression may be less engaged and as a consequence less involved with their children, which in turn may impact on the formation of father-child attachment. Thus, fathers'

involvement may mediate any potential associations between paternal depression/depressive symptoms and father-child attachment.

6.1.3 Limitations of previous research

There are two major methodological issues in the past literature that the current study aims to address. The first is that studies investigating paternal depression and fathers involvement discussed so far have been mostly focused on fathers with infants (Bronte-Tinkew et al., 2007; Davis et al., 2011; Lee et al., 2011; Paulson et al., 2010). But research has shown that fathers are less involved with their children during infancy, and more involved at pre-school and school aged years (Bruce & Fox, 1999). Fathers interact more during play activities, whereas mothers interact more by holding their infants during caregiving (Lamb, 1977a; MacDonald & Parke, 1986). Thus, fathers may interact most with their children through play tasks during pre-school and school-aged years when children's motor skills develop and children start having a curiosity for exploration (Bruce & Fox, 1999; Waters & Cummings, 2000).

The second limitation is that most of the literature on father-child attachment has measured fathers-child attachment during infancy and using the SSP (see Chapter 1.2.4.2 for other studies that have used SSP to measure father-infant attachment). It has been argued that that SSP may not adequately measure father-infant attachment, as original studies establishing the reliability and validity of this measure was undertaken with mothers and infants (Volling & Belsky, 1992). Thus, the tool may not adequately measure the father-child

attachment construct. Therefore, using an age appropriate tool to measure father-child attachment during pre-school/school-years when fathers are more involved may be more appropriate. Thus, in line with attachment theory (Grossmann et al., 2002; Waters & Cummings, 2000), the current study measures father-child attachment during pre-school and early school years.

6.1.4 Overview and Research questions

In summary, although researchers have now acknowledged the importance of father-child attachment in shaping children's development, there is a gap in the literature investigating the influence of paternal depression on father-child attachment. The three studies found in the literature investigating paternal depression and father-child attachment have suggested an association between paternal depressive symptoms and father-child attachment assessed mainly by questionnaires. The primary objective of the current study was to build this literature by investigating father-child attachment using an observational method measuring father-child attachment representation from the child's perspective (MCAST doll's house play, described in more detail in the methods section) during pre-school/school years and using a clinical interview to measure depression. To our knowledge there is currently no study that has investigated the association between paternal depression and father-child attachment representation in pre-school and school-aged children. Therefore, this study will address this gap. The secondary objective was to investigate whether other attachment related constructs (fathers' attachment representation of his parents and paternal involvement) might partially mediate any potential association

between paternal depression/depressive symptoms and father-child attachment (Figure 1).

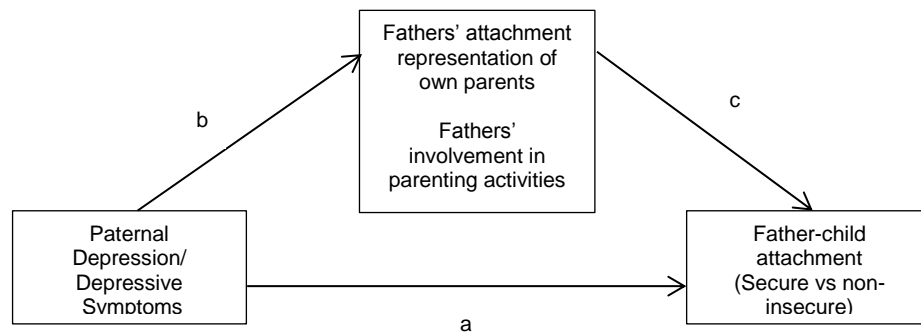


Figure 1 Proposed mediation model showing the effect of paternal depressive symptoms on father-child attachment (secure vs non-secure)

6.1.4.1 Covariates

There are three main factors that are important to control for when investigating parental depression and father-child attachment. Difficult infant temperament has been associated with insecure father-child attachment classifications (Fox, Kimmerly, & Schafer, 1991; Planalp & Braungart-Rieker, 2013; Szewczyk-Sokolowski, Bost, & Wainwright, 2005) and given that girls may be more socialised to playing with the doll's house, child gender is also an important factor to control for. Chapter 1.2.5.1 reported literature review of studies linking paternal depression with maternal depression and child temperament. Moreover, paternal depression has been reported to influence boys and girls differently (Ramchandani & Psychogiou, 2009; Ramchandani et al., 2005). Therefore, previous literature has found maternal depression, child

temperament and child gender to be associated with paternal depression, so we control for these factors wherever possible.

6.1.4.2 Outline of research questions

Primary research question

1. Are paternal depressive symptoms/depression associated with father-child attachment? (testing association a in Figure 1)

It was hypothesised that higher paternal depressive symptoms/depression would be significantly associated with insecure father-child attachment classification (secure vs insecure attachment).

Secondary research questions

2. Is paternal depressive symptoms/depression associated with other attachment-related constructs such as fathers' attachment representation of his parents and fathers' involvement? (testing association b in Figure 1)

It was hypothesised that higher paternal depressive symptoms/depression would be associated with fathers' negative representation of his own parents and less involvement in parenting.

3. Is fathers' own attachment representation to his parents and father's involvement associated with father-child attachment? (testing association c in Figure 1)

It was hypothesised that fathers' negative representation of his parents and lower involvement would be associated with insecure father-child attachment.

4. Does fathers' own attachment representation to his parents and father's involvement mediate the association between paternal depressive symptoms/depression and father-child attachment? (Figure 1)

Provided that questions 1, 2, and 3 are significant in relation to these constructs, mediation analysis will be conducted to investigate if fathers' own attachment representation of his parents and paternal involvement mediated any potential association between paternal depressive symptoms and father-child attachment. It was predicted that fathers' own attachment representation of his parents and father's involvement with childcare would partially mediate any associations between paternal depressive symptoms/depression and father-child attachment.

6.2 Methods

6.2.1 Participants

Participants were drawn from the Fathers in Focus (FIF) study (see Figure 2). The FIF was a longitudinal study of fathers and their children carried out at the University of Exeter examining the possible influence of fathers' depression on parenting and children's outcomes. The study recruited 160 fathers living in Devon with children aged 3 - 5 years old and consisted of two time-points. Time 1 (T1) was a home-visit and Time 2 (T2) follow-up was conducted approximately 1 year after T1 (mean=13.5 months, SD=2.8 months), which consisted of a home and lab visit. Mothers also took part in the study. The

inclusion criteria for the study were that the father had to be the biological father of the target child and was in contact with their child. Children that had neurological and cognitive developmental delays were excluded. The participants for the current analysis consisted of those with father-child attachment data (see figure 2 for full details of recruitment procedure).

There were no statistically significant differences between fathers that took part in T2 follow-up and those that dropped out in education ($X^2=5.06$, $p=0.41$), ethnicity ($X^2=5.44$, $p=0.14$), employment status ($X^2=2.61$, $p=0.62$), marital status ($X^2=5.95$, $p=0.20$), father's age ($t=0.16$, $p=0.87$), child's age ($t=-1.34$, $p=0.46$) or depressive symptoms ($t=-1.24$, $p=0.22$). However, there was a significant difference in child gender between fathers who took part in T2 and fathers who dropped out ($X^2=4.90$, $p=0.03$). Fathers who dropped out had more boys (boys=65.6%, girls=34.4%), compared to fathers who took part in T2 (boys=43.3%, girls=56.7%).

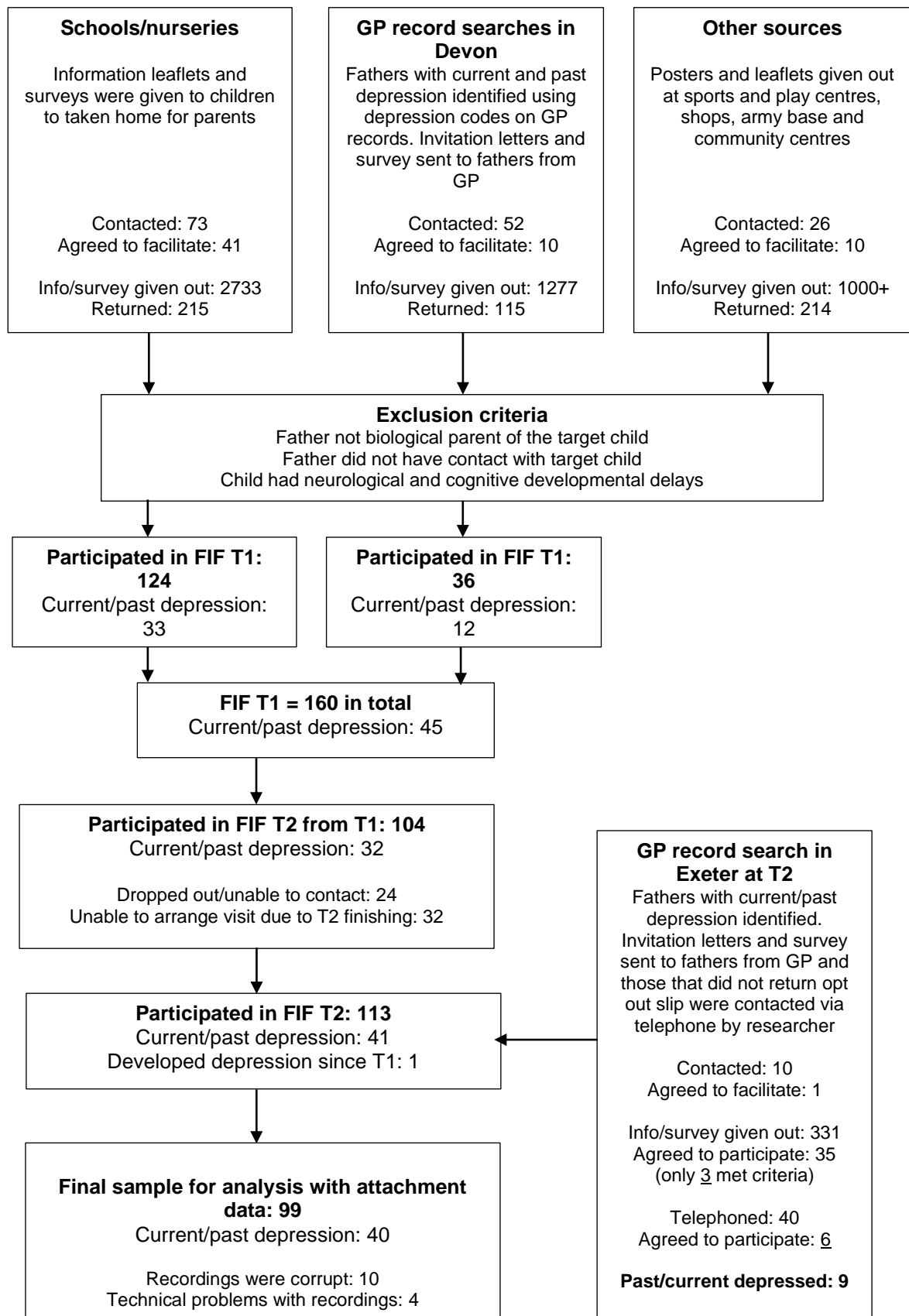


Figure 2: Recruitment flow chart for the FIF study

Table 1 shows demographic characteristics of all fathers in the sample with attachment data (n=99) and also of fathers with depression (n=40) and without depression (n=40). There were no significant differences between depressed and non-depressed groups on father's age, education, ethnic background, employment, marital status, and child age; therefore these factors were not controlled for during further analysis. There was a significant difference between depressive symptom scores between depressed and non-depressed fathers. Fathers in the depressed group reported a higher mean score compared to fathers in the non-depressed group. Significant differences were calculated using SPSS Independent t-test for continuous variables and Pearson Chi-Square for categorical variables where ***= $p < 0.001$ (Table 1).

Table 1 Demographic Characteristics of all and sub-analysis fathers (depressed vs non-depressed): matched depressed and non-depressed, from the Father-in-Focus study

Variable	All Fathers	Non-depressed Fathers¹	Depressed Fathers²	t/X²
<i>Number of Participants</i>	99	40	40	
<i>Fathers highest level of Education</i>				5.26
No qualifications	2 (2%)	0 (0%)	1 (2.5%)	
School level (GCSE, A-levels or equivalent)	37 (37.4%)	14 (35%)	18 (45%)	
Degree (or equivalent)	28 (28.3%)	13 (32.5%)	7 (17.5%)	
Postgraduate qualifications or equivalent	32(32.3%)	13 (32.5%)	14 (35%)	
<i>Father's Ethnic background</i>				1.19
White	96 (97%)	39 (97.7%)	39 (97.5%)	
Asian Indian	1 (1%)	0 (0%)	1 (2.5%)	
African-Caribbean	0 (0%)	0 (0%)	0 (0%)	
Other	2 (2%)	1 (2.5%)	0 (0%)	
<i>Father's employment</i>				2.13
Unemployed	8 (8.1%)	4 (10%)	4 (10%)	
Employed/leave	79 (79.8%)	31 (77.5%)	31 (77.5%)	
Self-employed	11 (11.1%)	5 (12.5%)	4 (10%)	
Retired	1 (1%)	0 (0%)	1 (2.5%)	
<i>Marital Status</i>				0.40
Married	82 (82.8%)	35 (87.5%)	35 (87.5%)	
Co-habiting	10 (10.1%)	3(7.5%)	2 (5%)	
Single	7 (7.1%)	2 (5%)	3 (7.5%)	
<i>Father's PHQ9 score³</i>				4.78***
M	3.84	1.93	6.13	
SD	4.28	1.62	5.32	
<i>Child's Gender</i>				
Boy	46 (46.5%)	17 (42.5%)	17 (42.5%)	
Girl	53 (53.5%)	23 (57.5%)	23 (57.5%)	
<i>Father's age (years)⁴</i>				1.07
Range	29-56 years	30-52	29-56	
M	40 years	40	41	
SD	5.33	4.45	6.08	
<i>Child's Age (years)</i>				0.73
Range	3-7 years	3-7	3-7	
M	5 years old	5	5	
SD	0.91	0.87	0.96	

¹ Fathers with no past or current depressive episodes using the SCID

² Fathers with current or past episode of depression within their life time using the SCID

³ There were 2 participants with missing data on this measure. Therefore the score is based on 97 participants

⁴ One participant's date of birth was missing; therefore the sample size for this variable was 98

6.2.2 Recruitment

Participants for the FIF study (Figure 2) were recruited via nurseries, schools, community centres, sports venues and shops using posters, leaflets and directly talking to fathers. In addition to this, participants were also recruited from NHS general practices by conducting GP record searches. A researcher with a research passport (approved from the local NHS authorities) contacted GP surgeries to participate in the study. The researcher then conducted a record search to identify fathers of children aged between 3 - 6 years old and those that were diagnosed by their GP with having depression (patients on depression codes were either on medication or receiving psychological therapy). A letter was then sent out to fathers from the GP on behalf of the FIF research project. With all these recruitment methods, fathers opted in to participate in the FIF study by replying to the initial survey which was sent to them along with an information leaflet about the study. From the initial survey, fathers that gave informed consent to take part in T1 home visit were contacted by the researcher.

The current sample consists of those that were: a) fathers who took part in FIF T1 and agreed to take part in the follow-up T2 study (n=104) and b) fathers recruited into the follow-up T2 (n=9) to increase size of depressed group as

some from this group dropped out from time 1 to time 2. These extra participants were recruited via general practices. See Figure 2 for the recruitment flow chart of the FIF study and the sample used for the analysis.

Ethical approval and consent

The FIF study had an already existing NHS ethics approval for T1 (REC reference number: 11/H0102/6). Additional measures were attached to the FIF study for T2 as NHS ethics substantial amendments. These were also approved before data collection for T2 started. The study also had ethical approval from the University of Exeter Ethics committee. Prior to taking part, all participating parents were sent information sheets about the study and filled out consent forms before taking part. See Appendix A for T2 information sheet and Appendix B for consent form.

6.2.3 Procedure

For the present study, fathers were contacted to take part in the FIF T2 follow-up study and also invited to attend a lab visit at the Exeter University. Fathers who were unable to come for the lab visit were offered a second home-visit. Before the follow-up home visit, fathers and mothers were sent information sheets and questionnaire packs to fill out, which were collected by the researcher during the home visit. Home visits were approximately 3 hours long and included the father-child attachment doll's house play and parent interview. The University lab visit was approximately 2 hours long and included the mother-child attachment dolls house play or the father-child doll's house play if

the researcher was unable to collect this data during the initial home visit. As a gesture of gratitude for taking part in the study, children picked a gift of their choice, and families were given a £15 M&S gift voucher and feedback on their child's language performance.

6.2.4 Measures

6.2.4.1.1 Paternal depressive symptoms

The Patient Health Questionnaire (PHQ-9) (Kroenke, Spitzer, & Williams, 2001; Spitzer, Kroenke, Williams, & Group, 1999) is a self-report questionnaire which was used to measure current depressive symptoms. The questionnaire is based on depressive episode criteria according to the DSM-IV-TR (American Psychiatric Association, 2000) and has been reported as a good screening instrument for current depression using the Structural Clinical Interview (Löwe, Kroenke, Herzog, & Gräfe, 2004). It contains 9 items, each rated on a 3-point scale ranging from 0=not at all to 3=nearly every day. Higher scores indicate higher depressive symptoms. Scores of 10 - 19 indicate of moderate levels of depression and 20+ severe levels of depression. In the current study, the internal reliability using Cronbach's alpha was $\alpha=0.87$ which shows good reliability for analysis. See Appendix C for the questionnaire.

6.2.4.1.2 Paternal depression

The Structural Clinical Interview for DSM-IV (SCID) research version (Spitzer et al., 1990; Spitzer, Williams, Gibbon, & First, 1992) was used to assess whether fathers' met diagnostic criteria for current or past episodes of depression in their

lifetime. This is a semi-structured interview corresponding to the DSM-IV-TR (American Psychiatric Association, 2000) criteria for major depressive episodes and is now the gold standard for assessing clinical diagnosis for depression in research settings. Certain difficulties must occur within a two week period either in the last month to fulfil criteria for current major depression or during the life time for past major depression. Either “feeling depressed or down most of the day nearly every day” or “losing pleasure or interest in things usually enjoyed”. And within those two weeks, 3 - 4 of the following must occur: significant increase or loss in appetite, insomnia or hypersomnia, psycho-motor agitation or retardation, fatigue, extreme feelings of worthlessness or guilt, inability to concentrate or make decisions and thoughts of suicide or self-harm. Therefore, a total of 5 criteria including one of the first two questions must be met for that to be considered as a depressive episode. The SCID interviews were administered by trained researchers from the Mood Disorders Centre, who were also trained to deal with any suicide risk (MDC risk training protocol). Due to the small number of currently depressed fathers in the sample, fathers with past depression and current were put together for analysis.

6.2.4.1.3 Father-Child attachment

The Manchester Child Attachment Child Story Task (MCAST) (Green et al., 2000) was used as a measure of parent-child attachment representation of fathers and mothers in the FIF study. It is appropriate for children aged 4-8 years old and has been widely used in clinical and community samples of children (Barone et al., 2009; Futh, O'Conner, Matias, Green, & Scott, 2008; Green, Stanley, & Peters, 2007).

Designed to measure children's attachment representations in a dyadic relationship involving one care-giver doll, child doll, and a furnished house consisting of a kitchen, living room and two bedrooms. The researcher explains to the child that they are going to do some story telling with the dolls and doll's house where the researcher starts off by telling the story and then the child will complete the story. The MCAST consists of 5 story stems. The first is the "breakfast story" which is a practice or control story to get the child familiar with the procedure. The rest of the story stems are designed to stimulate attachment-related distress in the child which consists of having a nightmare, injuring knee, tummy pain, and getting lost in a shopping centre.

Coding's for the MCAST are based on attachment representations from the Strange Situation Procedure (SSP; Ainsworth et al., 1979) and coherence of narrative from the Adult Attachment Interview (AAI; Main, Kaplan, & Cassidy, 1985). The child's responses are coded for child and parent proximity-seeking, child self-care, role reversal, parent-child conflict, fathers' responsiveness, sensitivity, warmth, intrusiveness, disengagement and the amount of resolution of the attachment-related distress situation. All variables are coded on a 9-point scale with 1 being little evidence of the category being demonstrated and 9 showing high levels of the category being demonstrated. These coding's are used to determine an interpersonal attachment strategy for each of the story stems, which is later combined to determine an overall attachment representation category. Secure (B) is an attachment representation that is illustrated by an interaction with parent doll where the child doll seeks proximity and resolves the distress. Avoidant (A) is suggested when the child doll uses

self-care and avoids contact with parent doll. Ambivalent (C) is applied when the interaction between parent and child doll does not resolve initial distress or distress escalates. Disorganised (D) is coded when the child uses multiple strategies that contradict each other or there is a lack of strategy. The inter-rater reliability reported by Green et al. (2000) for secure versus non-secure was high (94%, kappa=0.88).

For the FIF study there were eight researchers who administered the MCAST. One researcher (Selina Nath) was trained to Gold Standard administration and also attended training for the coding system of the measure by the developers of the instrument at University of Manchester (Green, Stanley, & Goldwyn, 2003). This researcher trained the rest of the team and regularly checked recordings to maintain standards on administration of the tool. The MCAST recordings were coded by a trained researcher who was blind to the group status of the participants (depressed vs non-depressed) and all other participant characteristics. The blind coder also did not have access to any of the FIF datasets. Inter-rater reliability was examined using 20 recordings (10 fathers and 10 mothers). The kappa for the attachment according to the dominant category for all 20 recordings were fairly low ($k=0.31$, $p=0.02$), for father MCASTs were low and non-significant ($k=0.14$, $p=0.26$) and for mother MCASTs the agreement was almost moderate, and statistically significant ($k=0.56$, $p=0.03$) (Viera & Garrett, 2005).

For the analysis father-child attachments were categorised into the binary outcome of secure vs non-secure (insecure avoidant, insecure ambivalent,

disorganised) according to the dominant category classification using the MCAST coding system (Green et al., 2009).

6.2.4.1.4 Father's own attachment style to his parents

The Close Relationships Questionnaire (CRQ) (Fraley, Waller, & Brennan, 2000) was used as an indicator of father's attachment style to his parents or parental figures. The CRQ consists of 9 items asking about relationship with mother or mother like figure, and father or father like figure. Attachment style is derived into two continuous variables measuring avoidance and anxiety towards the specific parent figure. Theoretically, four categories can be deduced from the two continuous measures indicating secure attachment (low avoidance and low anxiety), preoccupied attachment (low avoidance and high anxiety), dismissive attachment (high avoidance and low anxiety) and fearful-avoidant/insecure attachment (high anxiety and high avoidant). The current study used the two continuous measures, rather than the 4 categories in order to gain more power for the analysis. Using the scores for mother and father-like figures, continuous global scores were created for anxious and avoidant attachment towards parents. The internal reliability using Cronbach's alpha for avoidance of parents was $\alpha=0.94$ and for anxiety $\alpha=0.88$. See Appendix D for the questionnaire items.

6.2.4.1.5 Paternal involvement in parenting

Ten items from the Inventory of Father Involvement questionnaire (Hawkins et al., 2002) were selected to reflect age appropriate parenting activities and

interactions (see Appendix E for the questionnaire items selected). Scores range from 0=Not at all / never to 4=extremely / every day. The ten items were summed to create a scale ranging from 0 – 40. The internal reliability using Cronbach's alpha was high ($\alpha=0.81$).

6.2.4.1.6 Potential confounders

Maternal depression/depressive symptoms

Maternal depression was measured in the same way as fathers' depression using the SCID and depressive symptoms using the PHQ-9 questionnaire.

Child temperament

The Child's Behaviour Questionnaire – Very Short Form (CBQ-VSF) (Putnam & Rothbart, 2006) was used to measure child temperament. This questionnaire consists of 36 items with age appropriate (3-8 years old) situations and asks the respondent how the child might react. It measures effortful control (ability to focus attention), negative affectivity (shyness and difficult to calm), and extraversion (child which is generally happy) on a 7 point Likert scale (1=extremely untrue of my child to 7=extremely true of my child). We used mothers' report to avoid inter-reporter bias. The Cronbach's alpha for the scales were extraversion $\alpha=0.81$, negative affect $\alpha=0.63$ and effortful control $\alpha=0.65$. In accordance with the first author's instructions (Prof. Sam Putnam) to use all three variables in the analysis, regressions were run with all three variables and outcome variables. The temperament variables that were significantly correlated

with the outcome variables were used in the analysis. See Appendix F for questionnaire items.

6.2.5 Statistical Analysis plan

6.2.5.1 Data preparation

All analyses were conducted using SPSS 16. Descriptive statistics of children's attachment representation were examined in order to check the sample size of each attachment category. In order to reduce the chances of Type 1 and Type 2 error and obtain accurate results, all continuous outcome variables were checked for normal distribution of data (Field, 2009) (see Appendix G).

Variables that violated assumptions were transformed using log transformation and transformed versions of the data were used for the main analysis (see Appendix H). For variables that still did not meet assumptions after transformation, non-parametric test equivalents were used for the analysis.

Linear regressions for continuous outcomes and logistic regressions for binary outcomes were run to check whether covariates (maternal depressive symptoms, child temperament and child gender) were associated with outcome variables. Covariates that were significantly associated with the outcome variable were controlled for in any adjusted regression models. See Appendix I for table of regressions showing covariates that were associated with each outcome variable. As paternal depression has been reported to influence children differently, where boys seem more vulnerable to the effects of paternal depression (Ramchandani & Psychogiou, 2009; Ramchandani et al., 2005) and

girls are more likely to perhaps engage with the doll's house play, the sub-analysis matched fathers from depressed and non-depressed groups randomly according to child gender. This ensured that any findings were not due to child gender differences in the two samples. The matching was done blind to the father-child attachment data, which was added to the dataset after the groups were matched according to child gender. The sub-analysis comprised of 80 fathers: 40 fathers that had current or past depression during their lifetime and 40 had no diagnoses of depression during their life time.

6.2.5.2 Power analysis

Main analysis

An a priori power analysis was conducted using G*power (Cohen, 1992; Faul et al., 2009; Faul et al., 2007; Faul & Erfelder, 1992) to determine the sufficient sample size needed for the study to detect a significant effect. Power analysis was based on logistic regression modelling. The binary outcome variable (dependent variable) was father-child attachment (secure vs non-secure) and predictor' variables (independent variables) were continuous paternal depressive symptoms, maternal depressive symptoms and child temperament. The model was tested with α error probability =0.05, power of 0.80 and effect size based on odds ratio=1.7 based on previous literature on maternal depressive symptoms and power calculation setting with logistic regressions (Cohen, 1992; Hsieh, Bloch, & Larsen, 1998; Tharner et al., 2012). The sample size required to detect a significant model was reported as 128 participants (see Appendix J for the distribution graph). The actual sample size attained was 99 participants, giving 69% power or chance to detect a significant effect if present,

which is generally considered insufficient (Cohen, 1992). Post-hoc power analysis confirmed the power of the analysis as 0.69.

An a priori power analysis was repeated for linear regression model with the same settings as above and the sample size required was 87 participants, which suggests that the sample has a 95% power of detecting an effect (see appendix K). Post-hoc power analysis showed that there was a power of 0.97 for linear regressions run with continuous outcomes.

Sub-analysis

An a priori power analysis for independent samples t-test was run with the same settings as above, which suggested that the sample size required was a total of 172 (86 in each group of depressed and non-depressed fathers). The achieved sample lacked power for the sub-group analysis of depressed versus non-depressed fathers (see appendix L), which a post-hoc power analysis revealed that power was 60%.

6.2.6 Data analysis

Primary and secondary research questions were answered by analysing all fathers in the sample (main analysis) and also by analysing a sub-sample of depressed / non-depressed fathers matched according to child gender (sub-analysis). Details of the main and sub-analysis for each of the research

questions follow. All post-analysis assumptions were checked according to Field (2009) (see Appendix M).

6.2.6.1 Primary research question: Is paternal depressive symptoms/depression associated with father-child attachment?

Main analysis

Data analysis was initially carried out on all fathers with available father-child attachment data (n=99) using the PHQ-9 measure of paternal depressive symptoms (PHQ-9 scores) as the exposure variable (IV). Research questions were answered using logistic regression for binary outcomes of father-child attachment.

Sub-group analysis

A sub-group analysis was conducted comparing fathers with and without depression (exposure) according to the clinical interview (depressed n = 40, non-depressed n=40). A Pearson's chi-square test was used to investigate binary outcomes of father-child attachment representations. A further sensitivity analysis was conducted to investigate if paternal depression within the child's life may have an influence on the father-child attachment. This consisted of a total of 58 participants: 29 fathers that had current depression or depression within the child's life time and 29 fathers with no history of depression and wives/partners with no history of depression (pure controls). They were matched again according to child gender: there were 17 girls and 12 boys in

each group of the sensitivity analysis. The sensitivity analysis was conducted using the same statistics as the initial sub-analysis.

6.2.6.2 Secondary research questions (1): *Is paternal depression associated with fathers' attachment representation of his parents and fathers' involvement in parenting?*

Main analysis

Data analysis was initially carried out on all fathers with available father-child attachment data (n=99) using a questionnaire measure of paternal depressive symptoms (PHQ-9 scores) as the exposure variable. Linear regressions were used with continuous outcomes of fathers' attachment representations (anxious and avoidant) and fathers' involvement. For outcomes that did not meet the requirements of normal distribution, analysis was done using nonparametric Spearman's rho test.

Sub-group analysis

A sub-group analysis was conducted comparing fathers with and without depression according to the clinical interview (SCID). An independent samples t-test was used to investigate any differences between depressed and non-depressed fathers on continuous outcomes (fathers own attachment representations and involvement).

6.2.6.3 Secondary research question (2): *Is father's own attachment representation to his parents and father's involvement associated with father-child attachment?*

Research questions were answered using the whole sample to maximise on the number of participants (n=99) and using logistic regression where the outcome was binary attachment classification and exposure was either continuous father's representation of his parents (anxious or avoidant) or fathers involvement.

6.2.6.4 Secondary research question (3): *Does father's own attachment representation to his parents and father's involvement mediate any associations between paternal depressive symptoms and father-child attachment?*

Provided that the above research questions were statistically significant, research questions would have been answered using the whole sample to maximise on the number of participants (n=99) using SEM to investigate direct, indirect and total effects.

6.3 Results

Descriptive statistics are presented first. This is followed by the results answering the primary research question using the main analysis and sub-group analysis. Then the findings for the secondary research questions are presented.

6.3.1 Descriptive statistics

Table 2 shows descriptive statistics of the father-child attachment, father's attachment representations of his parents and fathers' involvement in parenting for the whole FIF sample, and boys and girls separately. There was a significant difference between boys and girls coding of attachment classifications ($X^2=5.00$, $df=1$, $p=0.025$). There were more boys classified as non-secure (insecure avoidant, insecure ambivalent and disorganised) compared to girls and more girls were classified as secure compared to boys.

Table 2 Attachment categories, fathers' attachment representation of his parents and fathers' involvement in parenting of whole sample of children and separately for boys and girls.

Outcome variable	All children	Boys	Girls
<i>Number of Participants</i>	99	46	53
Fathers' own attachment to parents ¹			
Avoidant	3.78(1.53)	3.88(1.52)	3.74(1.56)
Anxious	0.15(0.22)	1.67(1.07)	1.55(1.07)
Fathers' involvement mean ²	31.23(4.95)	31.04(4.80)	31.23(0.76)
<u>Father-child attachment</u>			
Secure attachment	57(58%)	21(46%)	36(68%)
Non-secure ³	42 (42%)	25 (54%)	17 (32%)

¹ There were 11 participants that had missing data on questionnaire measure of the Close relationship questionnaire

² There were 9 participants with missing data on the fathers' involvement questionnaire therefore the sample size was reduced to 88 and 90.

³ Includes Insecure avoidant, insecure ambivalent and disorganised coding's.

Table 3 shows descriptive statistics of the father-child attachment, fathers' attachment representations of his parents and fathers' involvement in parenting for fathers in depressed and non-depressed group according to life time depressive episode using the SCID. There were no statistically significant differences between boys and girls coding of attachment classifications ($X^2=2.46$, $df=1$, $p=0.116$).

Table 3 Attachment categories, fathers' attachment representation of his parents and fathers' involvement in parenting of 40 depressed and 40 non-depressed matched fathers

Outcome variable	Non-depressed fathers	Depressed fathers
<i>Number of Participants</i>	40	40
Fathers' own attachment to parents ¹		
Avoidant	3.30(1.46)	4.19(1.41)
Anxious	1.21(0.50)	1.90(1.33)
Fathers' involvement mean ¹	31.97(4.70)	30.46(5.01)
<u>Father-child attachment</u>		
Secure attachment	23 (58%)	25 (63%)

Non-secure attachment²

¹ There were 37 participants for each group as there was missing data from 3 participants.

² Includes Insecure avoidant, insecure ambivalent and disorganised coding's.

6.3.2 Primary research question: Are paternal depressive symptoms/depression associated with father-child attachment?

The odds ratios indicate that paternal depressive symptoms increase the odds of non-secure father-child attachment style increase (OR=1.01, 95% CI=0.92-1.11, p=0.776). However, inspection of the CI and P value indicates that these associations were not statistically significant. Child gender was significantly associated with the outcome (Appendix I) and after controlling for child gender in the model, paternal depressive symptoms still remained non-significant (OR=1.01, 95% CI=0.92-1.11, p=0.852). The sub-analysis of matched group (depressed vs non-depressed fathers) revealed no statistically significant differences between the two groups in father-child attachment classifications (Table 4). A further sensitivity analysis consisting of depressed fathers' who had an episode of depression within the child's lifetime revealed a p value of 1.00 when compared against non-depressed fathers. This suggests that that the father-child attachment representation categories were identical for children of depressed and non-depressed fathers.

Table 4 Comparison between depressed and non-depressed fathers on fathers own attachment to his parents, fathers' involvement, father-child attachment representation and attachment related-representations in doll's house play

Father-child attachment Outcomes	Fathers depressed during their life-time (n=40 depressed, 40 non-depressed)		Fathers depressed within child's life-time (n=29 depressed, 29 non-depressed)	
	X^2	P	X^2	P
<i>Binary father-child classifications</i>				
Secure vs non-secure	0.21	0.820	0.00	1.000
	t		t	
<i>Father's attachment to his parents</i>				
Avoidant	-2.21 (-1.44- -0.07) ¹	0.031	-2.01 (-1.62- -0.00) ²	0.050
Anxious	-2.99 (-0.23- -0.05) ¹	0.030	-2.36 (-0.20 - -0.02) ²	0.022
<i>Fathers' involvement</i>	1.18 (-0.09-0.36) ³	0.239	0.86 (-0.16-0.39) ⁴	0.407

¹ Sample size consisted of 37 non-depressed and 36 depressed participants as there were some questionnaires data missing

² Sample size consisted of 25 in each group participants as there were some questionnaires data missing

³ Sample size consisted of 37 participants in each group as there were some questionnaires data missing

⁴ Sample size consisted of 25 non-depressed and 26 depressed participants as there were some questionnaires data miss

6.3.3 Secondary research question (1): Is paternal depression associated with father's attachment representation of his parents and fathers' involvement?

Is paternal depressive symptoms/depression associated with father's attachment to his parents?

The association between parental depressive symptoms and fathers' avoidant (Coefficient=0.08, 95% CI=-0.00-0.15, p=0.052) and anxious (Coefficient =0.01, 95% CI=0.00-0.02, p=0.057) attachment to his parents were marginally significant in the unadjusted models, although the 95% confidence intervals crossed zero. Therefore, although the p values were approaching significance, there was no statistically significant association between paternal depressive symptoms and fathers' avoidant or anxious attachment to own parents in the unadjusted models. As the outcome variable of anxious attachment was skewed, a non-parametric test was also run. Non-parametric Spearman's rho showed no significant correlation between paternal depressive symptoms and fathers' anxious attachment to parents ($r = 0.20$, $p=0.06$). Child temperament was significantly associated with fathers' avoidance of parents (Appendix I). Therefore, after adjusting for child temperament, the association between paternal depressive symptoms and fathers' avoidance of parents became significant (Coefficient =0.08, 95% CI=0.01-0.16, $p=0.027$). Fathers with more depressive symptoms reported more avoidant relationships with their parents. Child temperament was also significantly associated with fathers' avoidance of his parents (Coefficient =-0.44, 95% CI= -0.80 - -0.08, $p=0.016$). Fathers with children that have a difficult temperament were more likely to report higher

avoidant relationship with their parents. No covariates were significantly associated with the anxious attachment (Appendix I); therefore an adjusted model could not be run for this regression model.

The sub-group analysis revealed a statistically significant difference between depressed and non-depressed fathers avoidant and anxious attachment representations of their own parents (Table 4). Depressed fathers reported higher levels of both avoidant and anxious attachment to their parents compared to non-depressed fathers. The sensitivity analysis using fathers who had depression within the child's life time replicated these findings. However, the outcome measure of father's anxious attachment to his parents was skewed even after transformation of the variable, therefore the results of this outcome should be viewed with caution. As child temperament was significantly associated with fathers' avoidance representation to parents (Appendix I), the t-test was followed up with a between subjects ANOVA controlling for child temperament. There was still a statistically significant difference between depressed and non-depressed fathers' avoidant representation of their parents ($F=4.43$, $p=0.039$). No covariates were associated with fathers anxious representations of parents therefore an adjusted ANOVA model could not be run.

Is paternal depressive symptoms/depression associated with father's involvement with child?

According to the unadjusted linear regression model, fathers with higher levels of depressive symptoms had lower levels of involvement with their children and this association was statistically significant (Coefficient = -0.28, 95% CI= -0.51 -

-0.04, $p=0.021$). None of the covariates were significantly associated with father's involvement (Appendix I); therefore an adjusted regression model could not be run for this analysis. The mean involvement scores of non-depressed fathers were very slightly higher ($M=31.46$) than those of depressed fathers ($M=30.79$), but there were no statistically significant differences between the involvement of depressed and non-depressed fathers (Table 4).

6.3.4 Secondary research questions (2): Is father's own attachment representation to his parents and father's involvement with child associated with father-child attachment?

Is fathers' attachment representation associated with father-child attachment?

Father's avoidant ($OR=0.86$, 95% $CI=0.65-1.13$, $p=0.281$) or anxious ($OR=0.74$, 95% $CI=0.01-1.17$, $p=0.203$) attachment representations to his parents were not significantly associated with father-child secure vs non-secure attachment.

Is fathers' involvement associated with father-child attachment?

Father's involvement with child was not significantly associated with father-child attachment ($OR=1.01$, 95% $CI=0.92-1.09$, $p=0.912$).

6.3.5 Secondary research question (3): Does father's own attachment representation to his parents and father's involvement mediate any associations between paternal depressive symptoms and father-child attachment?

SEM mediation analysis could not be run as there were no significant associations in all above research questions.

6.4 Discussion

6.4.1 Main findings

The primary aim of the current study was to investigate the association between paternal depressive symptoms/depression and father-child attachment. The study also had a number of secondary aims, which was to investigate the association between paternal depressive symptoms/depression and attachment-related constructs (fathers' attachment representations of his parents and fathers' involvement in parenting), and to see if there were any associations between fathers own attachment representation and fathers' involvement with father-child attachment outcome. Provided that these associations were significant, the mediating role of fathers' attachment to their own parents and fathers' involvement in parenting would have been tested in the association between paternal depressive symptoms and father-child attachment. As the relation of paternal depressive symptoms to father-child attachment was the primary research question, discussion will mainly focus on the null-findings of the primary aim of the study.

The study showed that current paternal depressive symptoms or depression (past history of depression before child's life, during child's life or current) were not related to father-child attachment classifications. Thus, pre-school and school aged children of depressed fathers were no more likely to have non-secure attachment representations of their fathers compared to children of non-depressed fathers. Current paternal depressive symptoms were significantly associated with fathers' involvement in parenting in the unadjusted model but the adjusted model could not be run, therefore it is impossible to know whether this association could have been explained by confounding with other child and mother characteristics. Therefore, it would not be appropriate to draw any conclusions from the unadjusted model. Depressive episodes (past history of depression before child's life, during child's life or current) were also not related to fathers' involvement and fathers' involvement was also not associated with father-child attachment. Therefore, the mediating role of fathers' involvement could not be tested.

Although current paternal depressive symptoms and depressive episodes were significantly associated with higher levels of avoidance by fathers of their own parents, there was no significant adjusted association between depressive symptoms and fathers anxious representation of his parents. Difficult child temperament was also associated with fathers' avoidance of his parents, but not fathers' anxious representation of his parents. There was a significant association between paternal depressive episodes (life time and within the child's life) and fathers' anxious representations about their own parents, but

this analysis was based on a small sample size and therefore needs to be replicated with a larger sample to draw firm conclusions. Moreover, clear conclusions cannot be made about fathers' representations of parents as both dimensions are needed to draw conclusions about attachment style (Fraley, Heffernan, Vicary, & Brumbaugh, 2011). There were no significant association between fathers' attachment representations and father-child attachment. Therefore, there seems to be no evidence from the current study to suggest that this is a plausible pathway through which paternal depression influences father-child attachment.

6.4.2 Methodological issues

There are three main explanations which may explain the null-findings of the primary aim of this study that also tie-in with the limitations of this study. Firstly, the null-findings may be due to the low levels of depressive symptoms (measured by the PHQ-9 scale) in the current FIF low-risk sample as a whole and the sub-sample analysis (Tharner et al., 2012). The mean scores of the whole FIF sample ($n=99$, $mean=3.84$), depressed fathers sub-group ($n=40$, $m=6.13$) and non-depressed sub-group ($n=40$, $m=1.93$) were all considerably below the clinical cut-off range of the PHQ-9 scale. A score of 10 - 19 is an indicator of moderate levels of depression and 20+ severe levels of depression (Kroenke et al., 2001; Löwe et al., 2004; Spitzer et al., 1999). In order for there to be an effect, perhaps a sample with severe levels of depressive symptoms on the PHQ-9 scale (20+) is required in the depressed group. The study attempted to address this issue by using the SCID clinical interview to assess episodes of current/past depression, but this sub-analysis lacked sufficient

power and there were only 4 fathers with current episodes of depression in the sample. Thus, depressive symptoms of the current sample may not have been strong enough to exert an influence on the father-child attachment classifications, as expected.

In the maternal depression literature, studies with high risk clinical samples have been shown to have a larger effect size compared to findings from non-clinical samples when investigating the associations between maternal depression and mother-infant attachment (Atkinson et al., 2000; Belsky & Fearon, 2008; Lyons-Ruth & Jacobvitz, 2008). In these samples, maternal depression was in the clinical range and there were other risk factors that contributed to insecure mother-infant attachment, such as family poverty and marital support (Atkinson et al., 2000). In a recent well-powered study of a large sample of mothers (n=506), Tharner et al. (2012) found no significant association between maternal depressive symptoms (peri-natal and post-natal) and mother-infant attachment at 18 months assessed using the SSP. The authors attributed the non-significant findings to the study sample being low risk, well-educated and married or co-habiting mothers from a high SES backgrounds. They argued that these aspects may have buffered any influence of maternal depression on the mother-infant attachment as such resources might dissipate stresses that may be caused by depressive symptoms (Tharner et al., 2012).

Paternal depression has been associated with unemployment, poverty, low family income, low education and ethnicity (Bergström, 2013; Costello et al.,

2001; Rosenthal et al., 2013). In line with Tharner et al. (2012) argument, the sample of fathers in the current study was predominantly highly educated, white, employed, and married/co-habiting (see Table 1). Therefore, these factors may have buffered any influence of paternal depressive symptoms. In addition to this, given the nature of the study there may have been a sampling bias. The FIF study required fathers to take part in T1 assessment with their family for a home visit lasting approximately 3 hours. The same families were then invited to take part in T2 home visit assessment lasting approximately 3 hours, with an addition of attending a university visit with their child lasting approximately 2 hours. Families were given £10 at T1, £15 and a child gift at T2 and feedback on their child's language performance at both time-points. Given the large amount of time investment involved and low incentive for taking part, fathers that took part in the study may have been those motivated in helping research and those highly involved with their children. This is reflected in the educational demographics of the fathers which showed that 28.3% of the fathers had degrees and 32.3% had post-graduate qualifications. Thus, approximately 60% of the fathers in the sample had been to university. This does not reflect the general population and indicates a privileged and highly educated group who might be less likely to be depressed. The mean involvement of fathers in the sample was also high (31.23 on a scale ranging from 0 - 40), suggesting that fathers who took part in the study were fathers who were highly involved with their children regardless of whether they were depressed ($m=30.97$) or non-depressed ($m=31.46$).

Both of the sample sizes for the main analysis (investigating paternal depressive symptoms and father-child attachment) and clinical sub-analysis (using clinically depressed fathers) was under-powered (see Appendix J and L). Perhaps with an appropriately powered study and a clinical high-risk population the results would have yielded more informative findings. This is something future research can consider and will be discussed in more depth in the final discussion chapter (chapter 7).

In relation to the attachment measures, it would have been more desirable to use the Adult Attachment Interview (AAI; George et al., 1985) to measure fathers' attachment representation of their parents. However, the measure is a long interview which would not have been appropriate to add to the current study given that the study already had pre-existing measures that were time consuming. Using a well-validated questionnaire measure such as the CRQ is time-efficient and cost-effective (Fraley et al., 2011) and has given preliminary findings of no association with father-child attachment, but the AAI may have given more useful and in-depth data. This is another aspect for future research to investigate further.

The inter-rater reliability for mother-child attachment ($k=0.56$, $p=0.03$) and father-child attachment classifications ($k=0.14$, $p=0.26$) were low. This suggests that the coding may not be reliable and therefore the findings of the current study may not be accurately revealing the association between paternal depressive symptoms and their children's attachment representations. Thus, the null findings could be due to the unreliable coding. The FIF study is

investigating this issue further by arranging the second coder to code more recording in the future before conducting any further analysis on the MCAST attachment dataset.

Finally, the father-child attachment MCAST data was mainly collected during home visits in an unstructured environment where there were many distractions (TV programs, other siblings, computers and other toy's). This made it difficult to administer the MCAST without the children involving other toys or irrelevant story themes in the play. However, the involvement of irrelevant themes in the play by children is coded as disorganised attachment according to the MCAST manual. Therefore, as the MCAST play is influenced by the child's current state of mind and environment, it might work better in a structured environment such as schools or at University visits.

6.4.3 Strengths

The study has a number of strengths. The FIF study was a large study focused on recruiting fathers. Traditionally, most studies focused on recruiting mothers' and fathers' participation is optional. Recruitment was intensive and widespread across Devon, but given the challenging nature of the sample being recruited (Bögels & Phares, 2008; Phares & Compas, 1992), the sample sizes for both time-points were relatively small (T1=160, T2=113). The recruitment process led to much knowledge to add to the limited literature about the most appropriate way to recruit fathers, which future projects can benefit from (Sherr, Davé, Lucas, Senior, & Nazareth, 2006). The study also used well-validated

mixed methods to collect data (interview, observational, questionnaire, psychophysiological). This level of detail could not have been achieved with a large cohort dataset consisting of thousands of participants. Given the age group of the sample (3 - 7 years old), it was also challenging for these families to take part as during the working weekday hours, the children were often at pre-school/school and fathers were at work, whereas research with infants and mothers benefit from mothers being on maternity leave and glad of the novel joint activities.

6.4.4 Future research

Previous studies using the SSP to measure father-infant attachment have also found null or weak findings (Braungart-Rieker, Garwood, Powers, & Wang, 2001; Eiden et al., 2002; van Ijzendoorn & De Wolff, 1997). In a meta-analysis of fathers' sensitive responding and father-child attachment style in the first year of the infant's life, van Ijzendoorn and De Wolff (1997), identified eight studies in which four used the SSP and found a weak affect size of $r = 0.13$ (six of the studies found non-significant findings). A later study by Braungart-Rieker et al. (2001) using the SSP also found non-significant effect of parental sensitivity on father-infant attachment. Subsequently, Eiden et al. (2002) found no direct association between paternal depressive symptoms and infants' SSP insecure attachments. Given that both SSP and MCAST are based on studies establishing the reliability and validity with mothers and their children, it may be that the SSP and MCAST do not adequately tap into measuring father-child attachment relationships (Volling & Belsky, 1992). In the current study the inter-rater reliability for mother-child attachment (MCAST) had an almost moderate

agreement between the two coders ($k=0.56$, $p=0.03$), whereas the agreement for father-child attachment classifications was non-significant ($k=0.14$, $p=0.26$). This might suggest that coding of mother-child attachment was more reliable compared to coding of father-child attachment. Therefore, a different assessment measure might be more appropriate for measuring father-child attachment.

According to Bowlby (1979) children need to have emotional security available in times of distress to adapt appropriately to the situations. Grossmann, Grossmann and Zimmermann (1999) conceptualised this as “secure exploration” and suggested that fathers may fulfil a more secure exploration role which may be specifically important for the formation of father-child attachment. Therefore, fathers who are low in sensitive responding to their children during play may not provide a secure exploration base leading to them developing a non-interpersonal avoidant strategy where they would avoid seeking fathers guidance in challenging or stressful situations, or ambivalent where they may be too clingy to feel safe to explore the environment but then might not accept guidance from their father during play, or be disorganised with no clear strategy. On the other hand, fathers who respond sensitively may promote more secure exploration, leading to a secure attachment and better developmental outcomes (Grossmann et al., 2002).

The different role of fathers in children’s attachment formation was further developed by Paquette (2004). Paquette (2004) proposed the “activation relationship theory” emphasising two dimensions of fathering that are essential

for father-child attachment: stimulation and discipline. Fathers act as a secure base by promoting their children to explore their environment (stimulation) while providing a safe environment for them by setting limits and boundaries (discipline). Fathers often become more involved with their children as they start developing motor skills and play time involving physical activities would serve as the ideal situation for stimulation, discipline and development of father-child attachment bond. Based on principles of this theory, a new method of assessing father-child attachment was developed called the Risky Situation Procedure (RSP) (Paquette & Bigras, 2010). The RS and SSP have been tested against each other and it has been found that the RSP administered to infants between 1 - 1½ years old predicted their internalising and externalising problems at 2½ - 3 years old, whereas the SSP did not (Dumont & Paquette, 2013). Such a measure needs to be developed for school aged children. There is currently no measure assessing father-child attachment based on activation theory for school-aged children, which is something for future research to consider (discussed further in Chapter 7).

6.4.5 Conclusions

In conclusion, current paternal depressive symptoms or depressive episodes (past history of depression before child's life, during child's life or current) were not related to non-secure father-child attachment classifications. A number of plausible explanations have been suggested for these null-findings such as the study of a low-risk non-clinical sample and lack of power. If these findings were replicated with an appropriately powered study and clinical sample, it would suggest that paternal depression does not influence insecure father-child

attachment. As measures of parent-child attachment such as the SSP and MCAST were validated with mothers, it may be that they are not appropriate tools for measuring father-child attachment. Future research needs to develop better tools for accurately measuring father-child attachment to investigate the association between paternal depression and father-child attachment.

Chapter 7 Discussion

The aim of this PhD was to investigate whether paternal depressive symptoms were associated with fathers parenting, father-child attachment and children's emotional, behavioural and cognitive outcomes. The purpose was to examine key propositions within the attachment-related parenting risk transmission model from father to child (Figure 1), which was based on findings from previous literature (Chapter 1.2.7). This was done by empirically testing different parts of the model in each Chapter. The thesis presented three papers that reported secondary data analyses and two chapters: one that extended the findings of the secondary data analysis and a chapter on primary data of the FIF study that builds on the findings of the secondary data analyses. This chapter will summarise the findings from the five empirical chapters that comprise the body of this thesis, placing them in the context of existing literature, practice and current policy. This will be followed by the theoretical and clinical implications of the work. The strengths and limitations will next be discussed. Finally, the Chapter will suggest directions for future research.

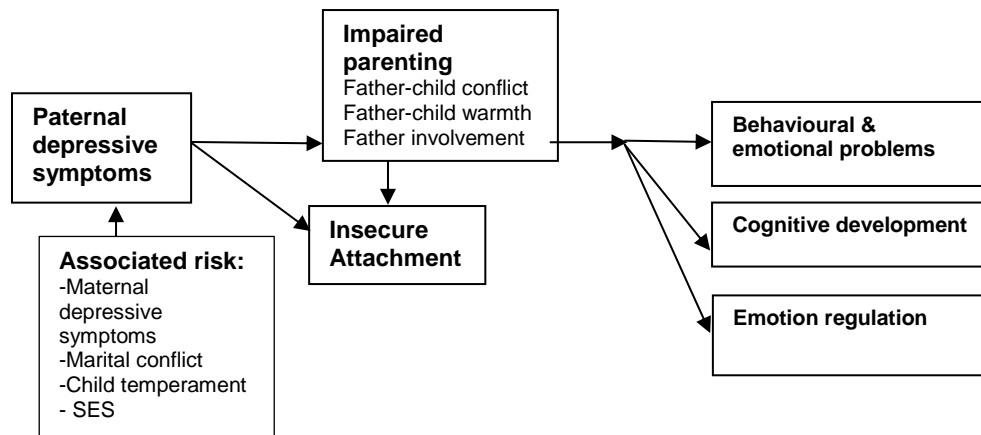


Figure 1: Proposed model on the risk of transmission via attachment related impaired parenting (Ramchandani & Psychogiou, 2009)

7.1 Substantive/main findings

7.1.1 Recap of research questions

The thesis sought to answer the following research questions:

1. What is the prevalence of depressive symptoms in fathers with young children? (Chapter 2)
2. What are the associated risk factors of paternal depression? (Chapter 2)
3. Is post-natal depression in fathers associated with their subsequent parenting? (Chapter 3)
4. Are post-natal paternal depressive symptoms associated with their children's behavioural, emotional and cognitive outcomes in school-aged children? (Chapter 4 and 5)
5. Does fathers' parenting mediate any associations in question 4? (Chapter 4 and 5)
6. Is paternal depression/depressive symptoms associated with children's insecure father-child attachment classifications? (Chapter 6)

7.1.2 Summary of findings in the context of existing literature

Individuals suffering with depression have low mood, loss of pleasure and interest in activities, poor appetite, sleeping disturbances (over sleeping, lack of sleep), low energy, low self-worth, lack of concentration and suicidal thoughts (American Psychiatric Association, 2000). Such symptoms can negatively impact on an individual's day-to-day functioning and interpersonal relationships (Hirschfeld et al., 2000; Klein & White, 1996). Some research has indicated that paternal depression may influence fathers' parenting, father-child attachment and child outcomes (Dette-Hagenmeyer & Reichle, 2013; Giallo et al., 2013; Malmberg & Flouri, 2011; Ramchandani & Psychogiou, 2009; Sarkadi et al., 2008), but the mechanisms that underlie this risk transmission are not well understood. This section will summarise the findings of each chapter in relation to the research questions and place them in the context of existing literature.

The primary aim of Chapter 2 was to estimate paternal depressive symptoms from 9 months to 7 years old and compare against findings with mothers (answering research question 1). The secondary aim was to identify potential associated risk factors of paternal depression (answering research question 2). The prevalence of paternal depressive symptoms was highest in the first year after birth and declines from 9 months to 7 years old, but trends for paternal depressive symptoms were lower than the trends of maternal depressive symptoms. Maternal depressive symptoms, parents' relationship conflict and unemployment were risk factors consistently associated with paternal depressive symptoms across all time-points (9 months – 7 years old), whereas child temperament was not. These findings suggest that these are key risk

factors that should be incorporated into theoretical models of parental risks for depressive symptoms and potential service providers working with depressed fathers should be made aware of such risk factors that may precipitate relapse or impede recovery. To my knowledge, the unique contribution of this study to literature was that this is the first study to investigate the prevalence of depressive symptoms among fathers over several time points in such a large and representative UK cohort of fathers.

Previous research has suggested that depression in fathers influences their ability to adequately parent their children (Wilson & Durbin, 2010). Given that paternal depressive symptoms were at their highest level in the first post-natal year and comparable to maternal depressive symptoms (Chapter 2), Chapter 3 investigated whether post-natal paternal depressive symptoms were associated with fathers' subsequent parenting (father-child warmth relationship, father-child conflict, fathers' involvement) (answering research question 3). Paternal depressive symptoms (9 months) were not associated with fathers involvement (5 and 7 years old) or father-child warmth relationship (3 years old), but were significantly associated with father-child conflict (3 years old) after adjusting for covariates. These findings were slightly contradicted by findings from Chapter 6 that suggested that paternal depressive symptoms were associated with fathers' involvement in the unadjusted model, but there were no significant differences between depressed and non-depressed fathers involvement according to the SCID diagnosis. This model remained unadjusted as no measured covariates were significantly associated with paternal depressive symptoms. In a larger sample that afforded more power, it may have been

possible to adjust for potential confounders, and it is possible that the association may have become non-significant. Therefore, taken together, the findings from Chapters 3 and 6 indicate that parental depressive symptoms affect father-child conflict, but may not change the amount of parenting activities with their child or warmth towards their child. In addition, the findings reported in Chapter 3 suggest that maternal depressive symptoms and marital conflict moderated the association between paternal depressive symptoms and father-child conflict. Unemployment and child temperament did not influence this association. As the findings of Chapter 3 suggested that only father-child conflict was associated with paternal depressive symptoms, father-child conflict construct was taken forward into the analysis for Chapters 4 and 5.

The studies described in Chapter 4 and 5 investigated whether father-child conflict mediated the association between paternal depressive symptoms at 9 month and children's emotional, behavioural and cognitive outcomes (answering research question 4 and 5). Emotional and behavioural outcomes were measured at 7 years old and cognitive outcome at 5, 7 and 11 years old. Greater father-child conflict mediated the association between higher levels of paternal depressive symptoms and mothers' reports of boys with higher scores on conduct problems (externalising difficulties). In contrast, higher father-daughter conflict mediated the association between higher paternal depressive symptoms and increased emotional problems in girls (internalising problems). There was no significant association between paternal depressive symptoms and children's cognitive outcomes at 5, 7 and 11 years old. These findings are in line with previous literature that suggests that fathers' negative parenting

mediated the association between paternal depressive symptoms and children's emotional-behavioural outcomes (Dette-Hagenmeyer & Reichle, 2013; Giallo et al., 2013; Malmberg & Flouri, 2011). The null-findings regarding the association between paternal depressive symptoms and children's cognitive outcomes are strengthened by the findings that maternal depressive symptoms and poverty were significantly associated with child cognitive outcomes within the same models, which is also consistent with previous literature (Grace et al., 2003; Guo & Harris, 2000; Kiernan & Mensah, 2011; Mensah & Kiernan, 2010; Schoon et al., 2012).

Finally, the primary objective of the study described in Chapter 6 was to explore the association between paternal depressive symptoms and father-child attachment (answering research question 6). It also investigated other attachment-related factors that might have explained any potential associations between paternal depressive symptoms and father-child attachment (paternal involvement and fathers own attachment representation to their parents). A subgroup analysis was conducted including participants with past/current depression using the SCID interview. No clear associations were found between paternal depressive symptoms/depression and father-child attachment, fathers' involvement or fathers' representations of his own parents. These findings tie in with the findings from Chapter 3, which also found no associations between paternal depressive symptoms and fathers' involvement (answering research question 3).

Although the findings in Chapter 6 presents no link between paternal depressive symptoms and father-child attachment, given the well-established association between maternal depression and insecure mother-child attachment (Fearon et al., 2010; Groh et al., 2012; Martins & Gaffan, 2000; Wan & Green, 2009), it does not seem plausible that paternal depressive symptoms have no influence on father-child attachment. Although this could be due to the highly educated and advantaged SES background of the sample in the FIF study discussed in Chapter 6 (Tharner et al., 2012), an alternative explanation for these findings is the conceptualisation of father-child attachment and the method used to measure it. As the MCAST was validated for measuring mother-child attachment (Green et al., 2000), it may be that it does not adequately measure father-child attachment construct.

An increasing number of researchers in the attachment field are questioning the application of attachment measures validated with mothers to measure father-child attachment (Grossmann et al., 2002; Grossmann et al., 1999; Paquette, 2004; Paquette & Bigras, 2010; Paquette & Dumont, 2013; Volling & Belsky, 1992). These researchers propose that mother-child attachment is formed differently to father-child attachment. Mother-child attachment develops during the early care-giving years, where mothers provide warmth and care by being a secure base from which the child can develop a primary attachment bond (Bowlby, 1973, 1988). Whereas fathers are more involved with children once they start developing motor skills and the attachment bond solidifies during interactions in play activities (Bowlby, 1982a). Paquette (2004) developed this point further by proposing the “activation relationship theory” emphasising two

dimensions of fathering that is essential for father-child attachment: stimulation and discipline, which can either activate or deactivate the child's development. Activated children are stimulated by their father and feel safe to explore their environment within the appropriate boundaries set by their fathers, whereas under-activated children do not receive the stimulation from their fathers to explore their environment and are either over-protected/restricted or lack appropriate boundaries to guide them in exploratory play. This theory emphasises the important role of fathers being playmates during play time activities involving physical play, which promotes the development of the father-child attachment bond. Based on principles of this theory, Paquette and Bigras (2010) developed a new method of assessing father-child attachment called the Risky Situation Procedure (RSP). The RSP and classic Strange Situation Procedure (SSP), which is a validated measure to test mother-child attachment, have been tested against each other and the RSP was found to predict children's internalising, externalising and emotion regulation problems, whereas the SSP did not (Ainsworth et al., 1978; Dumont & Paquette, 2013; Flanders, Leo, Paquette, Pihl, & Séguin, 2009; Flanders et al., 2010).

The main finding of the thesis was that father-child conflict relationship mediated the association between paternal depressive symptoms and children's internalising and externalising problems. The link regarding paternal depression and father-child conflict has support from findings in previous literature (Kane & Garber, 2004, 2009) and the current findings extend this to finding it to play a mediating role in the association between paternal depressive symptoms and children's behavioural and emotional outcomes. Explanations of

the main findings of this thesis could be found from the attachment literature, social learning perspective or the family systems theory.

An attachment related explanation of the findings could be that as the father is the child's primary playmate (Bowlby, 1982a), father-child conflict has a negative influence on father-child activation relationship (attachment) (Paquette, 2004), which later impacts on children's emotional and behavioural outcomes. In addition to this, as depression in fathers can make them neglectful and lose interest in pleasurable activities such as play-time with their children, paternal depression may disturb the formation of father-child attachment via lack of an activation relationship (Lee et al., 2011; Lee et al., 2012; Paquette, 2004). These issues need to be tested in future research to provide evidence for this explanation.

However, given that no significant association was found between paternal depression/depressive symptoms and father-child attachment (Chapter 6), an attachment theory approach may not adequately explain the influence of paternal depressive symptoms on children's behavioural and emotional outcomes. Instead, alternative theories on parent-child relationship may shed some light. According to Social Learning Theory (SLT) (Patterson, 1982; Scott & Dadds, 2009), parents influence their children by either modelling negative behaviours which are learnt by their children observationally, or parents reinforce children's behaviours by rewarding positive behaviours and punishing negative behaviours. Thus, parents with depression may find it difficult to reward positive behaviours (acting neutral towards them) and only give children

attention for negative behaviours with negative critical parenting (Patterson & Chamberlain, 1994; Scott & Dadds, 2009; Wilson & Durbin, 2010). In such situations where a child only gets parental attention for negative behaviours, the child becomes motivated to continue negative behaviours, as this parental reaction is preferred compared to the neutral response given to their positive behaviours. This may lead to father-child conflict during parent-child interactions and consequently an escalation of behavioural and emotional problems amongst their children. This then might encourage more father-child conflict which is maintained unless there is a break in the cycle.

Another theory, the family systems theory (Klein & White, 1996), suggests that factors associated with other members of the family may also influence fathers' depressive symptoms and child outcome (Chapter 1.2.5). This is supported by findings in Chapter 2 suggesting that higher levels of maternal depressive symptoms and marital conflict were associated with higher levels of paternal depressive symptoms. And Chapter 3 reported both these factors moderated the association between paternal depressive symptoms and father-child conflict. Studies have shown both these factors to also be associated with children's behavioural and emotional problems (Caplan et al., 1989; Cummings & Davies, 1994; Cummings, Merrilees, & George, 2010; Ramchandani & Psychogiou, 2009). Taken together, all three of these factors (maternal depressive symptoms, paternal depressive symptoms and marital conflict) maybe acting together to increase the risk to emotional and behavioural problems in children (Chapters 2, 3, 4 and 5). Moreover, factors within the family that are closely allied but not the same as parent-child conflict, such as high expressed

emotions of criticism have been associated with children's emotional and behavioural problems (Hirshfeld, Biederman, Brody, Faraone, & Rosenbaum, 1997; Psychogiou, Daley, Thompson, & Sonuga-Barke, 2007). A recent study reported depressive symptoms in fathers were not associated with their expressed emotions, but depressive symptoms in their partners (child's mother) were associated with the fathers expressed emotions (higher critical comments) about their infants (Psychogiou, Netsi, Sethna, & Ramchandani, 2013). This emphasises the potential influence of maternal depressive symptoms on fathers' critical expressed emotions which may influence father-child conflict.

In summary, the findings of the thesis emphasise the importance of father-child conflict as a possible pathway through which paternal depressive symptoms may be associated with the development of psychopathology in children. Early psychopathology, especially conduct and emotional problems have been associated with depression in adolescence and adulthood (Caspi et al., 1996; Roza, Hofstra, van der Ende, & Verhulst, 2003; Stringaris, Lewis, & Maughan, 2014), which therefore might explain the intergenerational transmission of depression from father to child. Explanations of the findings are explained from attachment, SLT and family systems perspectives. However, future research is needed to confirm these possible explanations of risk transmission from father to child.

7.2 Theoretical implications

The findings of the current thesis add to current theoretical understanding of intergenerational risk transmission from father to child (Goodman & Gotlib, 1999; Ramchandani & Psychogiou, 2009) and highlight the role of father-child conflict as a potential mechanism through which paternal depression may influence children's outcomes. This is supported by previous literature suggesting a link between paternal depression, father-child conflict and child-outcomes (Kane & Garber, 2004, 2009). Research has also reported that childhood behavioural and emotional problems are associated with the development of depression during adulthood (Roza et al., 2003; Stringaris et al., 2014). Taken together, paternal depression and father-child conflict might increase the risk of depression later in life for children of depressed fathers, like it does with mothers (Goodman & Gotlib, 1999). The final theoretical model proposed from the findings of the current thesis is presented in Figure 2, which can help further theory development.

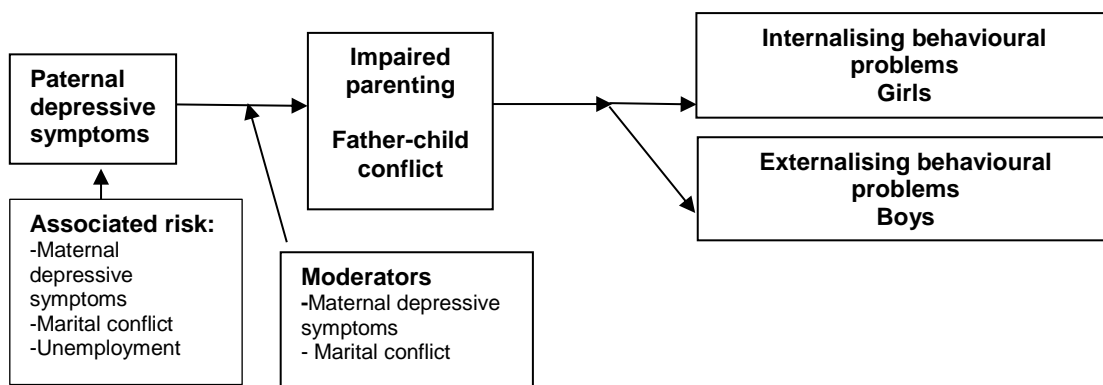


Figure 2: Model of risk of transmission via father-child conflict (Ramchandani & Psychogiou, 2009)

7.3 Practice and policy implications

The main clinical implication of the current thesis is that it suggests that paternal depressive symptoms and father-child conflict are important factors that are associated with detrimental effects to the behavioural and emotional outcomes in children and could be explored as targets to identify at risk groups, i.e. children of fathers with depressive symptoms (Ramchandani & Murphy, 2013). These findings are predominantly based on epidemiological data which investigated rates of paternal depressive symptoms over time, associated risk factors and which children were at risk of their father's depressive symptoms and how they were at risk. The findings of such epidemiological studies should inform clinical practice (Ford, 2008). It is important to develop, test and implement theory-driven interventions, but very few interventions involving fathers have been developed and applied based on theoretical foundations (McAllister et al., 2012; Panter-Brick et al., 2014; Scott & Dadds, 2009).

There are some specific implications that can be taken from the current thesis and implemented into routine practice, services for parents, and parenting interventions. Paternal depressive symptoms were found to be highest in the post-natal period and reduced over time. It is unrealistic to conduct clinical interviews with all fathers in maternity wards; therefore using an appropriate screening instrument after childbirth with fathers would be the most ideal in order to identify vulnerable or at risk fathers. GPs, midwives and health care visitors often repeatedly screen mothers for depressive symptoms, and perhaps they should be encouraged to screen fathers in a similar way. However, there is no point in screening fathers during the post-natal period in maternity wards and

the community, as is currently done with mothers, if there are no services or support available for fathers experiencing depressive symptoms. It would only be ethical to screen if there are services and effective interventions available. Currently, in depression, there is the latter, but not the former.

In a recent systematic review of interventions involving fathers, Panter-Brick et al. (2014) stressed the importance of incorporating fathers into parenting interventions. They found that there was a lack of interventions positively engaging fathers and intervention evaluations of outcomes were primarily based on mother and child improvement outcomes. According to the family systems theory, Klein and White (1996) argued that behaviour change is a result of family units functioning together and members of the family influencing each other. Therefore, implementing family interventions without engaging and evaluating outcomes based on fathers may not be cost-effective and may prevent interventions reaching their full potential.

Indeed, the economic impact of paternal depression has been reported as similar to maternal depression and suggests that depression in fathers is a significant economic burden to the healthcare system (Edoka et al., 2011). However, there is still a focus on care for mothers during the post-natal period and fathers' mental health is predominantly neglected. Men use the health care system to a much lower extent (Smith, Braunack-Mayer, & Wittert, 2006). Therefore, opportunities to screen are lower. A change in the infrastructure of the NHS and the training of staff members to deal with fathers in the post-natal period and during the early years might be beneficial, such as developing a

healthy dad's clinic (Wanless et al., 2008). One scale that would be appropriate for screening fathers with is the EPDS that has been validated with fathers (Eberhard-Gran, Eskild, Tambs, Opjordsmoen, & Ove Samuelsen, 2001; Edmondson, Psychogiou, Vlachos, Netsi, & Ramchandani, 2010; Matthey, Barnett, Kavanagh, & Howie, 2001) and has been found to be comparable to measuring maternal depression (Ramchandani et al., 2005). Using such a standardised questionnaire across all wards in the UK would yield national data which would provide a national picture of paternal depressive symptoms in the post-natal period over time to assist with service planning.

Consistent risk factors of paternal depressive symptoms from the post-natal period through to early childhood were maternal depressive symptoms, relationship conflict and unemployment. Moreover, maternal depressive symptoms and marital conflict moderated the association between paternal depressive symptoms and father-child conflict. Therefore, health care practitioners, couples' therapy workers and non-mental health service providers/professionals, such as job centres and unemployment officers, should be made aware that fathers with young children who are exposed to such risk factors could have an increased likelihood of developing depression, which negatively impacts on their parenting. If identified in the pre-natal period, prevention or early interventions could be put in place for such fathers to avoid potentially adverse influences on their children later.

Fathers' depressive symptoms were also associated with emotional-behavioural problem during the early school years which was mediated by father-child

conflict during toddlerhood. Therefore, parenting interventions could provide practical skills for managing conflict in parent-child relationships with depressed parents. Intervention programs based on family-centred foundations that promote proactive and positive parenting has been found to improve parenting skills, which improved children's emotional and behavioural problems, as well as improving mother's depressive symptoms (Dishion et al., 2008; Gardner et al., 2007; Shaw, Connell, Dishion, Wilson, & Gardner, 2009). In such interventions, improvements in mother's depressive symptoms reduced children's emotional and behavioural problems (Hutchings, Bywater, Williams, Lane, & Whitaker, 2012; Shaw et al., 2009). Although these studies attempted to include fathers in their interventions, the response rate was low and no outcome measures were reported with regards to evaluating father-child dyads. However, it does give some promising indication that the development of parenting programs that actively involve fathers could have the potential to improve fathers' positive parenting skills to reduce father-child conflict, improve fathers own mental health and prevent behavioural and emotion problems in their children. One parenting intervention that targeted fathers' ability to deal with anger, reduced their children's emotional and behavioural problems which was mainly attributed to the change in fathers' parenting (Wilson et al., 2014). The intervention may have reduced father-child conflict which could have reduced their children's emotional and behavioural problems. Therefore, extending such emotion coaching intervention to depressed fathers may prevent the influence of paternal depressive symptoms on father-child conflict and children's emotional-behavioural outcomes.

There have been very few interventions aimed at fathers. Interventions such as the Early Head Start (EHS) program which aim to promote positive interactions between father-child dyads, reduced negative father-child interactions during the post-intervention assessment (Roggman, Boyce, Cook, Christiansen, & Jones, 2004). Father-child improved play was associated with better emotional skills when their children were 2 years old. This suggests that father-child play interaction improved as a result of the intervention and play has been emphasised in the literature as essential for the father-child bond to evolve (Paquette, 2004). Combining focus group and questionnaires data from fathers, Frank, Keown, Dittman, and Sanders (2014) reported fathers' attendance at parenting interventions were influenced by the nature of the intervention. Those that acknowledged the importance of fathers in their children's development, and targeted increasing father-child activities and reducing father-child conflict were preferred. Moreover, fathers' that reported higher depressive symptoms preferred interventions specific to their difficulties with their child.

Finally, the findings of this thesis highlight the importance of fathers in children's emotional and behavioural development, suggesting that fathers are just as important as mothers and that the influence of having a depressed father may be just as detrimental as having a depressed mother (Lamb, 2010). However, there is still stigma surrounding paternal depression in society (Edoka et al., 2011; LeFrançois, 2010). A recent study found fathers themselves were not aware of parenting programs available to them (Frank et al., 2014) and fathers are often not included in parenting programs which are primarily targeted at mothers (McAllister et al., 2012; Panter-Brick et al., 2014). Therefore, it is

important to raise more awareness of paternal depression and promote a more acceptable environment for men to seek help and be involved in parenting interventions.

Panter-Brick et al. (2014) pointed out that clinicians and policy makers are not inadequately fulfilling their duty of care to identify risk, promote resilience and help the family unit function as a whole by involving fathers. Efforts have been put forward by charities such as the Fatherhood Institution and Fathers Direct to raise awareness and influence policy makers (Burgess, 2007; Fisher, 2007; McAllister et al., 2012; Panter-Brick et al., 2014). However, paternity leave given to fathers is often short and there is still a lack of awareness regarding paternal depression in the post-natal period which policy makers need to address (McAllister et al., 2012). Behavioural and emotional problems during childhood are associated with adverse outcomes during adulthood, such as dependency on services, poor academic achievement and psychiatric problems that cause great burden on society and the public health services (Caspi et al., 1996; Fergusson et al., 2005; Scott et al., 2001; Snell et al., 2013). Therefore, it is important to treat fathers' depression in order to prevent negative influences on their children and provide support for families with depressed fathers.

7.4 Methodological issues

7.4.1 Strengths

There are a number of strengths that make the findings of this thesis valuable. The main strength of this thesis is that it attempts to pull together findings from both longitudinal secondary data analysis of the MCS with a large sample size and also primary data collection of the FIF study using more in-depth measures. Four of the studies were from the MCS, which is a large representative cohort of fathers from the UK. These well powered studies increases confidence that findings detected (significant or non-significant) are likely to be reliable findings that were not subjected to type I or type II error.

The secondary data study designs were longitudinal. This allowed for mediation, moderation and moderated mediation analysis and to investigate paternal depressive symptoms trends over time. This provides some evidence that the associations may be causal (Selig & Preacher, 2009). However, the findings are still reliant on correlational analysis and determining causality from such findings would be misleading. Even with longitudinal mediation analysis methods that find full-mediation, there are always other contributing unmeasured mediators that are not accounted for by the tested model (Rucker et al., 2011). In addition to this, caution should be applied in assuming tested predictors to be causal factors in a model as covariates in models could also be potential causal factors or moderators (Emsley et al., 2010; Thapar & Rutter, 2009). Therefore, it is important for theory development to keep an open mind about associations and not to exclude alternative explanations (Rucker et al., 2011). A logical next step would be to investigate causal effects by using

experimental methodologies such as genetically sensitive designs with twins discussed later (Rutter, 2009).

The FIF study was a smaller in-depth study (FIF study) that builds on the findings of the secondary data and the model of parenting and attachment related risk transmission. This study was not constrained like the MCS, and included measures such as observational method for measuring father-child attachment (MCAST), Structural Clinical Interview for DSM-IV (SCID) to measure clinical depressive episodes and Patient Health Questionnaire (PHQ-9) to measure depressive symptoms. Such measures enable for more detailed findings compared to studies that are solely reliant on questionnaires.

In the analysis of both MCS and FIF datasets, mothers' reports on child variables were used to avoid inter-reporter bias which may have been influenced by fathers' depressive symptoms. Fathers with depression are likely to over report problems with their children (Frank et al., 2014). Therefore it was more objective to use mother's reports rather than father's reports. However, as research has found maternal and paternal depression to be co-existent (Paulson & Bazemore, 2010; Paulson et al., 2006), mothers' reports may be influenced by fathers' depression or socioeconomic factors that they are both exposed to; therefore teacher's reports may be a more reliable source to use in order to confirm findings. Collishaw et al. (2009) compared reports from different informants and found moderate agreement between parent and teacher ratings. They suggested that differences between reports may be due to reporter bias or situational reasons, and that studies should use multiple

reports from different informants of child outcomes. This is something future research could add to extend the findings of the current thesis.

7.4.2 Limitations

7.4.2.1 Secondary data limitations

The first five research questions were answered using secondary data. There are a number of limitations on the use of secondary data analysis. Firstly, the data analysis was constrained by the measures selected and collected by the MCS team. This meant that the available measures had to be used to inform the research questions. The secondary data analysis was particularly constrained by the data available on depressive symptoms. Both of the scales used to measure depressive symptoms were actually developed to measure psychological distress, which is a combination of depressive and anxiety symptoms. This is a limitation that most studies face until measures defining depressive symptoms and anxiety are used separately in longitudinal datasets. However, both of the scales have been used by previous studies as indicators of depressive symptoms and therefore provide good grounding for the scales to be used as an indicator of depressive symptoms; Rutter scale at sweep 1 and Kessler scale at sweeps 2 – 5 (Cairney et al., 2007; Dex & Joshi, 2004; Furukawa et al., 2003; Kessler et al., 2003; Kessler et al., 2010; Malmberg & Flouri, 2011; Rutter et al., 1970)

Secondly, depressive symptoms measured in the MCS do not suggest an influence of a clinically diagnosed episode of depression. Although findings on

clinical depression would be more informative, the reality of conducting clinical interviews with large sample sizes and with sufficient power to detect an effect would be costly and time consuming, for which there is an issue of available time and resources during a PhD. However, depressive symptoms are indicative of depression (Cairney et al., 2007) and therefore it is appropriate, useful and cost-effective to use secondary data analysis with large sample sizes. There is a possibility that clinical depression may have a similar or more amplified influence on father-child conflict and children's outcomes. Moreover, the measure of paternal depressive symptoms was taken by the MCS team at 9 months. Previous research suggests that paternal depressive symptoms are highest at 3 – 6 months after the birth of their child (Paulson & Bazemore, 2010), therefore a measure of paternal depressive symptoms more immediate after birth would have been more ideal. But as the MCS only had data available on paternal depressive symptoms in the post-natal period at approximately 9 months post-partum, this was used.

Another limitation of secondary data is that it is solely informed by questionnaire findings. Although inter-rater bias was minimised by using maternal reports of child outcomes, these may still be subject to information and recall bias by the mothers as paternal depressive symptoms are associated with maternal depressive symptoms (Paulson & Bazemore, 2010; Paulson et al., 2006) and depressed mothers have been shown to overestimate the level of behavioural problems in their children (Collishaw et al., 2009). In addition to this, fathers' self-reports of father-child conflict may have been influenced by recall bias.

Fathers reporting higher depressive symptoms may report more conflictual relationships with their toddlers.

Finally, with longitudinal data the issue of reverse causality or bidirectional effects could be discounted as child problems at 5, 7 and 11 years cannot possibly predict/cause paternal depressive symptoms at 9 months (Bell, 1968; Robins, Greenland, & Hu, 1999). However, critics could argue that children with problems at 5, 7 and 11 years old may have had similar difficulties at 9 months which could have influenced their fathers' depressive symptoms. Therefore, it is important to control for such outcomes at the time of exposure variable.

However, the analysis was restricted by the MCS data available and none of the outcome measures were available at 9 months. Only child temperament was available at 9 months and was incorporated into the analysis.

7.4.2.2 Primary data limitations

The primary data collected in Devon consisted of a community sample of low risk non-clinical fathers with depressive symptoms rather than clinical depression (Tharner et al., 2012). Great efforts were made to recruit a sample of clinically depressed fathers (40 fathers with past/current depression). But this was challenging and the sample size of the clinically depressed participants was underpowered then planned.

7.4.2.3 General limitations

Both the secondary data analysis and FIF study analysis were unable to consider the issue of anxiety disorders which are often comorbid with parental depression such as Obsessive-Compulsive Disorder (OCD), Generalised Anxiety Disorder (GAD), social phobia, specific phobia, panic disorder and Post-traumatic stress disorder (PTSD) (American Psychiatric Association, 2000; Bögels & Phares, 2008). Depressive episodes and anxiety disorders in parents have been found to overlap and have been associated with decreased functioning compared to having a single disorder (Matthey, Barnett, Howie, & Kavanagh, 2003; Matthey et al., 2001). Like depression, anxiety disorders in fathers have also been associated with impairments in parenting and the development of anxiety disorders amongst children (Bögels & Phares, 2008). Fathers' PTSD, anxiety and depressive symptoms have been associated with children developing PTSD (Kilic, Ozguven, & Sayil, 2003) and higher rates of paternal anxiety have been independently associated with father-child conflict (Edwards, Barkley, Laneri, Fletcher, & Metevia, 2001). Studies using data from a large cohort of fathers found paternal depressive and anxiety symptoms to be associated with children's emotional and behavioural problems (Kvalevaag et al., 2013; Kvalevaag et al., 2014). Therefore, anxiety is important to measure alongside depression and it is important to differentiate the influence of both on fathers parenting and children's outcomes. Efforts were made for the FIF study to avoid issues of co-morbidity by using the SCID to measure depressive episodes and anxiety disorders separately. However, the sample sizes meeting criteria for current or past depression were so low (n=40), that sub-analysis of participants with/without anxiety and comparing across groups would not have

been appropriate due to the loss in statistical power. This would have been a strength of the study if a larger sample could be gathered.

Finally, none of the studies were able to take into account genetic influences as all of the studies used biological fathers mostly full-time residents in households with their children and did not investigate influences of step/adopted-fathers which would have been a purely environmental influence. This suggests that the findings of the current thesis regarding father's depressive symptoms or father-conflict parenting cannot solely be determined as an environmental risk factor for child outcomes and could be genetic. This can be addressed in future studies building on the model proposed in this thesis which is discussed in the future directions section.

7.5 Future research

There are a number of future directions that the current thesis can lead research. There are some adjustments that could be made to the way father-child attachment is measured and current findings from the secondary data could be tested experimentally using more in-depth measures to overcome some of the limitations of the thesis mentioned earlier.

Given the strong association between maternal depression and mother-child attachment (Martins & Gaffan, 2000), it does not seem plausible that paternal depressive episodes are not related to father-child attachment. Two potential adjustments could be considered before researching the association between

paternal depression and father-child attachment in future research. The first would be to develop a more appropriate measure of father-child attachment that is not based on measures validated with mothers (Volling & Belsky, 1992). This can firstly be done by perhaps developing the MCAST measure and validating it with father-doll and child-doll observations. Mothers are seen more as secure base care-givers with whom children need to feel safe, to seek comfort from and increase proximity towards in times of distress (Bowlby, 1973). This is perfectly reflected in the current set-up of MCAST doll's house play where there is a distressing attachment-related event that occurs (hurt knee, nightmare, tummy ache and getting lost) and the child doll's reactions are coded according to proximity and comfort seeking. Fathers are seen more as playmates that encourage children to explore the outside world and are different to mothers (Bowlby, 1982a; Grossmann et al., 2002; Grossmann et al., 1999; Paquette, 2004). The MCAST coding system does have a coding for exploratory play, which is an optional coding that ranges from 0, indicating no observation of exploratory play, to 2, indicating a high level of exploratory play observed with story stems that demonstrate resolution of the attachment distress (Green et al., 2009). Therefore developing the exploratory play aspect of the MCAST might depict father-child attachment more clearly. In addition to this, the current thesis found that boys were more likely to be coded as disorganised (Chapter 6). Therefore, perhaps making the play more gender neutral so that both genders can engage appropriately with it might be more valuable. Perhaps the use of puppets and the absence of the doll's house might engage boys more (Sala, Pons, & Molina, 2014). Developing an appropriate assessment tool for measuring father-child attachment could yield more informative findings about the influence of paternal depression on father-child attachment.

Father-child attachment can also be measured using a different measure such as the RS. There is currently one for pre-school children aged 2 – 5 years old (Gaumon & Paquette, 2013), but the measure has not been developed for school-aged children based on activation theory of father-child attachment. Using the RS might enable researchers to build on the findings of the current thesis and develop the hypothesised model in figure 3.

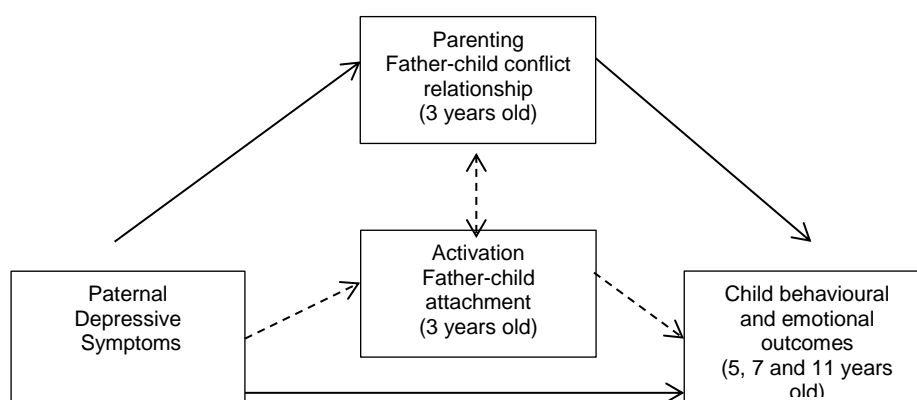


Figure 3: Hypothesised model with activation theory incorporated into the model of risk of transmission via father-child conflict

Future studies can build on the current findings of the thesis by using other methods to replicate them experimentally, such as using groups of clinically depressed fathers and non-depressed fathers and investigating differences between them by using more in-depth parenting measures. It is becoming increasingly popular to measure parenting and child behaviours using parent-child observation techniques (Aspland & Gardner, 2003). This consists of

recording parent-child interaction during structured and unstructured interaction tasks. Recordings are later coded with an appropriate parent-child coding scheme such as the Coding of Attachment Related Parenting (CARP), Parent Behaviour Coding System (PBCS), and Dyadic Parent-Child Interaction Scale (Aspland & Gardner, 2003; Matias, Scott, & O'Connor, 2006). Such parent-child observations can also be used to measure child behavioural problems too.

Observation methods have also been used to measure emotion regulation. Silk et al. (2006) used the waiting task to measure emotion regulation of children with and without depressed mothers. In this task children had to wait for a period of time for a desired gift and their behaviours were coded. Children of depressed mothers engaged in more passive waiting associated with maladaptive emotion regulation, whereas, children of non-depressed mothers used more adaptive strategies of active distraction associated with healthy emotion regulation. More recently, there has been the development of emotion regulation story stems, in which story stems are completed by children using puppets and these are later coded by trained researchers to get a measure of the child's emotion regulation (Sala et al., 2014). Emotion regulation has also been measured in the literature using psychophysiological measures to measure physiological emotion regulation (Kovacs et al., 2008). Children of depressed mothers find it difficult to physiologically regulate during stressful situations and the ability to psychologically regulate has been reported as a protective factor against their mothers' depression (Bandon et al., 2008; Kovacs et al., 2008). Using such measures can build on the findings of this thesis. And using such in-depth measures may yield more informative findings

compared to the findings of the current thesis on emotion regulation which was based on questionnaires. The FIF project has a number of observational and physiological data in the project which will be analysed at a later date.

Future studies can overcome the limitation of the current study suggesting that child outcomes may not only be influenced by parenting, but are genetic or an interplay of the two. This can be done by using longitudinal and experimental designs that utilise a genetically sensitive design investigating the gene-environmental interactions (G x E) (Rutter, 2009; Rutter et al., 1997).

Understanding the gene-environmental interplay will lead to better theory development and identification of risk factors that are subject to change. In a recent review of literature on adoption and twin studies, Natsuaki et al. (2014) reported parental depression to be an important environmental risk factor, but the effects were found to be stronger for mothers compared to fathers and that older children are more likely to be affected by fathers' depression. Therefore, such studies might be useful for developing the model proposed in this thesis (Figure 2).

7.6 Conclusion

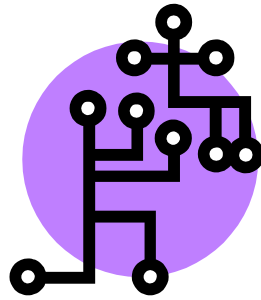
This thesis makes a contribution to the literature by investigating the role of fathers' parenting in the association between paternal depressive symptoms and children's emotional, behavioural and cognitive development. It also investigates the influence of paternal depressive symptoms on father-child attachment using an observational measure. Despite the limitations, it has a

number of strengths which make the contribution worthwhile. The most important outcome is that it has highlighted the crucial role of father-child conflict as a key factor for theoretical and clinical implications and a number of future research ideas can be built on the findings of this thesis.

However, there is still some stigma associated in society with regards to paternal depression, whereas people are arguably more aware and accepting of maternal post-natal depression (Edoka et al., 2011; LeFrançois, 2010).

Therefore, it is important to raise more awareness of paternal depression during child rearing years in society and encourage clinicians and policy makers to identify risk, promote resilience and help the family unit function as a whole via parenting programs and more family friendly/father incorporating policies (Panter-Brick et al., 2014). I hope that this thesis has shed some light on raising awareness of paternal depressive symptoms and that future research will build on the findings to develop more family-centred theories and interventions to promote healthier child development.

8.1 Appendix A: Participant information FIF T2



Fathers in Focus

Fathers' Well-being, Their Role in the Family and Children's Development

Information Sheet

Part 3 – Follow-up Assessment

Chief Investigator: Dr. Lamprini Psychogiou

Information sheet–home and University visit–v4 11.01.13

What is the reason for the study?

While a lot is known about the contribution of mothers to their child's development relatively little is known about the important contribution of fathers. This study will help us to better understand how father's feelings of well-being influence their role in the family and their children's development.

Why are you asking mothers to take part as well as fathers?

Although the focus of this study is fathers it is important for us to understand how mothers and fathers work together in supporting their child's development.

What will I have to do?

We will visit you at home and also the father and child will be invited to the University of Exeter. The visits will be arranged at times that are convenient for you. Prior to the visit, both fathers and mothers will be sent a few questionnaires to complete, to be handed to the researcher at the time of the home visit. During the visits you will take part in a few play tasks with your child. You will also be asked a few more questions about yourself and your child. During two of the tasks, physiological equipment will be used to measure how your bodies are reacting to the set task. This method is non-invasive and safe for children and adults.

We would like to video-tape the tasks and record the discussion in order to be able to analyse them later. These tapes will be stored in a locked filing cabinet or on the University of Exeter secure computer. They will only be accessible to the research team.

We would like to use some of the tapes for teaching and during presentations of the research to other professionals. If you do not want the tapes to be used in this way that is fine.

As a thank you for your time you will receive a £15 voucher, your child will receive a small gift and travel costs to the University will be reimbursed.

What will my child have to do?

Your child will complete two play tasks with both parents. During one of the play tasks, we will observe your child's behaviour and physiological response. They will then be asked to complete some tasks with the researcher. Two picture vocabulary tasks, a story task looking at understanding of emotions and an imaginative play task using a dolls house, which many children really enjoy.

All the tasks will be child-friendly and suitable for your child's age. The researcher is experienced in carrying out research with children and will be sensitive to your child's needs.

You are free to withdraw yourself or your child from the study at anytime without giving any reason.

What will happen to the results of the research?

The researchers aim to publish the work in an academic journal. Your identity will never be revealed in any report or publication. If you are interested in receiving a summary of the research please let us know.

Is the information I give confidential?

All information collected about you during the course of the research will be kept strictly confidential. Your personal details are stored in a separate locked cabinet from all the other information we collect and we never put your name on any of the questionnaires that we ask you to fill out.

The only exception would be if the questions revealed a significant risk of harm to yourself or others, in which case information may be fed back to your doctor but normally only after discussion with you.



Who can I speak to for more information?

If you have any questions about the study, please contact **Selina Nath** at:

School of Psychology, University of Exeter,
Washington Singer Laboratories,
Perry Road, Exeter
EX4 4QG
Tel: 01392 725019 Email: sn266@exeter.ac.uk

Thank you for considering taking part in this research.

8.2 Appendix B: FIF T2 consent form

Fathers' Well-being and Children's Development – Part3 – Follow-up Assessment

CONSENT FORM

			Please initial the box
1.	I agree to take part in the above study	YES/NO	
2.	I have read and understood the information sheet(v3 17.10.12) – Fathers in Focus – Part 3 Follow-up Assessment	YES/NO	
3.	I have received enough information about the study and I have had the opportunity to ask any questions	YES/NO	
4.	I am happy for my child to participate in this study and I understand that my child will be video-taped taking part	YES/NO	
5.	I agree to my interaction with my child being video-taped for research purposes	YES/NO	
6.	I agree to the discussion being audio-taped for research purposes	YES/NO	
7.	I agree to physiological measures to be taken for my child and me.	YES/NO	
8.	I agree to the audio / video-tape of the discussion and my interaction with my child being used for Presentations and Teaching purposes	YES/NO	
9.	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason	YES/NO	
10.	I agree to my contact details being added to the Psychology Department database so that I might be invited in the future to take part in other research	YES/NO	
11.	I consent to my G.P. being informed if there are concerns about my well-being	YES/NO	

Name of Participant
(BLOCK CAPITALS)

Date

Signature

I have explained the study to the above participant and he/she has indicated his/her willingness to take part.

Name of Researcher
(BLOCK CAPITALS)

Date

Signature

CONSENT TO FOLLOW-UP

We may want contact you again when your child is older. If you are happy for us to contact you about taking part in this follow up please indicate this here.

		Please initial the box
I am happy to be contacted in the future about taking part in a follow-up to this study.	YES/NO	

 Name of Participant (BLOCK CAPITALS) Date Signature

Is there a relative or friend, who does not live in this household, who will always know how to get in touch with you?

Yes

No

What is the name, address, and telephone number of that person? We will only contact this person if we cannot find you.

First Name: _____ Last Name: _____

Address: _____

Telephone: _____

Relationship to you: _____

8.3 Appendix C: PHQ-9 questionnaire to measure parental depressive symptoms

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
Little interest or pleasure in doing things	0	1	2	3
Feeling down, depressed, or hopeless	0	1	2	3
Trouble falling or staying asleep, or sleeping too much	0	1	2	3
Feeling tired or having little energy	0	1	2	3
Poor appetite or overeating	0	1	2	3
Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

PHQ-9: Copyright© 1999 Pfizer Inc.

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?			
Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8.4 Appendix D: Close Relationships Questionnaire (CRQ) to measure father attachment representation of mother and father

This questionnaire is designed to assess the way in which you think about important people in your life. You'll be asked to answer questions about your parents. If your parents have deceased, please think about how you felt about them. Please indicate the extent to which you agree or disagree with each statement

1	2	3	4	5	6	7
Strongly						Strongly

Please answer the following 10 questions about your mother or a mother-like figure

It helps to turn to this person in times of need	1	2	3	4	5	6	7
I usually discuss my problems and concerns with this person.	1	2	3	4	5	6	7
I talk things over with this person.	1	2	3	4	5	6	7
I find it easy to depend on this person.	1	2	3	4	5	6	7
I don't feel comfortable opening up to this person	1	2	3	4	5	6	7
I prefer not to show this person how I feel deep down.	1	2	3	4	5	6	7
I often worry that this person doesn't really care for me.	1	2	3	4	5	6	7
I'm afraid that this person may abandon me	1	2	3	4	5	6	7
I worry that this person won't care about me as much as I care about him or her	1	2	3	4	5	6	7
I don't fully trust this person	1	2	3	4	5	6	7

1	2	3	4	5	6	7
Strongly						Strongly

Please answer the following 10 questions about your father or a father-like figure.

It helps to turn to this person in times of need	1	2	3	4	5	6	7
I usually discuss my problems and concerns with this person.	1	2	3	4	5	6	7
I talk things over with this person.	1	2	3	4	5	6	7
I find it easy to depend on this person.	1	2	3	4	5	6	7
I don't feel comfortable opening up to this person	1	2	3	4	5	6	7
I prefer not to show this person how I feel deep down.	1	2	3	4	5	6	7
I often worry that this person doesn't really care for me.	1	2	3	4	5	6	7
I'm afraid that this person may abandon me	1	2	3	4	5	6	7
I worry that this person won't care about me as much as I care about him or her	1	2	3	4	5	6	7
I don't fully trust this person	1	2	3	4	5	6	7

8.5 Appendix E: 10-item father involvement questionnaire

About You and Your Child

On average how many days a week do you see this child? _____

On average how many hours per a day do you spend with this child when they are awake:

On a weekday: _____ hrs a day

At the weekend: _____ hrs a day

Over the past 12 months, how involved have you been in?	Not at all	Slightly	Moderately	Very	Extremely
Helping your child to read	0	1	2	3	4
Disciplining your child	0	1	2	3	4
The regular routines of taking care of your child's basic needs or activities (feeding, taking them places, putting to bed)	0	1	2	3	4
Setting rules and limits for your child's behaviour	0	1	2	3	4
Encouraging your child to be good or do the right thing	0	1	2	3	4
In a typical week, how often do you?	Never	Once a week	2-3 times a week	4-6 times a week	Every day
Spend time with your child doing things they like to do	0	1	2	3	4
Read to your child	0	1	2	3	4
Spend time just talking with your child when they want to talk about something	0	1	2	3	4
Praise your child for something they have done well	0	1	2	3	4
Tell your child that you love them	0	1	2	3	4

8.6 Appendix F: Child temperament questionnaire

About Your Child

For all the following questions think about your child who took part in the Fathers in Focus Study last year.

The following set of statements describes children's reactions to a number of situations. We would like you to tell us what your child's reaction is likely to be in those situations. There are no "correct" ways of reacting; children differ widely in their reactions, and it is these differences we are interested in. Over the **past 6 months**, how true is the following of your child. If you have never seen your child in that situation please circle N/A (not applicable)

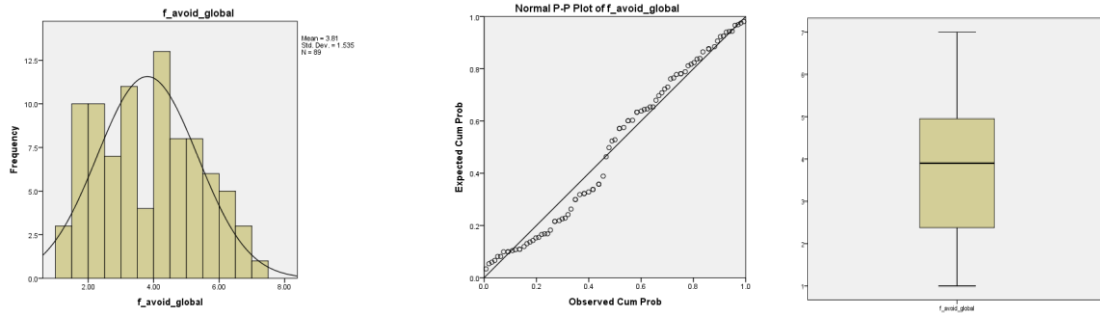
	1	2	3	4	5	6	7	
	Extremel	Quite	Slightly	Neither	Slightly	Quite	Extremel	
Seems always in a hurry to get from one place to another	1	2	3	4	5	6	7	N/A
Gets quite frustrated when prevented from doing something s/he wants to do	1	2	3	4	5	6	7	N/A
When drawing or coloring in a book, shows strong concentration	1	2	3	4	5	6	7	N/A
Likes going down high slides or other adventurous activities	1	2	3	4	5	6	7	N/A
Is quite upset by a little cut or bruise	1	2	3	4	5	6	7	N/A
Prepares for trips and outings by planning things s/he will need	1	2	3	4	5	6	7	N/A
Often rushes into new situations	1	2	3	4	5	6	7	N/A
Tends to become sad if the family's plans don't work out	1	2	3	4	5	6	7	N/A
Likes being sung to	1	2	3	4	5	6	7	N/A
Seems to be at ease with almost any person	1	2	3	4	5	6	7	N/A
Is afraid of burglars or the 'boogie man'	1	2	3	4	5	6	7	N/A
Notices it when parents are wearing new clothing	1	2	3	4	5	6	7	N/A
Prefers quiet activities to active games	1	2	3	4	5	6	7	N/A
When angry about something, s/he tends to stay upset for ten minutes or longer	1	2	3	4	5	6	7	N/A
When building or putting something together, becomes very involved in what s/he is doing, and works for long periods.	1	2	3	4	5	6	7	N/A
Likes to go high and fast when pushed on a swing	1	2	3	4	5	6	7	N/A

1	2	3	4	5	6	7	
Extremel	Quite	Slightly	Neither	Slightly	Quite	Extremel	

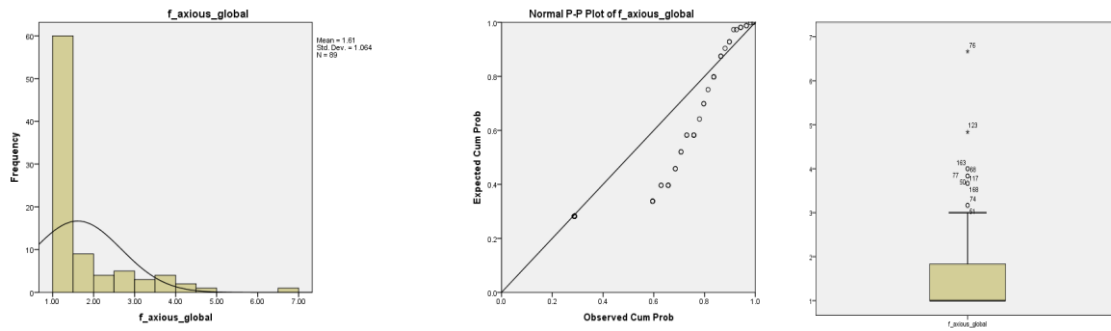
Seems to feel depressed when unable to accomplish some task	1	2	3	4	5	6	7	N/A
Is good at following instructions	1	2	3	4	5	6	7	N/A
Takes a long time in approaching new situations	1	2	3	4	5	6	7	N/A
Hardly ever complains when ill with a cold	1	2	3	4	5	6	7	N/A
Likes the sound of words, such as nursery rhymes	1	2	3	4	5	6	7	N/A
Is sometimes shy even around people s/he has known a long time	1	2	3	4	5	6	7	N/A
Is very difficult to soothe when s/he has become upset	1	2	3	4	5	6	7	N/A
Is quickly aware of some new item in the living room	1	2	3	4	5	6	7	N/A
Is full of energy, even in the evening	1	2	3	4	5	6	7	N/A
Is not afraid of the dark	1	2	3	4	5	6	7	N/A
Sometimes becomes absorbed in a picture book and looks at it for a long time	1	2	3	4	5	6	7	N/A
Likes rough and rowdy games	1	2	3	4	5	6	7	N/A
Is not very upset at minor cuts or bruises	1	2	3	4	5	6	7	N/A
Approaches places s/he has been told are dangerous slowly and cautiously	1	2	3	4	5	6	7	N/A
Is slow and unhurried in deciding what to do next	1	2	3	4	5	6	7	N/A
Gets angry when s/he can't find something s/he wants to play with	1	2	3	4	5	6	7	N/A
Enjoys gentle rhythmic activities such as rocking or swaying	1	2	3	4	5	6	7	N/A
Sometimes turns away shyly from new acquaintances	1	2	3	4	5	6	7	N/A
Becomes upset when loved relatives or friends are getting ready to leave following a visit	1	2	3	4	5	6	7	N/A
Comments when a parent has changed his/her appearance	1	2	3	4	5	6	7	N/A

8.7 Appendix G: Checking normality of continuous outcome variables

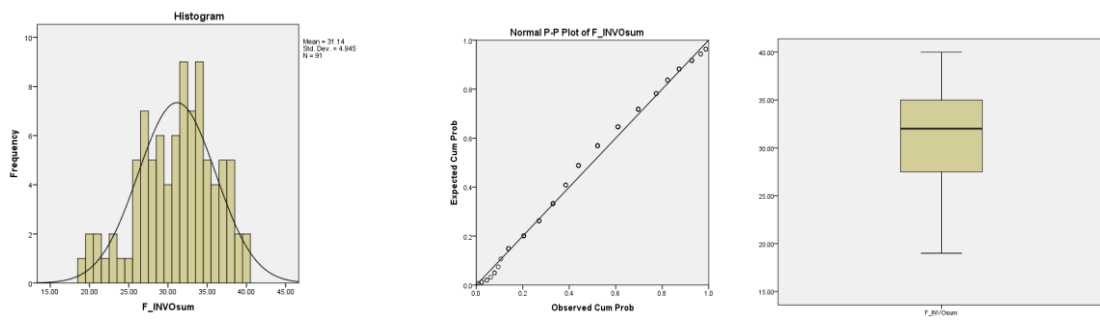
Father Avoidant attachment with own parents



Fathers anxious attachment with own parents



Fathers involvement sum scores



8.8 Appendix H: Checking normality of outcome variables after log transformation

Table before transformation – only father anxious trasformed

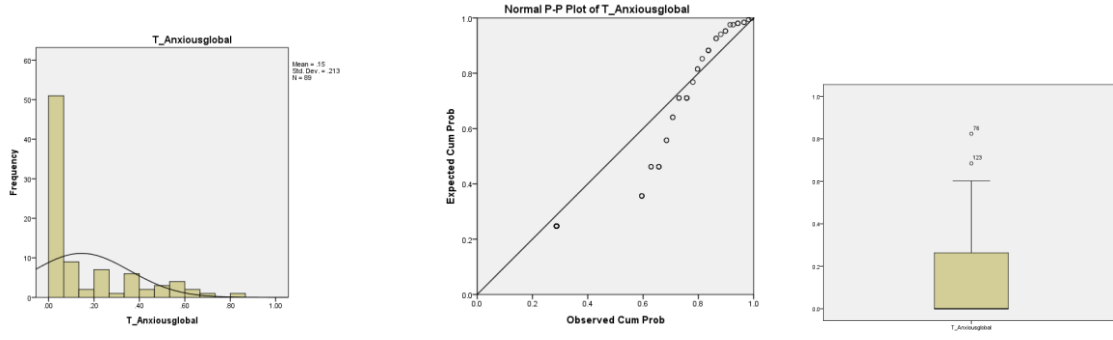
Report			
	f_avoid_global	f_axious_global	Father involvement sum
Mean	3.7765	1.6007	31.2330
Std. Deviation	1.55580	1.05147	4.95708
Minimum	1.00	1.00	19.00
Maximum	7.00	6.67	40.00
Range	6.00	5.67	21.00
Variance	2.421	1.106	24.573
Kurtosis	-1.068	5.492	-.472
Std. Error of Kurtosis	.476	.476	.472
Skewness	.121	2.210	-.384
Std. Error of Skewness	.240	.240	.238

Table after transformation

		T_Anxiousglobal
N	Valid	89
	Missing	10
Mean		.1453
Median		.0000
Mode		.00
Std. Deviation		.21264
Variance		.045
Skewness		1.315
Std. Error of Skewness		.255
Kurtosis		.600
Std. Error of Kurtosis		.506
Range		.82
Minimum		.00
Maximum		.82

Plots after transformation

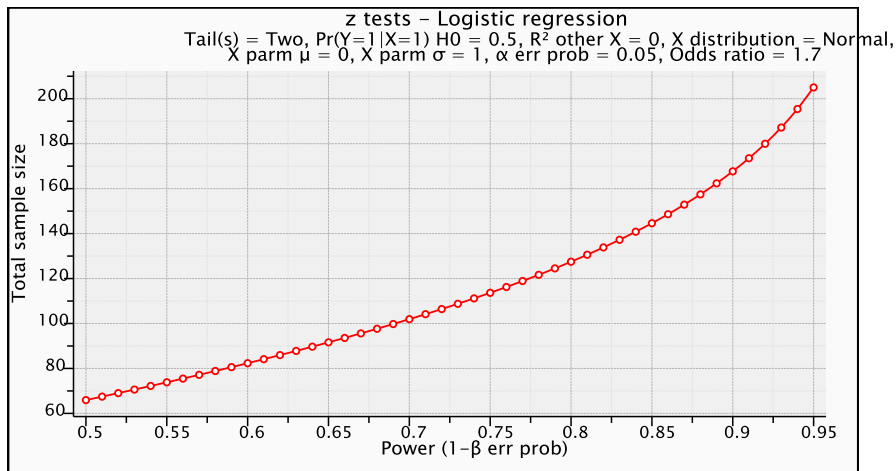
Anxious attachment to parents



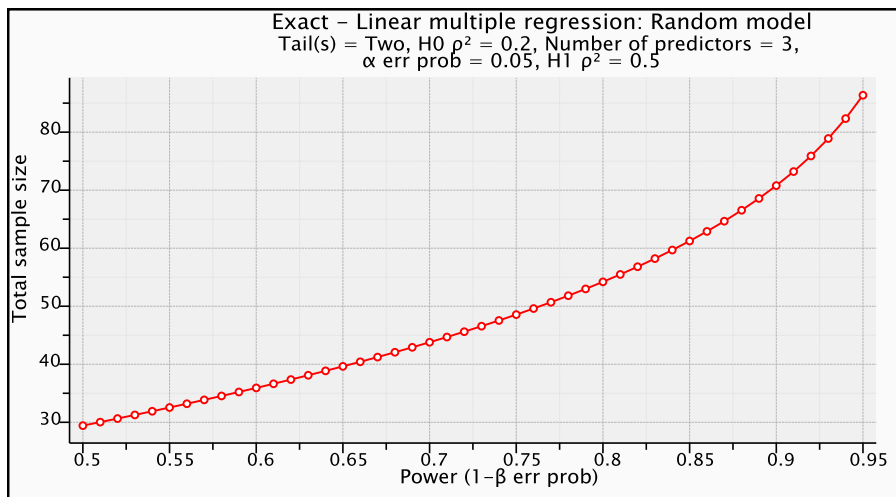
8.9 Appendix I: Linear and logistic regressions to check whether covariates were significantly associated with outcome variables

Attachment Outcomes	Maternal depressive symptoms		Child temperament sogeneity		Child temperament negative affect		Child temperament effort control		Child gender	
	Coef (95% CI)	P	Coef (95% CI)	P	Coef (95% CI)	P	Coef (95% CI)	P	Coef (95% CI)	P
<i>Aspects associated with paternal depressive symptoms</i>										
<i>Fathers' attachment</i>										
Avoidant	0.06(-0.06-0.18)	0.340	-0.41(-0.77- -0.04)	0.030	0.33(-0.08-0.74)	0.120	-0.49(-1.02-0.03)	0.065	0.14(-0.51-0.79)	0.679
Anxious	0.01(-0.01-0.03)	0.257	0.00(-0.05-0.05)	0.989	0.02(-0.04-0.08)	0.514	-0.06(-0.13-0.01)	0.106	0.03(-0.06-0.12)	0.557
Fathers involvement	-0.05(-0.45-0.35)	0.819	0.04(-0.08-0.16)	0.494	-0.10(-0.23-0.04)	0.156	-0.00(-0.71-0.17)	0.995	-0.20(-2.27-1.88)	0.852
<i>Binary father-child classification</i>										
Secure vs non-secure	0.95(0.82-1.09)	0.450	1.17(0.73-1.88)	0.506	0.80 (0.46-1.39)	0.434	0.90(0.46-1.76)	0.746	2.52(1.11-5.71)	0.027

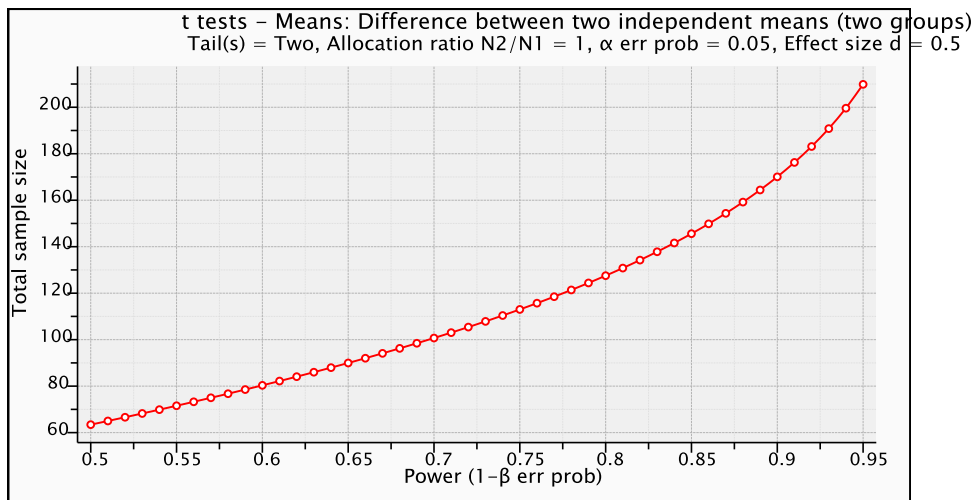
8.10 Appendix J: Power analysis for logistic regression for whole sample analysis



8.11 Appendix K: Power analysis for linear regression for whole sample analysis



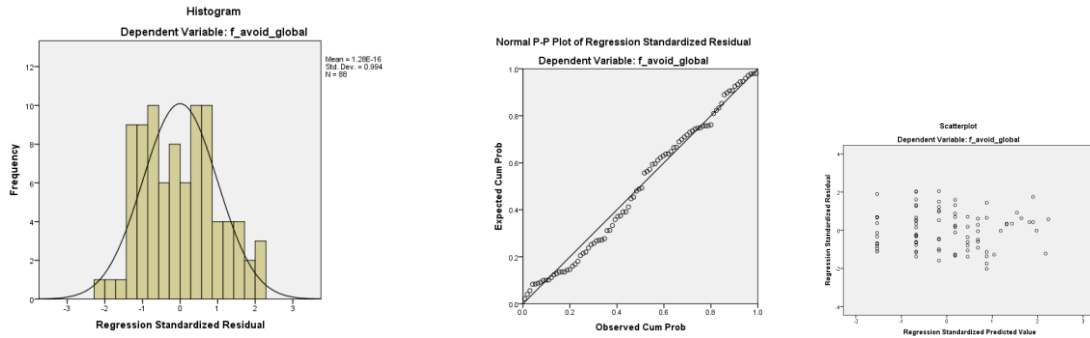
8.12 Appendix L: Power analysis for t-tests sub-analysis with depressed/non-depressed groups



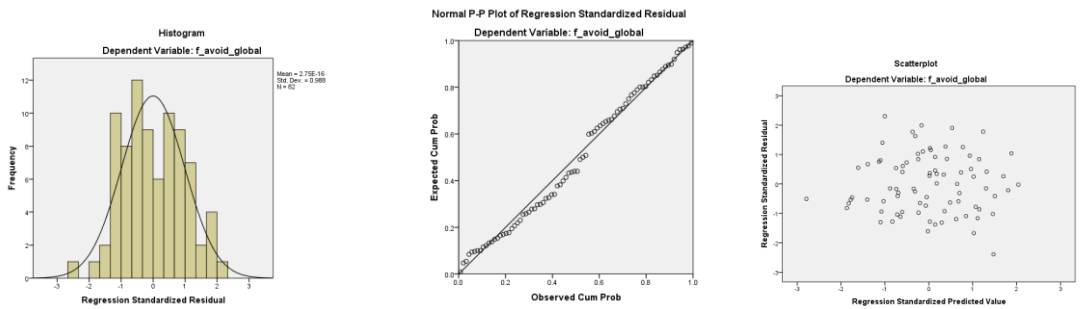
8.13 Appendix M: Post analysis tests for checking assumptions

Is paternal depressive symptoms associated with fathers own attachment to his parents?
(Avoidance)

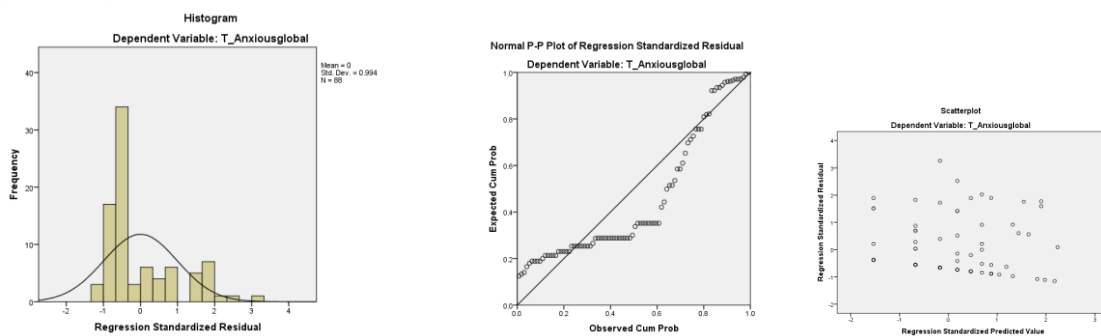
Unadjusted



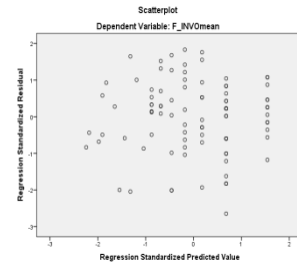
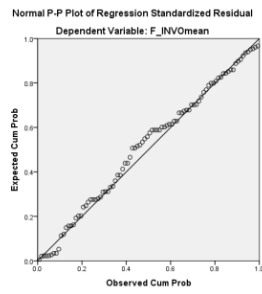
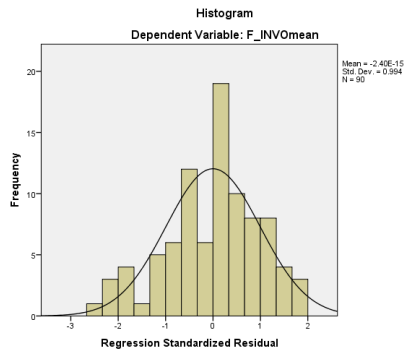
Adjusted for child temperament



Is paternal depressive symptoms associated with fathers own attachment to his parents?
(Anxious)



Is paternal depressive symptoms' associated with fathers involvement? Unadjusted



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