

**A systematic review and empirical study  
investigating the impact of maternal  
perinatal anxiety on mother-infant  
interaction at six months postpartum and  
children's emotional problems at age three**

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**May 2017**

Thesis submitted to the South Wales Doctoral Programme in  
Clinical Psychology, Cardiff University in partial fulfilment of  
the requirement for the degree of Doctor of  
Clinical Psychology



## Contents

### List of Tables & Figures

Paper 1: Systematic Review .....	1
Paper 2: Empirical Study .....	1
Thesis Abstract.....	2
Declaration.....	3
Acknowledgements.....	5
<b>Paper 1: Systematic Review .....</b>	<b>6</b>
Abstract.....	7
Introduction.....	7
Methods.....	9
Search procedure.....	9
Inclusion/exclusion criteria.....	10
Search results.....	10
Assessment of the quality of evidence.....	11
Results.....	11
Design.....	11
Participants.....	12
Maternal anxiety measures.....	12
Children's emotional problems outcome measures.....	13
Quality of studies.....	13
Synthesis of the findings.....	13
Early childhood emotional outcomes: effects of antenatal anxiety.....	14
Early childhood emotional outcomes: effects of postnatal anxiety.....	15
Middle childhood emotional outcomes: effects of antenatal anxiety.....	15
Middle childhood emotional outcomes: effects of postnatal anxiety.....	16
Late childhood emotional outcomes: effects of antenatal anxiety.....	16
Late childhood emotional outcomes: effects of postnatal anxiety.....	17
The effects of antenatal anxiety across childhood.....	17
Mechanisms of effect.....	17
Discussion.....	18
Summary of findings.....	18
Sample characteristics.....	19
Maternal anxiety measurement.....	19
Mechanisms which mediate or moderate child emotional outcomes.....	20
Gender differences.....	21
Shared method variance.....	22

Implications for future research.....	22
Implications for clinical practice.....	23
Strengths and limitations of the current review.....	23
Conclusion.....	24
References.....	25
 <b>Paper 2: Empirical Study</b> .....	 41
Abstract.....	42
Introduction.....	43
Method.....	46
Participants.....	46
Procedure.....	48
Measures.....	49
Covariates.....	51
Data analysis.....	52
Results.....	52
Descriptive analyses.....	52
Main analyses.....	53
Discussion.....	58
Strengths and limitations.....	59
Future research.....	60
Clinical implications.....	61
Conclusion.....	62
References.....	63
 <b>Paper 3: Critical Appraisal</b> .....	 67
Introduction.....	68
Paper 1: Systematic Review.....	68
Rationale for the topic.....	68
Search terms.....	69
Inclusion and exclusion criteria.....	70
Contacting authors.....	71
Quality Assessment.....	71
Synthesising data.....	72
Mechanisms of effect.....	72
Clinical Implications and Future Research.....	73
Paper 2: Empirical Study.....	74
Development of research question.....	74
Theories of child development.....	75

The fetal programming hypothesis.....	78
The impact of maternal anxiety on parenting.....	79
Impact of parenting on child development/emotional outcomes.....	80
Cardiff Child Development Study (CCDS) .....	81
Ethics.....	82
Mother-infant interaction coding scheme.....	83
Sample.....	88
Measures.....	89
Analyses.....	90
Clinical implications and future research.....	92
Personal reflections of the research process.....	94
References.....	98
Appendices.....	104
<b>Appendix A:</b> Author guidelines for submission to European Child and Adolescent	
Psychiatry.....	105
<b>Appendix B:</b> The Adult Wellbeing Scale.....	119
<b>Appendix C:</b> Email confirmation of ethical approval from Cardiff University	
ethics committee .....	123

## **List of Tables and Figures**

### **Paper 1: Systematic Review**

#### ***List of figures***

Figure 1: Flow diagram of included and excluded studies.....	29
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#### ***List of Tables***

Table 1: Summary of studies.....	30
Table 2: Quality assessment tool ratings.....	38

### **Paper 2: Empirical Study**

#### ***List of Tables***

Table 1: Sociodemographic characteristics of participants at Wave 1, Wave 2 and the current study sample.....	47
Table 2: Interrater reliability of mother-infant interaction.....	50
Table 3: Descriptive data between antenatal anxiety groups.....	53
Table 4: Descriptive data between postnatal anxiety groups.....	53
Table 5: Descriptive data for the mother-infant interaction data.....	54
Table 6: Pearson's correlation coefficients for main study variables.....	56
Table 7: Hierarchical regression analysis predicting child emotional problems at 3 years.....	57
Table 8: Direct and indirect effects of postnatal anxiety on child emotional problems with postnatal depression as a potential mediator.....	58

## **Thesis Abstract**

The presented thesis was completed by Sarah Rees for the Doctorate degree of Clinical Psychology (DClinPsy) at Cardiff University. The thesis title is 'A systematic review and empirical study investigating the impact of perinatal anxiety on mother-infant interaction at six-months postpartum and children's emotional problems at age three years'. This thesis was submitted on the 30<sup>th</sup> May 2017 and comprises three papers. Papers 1 and 2 have been prepared for submission to European Child and Adolescent Psychiatry.

Paper 1 presents a systematic review on the evidence for the impact of perinatal anxiety on children's emotional problems. A literature search was conducted and 14 studies were identified that satisfied inclusion criteria for the review. Whilst the findings of this review indicate that there is evidence for both maternal antenatal and postnatal anxiety having an adverse impact on child emotional outcomes, the evidence appears stronger for the negative impact of antenatal anxiety. Several methodological weaknesses make conclusions problematic and replication of findings is required to improve identification of at-risk parents and children with appropriate opportunities for intervention and prevention.

Paper 2 presents an experimental study, which explores the role of antenatal and postnatal anxiety on children's emotional problems at age three years. A sample of 186 women and their first-born children were followed from pregnancy to age three years postpartum. Mothers completed antenatal and postnatal anxiety measures. Maternal care-giving behaviour was assessed using observations of a mother-infant interaction task. At three years, the Child Behaviour Check List (CBCL) was administered to assess for children's emotional problems. Results indicated that maternal antenatal anxiety and postnatal depression independently predicted higher reported emotional problems in children at age 3 years after controlling for postnatal anxiety and antenatal depression symptoms. Postnatal depression was found to partially mediate the association between antenatal anxiety and children's emotional problems. Antenatal anxiety was associated with elevated maternal negative affect at 6 months postpartum. However, the association between antenatal anxiety and children's elevated emotional problems at age 3 was not explained by maternal negative affect at 6 months postpartum. These data suggest that children's emotional problems are adversely affected by maternal antenatal anxiety and postnatal depression. This has implications for targeting intervention or prevention in the antenatal period to prevent adverse emotional outcomes in children.

Paper 3 is a critical reflection of the systematic review, the empirical paper and the research process as a whole. Strengths and limitations are discussed as well as clinical and research implications.

## DECLARATION

This work has not been submitted in substance for any other degree or award at this or any other university or place of learning, nor is being submitted concurrently in candidature for any degree or other award.

Signed ..... (candidate)      Date .....

## STATEMENT 1

This thesis is being submitted in partial fulfillment of the requirements for the degree of DClinPsy

Signed ..... (candidate)      Date .....

## STATEMENT 2

This thesis is the result of my own independent work/investigation, except where otherwise stated, and the thesis has not been edited by a third party beyond what is permitted by Cardiff University's Policy on the Use of Third Party Editors by Research Degree Students. Other sources are acknowledged by explicit references. The views expressed are my own.

Signed ..... (candidate)      Date .....

## STATEMENT 3

I hereby give consent for my thesis, if accepted, to be available online in the University's Open Access repository and for inter-library loan, and for the title and summary to be made available to outside organisations.

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**For Julie and Stephen Rees**



## **Acknowledgments**

I would like to extend my heartfelt thanks to my supervisors, Dr Cerith Waters and Dr Sue Channon, for their continuous support, patience and incredible knowledge. Their endless encouragement to “just keep swimming” calmed and guided me through the whole research process.

My sincere thanks go to all the families who participated in the Cardiff Child Development Study (CCDS). It was a pleasure to watch all the videos of mothers and infants having fun and sharing special moments together. These families have inspired me to continue my clinical work helping families and young people and without them this thesis would not have been possible.

A very special thanks to my wonderful friends and family, you should know that your support and encouragement was worth more than I can express on paper.

To my mum, thank you for being so strong. This thesis has allowed me to reflect on my childhood and I would not be where I am today without your strength and unconditional love.

To dad who is always in my thoughts – you are deeply missed.

**The Impact of Maternal Perinatal Anxiety on Children's  
Emotional Problems: A Systematic Review.**

**The following paper has been prepared for submission to 'European Child  
and Adolescent Psychiatry'. The guidelines for authors can be found in  
Appendix A**

## ABSTRACT

Perinatal mental health difficulties are a major public health issue. Despite evidence that symptoms of both depression and anxiety are common during pregnancy and the postnatal period, the impact of maternal perinatal anxiety on the child has received relatively less attention than the impact of maternal depression. Furthermore, the evidence base for the direct impact of perinatal maternal anxiety on children's emotional outcomes lacks cohesion. The aim of this review is to summarise the empirical evidence regarding the impact of antenatal and postnatal anxiety on children's emotional outcomes. Whilst the findings of this review indicate that there is evidence for both maternal antenatal and postnatal anxiety having an adverse impact on child emotional outcomes, the evidence appears stronger for the negative impact of antenatal anxiety. Several methodological weaknesses make conclusions problematic and replication of findings is required to improve identification of at-risk parents and children with appropriate opportunities for intervention and prevention.

**Keywords:** *Perinatal, Maternal Anxiety, Child, Emotion, Development*

## INTRODUCTION

Perinatal mental health refers to a woman's mental health during pregnancy and the first year after birth. This includes mental health difficulties existing before pregnancy, as well as mental health problems that develop for the first time, or are greatly exacerbated in the perinatal period. Depression and anxiety are the most common mental health problems during pregnancy, with approximately 12% of women experiencing depression and 13% experiencing anxiety at some point, with many women experiencing both [e.g. 1-6]. Depression and anxiety also affect 15-20% of women in the first year after birth [1, 7]. Despite this, an estimated 40% of women in England and 70% of women in Wales have no access to specialist perinatal mental health services [7].

Perinatal mental health problems are a major public health issue. It is well established that maternal mental health difficulties in pregnancy have been associated with preterm labour, poor infant outcomes, and greater cognitive, behavioural and interpersonal problems in young

children [6, 8]. Perinatal depression, anxiety and psychosis carry a total long-term cost to society (including health and social care use, productivity losses, infant death, emotional problems and special educational needs) of an estimated £8.1 billion for each one-year cohort of births in the UK and 72% of this cost relates to the adverse impacts on the child rather than the mother [7]. Perinatal anxiety (when it exists alone and is not comorbid with depression) costs an estimated £35,000 per mother-child dyad of which £21,000 relates to the mother and £14,000 to the child [7].

The research literature has predominantly focused on postnatal depression [9], which is associated with reduced maternal sensitivity to the child and adverse offspring cognitive, behavioural and emotional outcomes, particularly for boys [10-13]. Although there is evidence that symptoms of both depression and anxiety are common prenatally, less attention has been paid to the direct impact of symptoms of anxiety occurring during and after pregnancy [3]. In a systematic review of the impact of postnatal maternal anxiety on child outcomes [8], the effects were categorised into three domains: somatic, developmental, and psychological. The strongest evidence for an adverse effect of postnatal maternal anxiety exposure was on offspring somatic and psychological outcomes (of which emotional outcomes were embedded) with the evidence for an effect of postnatal maternal anxiety on child developmental outcomes (developmental milestones and cognitive delay) as inconclusive.

There is variability within the developmental literature as to how emotional problems are defined. Within empirical studies researchers often use terminology that corresponds to the measures utilised. For example, studies which measure emotional outcomes using the Child Behaviour Checklist (CBCL) refer to emotional outcomes as 'Internalizing' difficulties; summing the emotionally reactive, anxious/depressed, somatic complaints and withdrawn scores on the measure generates the internalising total. Other studies refer to 'emotional symptoms' (measured by the Strengths and Difficulties Questionnaire; SDQ) or 'social-emotional competence' (e.g. self-regulation, compliance, interaction with people, measured using the Ages & Stages Questionnaire-social-emotional; ASQ:SE). Clinical diagnoses are also used for older

children. Therefore, for the purpose of the current review the term 'emotional problems' will be used throughout to encompass all definitions used within the reviewed studies.

Research data indicate that greater than typical elevations in maternal perinatal stress, anxiety and depressive symptoms are associated with a wide range of adverse cognitive, behavioural, and neurophysiological offspring outcomes [14]. A dominant hypothesis is that there are prenatal programming effects for psychopathology, a process known as 'fetal programming'. However, the evidence base for the direct impact of perinatal maternal anxiety on children's emotional problems lack cohesion, often embedding such findings within broader child development outcomes [15]. This poses a challenge to those who wish to draw upon research in this area, to guide clinical practice and further research developments. Therefore the aim of this review is to systematically review studies which measure the impact of maternal perinatal anxiety on child emotional problems to enable future practitioners and researchers to draw conclusions from the findings.

## **METHODS**

The guidance outlined in the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols [PRISMA-P: 16, 17] was followed.

### *Search Procedures*

Articles published between 1900 through January 31<sup>st</sup> 2017 were systematically identified through eleven electronic databases (*PsycInfo, PsychArticles, Pub Med, Medline, BIOSIS citation index, BIOSIS previews, the Science Citation Index, Embase, SCOPUS, Journal citation reports, Web of Science*). Search terms were a combination of database-specific index terms (anxiety, perinatal period, emotional development, behavior problems) and individual terms located in the title or abstract (*maternal OR mother\*, antenatal OR prenatal OR postnatal OR postpartum OR puerperal, child\* OR bab\* OR infant\*, behaviour\* OR behavior\*, emotion\**). The behaviour search terms were used to ensure the search captured emotional outcomes that are embedded within behavioural

measures.

#### *Inclusion/Exclusion Criteria*

All studies that prospectively examined the impact of maternal anxiety in the antenatal and postnatal period on children's emotional outcomes were considered for inclusion. The database search was restricted to human research articles, written in English, and published in peer-reviewed journals. Studies that did not assess maternal anxiety during the perinatal period, or where anxiety could not be distinguished from other measures (e.g. 'psychological distress'; a composite variable combining maternal anxiety and depression) were excluded. Articles that focused on maternal effects and not child outcomes or did not assess child emotional problems were also excluded. The titles and abstracts of all studies identified were screened, with those meeting the inclusion criteria selected for full text evaluation. Reference lists of identified papers were examined, and the bibliographies of key researchers reviewed. Related publications were searched using the investigators name(s)/study names and principle investigators were contacted. The comorbidity of perinatal anxiety and depression is acknowledged but given that less attention has been paid to maternal anxiety, the current systematic review concentrates primarily on the direct impact of perinatal anxiety on children's emotional problems.

Search results were uploaded to the systematic review software Covidence [18]. Articles from all searches were combined and duplicates removed. A second reviewer independently screened full text articles and any conflicts were discussed and resolved. A third reviewer was available to discuss screening outcomes in instances where discrepancies and uncertainties between the two reviewers were not resolved. A PRISMA flow diagram reporting the final numbers is shown in figure 1.

#### *Search results*

Excluding duplicates, 1,186 studies were identified through database searches. Evaluation of the title and abstracts according to the exclusion criteria decreased the articles from 1,186 to 58. Due to prior steps being conservative, several articles that did not meet the review criteria were retained for full text review because titles and abstracts were not specific enough to judge for

inclusion. Evaluation of the articles' text reduced the 58 studies to 13. One additional publication was identified through the examination of the reference lists. 14 articles were excluded because studies did not measure or report the direct impact of maternal anxiety measured during the perinatal period. 29 articles were excluded because studies did not measure child emotional problems and the full text of 2 articles could not be accessed. After applying these criteria 14 studies remained, which were published between 2002 and January 2017.

#### *Assessment of the quality of evidence*

The Critical Appraisal Skills Programme (CASP) guidance, recommended for reviewing observational research, was used to aid the appraisal of the included studies. The framework provides an appraisal tool for cohort studies across 12 quality domains with a series of prompt questions for each domain. In each domain a response of 'yes', 'no' or 'can't tell' is given. To aid the comparison of quality across studies a score of two was given for 'yes' a score of one was given for 'can't tell' (indicating mixed achievement of the domain) and score of zero was given to 'no'. Scores across domains were then summed to give a maximum quality score of 12. The total quality score for each study is included in Table 1 and a summary of the quality scores for each paper reviewed can be found in Table 2.

## **RESULTS**

#### *Design*

Table 1 provides an overview of the included studies, which details the study characteristics. The search and screening process identified 14 eligible articles. 13 of the studies identified were population-based cohort studies and one was a nested case-control study (a case control analysis based on data from a cohort study). 13 studies began in pregnancy and one began in the postnatal period; all studies prospectively followed children up from pregnancy (92%) or birth (7%) to the age at outcome assessment in a longitudinal design. Seven studies examined separate study populations, while seven reported different analyses of two cohorts (five on one cohort and two on another).

### *Participants*

All of the studies involved community-based samples of mother-infant dyads. Studies had a wide range of sample sizes, ranging from 71 to 7,944 mother-infant pairs (median 1,143). Ten studies reported mean maternal ages at pregnancy (range 26.8 to 31.8 years), two reported mean maternal age at assessment and two did not report details of mean maternal age. Children ages ranged from 14 months to 13 years. Twelve studies assessed children at one time-point, one study assessed children at two time-points (4 and 6 years) and one study assessed children at multiple time-points (4, 7, 9, 11.5 and 13 years)

### *Maternal anxiety measures*

A number of different measures were used to evaluate maternal anxiety including self-report scales and standardised clinical interviews that yield anxiety disorder diagnoses. The most frequently used measure was the State Trait Anxiety Inventory (STAI) [19, 20], which was used in six of the included studies. The STAI has acceptable reliability and established validity and is one of the most widely used measures of anxiety symptoms [21]. One study measured both state and trait anxiety and five studies measured anxiety using only the state anxiety scale of the STAI. Five studies measured symptoms of anxiety with the 8-item anxiety subscale of the Crown Crisp Experiential Index [CCEI; 22]. The CCEI is a well-validated self-report symptom scale and the anxiety subscale has frequently been used to measure anxiety in perinatal women [e.g. 3, 23]. One study used the Hopkins Symptom Checklist [24]. It is reasonable to infer that symptom assessments, while lacking specificity, have adequate sensitivity for capturing clinical and subclinical anxiety levels [8]. Three studies used self-report questionnaire measures for specific anxiety disorders (including: Social Interaction and Anxiety Scale; Social Phobia Scale; Generalised Anxiety Disorder Questionnaire, GAD-Q; Impacts of Events Scale). Only two studies used the Structured Clinical Interview for DSM-IV Diagnoses [SCID; 25] to confirm clinical diagnoses. Four studies measured maternal anxiety only in the antenatal period, eight measured maternal anxiety both pre and postnatally and two measured maternal postnatal anxiety only.



### *Child emotional problems outcome measures*

Emotional outcomes were measured using a variety of scales and clinical interviews with assessment time-points ranging from 14 months to 13 years. The most frequently used measure, in seven studies, was the Internalizing Scale of the CBCL, which has been extensively employed in studies of child and adolescent emotional and behavioural difficulties [26]. Four studies used maternal reports only, one study included father ratings using the parent report [27] and three studies reported on teachers' ratings using the teacher-adapted version of the CBCL [28]. Five studies used maternal reports of emotional problems on the emotional symptoms scale of the SDQ [29], an adaptation of a widely used index of psychiatric symptoms in children [30]. Maternal reports on their children's social-emotional competence using the ASQ:SE [31] was used in one study. Another study used both mother and father reports of emotional problems using the Development and Well-Being Assessment, a standardised clinical interview that yields psychiatric diagnoses [DAWBA; 32]. Two studies measured child anxiety alongside the CBCL; one used the Anxiety Disorder Interview Schedule, Parent Version [ADIS-P; 33] and the other used the child reported State Trait Anxiety Scale for Children [STAIC; 34].

### *Quality of studies*

Table 2 provides an overview of the quality ratings of published articles. The quality of the studies varied from a lowest score of five [35] to a highest of 11 out of 12 [36] with higher scores indicating better quality. Only one study used clinical diagnoses alongside maternal reports for study outcomes [37], with six using a second informant (e.g. teacher rating or father rating) as well as maternal report of emotional problems [35, 38-42]. The results of three studies were representative of the general population [36, 38, 43]. Following the quality appraisal, the study with the lowest quality rating score of five out of 12 [35] was removed from further discussion.

## **Perinatal Anxiety and Children's Emotional Problems: Synthesis of the findings**

Across the identified studies child emotional problems have been assessed at different developmental stages, with the majority of studies focusing on the early and middle childhood period. Most studies assessed maternal anxiety in the antenatal period with fewer studies

assessing anxiety in the postnatal period. Thus, relevant findings have been reported according to stages of childhood and timing of anxiety measurement.

*Early childhood emotional outcomes: the effect of antenatal anxiety*

When mothers reported on child outcomes, maternal antenatal anxiety was found to be associated with child emotional problems in early childhood (approximately 2 to 5 years of age) [36, 37, 40, 44]. After controlling for covariates four studies found maternal antenatal anxiety to be predictive of children's emotional problems in early childhood when anxiety was measured at 16 weeks gestation [40], 20 weeks gestation [37] and 32 weeks gestation [36, 44]. Pickles, Sharp, Hellier and Hill [43] found a strong effect of generalised state anxiety at 20 weeks on child emotional problems at 3.5 years but the strong effects were lost after controlling for confounders, which included postnatal anxiety and depression. This particular study had a high quality rating based on its strong methodology.

Two studies used different informants (either father, teachers or clinicians as opposed to maternal reports) to assess child emotional problems in early childhood. Murray and colleagues [37] looked specifically at socially anxious mothers and their children. They found that children of socially anxious mothers were more likely to be clinically diagnosed with social anxiety disorder than children of non-anxious mothers. However, no relationship was found between socially anxious mothers and child outcomes when teachers rated emotional problems. This is a surprising finding as children may be expected to show difficulties with social anxiety in the school environment. Therefore, this finding may indicate method variance where elevated associations between antenatal anxiety and children's emotional problems are a result of mother reports being used for both variables. Loomans *et al.*, [40] found significant positive relations between antenatal anxiety and emotional problems as reported by a teacher. However, this association was not significant after controlling for covariates including current emotional distress (composite measure of depression, anxiety and stress) [40]. Therefore, only one study [37] found maternal reports of child emotional problems ascertained from the CBCL were supported by clinical diagnoses of child anxiety. These studies used only one other informant rather than multiple informants to assess children's outcomes.

#### *Early childhood emotional outcomes: the effect of postnatal anxiety*

The impact of postnatal anxiety on child emotional problems in the early childhood period was assessed by three studies identified in the review. Garthus-Niegel, Ayers, Martini, von Soest and Eberhard-Gran [24] found Post Traumatic Stress Disorder (PTSD) symptoms at 8 weeks postnatal were significantly related to problems in socio-emotional development in children aged two years after controlling for confounders. With increasing maternal PTSD symptom load, boys had increasingly higher levels of socio-emotional problems, whereas girls' levels increased at a slower rate. In contrast to the PTSD symptoms, maternal reported symptoms of anxiety were not significantly related to child socio-emotional development in early childhood after controlling for confounders. O'Connor, Heron, Golding, Beveridge and Glover [44] found postnatal anxiety measured at 8 weeks was a predictor of emotional problems in both boys and girls aged 4 years. Prenoveau *et al.*, [41] found maternal report of child emotional problems at 24 months demonstrated significant associations with maternal Generalised Anxiety Disorder (GAD) trait factors measured at 9 weeks and 2, 3, 6, 10, 14 and 24 months postnatal. However, when persistent maternal anxiety and depressive symptom severity were both included as predictors, persistent anxiety did not independently predict maternal reported emotional problems above and beyond persistent maternal depression.

#### *Middle childhood emotional outcomes: the effect of antenatal anxiety*

Three studies assessed how maternal antenatal anxiety impacted on child emotional problems in middle childhood (approximately 6 to 8 years of age). Using a single-path analytic model, Barker, Jaffee, Uher & Maughan, [38] found that antenatal anxiety, measured at 32 weeks gestation was associated with a small increase in child emotional problems when children were seven to eight years of age. Similarly, O'Connor, Heron, Golding & Glover, [45] found high levels of antenatal anxiety, measured at 32 weeks, was associated with emotional problems for boys and girls age six to seven years. Antenatal anxiety was similarly predictive of a 1-2-fold increase in emotional problems in boys and girls after controlling for antenatal, obstetric, psychosocial risks and postnatal anxiety and depression.

Pregnancy-specific anxiety was also found to be associated with higher child anxiety at six to nine years of age [46]. Children with anxiety ratings within the normal range, as measured using the CBCL were exposed to significantly lower maternal pregnancy-specific anxiety during pregnancy compared to children in a borderline/ clinically significant group. However, in this particular study antenatal maternal general anxiety was not significantly associated with child anxiety [46].

*Middle childhood emotional outcomes: the effect of postnatal anxiety*

Only two studies examined the impact of maternal postnatal anxiety on offspring emotional problems in middle childhood. With regard to postnatal anxiety, controlling for antenatal anxiety, depression and other covariates, Barker *et al.*, [38] found postnatal maternal anxiety predicted increases in emotional problems in children at age seven to eight years with no significant gender differences. O'Connor *et al.*, [45] found postnatal anxiety at 8 weeks was a significant predictor of children's emotional problems at six years; this result was significant for boys but not for girls. Although postnatal assessment of anxiety was significantly associated with emotional problems in boys, it did not eliminate the effect attributable to anxiety in the late antenatal period [45].

*Late childhood emotional outcomes: the effect of antenatal anxiety*

The associations between antenatal maternal anxiety and child emotional problems in late childhood (approximately 9 to 11 years of age) were assessed by two studies included in the review. Van den Bergh & Marcoen [42] did not find maternal anxiety measured at 12-22 weeks gestation or 32-40 weeks gestation to be a significant predictor of maternal or teacher reported emotional problems in children aged eight and nine years old. Yet, antenatal anxiety at 12-22 weeks gestation was significantly associated with child self-reported anxiety in the eight and nine year olds [42]. However, this study did not control for the effects of antenatal or postnatal depression on child outcomes.

Leis, Heron, Stuart & Mendelson, [39] found elevated levels of antenatal anxiety were associated with mother and teacher-reported child emotional problems in 10-11 year olds. Multivariate regression models found exposure to elevated symptoms of anxiety during pregnancy predicted an increase in child emotional problems at ages 10 and 11 after accounting for later exposure to

symptoms of anxiety and exposure to symptoms of maternal depression during pregnancy, the postnatal period, and childhood. Further analyses, which controlled for maternal mental health problems during other periods and sociodemographic and psychosocial characteristics, found significant associations persisted between elevated symptoms of antenatal anxiety and child emotional problems. Associations between elevated symptoms of anxiety and teacher-reported child emotional problems were not maintained in multivariable models.

#### *Late childhood emotional outcomes: the effect of postnatal anxiety*

Leis *et al.*, [39] also found symptoms of anxiety in the postnatal period and during childhood were associated with elevated emotional problems in children aged 10 and 11 years as reported by mothers. However, maternal postnatal anxiety, measured at eight weeks and eight months, was not associated with teacher-reported emotional problems [39].

#### *The effects of antenatal anxiety across childhood*

O'Donnell, Glover, Barker & O'Connor [47] measured children's emotional problems using the SDQ on five occasions from age 4 to 13 years. All correlations of maternal antenatal anxiety with child emotional problems were statistically significant across the 5 time points (4, 7, 9, 11.5 and 13 years) and the correlation coefficients were almost identical with maternal anxiety at 18 and 32 weeks, suggesting no/minimal timing effects. Their analyses, based on a longitudinal growth model, found that child emotional problems changed over time in a U-shaped manner, with lower scores at age 9 than at 4 or 13 years.

### **Maternal Antenatal Anxiety and Children's Emotional Problems: Mechanisms of Effect**

Three studies examined potential mediators or moderators of the association between maternal antenatal anxiety and child emotional problems. Murray *et al.*, [37] found children of mothers with social anxiety had higher levels of emotional problems than children of non-anxious controls. Although antenatal anxiety at 20 weeks was found to be predictive of emotional problems at child age 4 to 5 years, Murray *et al.*, [37] did not control for the effects of antenatal or postnatal depression. Furthermore, this association was influenced by child attachment; the

effect of maternal disorder was significant for securely attached children but not for those who were insecurely attached.

Sharp, Hill, Hellier & Pickles [36] hypothesised that maternal stroking would modify the association between antenatal anxiety and child emotional problems. Their research found that emotional problem scores, measured using the CBCL at 2.5 years, were strongly predicted by antenatal anxiety assessed at 32 weeks of pregnancy after controlling for postnatal anxiety and depression. With increasing antenatal anxiety the daughters of low stroking mothers showed increasing emotional problems, whereas the effect was not seen in girls whose mothers were in the high stroking group, nor was it seen in boys. This study received the highest quality rating. Pickles, Sharp, Hellier & Hill [43] examined whether the effect of early maternal stroking was still evident at 3.5 years and used a larger sample ( $n = 813$ ) than the previous publication. They found that, after controlling for postnatal anxiety and depression, frequency of infant stroking modified associations between pregnancy-specific anxiety at 20 weeks gestation and maternal ratings of emotional problems in children aged 3.5 years. However, this finding was not significant for generalised state anxiety assessed at 20 weeks on child emotional problems. Despite both having high quality ratings and using a larger sample from the same cohort, results from these two studies assessed maternal anxiety using different measures and at different time points, which make results difficult to compare. O'Connor *et al.*, [45] found the association between antenatal anxiety and child emotional problems was not moderated by psychosocial risk (indexed by education, history of teenage parenthood, crowding), obstetric and antenatal risks, postnatal anxiety or depression or a self-report questionnaire-based measure of positive and negative parenting. This was the only study to assess whether postnatal depression moderated the association between antenatal anxiety and child emotional outcomes.

## **DISCUSSION**

### *Summary of findings*

This review systematically evaluated the evidence relating antenatal and postnatal maternal anxiety to children's emotional problems at different phases of development. Based on this

review, evidence exists for an effect of antenatal maternal anxiety on child emotional problems [36-42, 44, 45, 47]. There is also evidence for the impact of pregnancy-specific anxiety on child emotional problems [43, 46]. Interestingly, although two studies found evidence for the impact of pregnancy-specific anxiety, contradictory to the other studies in this review, they found no significant evidence of maternal antenatal anxiety (as measured by STAI) on child emotional problems [43, 46].

This review found preliminary evidence for the impact of postnatal anxiety on child emotional problems [24, 38, 41, 44, 45]. However, the limited number of studies measuring anxiety in the postnatal period makes this an unreliable conclusion. Whilst the findings of this review indicate that exposure to both maternal antenatal and postnatal anxiety has an adverse impact on child emotional problems, the evidence appears stronger for antenatal than postnatal anxiety. Across the included studies, several methodological weaknesses limit the ability to draw definitive conclusions.

#### *Sample characteristics*

While seven studies examined separate study populations, five reported analyses using the Avon Longitudinal Study of Parents and Children [ALSPAC; 48] cohort and two used the Wirral Child Health and Development Study cohort. Therefore, a large part of the evidence has been drawn from one area of England and therefore may not be generalizable to other areas or countries. Further, the sample sizes between studies vary considerably and all are significantly smaller than original population samples (e.g. 12,998 from ALPAC and 1,233 from the Wirral Child Health and Development study). Attrition due to missing data and exclusion criteria mean that despite being longitudinal studies recruited from the general population, the sub-samples used in the published studies, ALPAC in particular, may not be generalizable at a population level.

#### *Maternal anxiety measurement*

Assessment of maternal anxiety at different stages of pre or post pregnancy makes the studies difficult to compare. The times of measurement range from 12 weeks gestation to 3.5 years postnatal. The most common time-point to measure antenatal anxiety was 32 weeks but this

corresponded with the ALSPAC cohort studies. Postnatal measurements ranged from 8 weeks [44, 45] to 24 months [41]. All of the studies relied on naturally occurring variations in maternal anxiety in community not clinical populations and the longitudinal designs, based on large community samples, were strengths of most studies. However, selective attrition could mean that studies were examining associations among the less vulnerable individuals. For example, attrition analysis in one study found that mothers who did not provide data at the assessed time point were more anxious, younger, less likely to have a university degree and more likely to have smoked in pregnancy [45]. Implications of missing a disproportionate number of children exposed to high levels of anxiety may lead to underestimations of the long-term effect of more severe perinatal anxiety.

#### *Mechanisms which mediate or moderate child emotional outcomes*

It is well established that antenatal exposures covary with postnatal exposures. That is, women who are psychologically distressed during pregnancy tend to remain so after pregnancy [3]. Therefore, the burden of proof for researchers is to demonstrate that maternal antenatal anxiety, which is presumed to affect the developing fetus through ‘fetal programming’, presents significant, unique variance to outcomes above and beyond known associations, such as parenting behaviours, which in turn influence child outcomes [49]. Anxiety and depression symptoms also often co-occur and the presence of co-morbidity is a marker of severity [50]. Inadequate measurement or control of postnatal maternal anxiety or co-morbid postnatal depression could result in the misattribution of postnatally mediated mechanisms to antenatal biological ones. As previously mentioned, five of the reviewed studies examined the same cohort (ALSPAC). The ALSPAC study design enabled the control of both antenatal and postnatal anxiety and they were also able to control for the high depression/anxiety comorbidity. Two studies did not include a control measure of antenatal or postnatal depression [37, 42]. The potential mechanisms that underpin the associations between exposure to maternal perinatal anxiety and adverse offspring emotional problems were generally not considered throughout the studies, with only five studies incorporating measures of the quality of mother’s postnatal care-giving into their analyses [36, 37, 41, 47]. Only O’Connor *et al.*, [45] assessed for interaction effects of self-reported parenting or postnatal anxiety or depression on the association between maternal



antenatal anxiety and child emotional problems at age six to seven years but found no significant results.

It is also difficult to separate the effects of maternal perinatal anxiety from the consequence of other factors that might contribute to child emotional problems that were not measured in the included studies. For example, the reviewed studies could not rule out potential genetic factors that might affect the observed association. Genetically informed studies involving children conceived in vitro fertilisation who were not genetically related to their mothers provide strong evidence that the environment contributes to poor child mental health including anxiety risk [51, 52]. Furthermore, only one study included endocrine (cortisol) measures to test for potential underlying mechanisms consistent with the fetal programming hypothesis [46]. In this study, exposure to elevated maternal cortisol during gestation was associated with childhood anxiety as long as nine years later. However, maternal cortisol and psychosocial distress (maternal perceived stress, depression, general anxiety or pregnancy-specific anxiety) were not correlated and thus, both measures exerted independent effects on child mental health. The other studies in this review did not examine physiological factors. Therefore, direct assessments of the physiological processes that may explain the observed associations and have been implicated by animal and human research (e.g. fetal programming) cannot be determined by this review.

### *Gender differences*

Only five studies examined gender differences in their samples. Effects of antenatal anxiety at 18 weeks were found to predict emotional problems in girls but not boys at age four [44] whilst antenatal anxiety at 32 weeks gestation predicted emotional problems in both boys and girls at age four [44] and six years [45]. Postnatal anxiety at 8 weeks was also a predictor of emotional problems in both boys and girls aged four years [44] but only a predictor in boys at six years [45]. After controlling for postnatal anxiety at 8, 21 and 33 months, antenatal anxiety at 32 weeks remained significantly predictive of emotional problems in boys at six years but not for girls [45]. Sharp *et al.*, [36] reported their effects were found to be stronger in girls than boys. Garthus-Niegel *et al.*, [24] found with increasing maternal PTSD symptom load, boys had increasingly higher levels of socio-emotional problems, whereas girls' levels increased at a slower rate. These

mixed results from the few studies that assessed for gender differences show the impact of gender on the association between maternal perinatal anxiety and child emotional outcomes is inconclusive.

#### *Shared method variance*

All studies had methodological issues related to shared method variance, which reduced their quality ratings. The use of self-report questionnaires meant that often mothers were reporting on their own levels of anxiety and also on their perceptions of their child's behaviour. This could lead to mothers with elevated symptoms of anxiety and depression over- or misreporting their child's emotions and mothers who do not experience anxiety not recognising symptoms in their children. Limited studies used multiple informants on the child outcome measure. Barker *et al.*, [38] incorporated fathers' reports of child outcomes and Leis *et al.*, [39], Loomans *et al.*, [40], and Van den Burgh & Marcoen [42] examined teacher rated child outcomes. Murray *et al.*, [37] and Prenoveau *et al.*, [41] were the only studies to use observational measures of child outcomes. Indeed, across the included studies, the effect of maternal anxiety on child emotional problems was most profound when mothers had reported on their child's behaviour. These differences may highlight factors in addition to the effect of shared method variance including the impact of context on understanding and interpreting children's behaviours and emotional experience. In particular, mothers and teachers observe children in different circumstances where children's behaviour and emotional experience may vary considerably. Also, mothers have known their child for a longer period of time compared to a teacher, whereas a teacher might be more able to view a child's behaviour and emotional experience in comparison with peers [53, 54]. Nevertheless it is likely that shared method variance partly explains the greater associations when mothers report on their own anxiety symptoms and their child's emotional problems.

#### *Implications for future research*

Future studies should incorporate multiple informants and employ multiple measures of children's emotional problems (e.g. standardised clinical interviews, bio-markers of child emotional problems and observational data). Biological measures would enable future studies to examine the association between both biological and psychological factors during gestation and

the risk for adverse emotional outcomes in childhood. Similarly, the inclusion of postnatal risk factors such as quality of parenting should be incorporated as a potential mediator or moderator of the association between perinatal anxiety and children's emotional problems. Future research should also examine the role of gestational age and severity of antenatal anxiety and whether anxiety met diagnostic criteria relative to high symptom levels alone.

#### *Implications for clinical practice*

The finding that maternal anxiety during the perinatal period was associated with adverse emotional outcomes in children provides support for a preventative approach to infant developmental problems. Historically, much attention has been paid to postnatal depression, which has focused its approach on prevention and intervention beginning during the postnatal period. Whilst this review provides limited evidence for the impact of maternal anxiety during the postnatal period, it also demonstrates that anxiety experienced during the antenatal period has significant consequences for a child's emotional development. These results highlight the need for approaches for maternal mental health to be implemented much earlier than the postnatal period. It is possible that addressing maternal mental health, including anxiety in pregnancy may in turn affect the mother's relationship with her child and the overall family functioning with widespread effects. As these results were found in community-based samples it suggests that mental health assessment and intervention are important components of routine perinatal care. However, as previously stated many women have no access to specialist perinatal mental health services [7] carrying a cost of an estimated £8.1 billion for each one-year cohort of births in the UK to the public sector. The cost to the public sector of perinatal mental health problems is five times the cost of improving services [7]. Therefore, this review provides health and economic-related arguments to support increased screening and access to specialist perinatal mental health services, with long-term implications for women's mental health, child development and well-being.

#### *Strengths and Limitations of the current review*

The findings of this review are the result of a thorough, systematic process reviewing a large number of articles. The inclusion of studies that measured anxiety symptoms alongside those

that measured clinical diagnoses of anxiety is a strength of the review. The results highlight the importance of measurement of different forms of anxiety when considering the impact on child emotional problems. Despite the strengths of this review, some limitations exist. Only articles published in English were included, which means relevant articles published in other languages may have been overlooked. It is also acknowledged that the use of a quality assessment tool involves a degree of subjectivity in the ratings process. Furthermore, inconsistent presentation of the results across the included studies rendered a meta-analysis difficult and beyond the scope of the current paper. Therefore, a narrative synthesis was conducted.

## **CONCLUSION**

While there is some evidence that antenatal and postnatal anxiety exposure may lead to adverse emotional outcomes in children, the evidence is far from conclusive. Expanding on the literature and improving the methodological rigour of such studies will enable a better understanding of the effects of maternal anxiety during the perinatal period on child emotional outcomes. Such research could lead to the improved identification of at-risk parents and children with appropriate opportunities for intervention and prevention.

**The authors declare that they have no conflict of interest**

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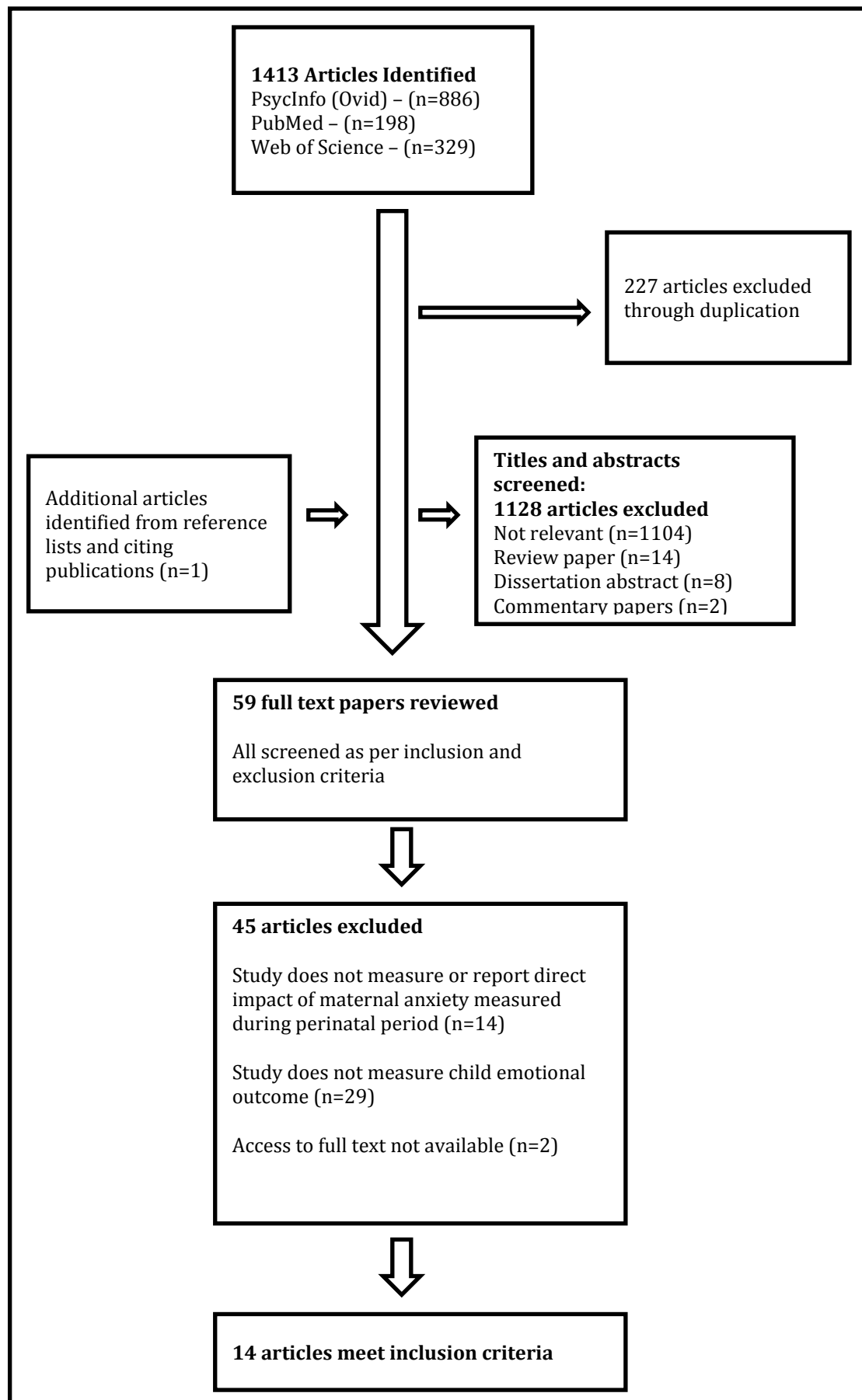
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**Fig 1** Flow diagram of included and excluded studies

**Table 1.** Summary of studies examining exposure to perinatal maternal anxiety and child emotional problems

Study, location, design and quality rating (Q)	Participants	Measures	Covariates	Primary results	Main limitations
<b>Barker et al. (2011)</b>  England  Prospective cohort  Q=9	3,298 mother-infant pairs recruited from the ALSPAC longitudinal study.  Mean maternal age during pregnancy = 28 years	<b>Mothers:</b> CCEI  Prenatal assessments at 32 weeks pregnancy  Postnatal assessments at 1.5 years.  <b>Children:</b> DAWBA  Assessment reported by mothers and fathers at child ages 7-8 years	Low SES No partner Teen pregnancy Criminal behaviour Substance misuse Cigarette smoking Pre and postnatal depression Pre and postnatal anxiety	Prenatal anxiety was associated with child internalising difficulties.  Controlling for prenatal anxiety, depression and risk factors, postnatal anxiety predicted increases in internalising difficulties.	<b>Sample:</b> Low rates of ethnic minorities in sample.  Loss to follow up over time limits confidence in generalizability of results  <b>Measures:</b> Assessment of symptom scores of anxiety, did not examine role of timing, severity or diagnostic criteria.  All measures based on maternal reports, raises possibility of shared method variance.  <b>Mechanisms:</b> No measurement of parenting quality as potential mediator or moderator.  Interactions between psychosocial risk and maternal psychopathology not assessed
<b>de Bruijn et al. (2009)</b>  Netherlands  Prospective cohort  Q=5	444 healthy Dutch Caucasian singleton pregnant women and children  Mean maternal age=30.7	<b>Mothers:</b> STAI (State subscale) and SCL-90 (anxiety scale)  Prenatal assessments at 12, 24 and 36 weeks pregnancy.  <b>Children:</b> CBCL	Educational level of parents Prenatal smoking Women's parity Child's age Postnatal anxiety (mothers and fathers) Postnatal depression (mothers and fathers)	After controlling for confounding factors, significant effects were found for mean prenatal STAI scores on internalising problems in girls, as reported by fathers.  No significant effects found for mothers reports.	<b>Measures:</b> Large age range reported on child outcomes  <b>Mechanisms:</b> No measurement of parenting quality as potential mediator or moderator.

		Assessment reported by mothers and fathers at child ages between 14 and 54 months			
<b>Davis &amp; Sandman (2012)</b>	178 Mother-child pairs recruited from obstetric clinics	<b>Mothers:</b> STAI (State subscale) and Pregnancy Related Anxiety Scale	Gestational age at birth Maternal current psychological state (perceived stress, general anxiety & depression) Maternal education Child sex	Children with anxiety ratings within the normal range were exposed to significantly lower maternal pregnancy-specific anxiety during gestation compared to children in the borderline/ clinically significant group.	<b>Measures:</b> All measures based on maternal reports, raises possibility of shared method variance.
Southern California	Mean maternal age at time of assessment = 38.1 years	Prenatal assessment at 19, 25 and 31 weeks pregnancy.			<b>Mechanisms:</b> Relied on naturally occurring variations in maternal psychological distress. Did not account for genetic factors or exposure to extreme stress.
Prospective cohort		<b>Children:</b> CBCL		Prenatal maternal general anxiety was not significantly associated with child anxiety.	
Q=8		Assessment reported by mothers at age 6 to 9 years.			
<b>Garthus-Niegal et al. (2016)</b>	1,472 women and children recruited from The Akershus Birth Cohort (ABC) longitudinal study	<b>Mothers:</b> Hopkins Symptom Checklist and The Impact of Events Scale	Postnatal depression at 8 weeks Postnatal anxiety at 8 weeks Age at delivery Maternal education Gestational age Infant temperament Current child health problems Child gender	PTSD symptoms were significantly related to problems in socio-emotional development after controlling for confounders.  Symptoms of anxiety were not significantly related to socio-emotional development after controlling for confounders  Sex of child significantly moderated association between maternal PTSD symptoms and child social-emotional development.	<b>Sample:</b> Selective attrition threatens representativeness of sample. Women, who were younger, had lower education and symptoms of depressed were more likely to drop out.  <b>Measures:</b> All data based on mother reports. Relationships could have occurred due to common method bias  <b>Results:</b> Only modest effect size between postnatal PTSD symptoms and socio-emotional development outcome.  <b>Mechanisms:</b> No measurement of parenting quality as potential mediator or moderator.
Norway	Mean maternal age not reported	Postnatal assessment at 8 weeks postpartum			
Prospective cohort		<b>Children:</b> ASQ:SE			
Q=6		Assessment reported by mothers at child age 2 years.			

				No interactions found for symptoms of anxiety.	
<b>Leis et al. (2014)</b>	2,891 mother-infant pairs recruited from the ALSPAC longitudinal study.	<b>Mothers:</b> CCEI  Prenatal assessment measured at 18 and 32 weeks pregnancy  Postnatal assessment measured at 8 weeks and 8 months postpartum; 21, 33, 61, and 73 months and 11 years of childhood  <b>Children:</b> SDQ  Assessment reported by mothers at child age 11 years and referred to the last 6 months and teachers' reports at child age 10 years and referred to current school year.	Marital status Maternal age at birth Child birth weight Child gender Maternal educational attainment Cigarette smoking Alcohol use Pre and postnatal Anxiety Pre and postnatal Depression	After controlling for maternal mental health problems during infancy and childhood and other covariates, significant associations persisted between elevated symptoms of prenatal anxiety and offspring emotional symptoms.  Associations between elevated symptoms of anxiety and teacher reported emotional problems were not maintained in multivariable models	<b>Sample:</b> loss to follow up over time limits confidence in generalizability of results  <b>Measures:</b> Assessment of symptom scores of anxiety, did not examine role of timing, severity or diagnostic criteria.  Reliance on maternal report of child behaviour associations observed might be biased due to mothers mis-reporting child's behaviour.  <b>Mechanisms:</b> Unable to account for family functioning, paternal mental health, and negative life events.  No measurement of parenting quality as potential mediator or moderator.
<b>Loomans et al. (2011)</b>	3446 mothers; 3520 teachers; 3758 children recruited from ABCD longitudinal study.  Mean maternal	<b>Mothers:</b> STAI (State subscale)  Prenatal assessment measured at 16 weeks pregnancy.  <b>Children:</b> SDQ	Child's birth weight corrected for gestational age Parity Maternal ethnicity Maternal educational level Smoking during pregnancy	Univariate regression revealed a positive association between antenatal anxiety and emotional problems. After controlling for covariates, antenatal anxiety remained positive but weakly related to children's emotional symptoms, as reported by mothers.	<b>Sample:</b> Sample attrition was not completely random. Women who were younger, less educated, did not have a western background, and were more anxious were less likely to participate in follow-up.  <b>Mechanisms:</b> Did not measure the contributions of physiological or genetic factors.

Q=6	age at pregnancy = 31.8 years.	Assessment reported by mothers and teachers at child age 5 years.	Alcohol consumption Current emotional distress (anxiety and depression) Parental self-reported history of psychopathology	Significant positive relations between antenatal anxiety and children's emotional problems as reported by teacher did not remain after controlling for covariates.	No measurement of parenting quality as potential mediator or moderator.
<b>Murray et al. (2014)</b>	73 mothers diagnosed with social anxiety disorder and 63 non-anxious controls recruited from a community sample screened in pregnancy.	<b>Mothers:</b> SCID; Social Interaction and Anxiety Scale; Social Phobia Scale  Prenatal assessment measured at 20 – 30 weeks pregnancy.  <b>Children:</b> ADIS-P; CBCL	Child gender Child attachment style Behavioural Inhibition Mother's IQ Birth order Maternal age SES	Children of mothers with social anxiety disorder were more likely to be diagnosed with social anxiety disorder than children of mothers without social anxiety disorder. Neither behavioural inhibition nor attachment moderated this association.  Index group children had higher mother reported internalising difficulties than controls. This relationship was not influenced by behavioural inhibition but the effect was significant for securely attached children but not for insecurely attached children.	<b>Measures:</b> CBCL and ADIS-P relied on info derived from mothers – potentially confounding effects of the maternal disorder.  <b>Mechanisms:</b> Did not examine father or family members who might compensate for difficulties experienced by mothers. May have underestimated direct effects of maternal social anxiety disorder on the child.
England					
Nested case control study based on data from cohort study					
Q=7	Mean maternal age 30.4 and 31.2 for index and control group respectively.	Assessment reported by mothers and teachers at child age 4 to 5 years.			
<b>O'Connor et al. (2002)</b>	7,448 women and children recruited from the ALSPAC longitudinal study.	<b>Mothers:</b> CCEI  Prenatal assessment measured at 18 and 32 weeks pregnancy  Postnatal assessment measured at 8 weeks and 8 21, 33 months	Gestational age Birth weight for gestational age Mode of delivery First or later born status Smoking Alcohol consumption Known or suspected problem with foetus SES Maternal education	After controlling for covariates, effects of antenatal anxiety at 18 weeks predicted emotional problems in girls whilst antenatal anxiety at 32 weeks gestation predicted emotional problems in both boys and girls. Postnatal anxiety at 8 weeks was also a predictor of emotional problems in both boys and girls aged 4 years.	<b>Sample:</b> Sample attrition was not completely random. Attrition was more likely in those with higher anxiety scores at earlier assessments. This could result in a diminished effect of prenatal anxiety.  <b>Measures:</b> All data based on mother reports. Relationships could have occurred due to common method bias  <b>Results:</b> The effect sizes were small to
England					
Prospective cohort study					
Q=7	Mean maternal age at pregnancy = 28 years.				

		Assessment reported by mothers at child age 4 years.	Maternal age Antenatal and Postnatal depression Postnatal anxiety		modest  <b>Mechanisms:</b> The data do not allow determination of what physiological mechanisms account for the observed associations.  No measurement of parenting quality as potential mediator or moderator.
<b>O'Connor et al. (2003)</b>  England  Prospective cohort study  Q=7	6,493 women and children recruited from the ALSPAC longitudinal study.  Mean maternal age at pregnancy = 28 years.	<b>Mothers:</b> CCEI  Prenatal assessment measured at 18 and 32 weeks pregnancy  Postnatal assessment measured at 8 weeks, 8, 21 and 33 months.  <b>Children:</b> SDQ  Assessment reported by mothers at age 47 and 81 months	Maternal depression Postnatal Anxiety Gestational age Birth weight for gestational age Mode of delivery First or later born status Smoking Alcohol consumption Known or suspected problem with foetus SES Maternal education Maternal age	After controlling for covariates, antenatal anxiety at 32 weeks gestation predicted emotional problems at 81 months in both boys and girls. Postnatal anxiety at 8 weeks was also a predictor of emotional problems at 81 months in boys but not girls.  After controlling for postnatal anxiety at 8, 21 and 33 months antenatal anxiety at 32 weeks remained significantly predictive of emotional problems in boys at 81 months but not for girls.	<b>Sample:</b> Attrition was not completely random. Those who dropped out were more likely to be initially anxious and at greater psychological disadvantage. This could lead to underestimation of effect of prenatal anxiety.  <b>Measures:</b> All data based on mother reports. Relationships could have occurred due to common method bias.  Screening measure of problems in children used rather than clinical assessments.  <b>Mechanisms:</b> The data do not allow determination of what physiological mechanisms account for the observed associations.  No measurement of parenting quality as potential mediator or moderator.
<b>O'Donnell et al. (2014)</b>  England  Prospective	7,944 women and children recruited from the ALSPAC longitudinal study.	<b>Mothers:</b> CCEI.  Prenatal assessment measured at 18 and 32 weeks pregnancy.	Maternal SES Parenting behaviour Maternal age Smoking Alcohol/substance use Birth weight	Results indicated that maternal prenatal anxiety predicted persistently higher emotional symptoms across childhood with no diminishment of effect into adolescence.	<b>Measures:</b> All data based on mother reports. Relationships could have occurred due to common method bias.  <b>Mechanisms:</b> Did not have direct measures of biological mechanisms that might mediate

cohort study					the effect
Q=7	Mean maternal age at pregnancy = 28 years	Postnatal assessment measured at 33 months.  <b>Children:</b> SDQ  Assessment reported by mothers when child was 4, 7, 9, 11.5 and 13 years of age	Gestational age Maternal postnatal depression and anxiety Paternal pre and postnatal anxiety		No measurement of parenting quality as potential mediator or moderator.
<b>Pickles et al. (2016)</b>	813 mothers and infants recruited from the Wirral Child Health and Development Study	<b>Mothers:</b> STAI (State scale); The Pregnancy-Specific Anxiety Scale  Prenatal assessment measured at 20 weeks of pregnancy  Postnatal assessment measured at 9 weeks, 14 months and 3.5 years.  <b>Children:</b> CBCL  Assessment reported by mothers at child age 3.5 years.	Maternal age Marital status Education SES Smoking Alcohol consumption Sex of infant Birth weight by gestational age Postnatal depression and anxiety	Frequency of infant stroking modified associations between pregnancy-specific anxiety at 20 weeks gestation and maternal ratings of internalising behaviours in children aged 3.5 years. There was a strong effect of generalised state anxiety at 20 weeks on internalising symptoms but this was lost after accounting for confounders. The postnatal maternal anxiety and 3.5 year depression accounted for this difference.	<b>Measures:</b> All data based on mother reports. Relationships could have occurred due to common method bias.  <b>Mechanisms:</b> The data do not allow determination of what physiological mechanisms account for the observed associations
England					
Prospective cohort study					
Q=10	Mean maternal age at 20 weeks pregnancy = 26.9 years				
<b>Prenoveau et al. (2017)</b>	296 mothers and infants recruited from Oxford Parent Project.	<b>Mothers:</b> GAD-Q; SCID  Postnatal assessment measured at 9 weeks and 2, 3, 6, 10, 14 and 24 months.	Mothers age Infant age Infant sex Infant birth order Mother marital status Postnatal depression	Maternal report of child CBCL internalising at 24 months postpartum demonstrated significant associations with maternal GAD trait factors.  When observational outcomes	<b>Sample:</b> Small sample size for structural equation modelling.  GAD rates in sample were greater than that of the general population and sample consisted of primarily Caucasian women, which threatens representativeness of
England					
Prospective cohort	Mean maternal age at 3 months				

Q=7	postpartum = 32.3 years	<p><b>Children:</b> CBCL</p> <p>Assessment reported by mothers at child age 24 months.</p> <p><b>Observational data:</b> mother-infant interaction play task, child individual play task, and barrier paradigm. Coded for child negative emotional reactivity, child negative emotional tone and maternal sensitivity.</p>	were considered trait factors for maternal GAD were not significantly related to child negative emotional tone or negative emotional reactivity at 24 months postpartum.	<p>sample.</p> <p><b>Measures:</b> Observational data carried out in experimental laboratory, which may lack ecological validity.</p> <p>Data based on mother reports. Relationships could have occurred due to common method bias.</p> <p>Child outcomes only assessed at one time point</p> <p><b>Mechanisms:</b> The data do not allow determination of what physiological mechanisms account for the observed associations</p>
<p><b>Sharp et al. (2015)</b></p> <p>England</p> <p>Prospective cohort</p> <p>Q=11</p>	<p>316 mothers and infants recruited from the Wirral Child Health and Development Study</p> <p>Mean maternal age at pregnancy = 26.8 years</p>	<p><b>Mothers:</b> STAI (State scale)</p> <p>Prenatal assessment measured at 32 weeks of pregnancy</p> <p>Postnatal assessment measured at 5, 9 and 29 weeks, 14 months and 2.5 years.</p> <p><b>Children:</b> CBCL</p> <p>Assessment reported by mothers at child age 2.5 years.</p>	<p>Partner psychological abuse</p> <p>Breast-feeding over the first weeks of life</p> <p>Mother's age</p> <p>Marital status</p> <p>Education</p> <p>SES</p> <p>Smoking</p> <p>Alcohol consumption</p> <p>Infant sex</p> <p>Birth weight by gestational age</p> <p>Maternal sensitivity</p> <p>Postnatal anxiety</p> <p>Depression</p>	<p>Internalising scores were strongly predicted by prenatal anxiety assessed at 32 weeks of pregnancy. The effects were found to be stronger in females than males, and the three-way interaction prenatal anxiety x maternal stroking x sex of infant was significant for internalising symptoms.</p> <p><b>Measures:</b> All data based on mother reports. Relationships could have occurred due to common method bias.</p> <p><b>Mechanisms:</b> Did not have a measure of maternal sensitivity contemporaneous with maternal reports of their stroking. May also be other maternal characteristics associated with stroking that are not accounted for.</p> <p>The data do not allow determination of what physiological mechanisms account for the observed associations</p>



<b>Van den Bergh &amp; Marcoen (2004)</b>	71 mothers and children recruited from obstetrical consultations in hospital.	<b>Mothers:</b> STAI Postnatal assessment measured at 12-22 weeks and 32-40 weeks pregnancy and at child age 8-9 years.	Parents' educational level Smoking during pregnancy Birth weight Child gender Postnatal maternal trait anxiety	After controlling for covariates prenatal maternal anxiety at 12-22 weeks gestation was significantly associated with self-report anxiety in the 8 and 9-year-old offspring.  No significant associations with maternal anxiety during pregnancy emerged for internalising problems, despite significant correlation of anxiety at 32-40 weeks gestation.	<b>Sample:</b> Small sample and results might be sample specific  <b>Mechanisms:</b> The data do not allow determination of what physiological mechanisms account for the observed associations  No measurement of parenting quality as potential mediator or moderator.
Belgium					
Prospective cohort	Maternal age during pregnancy between 18 and 30 (mean age not reported)	<b>Children:</b> CBCL; STAIC  Assessment reported by mothers and teachers at child age 8-9 years.			
Q=6					

CCEI= Crown Crisp Experiential Index; STAI= State Trait Anxiety Inventory; GAD-Q= Generalised Anxiety Disorder Questionnaire; SCID= Structured Clinical Interview for DSM-IV Diagnoses; CBCL= Child Behavior Checklist; SDQ= Strengths and Difficulties Questionnaire; DAWBA= Developmental and Well-Being Assessment; ADIS-P= Anxiety Disorder Interview Schedule (Parent Version); STAIC= State Trait Anxiety Scale for Children.

**Table 2:** CASP quality review for cohort studies framework scores

	Barker et al. (2011)	de Brujin et al. (2009)	Davis & Sandman (2012)	Garthus-Niegel et al. (2016)	Leis et al. (2014)	Loomans et al. (2011)	Murray et al. (2014)	O'Connor et al. (2002)	O'Connor et al. (2003)	O'Donnell et al. (2014)	Pickles et al. (2016)	Prenoveau et al. (2017)	Sharp et al. (2015)	Van den Bergh & Marcoen (2004)
<b>Did the study address a clearly focused issue?</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>
Is the population clear?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Are the factors studied clear?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Are the outcomes clear?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Is it clear whether the study tried to detect a beneficial or harmful effect?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
<b>Was the sample recruited in an acceptable way?</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>
Was the cohort representative of a defined population?	y	n	n	n	n	n	n	n	n	n	y	n	y	n
Was everybody included who should have been included?	n	n	y	n	y	n	n	n	n	y	y	y	y	y
<b>Was the exposure accurately measured to minimise bias?</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Did they use objective	n	n	n	n	n	n	y	n	n	n	n	n	n	n

measurements?														
Are they valid measures?	y	y	y	Partial	y	y	y	y	y	y	y	y	y	y
Were all the subjects classified into exposure groups using the same procedure?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
<b>Was the outcome accurately measured to minimise bias?</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
Did they use objective measurements?	partial	partial	n	n	partial	partial	y	n	n	n	n	partial	n	partial
Are they valid measures?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Were the measurements methods similar in the different groups?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Have the authors identified and taken into account of all important confounding factors?	y	y	y	y	y	y	n	y	y	y	y	y	y	n
Was the follow up of subjects complete enough?	y	partial	y	y	y	y	y	y	y	y	y	y	y	Partial
Was the follow up of subjects long enough?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
<b>Results</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Were confidence intervals given?	n	n	y	n	n	n	y	y	y	n	n	n	n	n

Are conclusions adequately supported by the results?	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Can the results be applied at population level?	2	0	0	0	2	0	0	0	0	0	2	0	2	0
Total quality score out of 12	9	5	8	6	7	6	7	7	7	7	10	7	11	6

**The Impact of Maternal Perinatal Anxiety on Mother-Infant  
Interaction at 6-Months Postpartum and Children's Emotional  
Problems at Age Three Years**

**The following paper has been prepared for submission to 'European Child  
and Adolescent Psychiatry'. The guidelines for authors can be found in  
Appendix A**

## **ABSTRACT**

Maternal anxiety is common but often neglected in the perinatal mental health research literature. Thus, the impact of maternal perinatal anxiety on children's emotional development has received little robust research attention. The study examined the role of antenatal and postnatal anxiety on children's emotional functioning at age three years. A sample of 186 women and their first-born children were followed from pregnancy to age three years postpartum. Mothers completed anxiety measures during their third trimester of pregnancy and again at 6 months postpartum. At 6 months, maternal care-giving behaviour was assessed using observations of a four-minute mother-infant interaction task. At three years, the Child Behaviour Check List (CBCL) was administered to mothers, fathers and another family member to assess for children's emotional problems. Results indicated that maternal antenatal anxiety and postnatal depression independently predicted higher reported emotional problems in children at age 3 years after controlling for postnatal anxiety and antenatal depression symptoms. Postnatal depression was found to partially mediate the association between antenatal anxiety and children's emotional problems. Antenatal anxiety was associated with elevated maternal negative affect at 6 months postpartum. However, the association between antenatal anxiety and children's elevated emotional problems at age 3 was not explained by maternal negative affect at 6 months postpartum. These data suggest that children's emotional problems are adversely affected by maternal antenatal anxiety and postnatal depression. This has implications for targeting intervention or prevention in the antenatal period to prevent adverse emotional outcomes in children.

**Keywords:** *Perinatal, Maternal Anxiety, Mother-Infant Interaction, Child, Emotion, Development*

## INTRODUCTION

### **Maternal perinatal anxiety and children's emotional problems**

Although emotional problems are observed in young children, they have received less research attention compared to behavioural problems in early childhood. A possible reason for this difference is that child behavioural problems are more disruptive in nature, whereas children with emotional problems are often perceived as being less demanding for parents and teachers [1], and therefore may often go unnoticed. However, behavioural problems could be a manifestation of emotional problems and for many children, both emotional and behavioural problems are persistent, and often lead to more severe mental health issues, and more specific diagnoses as the children grow older [e.g 2]. Comorbidities within childhood, such as between anxiety and depression, are also prevalent. Up to 70% of children with depression also suffer from anxiety, and anxiety tends to precede the occurrence of depressive symptoms [3,4]. There is variability within the child developmental literature as to how emotional problems are defined. Within empirical studies researchers often use terminology that corresponds to the measures utilised. The most common measures of emotional problems in early childhood include emotional reactivity, anxious/depressed, somatic complaints and withdrawn symptom scores [5]. The term 'emotional problems' will be used in this paper to encompass this variability. Research of emotional and/or behavioural problems indicates that those children who experience emotional problems from a very early age are at greater risk for more severe problems later in development than are those who exhibit emotional symptoms later [6].

A recent systematic review [7] on the impact of maternal anxiety, experienced in the perinatal period, on children's emotional outcomes found that evidence exists for an effect of antenatal maternal anxiety on child emotional problems [8-20]. This review also found preliminary evidence for the impact of postnatal anxiety on children's emotional problems [8,10,14,15,21]. However, the limited number of studies measuring anxiety in the postnatal period made this an unreliable conclusion. Whilst the findings of this review indicate that exposure to both maternal antenatal and postnatal anxiety has an adverse impact on child emotional outcomes, the evidence

appears stronger for antenatal than postnatal anxiety. The review highlighted a number of methodological limitations across the 14 included studies including shared method variance, which could lead to mothers with elevated symptoms of anxiety and depression over- or misreporting their child's emotional experience. Furthermore, there was a general lack of consideration for potential mechanisms that underpin the associations between exposure to maternal perinatal anxiety and adverse offspring emotional problems, for example, parenting style or subsequent/comorbid maternal mental health difficulties.

### **Impact of maternal antenatal anxiety on subsequent mental health difficulties**

Depression experienced in the perinatal period may be secondary to anxiety, due to altered physiological pathways or the psychological effects of failing to cope with stress [22]. Anxiety is common and often co-morbid with depression [23] but often neglected in studies of the perinatal period [24, 25]. Anxiety experienced during pregnancy has been shown to be a strong predictor of antenatal depression [26] and postnatal depression [27-30]. Heron, O'Connor, Evans, Golding and Glover [22] looked at a community sample of women and found that anxiety in pregnancy was associated with a substantial increased likelihood of postnatal depression, even after controlling for antenatal depression. Thus, in any study of the impact of maternal perinatal anxiety on children's emotional development, the effects of antenatal and postnatal depression need to be controlled for. Given the impact and role of maternal anxiety has been relatively neglected during the perinatal period and the high comorbidity between depression and anxiety, it is possible that the well-documented adverse impact of perinatal depression on children's development could in part be attributed to the adverse effects of perinatal anxiety. The mechanisms of action need to be better understood to ensure appropriate intervention.

### **Impact of maternal anxiety on parenting behaviour**

Early in life, infants are completely dependent on their caregivers, the infant-caregiver relationship is vital for healthy development [31, 32] and the interaction can be affected by maternal anxiety. Mothers with generalized anxiety disorder (GAD) have been found to be less



responsive than non-anxious mothers during interactions with their 10-month old infants, especially when a ruminating style of thinking was induced [33]. In interaction with older children, aged 7–12 years, mothers with anxiety interact more intrusively and less warmly with their children, effects that were moderated by the child's expression of anxiety and mediated by the mother's experience of negative emotions [34]. Higher ratings of maternal sensitivity and dyadic coordination in infancy are associated with increased behavioural and physiological regulation [35, 36]. Mothers experiencing anxiety have also been shown to demonstrate more insensitive behaviours compared to non-anxious controls [37]. As a result, infants of mothers with anxiety might frequently receive insufficient regulatory scaffolding. This dysregulation might contribute to the increased risk for the development of emotional problems in infants of mothers experiencing anxiety [38]. Generally, there have been relatively few studies that have assessed maternal behaviour in the context of maternal anxiety.

In a study on depressed mothers and their three-month-old infants [39], findings show that mothers with high anxiety scores interacted more intrusively and less positively. In another study [40] in which mothers scoring high in depressive symptomatology were removed, mothers who were more anxious showed less sensitivity and emotional vocalizations in their interactions with their 10- to 14- month-old infants, suggesting that the observed differences in mother-infant interaction were due to anxiety.

The current research aims to build on the existing literature for the impact of perinatal anxiety on children's emotional problems and to improve methodological rigour by accounting for shared method variance and incorporating parenting style and gender differences into analyses to assess for mechanisms of effect. The aim of the present paper is to test the following hypotheses: (1) do children whose mothers are anxious in pregnancy display higher levels of emotional problems at age three; (2) do children whose mothers are anxious in the postnatal period display higher levels of emotional problems at age three; (3) do mothers who are anxious in pregnancy and/or the postnatal period display poorer quality mother-infant interactions at six-months; and (4) are the effects of antenatal anxiety on children's emotional outcomes explained by later exposure to maternal depression and/or parenting style.

## **METHODS**

### **Participants**

The present study was embedded within the Cardiff Child Development Study (CCDS), a prospective longitudinal study of firstborn children. Women were recruited from antenatal clinics in hospitals and general medical practices across two National Health Service (NHS) Health Boards in Wales, UK. The CCDS obtained ethical approval from the NHS Multi-Centre Research Ethics Committee and the current study obtained ethical approval from the Cardiff University School of Psychology Research Ethics Committee (see appendix C). The research team ensured the sample was as representative as possible by including recruitment through a specialised midwifery team designed to support women at high social risk. Families who expressed an interest in participating provided contact details and were contacted by telephone to arrange a date for the initial interview, which was scheduled for the third trimester of pregnancy. Both study participants and those who chose not to participate represented the entire range of sociodemographic categories associated with UK postcodes.

Of the 332 families who took part during pregnancy, 301 participated in the assessment at a mean of 6.6 months (SD 0.9) postpartum (hereafter referred to as wave 2). Assessment at this wave consisted of a semi-structured clinical interview with parents, the completion of standardised questionnaires, assessments of infant emotion and behaviour, and observations of parent-child interaction across a range of developmentally appropriate tasks. At the postnatal assessment one parent was interviewed by telephone, eight provided questionnaire data only, six families had withdrawn from the study, four failed to keep appointments, eight could not be traced within the time window, and four could not be assessed due to ill health or adverse family circumstances. Reasons given by families for not participating at wave 2 were that they did not wish for their child to be video recorded or they found the procedures too much of a time commitment. The sociodemographic characteristics of the full CCDS sample, those included at wave 2 and the current study sample are displayed in table 1.

*Table 1: Sociodemographic characteristics of participants at Wave 1, Wave 2 and the current study sample*

	Wave 1: Full CCDS sample (n=332)		Wave 2 (n=301)		Study sample (n=186)	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Maternal age at birth	26.39 (7.18)	16-42	28.09 (6.25)	16-42	29.4 (5.39)	16-40
Social class, % working class rather than middle class (n)	49.7% (163)		45.8% (138)		37.1% (69)	
Maternal low education, % with less than 5 GCSEs or equivalent, (n)	21.7% (72)		20% (60)		13.4% (25)	
Maternal ethnicity, % not British or Irish (n)	7.3% (23)		13.1% (23)		9.1% (15)	
Maternal marital status at wave 1, % unmarried, (n)	49.7% (165)		45.5% (137)		37.1% (69)	
Not in a stable relationship at wave 1, % unmarried, (n)	9.6% (32)		8.6% (26)		4.8% (9)	
Infant gender, % female, (n)	43.3% (142)		43.9% (132)		46.2% (86)	

The wave 2 parent-infant observational tasks analysed in the present research included both the 'Free Play' and 'Activity Board' tasks. Of the 301 families who participated at wave two, 271 participated in the 'Free Play' task and 279 participated in the 'Activity Board' task. Missing data was due to lack of time available to complete the task, equipment problems, the family's wish to discontinue the assessment or the infant being too distressed or restless to participate. As one of the core aims of this research was to examine mother-infant interaction in the context of perinatal anxiety, families where the father or another family member completed the observational tasks are excluded from the current analysis ( $n=10$ ).

Comparisons were made between study participants and those who provided data at wave 2 but were unable to be followed up for the current sample due to missing data (excluded participants). Excluded participants differed significantly from those in the current sample on maternal age at birth ( $F=24.89$ ,  $p<.001$ ), social class ( $\chi^2 = 15.014$ ,  $p<.001$ ) education ( $\chi^2 = 12.859$ ,  $p<.001$ ), marital ( $\chi^2 = 13.912$ ,  $p<.001$ ) and relationship status ( $\chi^2 = 8.904$ ,  $p<.01$ ) Excluded mothers were older in age, from a lower social class, had lower educational attainment and were more likely to be unmarried or not in a stable relationship at time of assessment.

Included and excluded participants did not differ significantly on ethnicity or infant gender. There were no significant differences on antenatal anxiety, postnatal anxiety or postnatal depression scores between participants included at wave 2 and the current sample. However, mothers excluded from the current sample were more depressed during pregnancy ( $F= 8.882, p=.003$ ) compared to those included. 272 families (82%) participated in the assessment in early childhood (wave 5). Infants in this wave had a mean age of 33.6 months (SD 2.5). The final number of participants with complete data available at each of the three time-points was 186.

## **Procedure**

### *Wave 1: Home visit during pregnancy*

Mothers completed the Adult Wellbeing Scale [41] during the third trimester of pregnancy. Mothers also completed a questionnaire that captured demographic information including their educational history, occupation, relationship status, and living circumstances. Informed consent was obtained prior to commencing the assessment.

### *Wave 2: Early infancy home visit*

Families assessed at wave one were followed up at a target age of 6 months (Mean = 6.55 months, SD = 0.82). The home visit included a second administration of the Adult Wellbeing questionnaire and a four-minute observation of the primary daytime caregivers (88% mothers) interacting with the infant. Informed consent was obtained for these observations to be video-recorded for later analysis. Two mother-infant interaction tasks were used for the current research: free play in which mothers were encouraged to play a game they might normally play with their infant and a topic-sharing task using a commercial activity board. The activity board depicted cartoon animals, on separate flaps like in a book. The mother was asked to show the infant the toy and take them through the pictures. Mother-infant interactions were digitally recorded across both tasks.

### *Wave 5: Early childhood assessment*

Families were invited to participate in the early childhood assessment at a target age of 33 months (Mean = 34.94, SD = 5.85). Parents were asked to complete the Child Behaviour Check List for toddlers [CBCL: 5] as part of a battery of questionnaires.

## **Measures**

### *Antenatal and postnatal anxiety*

Information about the mothers' anxiety was obtained by questionnaire in pregnancy and at the early infancy home visit, using the Adult Wellbeing Scale. This scale was originally known as the Irritability, Depression, Anxiety Scale [IDA; 42, 43]. The IDA was developed as a clinical self-assessment scale for measuring anxiety and has been widely used by the UK Department of Health [44] as the Adult Wellbeing Scale in the Family Assessment Framework throughout the UK [41]. The anxiety subscale comprised of five questions: "I feel tense or 'wound up'"; "I can sit down and relax quite easily"; "I have an uncomfortable feeling like butterflies in the stomach"; "I get scared or panicky for no very good reason"; and "I can go out on my own without feeling anxious". Possible responses on the anxiety subscale included 'yes definitely' (3), 'yes sometimes' (2), 'no not much' (1) and 'no, not at all' (0) with two questions requiring reverse scoring. Continuous scores and two categorical variables that identified mothers scoring in the top quartile for antenatal and postnatal anxiety were used in the analyses. The validation of the Adult Wellbeing Scale was tested on both clinical and non-clinical samples comparing self-assessments with diagnostic clinical interviews. The resulting reliability correlations for the anxiety subscale ranged between .74 and .87 [42, 43].

### *Mother-infant interaction*

The observation task at 6 months was used to assess parenting behaviour through mother-infant interaction. The two tasks used for the present research (Free Play and Activity Board) were coded using an adapted version of the Qualitative Ratings for Parent-Child Interaction at 3-15 Months of Age coding scheme [45] which was adapted from The NICHD Study of Early Child Care Mother-Infant Interaction Scales [46]. The scheme consisted of seven parent codes and one

dyadic code. Parent codes included: sensitivity/responsiveness; intrusiveness; detachment/disengagement; positive regard for the child/positive affect; negative regard for the child/negative affect; animation; and stimulation of development. The dyadic code measured dyadic mutuality. The construct of dyadic mutuality assessed the synchronism of the interaction and the degree of shared experience between mother and child. All codes were rated on a 5-point rating scale (ranging from 1 *not at all characteristic* to 5 *highly characteristic*). Comprehensive definitions of each construct and each point on the scale were detailed in the coding manual. The researcher received training and supervision on the coding scheme and in each task the coder was blind to all information pertaining to maternal mental health, social risk factors and child emotional outcomes. An independent rater coded a random sample of 25 videos for the purposes of establishing reliability. Intra-class correlations for the coders are displayed in table 2. Good reliability was established across all subscales. Any conflicting codes identified were discussed and agreement reached for the final scores used in the analysis.

*Table 2: Intra-class correlations for the interrater reliability of mother-infant interaction*

Sensitivity	Intrusiveness	Detachment	Positive affect	Negative affect	Animation	Stimulation of development	Dyadic mutuality
.86	.89	.86	.82	.85	.80	.83	.90

#### *Children's emotional outcomes*

The Child Behaviour Check List (CBCL) for toddlers [5] was administered to mothers, fathers and another family member during early childhood (wave 5). The CBCL is a standardised questionnaire which requires the informant to rate the child in terms of 99 behavioural and emotional problem items. Each item can be scored as 0 (Not True), 1 (Somewhat or Sometimes True) or 2 (Very True or Often True). The items are grouped to form clusters of emotional and behavioural problems described as 'syndromes'. For the purposes of the current study the emotionally reactive and anxious/ depressed syndrome scores were combined to give a measure of children's emotional problems. A total possible score for emotional problems was 34. Informants' ratings were significantly correlated on the emotional problems scale ( $r = .259, p < .001$  between mothers and fathers;  $r = .308, p < .001$  between mothers and third informant; and  $r$

= .253,  $p < .001$  between fathers and third informant). Scores from the three informants were combined to create a composite factor score for emotional problems.

## **Covariates**

### *Sociodemographic adversity*

Principle components analysis (PCA) was used to create a general index of children's exposure to maternal factors known to be associated with risk for social adversity. The maternal experiences that contributed to this index were as follows: (a) the mother being 19 years of age or under at the time of the child's birth; (b) the mother not having achieved basic educational attainments (i.e. the mother having no qualifications or fewer than five GCSEs or equivalent attainments); (c) the mother not being in a stable couple relationship during the pregnancy; (d) the mother not being legally married during the pregnancy; and (e) the mother's occupation being classified as working class according to the Standard Occupational Classification 2000 [SOC2000; 47]. The PCA was based on the polychoric correlation matrix due to the items being categorical. The PCA confirmed that all these items contributed to a single component (eigenvalues 3.84 and 0.68 for the first and second component extracted, respectively); this component explained approximately 77% of the shared variance in these risk indicators. Summary scores derived from this PCA were used as a proxy for the family's exposure to socioeconomic adversity.

### *Maternal antenatal and postnatal depression*

Symptoms of depression experienced during pregnancy and in early infancy were assessed with the depression subscale of the Adult Wellbeing Scale [42 -44]. As with the anxiety subscale, the depression subscale consists of five questions and scores on each question range from 0 to 3. The validation of the Adult Wellbeing Scale was tested on both clinical and non-clinical samples comparing self-assessments with interviews, the resulting reliability correlations for the depression subscale ranged between .72 and .81 [42, 43].

## **Data Analysis**

A complete data set was available for 186 cases. Pearson's correlations were performed to examine relationships between maternal anxiety measures, child emotional outcomes and associated risk factors. A hierarchical regression was performed on children's emotional outcomes. Possible covariates (including antenatal and postnatal depression and adversity) were controlled for where appropriate. Multivariate mediation analyses were conducted using the PROCESS method [48] to examine the hypothesised mechanisms. As standard statistical techniques assume normal sampling distributions, bootstrapping was used to estimate standard errors which are robust to deviations from normality [49]. Bias corrected and accelerated bootstrap standard errors, based on 5000 bootstrap samples, were estimated.

## **RESULTS**

### **Descriptive Analyses**

Mean maternal age for the study sample was 29.4 (SD=5.39) years. Approximately 37% of mothers were from a working class background, 13% had a low educational attainment, and 9% did not consider themselves British or Irish. 37% were married, with 5% not being in a stable relationship during pregnancy. CCDS participants who did not have complete data available for the current study were older in age ( $F=38.872, p<.001$ ), from a lower social class ( $\chi^2 = 23.686, p<.001$ ), had lower educational attainment ( $\chi^2 = 32.263, p<.001$ ) and were more likely to be unmarried ( $\chi^2 = 26.869, p<.001$ ) or not in a stable relationship ( $\chi^2 = 11.188, p=.001$ ); these differences were statistically significant. Included and excluded participants did not differ significantly on ethnicity. Therefore, the current sample underrepresents women with social risk. Mothers gave birth to fewer girls (46%) than boys in the current sample. Attrition analyses revealed that women included the study were less anxious ( $F = 6.685, p=.01$ ) and less depressed ( $F = 14.483, p<.001$ ) in the antenatal period but there were no significant differences in postnatal anxiety or postnatal depression scores between included and excluded participants.



## Antenatal Anxiety, Postnatal Anxiety and Children's Emotional Problems: Descriptive Statistics

Table 3 and 4 report descriptive data for the main variables included in the current study. Mothers participating in the study were assessed for symptoms of anxiety both during pregnancy and at six months postpartum. Women were categorised as either 'high anxiety' or 'low anxiety' at each time-point; the top quartile of scores were assigned to the 'high anxiety' group. There were significant differences between groups on all main variables including in the current study. There were no significant differences between infant gender on scores of antenatal and postnatal anxiety and child emotional outcomes. Therefore, gender differences were not assessed in further analyses.

*Table 3: Comparison of descriptive data between antenatal anxiety groups*

	<b>Low Antenatal Anxiety Group (n=131)</b>		<b>High Antenatal Anxiety Group (n=55)</b>	
	Mean score (SD)	Range	Mean (SD)	Range
Maternal Antenatal Anxiety	1.90 (1.39)	0-4	6.47 (1.62)	5-11
Maternal Postnatal Anxiety	2.60 (1.99)	0-8	5.73 (2.64)	1-12
CBCL Emotional Problems	3.09 (2.08)	0-11	4.88 (2.70)	0-13

*Table 4: Comparison of descriptive data between postnatal anxiety groups*

	<b>Low Postnatal Anxiety Group (n=126)</b>		<b>High Postnatal Anxiety Group (n=60)</b>	
	Mean score (SD)	Range	Mean (SD)	Range
Maternal Antenatal Anxiety	2.41 (2.02)	0-8	5.00 (2.69)	0-11
Maternal Postnatal Anxiety	2.05 (1.39)	0-4	6.62 (1.77)	5-12
CBCL Emotional Problems	3.06 (2.07)	0-10.5	4.79 (2.68)	0-13

Descriptive statistics for the mother-infant interaction subscales are displayed in table 5. Overall, as the ranges and standard deviations illustrate, there was low variability amongst participants on all scales of the mother-infant interaction coding scheme.

*Table 5: Descriptive data for the mother-infant interaction data*

	Mean score	Standard Deviation	Range
Maternal Sensitivity	4.45	0.78	2-5
Maternal Intrusiveness	1.22	0.55	1-5
Maternal Detachment	1.26	0.58	1-4
Maternal Positive Affect	4.20	0.88	1-5
Maternal Negative Affect	1.12	0.37	1-3
Maternal Animation	4.28	0.84	1-5
Maternal Stimulation of Development	4.04	0.90	1-5
Dyadic Mutuality	4.09	0.86	1-5

**Do children whose mothers are anxious in pregnancy display higher levels of emotional problems at age three (hypothesis one) and do children whose mothers are anxious in the postnatal period display higher levels of emotional problems at age three? (hypothesis two)**

Mothers in the high antenatal anxiety group differed significantly on antenatal anxiety scores ( $F = 379.25, p < .001$ ), postnatal scores ( $F = 78.31, p < .001$ ) and emotional problem scores ( $F = 26.57, p < .001$ ) compared to mothers in the low antenatal anxiety group. Similarly, mothers in the high postnatal anxiety group differed significantly on antenatal anxiety scores ( $F = 53.53, p < .001$ ), postnatal scores ( $F = 367.69, p < .001$ ) and emotional problem scores ( $F = 24.24, p < .001$ ) compared to mothers in the low postnatal anxiety group.

Correlations between antenatal and postnatal anxiety symptoms and child emotional problems and potentially confounding variables included in the study are displayed in table 6. Maternal antenatal anxiety symptoms are significantly positively correlated with children's emotional problems ( $r = .333, p < .01$ ). Maternal postnatal anxiety was also significantly positively correlated with child emotional problems ( $r = .385, p < .01$ ). A multiple regression analysis tested for the effect of antenatal anxiety on children's emotional problems whilst controlling for the influence of postnatal anxiety. When antenatal anxiety was entered in the first step it significantly

predicted children's emotional problems ( $\beta = .333, p < .001$ ). When anxiety in the postnatal period was added into the model, antenatal anxiety remained significant ( $\beta = .175, p = .026$ ) with postnatal anxiety also found to be a significant predictor of children's emotional problems ( $\beta = .289, p = .003$ ). Thus, both maternal antenatal anxiety and postnatal anxiety are independent predictors of children's emotional problems.

**Do disturbances in mother-infant interaction in infancy explain the relationship between perinatal anxiety and children's emotional problems? (hypothesis three)**

At six months postpartum maternal negative affect was positively correlated with antenatal anxiety ( $r = .174, p < .01$ ). No significant associations were found between antenatal anxiety and any other mother-infant interaction subscales. Postnatal anxiety was not associated with any mother-infant interaction subscales. A multivariate analysis of variance (MANOVA), including all subscales of mother-infant interaction established that the overall effect of antenatal anxiety group (Wilks  $\lambda F(8,177) = 1.806, p = .079$ ) and postnatal anxiety group (Wilks  $\lambda F(8,177) = .966, p = .629$ ) on mother-infant interaction were not significant. Therefore the null hypothesis was accepted.

Table 6: Pearson's correlation coefficients for main study variables

	Maternal AnteAnx	Maternal PostAnx	Maternal AnteDep	Maternal PostDep	CBCL Emotional Problems	MII Maternal Sensitivity	MII Maternal Intrusiveness	MII Maternal Detachment	MII Maternal Positive Affect	MII Maternal Negative Affect	MII Maternal Animation	MII Maternal Stimulation of Development	MII Dyadic Mutuality	Adversity
Maternal AnteAnx	1													
Maternal PostAnx	0.546**	1												
Maternal AnteDep	0.552**	0.365**	1											
Maternal PostDep	0.342**	0.590**	0.424**	1										
CBCL Emotional Problems	0.333**	0.385**	0.242**	0.378**	1									
MII Maternal Sensitivity	-0.084	0.042	-0.096	-0.132*	-0.016	1								
MII Maternal Intrusiveness	0.057	-0.046	0.158*	0.118	-0.021	-0.436**	1							
MII Maternal Detachment	0.63	0.039	0.067	0.098	0.058	-0.670**	0.075	1						
MII Maternal Positive Affect	-0.049	0.054	-0.087	-0.115	0.002	0.772**	-0.294**	-0.573**	1					
MII Maternal Negative Affect	0.174**	0.070	0.220**	0.222**	0.117	-0.524**	0.534**	0.286**	-0.423**	1				
MII Maternal Animation	0.023	0.085	-0.016	-0.008	-0.009	0.647**	-0.122*	-0.571**	0.804**	-0.176**	1			
MII Maternal Stimulation of Development	-0.047	0.077	-0.039	-0.052	-0.035	0.711**	-0.291**	-0.541**	0.714**	-0.355**	0.673**	1		
MII Dyadic Mutuality	0.041	0.119	0.017	0.001	0.068	0.704**	-0.430**	-0.439**	0.664**	-0.389**	0.575**	0.6323**	1	
Adversity	0.237**	0.110	0.183**	0.267**	0.099	-0.164*	0.129*	0.120	-0.196**	0.096	-0.49	-0.156*	-0.152*	1

Note: AnteAnx = Antenatal Anxiety; PostAnx = Postnatal Anxiety; AnteDep = Antenatal Depression; PostDep = Postnatal Depression; MII = Mother-Infant Interaction

\*\* Correlation is significant at the 0.01 level (1tailed); \* Correlation is significant at the 0.05 level (1 tailed) Bootstrapped results are based on 5000 samples

# **Are the effects of antenatal anxiety on children's emotional outcomes explained by later exposure to maternal depression (hypothesis 4)**

A series of hierarchical regression analyses were used to test the effect of perinatal anxiety on children's emotional problems whilst controlling for the identified covariates. To control for the effect of antenatal and postnatal depression and adversity, these scores were added into the model. Adversity and antenatal depression were found not to be significant predictors of emotional problems so were removed from the final model (Table 7)

*Table 7: Hierarchical Regression Analysis Predicting Child Emotional Problems at 3 years (N=186)*

Covariates and predictors		Unstandardised coefficients		$\beta$	Sig.	Confidence intervals	
		<i>B</i>	<i>SEB</i>			Lower	Upper
Step 1: Covariates							
Constant		-.449	.091		.000	-.627	-.293
Postnatal anxiety		.063	.021	.248**	.004	.024	.107
Postnatal depression		.075	.028	.232**	.010	.020	.137
R <sup>2</sup> for Step 1	.183***						
Step 2: Predictors							
Constant		-.449	.091		.000	-.627	-.293
Postnatal anxiety		.041	.024	.159	.091	-.003	.088
Postnatal depression		.073	.028	.227*	.011	.019	.134
Antenatal anxiety		.044	.020	.169*	.028	.004	.086
$\Delta R^2$ for Step 2	.190*						
$F_{\text{Model}}$	15.4***						

$p < .05^* \quad p < .01^{**} \quad p < .001^{***}$

As can be seen in table 7, after controlling for the effects of postnatal anxiety and postnatal depression, antenatal anxiety remains a significant predictor of children's emotional problems at age 3 years. Postnatal depression also remained a significant independent predictor of emotional problems. The proportion of the variance explained by these predictors was significant (19%). Postnatal anxiety was no longer found to be a predictor of child emotional outcomes after controlling for postnatal depression despite a significant correlation (see Table 6).

## Direct and indirect effects of antenatal anxiety on children's emotional problems with postnatal depression as a potential mediator

Given the finding that postnatal depression remains a significant predictor of child emotional problems after controlling for confounding variables, further mediation analyses were conducted to explore whether postnatal depression mediates the relationship between antenatal anxiety and children's emotional problems. As shown in table 8 there is a significant indirect effect of antenatal anxiety through postnatal depression on children's emotional problems ( $\beta=.0269$ ,  $p<.05$ ). This represents a medium effect ( $R_M = .3329$ ,  $BCa\ CI=.0133, .0470$ ). The direct effect remained significant ( $\beta=.0606$ ,  $p<.05$ ) but was reduced from the total effect ( $\beta=.0876$ ,  $p<.05$ ). Thus, the effect of antenatal anxiety on children's emotional problems is partially mediated by postnatal depression.

Table 8: *Direct and Indirect Effects of Postnatal Anxiety on Child Emotional Problems with Postnatal Depression as a potential mediator.*

	Unstandardised coefficients		Confidence intervals	
	<i>B</i>	<i>SEB</i>	Lower	Upper
Constant	-.4888*	.09	-.66	-.32
Postnatal depression (b)	.0965*	.02	.05	.14
Antenatal anxiety	.0606*	.02	.02	.10
Direct and indirect effects				
Direct effect (c)	.0606*	.02	.02	.10
Indirect effect (ab)	.0269*	.01	.01	.05

\*denotes significance at  $p<.05$  based on 5000 bootstrapped samples, significance is determined if the confidence intervals do not cross zero.

## DISCUSSION

The current study found that anxiety experienced in the antenatal and postnatal period was related to increased emotional problems, as reported by mothers, fathers and significant others, in their three year old children. However, when the effects of maternal depressive symptoms were accounted for, postnatal anxiety did not independently predict child emotional problems. Antenatal anxiety and postnatal depression were both independent predictors of children's emotional problems after accounting for postnatal anxiety and antenatal depression. Further,

postnatal depression was found to partially mediate the relationship between antenatal anxiety and children's emotional outcomes. In contrast to past research findings, neither antenatal anxiety nor postnatal anxiety were found to be significantly related to any parenting behaviours. Similarly there were no significant differences found between boys and girls.

Several features of the results for perinatal anxiety deserve attention. The first is that, as shown in a recent systematic review [7], the evidence is stronger for the adverse effects of antenatal anxiety on child emotional outcomes, over and above the effects of postnatal anxiety. Despite the finding that postnatal depression mediated the effect of antenatal anxiety on child emotional problems this was only a partial mediation, which confirms that there is something salient to maternal anxiety in pregnancy that is not fully accounted for by postnatal mood. The second key feature is that the findings in the current study could not be further explained by parenting behaviour. There is extensive evidence that maternal depression has a negative impact on parental emotional scaffolding [50], which predicts child emotional dysregulation [51]. However, results from maternal anxiety studies are more limited and mixed [10]. These results extend previous research and may add support to the emerging fetal programming hypothesis that adverse experiences during sensitive periods of antenatal development have negative consequences on later child emotional, cognitive and behavioural development [15, 16, 20]. Thus, children could be predisposed to developmental difficulties, including emotional problems, if they are exposed to maternal anxiety in the antenatal period.

### **Strengths and limitations**

Several strengths of the current study are worth highlighting. Data was drawn from a prospective longitudinal study that began in pregnancy and followed participants up for three years. The sample size of 186 mother-infant dyads included in the study is a considerable strength, which gives credibility to the findings. This allows greater generalizability to the findings, especially given that the sample has reasonable sociodemographic diversity. The inclusion of robust cross-informant measures of childhood emotional problems based on standardised clinical scales were used, which offers greater objectivity in the measurement of emotional problems than basing

scores on just one informant. Although further observational data of childhood emotional functioning would have provided more robust findings, the CBCL offers a practical way to obtain data that minimises the time-intensity of the assessment process for families and is a widely used tool across the child development literature.

The present results should be interpreted in the context of some limitations. Sample attrition was not completely random; women who were younger, less well educated, working class, unmarried or not in a stable relationship and more anxious in the antenatal period were less likely to participate in the follow-up measures. Therefore, the current sample may underrepresent women at most risk or under-estimate the true effect. The current analyses looked at symptom scores of maternal anxiety and emotional problems in children and did not focus on those with scores in the clinical range as assessed by standardised clinical interviews. Anxiety was measured at only one time-point in the antenatal and postnatal periods. Therefore, it was not possible to investigate whether there were any critical periods during pregnancy (e.g. by trimester of pregnancy) or the postnatal period, which are more sensitive for the development of children's emotional problems. Whilst every effort was made to minimise the impact of observation, it is possible that the observation of mothers and infants may have altered the way in which they interacted with each other, which contributed to the null findings. Finally, the current study was not able to confirm causal effects from an observational study design. Perinatal studies lack the experimental leverage to show causal associations between perinatal anxiety and child outcomes. It would be unethical to induce anxiety in pregnancy, and treatment trials for reducing prenatal anxiety are so far fairly limited [52]. Further, the inclusion of physiological measures (e.g. level of cortisol in the mother) was not possible in the current sample but would have enabled the testing of the assumed causative role in fetal programming.

### **Future research**

Future research should contrast the present results with those that examine the role of timing (i.e. onset, chronicity, and occurrence) and severity of antenatal anxiety and whether anxiety met diagnostic criteria relative to high symptoms alone. Whilst the sample size was big enough to



draw some tentative conclusions, future research should aim to replicate with larger samples of women who are anxious in the antenatal and postnatal period. Although the current study looked at associations between maternal perinatal anxiety and child emotional problems at age three years, future research should consider how these associations might vary at different stages of childhood. Further research is needed to clarify the mechanisms that effect the relationship between antenatal anxiety on child emotional problems above and beyond postnatal depression and parenting. The potential role of parenting needs further exploration, especially given that the overall rates of emotional problems in the sample were low and so this may have had an impact on the results. Further, there is a body of literature, which focuses on the impact of maternal perinatal mental health on infant temperament [e.g. 53-55], thus infant temperament should be explored as a potential mediator or moderator in perinatal research.

### **Clinical implications**

Findings of the current study reveal that antenatal anxiety and postnatal depression represent separate risks for children's emotional problems. However, the relationship between antenatal anxiety and children's emotional problems is partially mediated by postnatal depression. As past research indicates, antenatal anxiety is a risk factor for postnatal depression [22, 27-30] and subsequently both are risk factors for adverse child emotional outcomes [e.g. 8-18, 56, 57]. These potential risk factors can be ascertained during routine pregnancy care and it is therefore important that perinatal healthcare providers and women themselves are educated about these risks. It is highly probable that many women may have experienced symptoms of anxiety but not view these feelings as harmful but rather a normal consequence of pregnancy. However, an increased awareness of the impact of maternal mood in pregnancy and asking mothers how they feel could be advantageous. Furthermore, researchers may have overemphasised the role of postnatal depression on child development and underestimated the effects of antenatal anxiety. Thus, current findings indicate that anxiety experienced in the antenatal period should be a focus of attention in perinatal services, especially as it may have a direct effect on the fetus or predict later exposure to postnatal depression. The finding that perinatal anxiety is not related to parenting style further emphasises that the target of intervention or prevention is crucial in the

antenatal period. These findings are in line with current policy guidelines including the cross party manifesto produced by the government: '1001 critical days: The Importance of the Conception to Age Two Period' [58] which stipulated the need for a tiered approach to evidenced based intervention aimed at promoting holistic services for mothers experiencing mental health difficulties to ensure optimal infant well-being. The NICE clinical management and service guidance for antenatal and postnatal mental health [31] promotes early detection and good management of mental health difficulties to improve women's quality of life during pregnancy and in the first year after birth. The findings from the current study contribute to the better understanding of the effect of anxiety in the perinatal period and the mechanisms by which perinatal anxiety adversely affects child development and will greatly inform the successful implementation of the policy guidance.

## **CONCLUSIONS**

In conclusion, the present results highlight that maternal antenatal anxiety and postnatal depression have adverse effects on children's emotional problems at age three years. Furthermore, the effect of antenatal anxiety is partially mediated by the effects of postnatal depression. However, the exact mechanisms underlying these effects are not entirely clear and in the current study parenting assessed at six months postpartum appears to play no role in the relationship between antenatal anxiety and children's emotional problems. Nevertheless, the current research emphasises the importance of early and if necessary sustained intervention for mothers who are at risk for anxiety and depression in the perinatal period as this may be the most efficient manner to prevent adverse emotional outcomes for children.

**The authors declare that they have no conflict of interest**

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**A Reflective Paper on the process of completing a Doctorate in  
Clinical Psychology Research Project**

**Word count: 9,986**

## INTRODUCTION

The following paper presents a critical appraisal of the research conducted within the current thesis. The appraisal will comprise a critical evaluation of the development, implementation and interpretation of the systematic literature review and empirical study respectively. The strengths and limitations will be discussed alongside the consideration of work that was deliberated but not done. Critical reflections of the research process as a whole will also be presented.

### **Paper 1: Systematic literature review**

#### *Rationale for the topic*

There has been an expansion of research examining the impact of maternal mood during pregnancy on offspring development. Research and clinical focus has largely focused on the effects of postnatal depression on women, children and families (Murray & Cooper, 1997; O'Hara & McCabe, 2013) and more recently the impact of depression during pregnancy and the continuity between antenatal and postnatal depression (Heron, O'Connor, Evans, Golding & Glover, 2004; Pawlby, Hay, Sharp, Waters & O'Keane, 2009; Waters, Hay, Simmonds & van Goozen, 2014). Symptoms of anxiety during the perinatal period have often been overlooked despite their ability to disrupt mother-infant bonding and attachment formation (Barnett & Parker, 1986; Dawson, Ashman & Carver, 2000). Therefore, anxiety may be as significant a risk for adverse child outcomes as depression symptoms and warrants further investigation.

The aim of the systematic review was to focus on pregnant women's maternal mood and the implications for child development. The public health and clinical consequences of this line of research for child mental and physical health is now attracting considerable attention (O'Connor, Monk & Fitelson, 2014). Glasheen, Richardson and Fabio (2010) conducted a systematic review to evaluate the evidence for the association between postnatal maternal anxiety and children's outcomes categorised across three domains: somatic, developmental, and psychological



outcomes. This systematic review included 18 studies which met their inclusion criteria. Emotional outcomes were embedded within the psychological outcome domains and only two studies within the review reported on emotional outcomes. It was decided it would be beneficial to update the Glasheen *et al.*, (2010) review because there have been many relevant studies published since 2010 but also to focus on children's emotional outcomes as they may have been underrepresented in the research literature. It was also considered relevant to review the impact of maternal anxiety in both the antenatal and postnatal period. The review topic complemented the empirical study and to my knowledge was the first systematic review to consider the impact of maternal perinatal anxiety on child emotional outcomes.

This review has particular relevance for perinatal and child practitioners to inform their practice. Reviewing the evidence for an impact of maternal anxiety in the perinatal period on child development would provide clinicians with a better understanding of the aetiology of children's emotional problems. Furthermore, this may enable the identification of causal mechanisms and lead to effective interventions. A further rationale for this review is that awareness of this growing body of evidence may stimulate new preventative intervention strategies to improve mother and child mental health.

### *Search terms*

Glasheen *et al.*, (2010) study search could not be replicated due to the decision to include both antenatal and postnatal maternal anxiety and narrow the child outcomes to look for emotional outcomes only. It was decided to search databases that were comprised of literature relating to psychological theories and interventions and therefore PsycInfo, Pub Med, Medline, Embase and Web of Science were utilized. Search terms and sets were reviewed and obtaining a balance between sensitivity and specificity were discussed with the research team. Initially I decided on three search sets including terms that related to (1) maternal perinatal anxiety, (2) children and (3) emotional outcomes. However, given that previous research had emotional problems embedded within behavioural outcomes, behavioural terms were added into the outcomes search set. Although this meant that search results increased significantly, it was decided that the

revised search including behavioural outcomes would be more sensitive to producing relevant papers. This became evident, as many of the included studies do not directly refer to emotional outcomes in their titles or abstracts. One reason for this is that study authors use various terminologies for child outcomes, including emotional outcomes, as discussed in the systematic review paper.

### *Inclusion and exclusion criteria*

The research team spent time discussing how to define emotional problems and which aspects of child development would be relevant for the current systematic review. Given the broad scope of child development and that definitions vary widely in the literature I found these discussions necessary and helpful. For example, the inclusion or exclusion of infant temperament research was discussed within the research team. Temperament is a concept about which limited agreement exists among researchers, broadly speaking temperament is defined as individual differences in reactivity and self-regulation and is assumed to be the relatively enduring biological makeup of the individual, influenced over time by the interaction of the heredity, life experience, and maturation (Rothbart, 1981). Given that there is a body of literature, which focuses on the impact of maternal perinatal mental health on infant temperament (e.g. Austin, Hadzi-Pavlovic, Leader, Saint & Parker, 2005; Britton, 2011; Huizink, Robles De Medina, Mulder, Visser & Buitelaar, 2002), the decision was made to view temperament as a separate construct to emotional problems. However, by doing so we may have overlooked aspects of child development that may overlap between infant temperament and emotional problems, such as behavioural inhibition. The team also discussed whether to include specific anxiety disorders, such as the inclusion of studies of mothers with social anxiety and post traumatic stress disorder (PTSD) or whether to exclude these and look only at symptoms of anxiety. The team decided that all papers that referred to maternal anxiety (specific diagnoses and symptoms) would be screened and relevant papers would be included in the review. The assessment measures in studies were closely examined to ensure it assessed anxiety independently of other constructs such as depression or stress, before the paper was included. However, as a consequence research that assessed comorbidity was excluded from the current systematic review. A strength of the

current review is that the use of the systematic review software Covidence ([www.covidence.org](http://www.covidence.org)) allowed for a second reviewer to screen full text articles for inclusion/exclusion. Covidence is a not-for-profit service working in partnership with Cochrane to improve the production and use of systematic reviews for health and wellbeing. Covidence allows the importation of citations to an online system. This system allows titles and abstracts to be screened quickly by choosing to accept or reject. Decisions on studies in full text are done so in a similar manner and covidence allows reasons for exclusions and any notes to be captured so that any disagreements between reviewers can be resolved quickly. In the current systematic review the second reviewer could have been involved earlier in the process to strengthen the screening process.

### *Contacting authors*

To ensure that the review identified all relevant papers I contacted recognised authors, via email, to enquire as to whether they had any recommendations of published, unpublished or key research papers in the area. However, none of the contacted authors replied. It was therefore assumed that the papers that were identified through the systematic search were up to date and no additional research was obtainable. When papers could not be accessed (e.g. Van den Bergh, Van den Noortgate, Braeken & Lagae, 2007) authors were again contacted to enquire as to whether they would approve of their research being reviewed and provide a copy of the paper. Again, I received no reply and therefore these papers were excluded from the review.

### *Quality Assessment*

The Critical Appraisal Skills Programme (CASP) guidance for cohort study checklist was used to aid the appraisal of the studies identified. This framework is recommended by Cardiff University's Specialist Unit for Review Evidence (SURE) for reviewing observational research. The quality assessment tool in this study was adapted to fit with the cohort studies in the review. A response of 'can't tell', indicated by a score of 1, was added when there was mixed achievement of a domain. For example, certain measures of child emotional problems were reported by both mothers and another informant, either father or teacher. Although there was a second informant,

these scores were considered independent of each other and not summed. Therefore, such outcome measures could only be considered partially objective and were therefore given a score of 1. It has been recognised that quality assessment tools are prone to biased ratings and poor inter-rater reliability (Higgins, Altman & Sterne, 2011). Although it is desirable to have all included studies second-rated by an independent rater, this was not possible for the current review.

### *Synthesising data*

A narrative synthesis of the findings was conducted in the present paper. Although meta-analysis techniques are considered a strength due to calculation of effect sizes, these were not employed in the current review as there was variation in the designs and methodology across studies (Garg, Hackam & Tonello, 2008). I found it challenging to select salient data and present them in a concise, reasoned and meaningful way. One of the key challenges was lifting the emotional outcomes from the study findings. Many emotional outcomes were embedded within other findings e.g. behavioural problems. Some studies were not explicit about direct emotional outcomes and I had to ensure that papers were read and understood thoroughly to avoid missing important data. A further challenge was how to present the findings. When presenting the synthesis of findings section, it was decided to divide the sections into stages of child development for ease of reading. One of the difficulties was finding a definitive reference that outlined the stages of child and/or emotional development in childhood (e.g. Saarni, 1999). The decision was made to categorise the findings in a meaningful way; grouping similar or close ages that were reported in the studies and provide the labels of early, middle and late childhood accordingly. However, because of this, caution must be taken when reporting or replicating findings as these stages of childhood have been categorised for the purposes of the thesis.

### *Mechanisms of effect*

Clearly, there are a number of unresolved issues about mechanisms and it would be unlikely if there were a single mechanism involved, although this is implicitly assumed in most studies, as

with the current empirical study, which target one or other mechanisms. The research process enabled me to acknowledge that it is difficult to reflect a very complex system in a coherent, systematic way within a research structure. Identifying the mechanisms of effect is valuable for identifying the most favourable targets for a preventative intervention (O'Connor *et al.*, 2014). The current systematic review highlighted a number of limitations regarding the lack of study of mechanisms of effect. Recognition of these limitations afforded me the opportunity to strengthen the current empirical research by exploring both gender and parenting behaviour as mechanisms of effect.

### *Clinical Implications and Future Research*

The results of this review raise the important possibility that antenatal interventions to reduce maternal mental health difficulties in pregnancy may have carry-over beneficial effects for the fetus and child. Therefore, there is a wide range of novel practical applications, such as using antenatal interventions to prevent child emotional problems. Perinatal interventions may be comparatively easier and cheaper to introduce than interventions targeting children after the onset of difficulties (O'Connor *et al.*, 2014). Prevention of emotional difficulties would further prevent suffering and other emotional and financial burden on the family and would be preferable to waiting for the problem to develop (O'Connor *et al.*, 2014).

Perinatal psychiatry requires greater integration with child mental health practitioners. Given the findings linking women's mental health in the perinatal period to child emotional well-being, collaboration with perinatal psychiatrists could offer valuable opportunities for improved service delivery and child mental health outcomes. Clinical Psychologists can not only provide direct assessment and evidenced-based psychological intervention within perinatal and child services but are also able to offer consultation, teaching and training around the aetiology and trajectory of children's emotional problems to ensure effective transition through services. Research on perinatal mental health may encourage an increased emphasis in research and treatment on underlying mechanisms rather than the somewhat artificial divisions associated with disciplinary training (O'Connor *et al.*, 2014). Movement towards aetiology-focused, multi-disciplinary models

of child mental health will prove increasingly valuable. However, it is not yet established that perinatal anxiety has a direct causal impact on the fetus and child. Reasons for this are that observational design in human studies is inherently limited for drawing causal conclusions. Whether or not replicating the widely reported findings provides a “high enough” level of evidence to institute change in practice or policy may depend less on a scientific threshold and more on clinical, cultural or institutional ones (O’Connor *et al*, 2014).

Based on the findings of the systematic review, if I were starting my research again and the data were available, I would have been interested in researching the significance of timing of maternal perinatal anxiety. I would want to measure anxiety at multiple time points of pregnancy and the postnatal period and assess children’s emotional outcomes at multiple time points of childhood. Having such data available would provide the opportunity to support or question the findings of the systematic review in terms of timing of effect and would contribute to a better understanding of when is a salient time to intervene. Furthermore, the effect of parenting behaviour at a later stage of childhood could be examined to investigate whether sensitive parenting in older children is a protective factor or negative parenting is a risk factor for children’s emotional problems.

## **Paper 2: Empirical paper**

### *Development of research question*

I became aware and interested in the Cardiff Child Development Study through a research fare held at Cardiff University for students on the Doctorate in Clinical Psychology training course. I approached the researchers and began discussions regarding my interests and the interests of the research team. After a literature review, I became aware of the gap in the perinatal literature regarding the impact of anxiety experienced in pregnancy and the postnatal period on child development. Initially I was interested in both child emotional and behavioural development. However, after completing a thorough systematic review on child emotional outcomes, it became apparent that research in this area was sparse and inconsistent and required further

investigation. If I had included behavioural problems, there was the possibility that behavioural outcomes may have overshadowed the findings on emotional outcomes, as I experienced whilst conducting the systematic literature review. However, including behavioural problems as an outcome may also have revealed findings of interest, which may or may not support previous research findings. The research team were in agreement and provided support for the current empirical study to focus on the impact of maternal perinatal anxiety on child emotional outcomes. Given that data had already been collected for the study, the research team agreed that I could contribute to and strengthen the data by researching parenting behaviours as a mechanism of effect.

### *Theories of child development*

Theories of development provide a framework for thinking about human growth, learning and development. I felt it was important to understand the factors which may support or compromise development and integrate this knowledge into both my research and clinical work with children and families. John Bowlby and Mary Ainsworth were the key theorists of attachment theory (Ainsworth & Bowlby, 1991; Bowlby, 1973; 1982; 1988). Their research was the first to document the importance of the relationship that developed between the mother and her child and helped to identify the detrimental impact on children's development resulting from parental separation, bereavement, or deprivation (Ainsworth & Bowlby, 1991). Attachment is thought to develop in phases, beginning in the antenatal period, when mothers first develop emotional feelings for their unborn babies (Armstrong, Ogg, Sundman-Wheat & St John Walsh, 2014) and is a lifelong process, involving both intimacy and independence. In the postnatal period the baby and mother must adjust and adapt to the changes brought on by the baby's first few months at home. The quality of early caregiving can either assist or impede the baby's ability to regulate inner emotional states. Emotional regulation is a process whereby the infant learns to manage stressful situations through interactions with the mother, which eventually helps the infant to self-soothe (Armstrong *et al.*, 2014). By 6 months of age, infants show differentiated emotions including joy, sadness, disgust, and anger and can respond to the emotional expressions of others. Infants become attached to caregivers with whom they have had significant amounts of

interaction and they become increasingly wary and anxious around strangers. Securely attached children are described as socially confident, more autonomous, affectionate, and flexible in problems solving. At age three years, these children are described as empathetic, good communicators and have better social skills.

Attachment theory posits that early human relationships and experiences lay the foundation for later development and learning. When an infant's attachment figure is not available and supportive, seeking proximity with them fails to relieve distress, negative models of self and others are formed and the likelihood of later emotional problems and maladjustment increases (Mikulincer & Shaver, 2012). According to attachment theory, interactions with inconsistent, unreliable, or insensitive attachment figures reduces resilience in coping with stressful life events and predisposes a person to break down in times of crisis (Bowlby, 1982). The transition to parenthood is conceptualised as a general life stressor that activates the attachment system (Monk, Leight & Fang, 2008). When insecure schemas are predominant (characterised by either worry about the emotional availability and support of others or by distrust or fear of closeness), this 'world view' and associated behaviour contribute to pregnant women feeling depressed and anxious throughout the perinatal period (Bifulco *et al.*, 2004; Feeney, Alexander, Noller & Hohaus, 2003; Meredith & Noller, 2003; Simpson, Rholes, Campbell, Tran & Wilson, 2003). Therefore, women who have insecure attachment styles may be more vulnerable to experiencing anxiety when pregnant, which in turn could impact on their ability to provide a secure attachment to their infant (Manassis & Bradley, 1994). Subsequently, in line with attachment theory, insecurely attached mothers may find it more difficult to offer high quality early caregiving, which could have an adverse effect on the child's ability for emotional regulation.

Some theorists have formulated models that place family process firmly within the larger whole community, culture, and society. Ecological systems theory goes some way to explaining how perinatal anxiety could impact on children's emotional development. Ecological systems theory was proposed by Urie Bronfenbrenner (1979) to explain how children develop within the context of their world. He considered both environmental and biological factors to be important in shaping development and child outcomes and the concept of risk and protective factors



emerged out of ecological systems theory. Risk factors, which are biological in nature, reside within the child and include prenatal exposures such as maternal antenatal anxiety. Environmental risk factors, or those external to the child, would include factors such as inconsistent caregiving and neglect. Protective factors are thought to improve self-regulation and behaviour. Within-child protective factors include health and wellness and strong adaptive skills and external protective factors include warm and predictable caregiving relationships, safe experiences and environments, and firm and consistent discipline. Therefore, in line with ecological systems theory, maternal anxiety experienced in the perinatal period could be a risk factor for the child and in combination with adverse environmental risk factors such as negative parenting behaviour could increase a child's vulnerability to adverse developmental outcomes, including emotional problems.

Bowen family system theory (Bowen, 1978) is a theory of human behaviour that views the family as an emotional unit and uses systems thinking to describe the complex interactions in the unit (Kerr, 2000). This theory maintains that a stressor, such as anxiety, is inevitably less significant than a family's reaction to the disturbance. Kerr and Bowen (1988) describe this phenomenon as anxiety 'rubbing off' on people; it is transmitted and absorbed without thinking. As anxiety goes up, the emotional connectedness of family members becomes more stressful than comforting (Kerr, 2000). In relation to the current research, this theory posits that the child may accommodate the most to reduce tension in the mother. It is a reciprocal interaction. The child may take too much responsibility for the distress of their mother to their unrealistic expectations of them, or the child may give up too much control of their thinking and decision-making to an anxious mother telling them what to do. The child will then absorb system anxiety and is the family member most vulnerable to adverse outcomes, such as emotional problems. Further, the child's anxiety may transfer to other family members or back to the mother and the anxiety is maintained in the family system. There are important implications of a family systems view of anxiety that differ from an individual perspective. While the individual, such as the mother, may exhibit the symptom related to anxiety, any person in the emotional system, such as the child or father, has the power to absorb or modify that emotional system and perhaps influence the symptom.

Recognition of both positive and negative influences on child development is essential because the interplay between them determines outcomes (Cummings, Davies & Campbell, 2000). For example, a child facing an adverse family environment, including maternal anxiety or depression may function in a positive manner or their otherwise adverse experiences in life may include hidden positive elements that foster resiliency. Similarly, a mother experiencing anxiety may remain emotionally responsive to a child, fostering a secure mother-infant emotional bond that helps protect the child despite the challenges of having a parent with anxiety (Cummings *et al.*, 2000). Unfortunately, the research literature on the prediction of problems based upon risk factors offer limited guidance on individual clinical cases. This illustrates an important need for more complex and sophisticated models for understanding how children develop, models that consider the operation of multiple factors and their interaction over time, and that identify the causal processes that underlie relations between experiential events and child emotional development.

#### *The fetal programming hypothesis*

Researchers in mental health sciences are increasingly making use of the Developmental Origins of Health and Disease (DOHaD) model to understand how maternal mental health difficulties in pregnancy impact on the intrauterine environment and influence fetal development. The DOHaD model proposes that in-utero development and possibly even factors prior to conception, such as the mother's pre-pregnancy weight, nutritional status or her mental health history, can influence maternal functioning over pregnancy and in this way can be transmitted to the child during fetal development (Lewis, Austin, Knapp, Vaiano & Galbally, 2015). The DOHaD has a strong focus on the mechanisms driving fetal and early postnatal development. The framework integrates evolutionary theory, molecular sciences and draws on experimental animal models to test causal pathways (Gluckman, Hanson & Buklijas, 2010).

Programming refers to the influence of specific exposures that trigger biological processes operating during critical periods in early life, which in turn produce stable and long term

alterations in the organism's developmental pathway (Lewis, Galbally, Gannon & Symeonides, 2014). The concept of programming has been proposed to provide an explanatory framework for understanding observed associations between environmental exposures in early development, such as maternal anxiety, and later adverse effects of child development, including emotional problems. Cortisol provides a good example of hormonal imprinting where exposure of the fetus to maternal cortisol during fetal development may impact on the responsivity of neuroendocrine systems related to stress and psychopathology in later development (Lewis *et al.*, 2015). The exact mechanisms involved are complex and outwith the scope of discussion in this paper. However, the effect might occur in relation to establishing the density of hormone receptor sites such as the glucocorticoid receptor in target brain regions such as the hypothalamus or hippocampus (Lewis *et al.*, 2015). Variation in hypothalamic-pituitary-adrenal (HPA) activity may be due to changes in the activity or concentration of glucocorticoids or it may be due to alteration in glucocorticoid receptor density in target tissues or even to alteration in cortisol metabolism (Bertram & Hanson, 2002). Variation in the density of receptor sites is likely to have long-term functional implications. It is possible that these processes result in not only intrauterine growth restriction or preterm birth, but in long lasting effects on child development such as emotional problems via fetal HPA axis programming (Lewis *et al.*, 2015). There are a variety of mechanisms by which maternal mental health difficulties may impact on fetal development. In most, but not all studies, maternal psychological distress, which includes anxiety, is associated with elevated maternal stress hormones such as cortisol, adrenocorticotrophic hormone (ACTH) and adrenaline (Lewis *et al.*, 2015). This model raises important conceptual challenges for studies of developmental models of psychopathology that tend to consider neither prenatal exposures nor programming effects. Along with the findings from the current research this has sizable implications for intervention and timing of early interventions.

#### *The impact of maternal anxiety on parenting*

Nicol-Harper, Harvey & Stein (2007) examined the nature of the interactions between anxious mothers and their children. They highlighted that such research was important as the child is

developing rapidly and may be particularly susceptible to parenting difficulties. Also, it is important to know if parenting difficulties demonstrated amongst anxious parents of older children are evident in the early years of life. Furthermore, when attempting to disentangle bidirectional effects on interaction, measuring anxiety in the postnatal period is important, as any interactional difficulties are more likely to stem from within the mother and is less likely to be a consequence of children's emotional problems. They found that mothers with high anxiety showed less sensitive responding and reduced emotional tone (Nicol-Harper *et al.*, 2007). Theories as to why mothers who are anxious demonstrate lower levels of sensitivity have been discussed. Experiencing anxiety leads to an increased focus on negative threat related issues (Williams, Watts, MacLeod, Mathews & Wiley, 1997) and adversely affects attentional processing (Mogg, Mathews, Eysenck, & May, 1991). These difficulties may in turn interfere with maternal sensitive responsiveness. Also, anxiety, when associated with insecure attachment representations may adversely affect attention and memory processes, which also may potentially affect mother-infant interaction (van Emmichoven, van IJzendoorn, de Ruiter, & Brosschot, 2003). I found this research of interest and it contributed to an understanding of how maternal anxiety may impact on parenting behaviour in the current research.

#### *Impact of parenting on child development/emotional outcomes*

Parenting styles is a concept first described by Diana Baumrind (1966) and later extended by Maccoby and Martin (1983). It refers to the degree to which parents respond to their child's needs, disciplinary strategies they use, and parental expectations for maturity and control (Armstrong *et al.*, 2014). Theoretical models of parenting styles and research have emphasised the impact of parenting on the development, maintenance, and amelioration of childhood anxiety and emotional problems (e.g., Chorpita & Barlow, 1998; Craske, 1999; Dadds & Roth, 2001; Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Krohne, 1990; Manassis & Bradley, 1994; Rapee, 2001; Vasey & Dadds, 2001). Some theoretical models hypothesise that when parents are highly controlling in contexts when it is developmentally appropriate for children to act independently, children may experience decreased self-efficacy and therefore increased anxiety (Wood, 2006). Some models posit that parenting is particularly influential early in a child's life when parents

represent the main socializing agent (Chorpita, 2001).

Reviews of the empirical evidence linking parenting to childhood emotional problems have provided mixed support for existing theories (see Gerlsma, Emmelkamp, & Arrindell, 1990; Masia & Morris, 1998; Rapee, 1997; Wood, McLeod, Sigman, Hwang, & Chu, 2003). Parental negativity is typically conceptualised as the absence of warmth and acceptance within the family and operationalized as parental criticism or rejections (Bogels & Brechman-Toussaint, 2006). A negative rearing environment is assumed to effect children's emotional problems by influencing the beliefs and attributes children hold. The frequency and intensity of negative feedback may contribute to perceptions of the environment as threatening and hostile, the self as less than competent and to negative outcome expectancies (Bogels & Brechman-Toussaint, 2006). Other evidence points to non-parenting factors that might be considerably more powerful in their impact. For example, twin studies have suggested that additive genetic effects may account for 30-80% of the variance in children's trait anxiety, and that the non-shared environment (i.e., biological and social environmental influences that affect one sibling but not another) might account for a substantial proportion of additional variance. Nonetheless, most behavioural genetic studies suggest that there is at least some role of the "shared environment" in children's emotional problems, which can include parenting behaviours (McLeod, Wood & Weisz, 2007). The impact of parenting on children's emotional problems was not explored in the current study. Future research could investigate this in the CCDS sample. The parenting behaviour data, which I established by coding the mother-infant interactions, could be used to see whether any of the negative parenting behaviours (e.g. intrusiveness, negative affect, detachment) are predictors of child emotional problems or whether child emotional problems are predictors of parenting behaviours. If an effect were found then it could go some way to disentangling the bidirectional effect between parenting and child emotional problems.

#### *Cardiff Child Development Study (CCDS)*

The Cardiff Child Development Study is a prospective, longitudinal study of a nationally representative sample of first-born children and their parents. Recruitment began in 2005 with

participants recruited into the study during pregnancy for the first assessment (wave 1). These families were followed up six (wave 2), 12 (wave 3) and 20 (wave 4) months postpartum and at age three (wave 5) and seven (wave 6). The CCDS is based at Cardiff University and funded by the Medical Research Council. The CCDS has collected a wide range of data including data on social interaction, data on parents' mental health and social, economic and psychological risk factors, data from education providers, data on parent and infant interaction, and DNA and physiological data from infants. The CCDS allowed conclusions to be drawn about the effects of antenatal and postnatal anxiety and mother-infant interaction over time. The participants in this study were followed up for three years, with data collected at three time-points; from the first, second and fifth waves of the study. This would not have been possible without access to data from the CCDS and is a significant strength of the current research. It would however have been possible to examine outcome data from additional time-points as the children participating in the study are now 7 to 8 years old. Examining additional time-points was outwith the scope for the current research but if it had been possible, it would have established if the effects detected remain as the children develop through middle and late childhood into adolescence.

As I was analysing data from the CCDS I was able to work alongside PhD students who were also researching child development using CCDS data. I found this to be extremely supportive and was able to use and reflect on their knowledge and expertise throughout the research process.

### *Ethics*

The Cardiff Child Development Study obtained ethical approval for all procedures from the Cardiff University School of Psychology Research Ethics Committee and the NHS Multi-Centre Research Ethics Committee. The CCDS has an ethical approval system that supports undergraduate and postgraduate research projects. The principal investigator for the CCDS reviewed the proposal for the current research to confirm it was consistent with the prior ethical approval. The proposal was then submitted for ethical review to the Cardiff University School of Psychology Research Ethics Committee (see appendix C for confirmation of ethical approval). No

additional data were collected for the current research and therefore an application to the NHS National Research Ethics Service (NRES) was not necessary.

#### *Mother-Infant Interaction Coding Scheme*

Early parent-child interactions are considered to be important contributors to the development of child behaviours and emotions. In terms of parenting behaviours, early childhood researchers have typically examined sensitivity/ responsiveness and negativity (e.g. harshness, intrusiveness and hostility). Low levels of parental sensitivity/responsiveness are considered to interfere with emotion regulation development, placing children at risk for increased emotional problems (e.g. Briggs-Gowan, Carter, Bosson-Heenan, Guyer & Horwitz, 2006). Similarly, parental intrusiveness and hostility are associated with child emotional problems (e.g. Chorpita & Barlow, 1998). However, the majority of studies focus on behavioural difficulties in older children (e.g. Rubin, Burgess, Dwyer & Hastings, 2003; Campbell, Shaw & Gilliom, 2000) with relatively few focusing on emotional problems in younger children.

The Qualitative Ratings for Parent-Child Interaction at 3-15 Months of Age coding scheme (Cox & Crnic, 2003) adapted from the NICHD Study of Early Child Care Mother-Infant Interaction Scales (NICHD, 1999) was chosen to code parenting behaviours of the mother-infant interactions at 6 months. This scheme has been used in a number of other studies assessing parenting behaviours (e.g. Barnett, Deng, Mills-Koonce, Willoughby & Cox, 2008; Barnett, Shanahan, Deng, Haskett & Cox, 2010; Gustafsson, Cox & Blair, 2012) and was deemed appropriate for use in the current study. After discussion with the research team, it was agreed that the parent codes and the dyadic code would be used as we were focusing specifically on the mother's behaviour rather than the child's. The coding scheme could not be included in the appendix due to copyright. Each of the global rating scales are described below with direct quotes used from the coding scheme:

#### Sensitivity/Responsiveness (Adapted from Ainsworth)

"This scale focuses on how the parent observes and responds to the child's social gestures, expressions, and signal as well as responds to cries, frets, or other expressions of negative affect.

The key defining characteristic of sensitive interaction is that it is child-centred. The sensitive parent is tuned to the child manifests awareness of the child's needs, moods, interests, and capabilities, and allows this awareness to guide his/her interactions...

Markers of sensitivity include:

- a) Acknowledging the child's affect;
- b) Contingent vocalisations by the parent;
- c) Facilitating the manipulation of an object or child movement;
- d) Appropriate attention focusing;
- e) Evidence of good timing paced to the child's interest and arousal level;
- f) Slowing the pace when the child appears over stimulated or tired;
- g) Picking up on the child's interest in toys or games;
- h) Shared positive affect;
- i) Encouragement of the child's efforts;
- j) Providing an appropriate level of stimulation when needed; and
- k) Sitting on floor or low seat, at the child's level, to interact"

### Intrusiveness

"An intrusive, insensitive interaction is adult centred rather than child centred. Prototypically, intrusive parents impose their agenda on the child despite signals that a different activity, level, or pace of interaction is needed. High arousal, vigorous physical interaction, or a rapid pace, are not, by themselves, indicative of intrusive overstimulation if the child responds positively with sustained interest and is not engaging in defensive behaviours...

Specific behaviours characterising intrusive interactions include:

- a) Failing to modulate behaviour that the child turns from, defends against, or expresses negative affect to;
- b) Offering a continuous barrage of stimulation (physical and/or verbal), food, or toys;
- c) Not allowing the child to influence the pace or focus of play, interaction, or feeding;
- d) Taking away objects or food while the child still appears interested;



- e) Not allowing the child to handle toys he/she reaches for;
- f) Insisting that the child do something (play, eat, interact) in which he/she is not interested;
- g) Not allowing the child to make choices; and
- h) Manipulating the child's body in an intrusive manner (e.g. making the child dance or bounce for the parent)
- i) Physically impairing the child's movement"

#### Detachment/Disengagement

"The detached parent appears emotionally uninvolved or disengaged and unaware of the child's needs for appropriate interaction to facilitate involvement with objects or people. This parent does not react contingently to the child's vocalisations or actions, and does not provide the "scaffolding" needed for the child to explore objects...The detached parent will remain disengaged even when the child makes a bid for interaction with the parent. The detached parent is passive and lacks the emotional involvement and alertness that characterises a sensitive parent. He/she appears uninterested in the child...A parent receiving a high rating for detachment is considered to be insensitive. A low rating for detachment can signal either sensitivity or intrusiveness"

#### Positive Regard for the child/ Positive Affect

"This scale rates the parent's positive feeling toward the child, expressed during interaction with him/her

Positive feelings are shown by:

- a) Speaking in a warm tone of voice;
- b) Hugging or other expressions of physical affection;
- c) An expressive face;
- d) Smiling;
- e) Laughing with the child;
- f) Enthusiasm about the child;

- g) Praising the child; and
- h) General enjoyment of the child.”

#### Negative Regard for the child/ Negative Affect

“This scale rates the parent’s negative regard for the child. Both frequency and intensity of negative affect toward the child are considered.

Some markers of negative regard include:

- a) Disapproval;
- b) Tense body;
- c) Negative voice when correcting;
- d) Abruptness;
- e) Tense facial muscles and strained expression;
- f) Harshness;
- g) Threatening the child or punishing without explanation;
- h) Roughness in wiping the child’s face, changing his/her diapers, or burping;
- i) Calling the child unflattering names; and
- j) Teasing in a non-playful manner”

#### Animation

“This scale measures how animated the parent is. Animation may reflect energy, excitement, or interest (e.g. watching the child with eyes bright). Animation is often seen in big facial expressions such as opening mouth wide, eyes wide open, and an enthusiastic tone of voice. Lack of animation, (i.e. flat affect) may reflect boredom, depression, fatigue, or distraction...this scale assesses the parent’s overall demeanour, not just animation with the target child”

#### Stimulation of Development

“This scale measures the degree to which the parent tries to foster the child’s development. A stimulating parent may take advantage of even simple activities (like feeding and diapering) to

stimulate development, and will consistently engage in a variety of activities that can facilitate learning. The parent will make deliberate attempts to encourage the child's development, achievement and learning...The focus of this scale is on the amount and quality of activities that may ultimately enhance perceptual, cognitive, linguistic, and physical development."

#### Dyadic Mutuality

"This scale assesses the synchrony of the interaction and the degree of shared experience between parent and child. Essentially we are interested in the behaviours that reflect intimacy and coordination in the dyad. Dyadic mutuality may be reflected by reciprocal play, reciprocal communication and shared enjoyment...Dyads who are low on this scale rarely exchange glances or shared experience during interaction. They may negate or reject the experience or behaviours of the partner, or they may be largely disengaged from one another...Dyads high on this scale almost always have a moment of shared emotion that is pleasurable. They are often engaged in the same activity and share experiences with the toys or activities...there is also a clear synchronous back and forth between partners, such that both partners are open to the behaviours and emotions of each other. The partners are in tune to each other's signals and respond appropriately."

Mother-infant interactions were coded using the above scales for two 2-minute play tasks: the Free-Play task and the Activity Board task. Each task was coded individually and then a global rating was given based on the scores of the two tasks. For the current study it was decided that the global rating would be used in all analyses. It was a strength that the tasks took place in families' own homes, minimising the impact of the observation on the interaction. However, it is possible that the observation of mothers and children may have altered the way in which they interacted with each other. For example, some mothers were noted to state to camera that they felt their behaviour was different due to being filmed. Also, some children were observed to be distracted by the researcher in the room rather than attending to their mothers, which also may have impacted on mother-infant interactions.

I found the use of the two tasks both a challenge and of value. For example, I found that the activity board task allowed for more accurate coding of the scale for stimulation of development as the task required the mothers to show their child a story book with pictures of animals. This allowed for identification of mothers high on the stimulation of development scale by observing mothers talk through and label pictures etc. However, when children were engaged with the activity book, some mothers allowed their child to independently explore the toy – a sign of sensitive parenting. Thus, it then became difficult to score these mothers on the stimulation of development scale as in these instances mothers were not required to provide stimulation to keep their child interested. Hence, the global rating provided a more accurate reflection of overall parenting behaviour that may have been skewed had I only used one of the interaction tasks.

Factor analysis revealed that it was possible to create composite scores for the mother-infant interaction: a sensitive parenting score (the mean of Sensitivity, Stimulation of Development, Positive Regard, Animation, and reverse scored Detachment) and harsh-intrusive parenting score (the mean of Intrusiveness and Negative Affect). However, further analyses utilising these composites revealed no significant findings and therefore the decision was made to retain the subscale scores to report the effects of negative affect. I was disheartened that the mother-infant interactions did not yield any significant findings, given the time spent on coding the interactions and previous research findings. However, good inter-rater reliability was established for the coding of mother-infant interaction in this study, which allows confidence in the consistent measurement of the constructs of parenting. Further, coding the mother-infant interaction videos contributed to the data available to the CCDS and can therefore be used in subsequent studies that wish to look at parenting as a mechanism of effect.

### *Sample*

The sample size of 186 mother-infant dyads included in the empirical research study is a considerable strength, which gives credibility to the findings. Furthermore, this allows greater generalizability of the findings, especially as the sample has reasonable sociodemographic diversity. Research of this scope would not have been possible for a Doctorate in Clinical

Psychology thesis without access to data from the CCDS; this has therefore maximised what is feasible to achieve and has allowed investigation of a clinically relevant topic with the rigour that a cohort study provides. However, due to missing data the sample size reduced considerably from the total CCDS sample. Attrition from the sample is unavoidable in longitudinal research but it is possible that this may have had an impact on the results found in this study. I reflected on whether this might have contributed to lack of findings relating to mother-infant interactions. Those who were excluded from the study, due to missing data, were found to be more anxious in the antenatal period and therefore could have displayed more adverse parenting behaviours in line with past research.

### *Measures*

The measures of perinatal anxiety were self-report, symptom measure questionnaires completed by the mothers during pregnancy and postnatally. The inability to introduce distress at a particular point in pregnancy (for obvious ethical reasons) means that there is limited leverage for assessing a timing effect. The current research assessed for maternal antenatal anxiety at one time-point and therefore no conclusions on the timing of maternal anxiety on child emotional outcomes could be drawn. Given that the CCDS data had already been gathered, it was not possible for me to assess anxiety at any other time-points. Unfortunately, data used to create dichotomous variables in order to measure the presence or absence of anxiety (or clinical diagnoses) in the antenatal period, in the first six months postnatally and prior to pregnancy were not available for the current study. Therefore, continuous variables for symptom scores or transformed variables were used.

Children's emotional problems were calculated through a factor mean score incorporating ratings from mothers, fathers and a significant other. Although this is a strength of the current study it meant that it was not possible to compare scores between raters to establish whether there were any significant differences of interest.

## *Analyses*

Data analysis was carried out using SPSS version 23 (IBM corporation, 2015). Data were visually checked for any errors. Visual inspection of histograms and associated statistics for the mother-infant interaction and emotional problems variables identified that all the mother-infant interaction variables were non-normally distributed (intrusiveness, detachment, negative affect having a positive skew and sensitivity, positive affect, animation, stimulation of development and dyadic mutuality having a negative skew), as was emotional problems (positive skew). There was kurtosis of the all mother-infant interaction data and emotional outcomes. The visual inspection of the data and presence of potential outliers led to the decision that the assumptions for parametric statistics had been violated. I considered options for transforming the data and/or removing outliers. However, the potential outliers identified were not understood to be a misrepresentation of the data and transformation is not considered the most effective way of managing a skewed distribution with heterogeneity of variance (Bakker & Wicherts, 2014; Osborne, 2013). In line with the most up to date guidance on parametric testing, the decision was made to analyse the data using parametric analyses and bootstrapping methods (Efron & Tibshirani, 1993).

Due to the violations of the assumptions for parametric testing detected for the mother-infant interaction data and the use of a representative sample (Aguinis, Gottfredson & Joo, 2013; Bakker & Wicherts, 2014; Wilcox, 2012) bootstrapping methods were used where appropriate (Efron & Tibshirani, 1993). Alternative options for managing the data would have been to apply transformations to it (Field, 2013; Pallant, 2013). The current literature suggests that transforming data is not always effective, reduces power, and impacts on the interpretation of the findings while parametric tests are less powerful and can still be affected by outliers (Bakker & Wicherts, 2014; Osborne, 2013). Therefore, bootstrapping methods are currently a widely recommended approach to statistical analysis where assumptions for parametric testing are violated (Bakker & Wicherts, 2014; Wilcox, 2012; Wright, London & Field 2011). Bias corrected and accelerated (BCa) confidence intervals were used in the current study as these offer more accuracy at the 95% percentile confidence interval in terms of minimising the bias of the mean

(Efron & Tibshirani, 1993; Field, 2013). These confidence intervals were then used to test the null for each hypothesis at a 95% confidence level; the null was accepted if the BCa confidence interval crossed zero (as zero would indicate no effect).

The effect of antenatal and postnatal anxiety on mother-infant interaction was investigated using a MANOVA to reduce the risk of type one error. In order to analyse the data using a MANOVA, continuous antenatal and postnatal data were transformed into a new categorical variable (Field, 2013) for high anxiety and low anxiety. The decision was made to use the top 25% (top quartile) of antenatal and postnatal scores respectively to reflect the high anxiety groups.

The PROCESS custom dialogue box for SPSS (Hayes, 2013; available from [www.afhayes.com/spssas-and-mplus-macros-and-code.html](http://www.afhayes.com/spssas-and-mplus-macros-and-code.html)) was used to test the direct and indirect effects of maternal antenatal anxiety on child emotional problems with postnatal depression as a potential mediator. Significance of the direct and indirect effects was derived from examining the bootstrapped confidence intervals. The most recent guidance (Field 2013; Hayes, 2009; 2013) suggests that the indirect pathway between variables should be tested without reliance on testing individual pathways (e.g. testing mediation following a 'causal steps' approach; Baron & Kenny, 1986). It is argued that the causal steps method fails to directly quantify the indirect pathway and holds the erroneous assumption that the constituent pathways must be independently significant in order to establish that an indirect effect is present (Hayes, 2009) and that *p* values represent a somewhat arbitrary cut-off rate in terms of estimating the significance of an effect. This causes problems when effects are combined across analyses as is the case with the causal steps method (Field, 2013). PROCESS analysis utilises ordinary least squares or logistic regression based path analysis to estimate the direct and indirect effects of antenatal anxiety on children's emotional problems when considering postnatal depression. The indirect (or mediation) pathway is calculated by testing the significance of the combined coefficients for the *ab* pathway (i.e. *a* combined with *b*).

The CCDS data lends itself to quantitative research methodology. For this reason, qualitative methodologies were not possible. However, semi-structured interviews with participants in the

study could have offered a more rich, detailed description of their personal experiences of anxiety during pregnancy and the postnatal period and/or how they feel this may, or may not, impact on parenting behaviours and child emotional problems. Employing qualitative methodologies could have expanded on the research to explore common themes or develop a psychological theory based on mother's experiences.

### *Clinical Implications and Future Research*

Despite the current research findings, the absence of a compelling evidence base from antenatal treatment studies is notable and this impairs clinical decision-making about which interventions may be helpful, and for whom (O'Connor *et al.*, 2014). Further, the lack of randomised controlled trials means that a potential source of experimental leverage for testing basic questions about the impact of perinatal anxiety on child emotional outcomes has not been fully exploited. A consistent finding is that the effects of prenatal distress, including anxiety, on child outcomes are not limited to severe maternal mental health difficulties; rather, fairly linear patterns have been reported. This implies that the potential impact of antenatal anxiety may be detectable at subclinical levels of distress, further raising the public health concern. One implication of this is that interventions to reduce antenatal anxiety, which benefit the mother and child, need not be limited to or targeted on women with clinical diagnoses (O'Connor *et al.*, 2014).

The NSPCC report: 'Prevention in Mind' (Hogg, 2013) calls to action managers, commissioners and policy makers to work together to close the gaps in perinatal services in order to improve the lives of children and families, and prevent unnecessary suffering. It highlights that women with perinatal mental health difficulties and their children have specific needs, and it is important that they are given expert specialist care. It further highlights that if untreated, perinatal mental health difficulties can inhibit a mother's ability to provide her child with sensitive, responsive care that they need. The WAVE trust and NSPCC also contributed to the cross party manifesto produced by the government: '1001 critical days: The Importance of the Conception to Age Two Period' (Leadsom, Field, Burstow & Lucas, 2014) which stipulated the need for a tiered approach to evidenced based intervention aimed at promoting holistic services for mothers experiencing



mental health difficulties to ensure optimal infant well-being. The NICE clinical management and service guidance for antenatal and postnatal mental health (NICE, 2014) promotes early detection and good management of mental health difficulties to improve women's quality of life during pregnancy and in the first year after birth. In line with the current research findings, it states that services need to recognise when a woman experiences a mental health difficulty in the perinatal period as there may be implications for the mother-infant relationship and subsequent child cognitive and emotional development. The findings from the current study contribute to the better understanding of the effect of anxiety in the perinatal period and the mechanisms by which perinatal anxiety adversely affects child development and will greatly inform the successful implementation of the policy guidance.

Notwithstanding the guidance and recommendations of government policies, one of the challenges to services concern issues of identifying women and families in need and service responsiveness. Pregnancy begins the process of earlier experiences, beliefs, scripts, and internal working models being activated in pregnant mothers. If their experience of being parented was not good or they are feeling negative or critical of themselves then the prospect of becoming a parent can be daunting and overwhelmingly anxiety-provoking (Galbraith, Balbernie & White, 2015). The challenge for services is to identify families who require support. One way of doing this is to offer training to maternity services on the social and emotional aspects of conception, pregnancy, birth and early parenthood and on risk factors such as anxiety. This could be followed up with reflective practice sessions to help staff put theory into practice and practice into theory, and provide them with a space to reflect on their own emotional processes in relation to their work (Morrell *et al.*, 2009). Engaging the mother is important for psychological support as there may be fears that the perception that they aren't coping will lead to their child being taken into care and therefore disengagement with services. Nevertheless, NICE (2014) and commissioner guidance (Joint Commissioning Panel for Mental Health, 2012) suggest using clear integrated care pathways and stepped-care models. Clinical psychologists' high level of training and ability to use a range of therapeutic approaches dependant on the needs of the individual enables them to work with moderate to severe cases and complex cases with co-morbid problems. There is recognition that there are increasing demands on an NHS with limited resources, with a focus on

balancing the need to provide evidence-based, high quality and cost effective treatments that reflect high levels of service-user satisfaction. The British Psychological Society document 'Perinatal Service Provision: The role of Perinatal Clinical Psychology' (BPS, 2016) outlines how clinical perinatal psychology services can achieve these outcomes.

### **Personal reflections of the research process**

Prior to starting the Doctorate in Clinical Psychology I had completed two University research projects: one for an Undergraduate degree in Psychology and one for a Masters Degree in Abnormal and Clinical Psychology. For the Undergraduate degree project I chose to use quantitative methods to explore the psychological and sociological factors related to body image satisfaction. This was the first opportunity I had to use statistical analyses for research. For the Masters research project I chose to expand on my research skills and instead chose a qualitative methodology (Grounded Theory) to explore the transition from Assistant Psychologist to Trainee Clinical Psychologist. Having interviewed Trainee Clinical Psychologists for the research I already had insight as to how stressful or anxiety-provoking training could be. Many of the interviewees discussed their doctorate research projects and spoke about ensuring that support and supervision was available and choosing a research topic of interest in order to sustain motivation and enthusiasm for the project.

I found benefit and challenges to the experiences of both methodologies; qualitative methods took substantially more time to transcribe and analyse data, whereas the data collection process was time-consuming for the quantitative project. I took time to reflect on both of these experiences before deciding on a preference for quantitative methodology in the current research. This decision was based on the knowledge that I would still be working clinically whilst undertaking the project and this would contribute to the pressure of workload and work-life balance. Unfortunately, at the start of the research project I was placed on a 'non-commutable placement', which meant living away from home during the week. This made data collection, i.e. coding the mother-infant interaction videos difficult as the CCDS holds the data in Cardiff. I found

this a challenging time; the combination of being away from home, travelling long distances on a weekly basis and the pressure to keep on top of data collection felt strenuous. On the other hand, the 'non-commutable placement' was in a Child and Adolescent Mental Health Service, which afforded me the opportunity to reflect on not only how the research could have implications for perinatal services but also how children's services could formulate children's mental health difficulties from a developmental perspective.

I had no prior clinical or research experience in the area of perinatal or child development. Furthermore, I was required to take time to understand the CCDS study (e.g. what data was collected at each wave of the study, the measures used etc.). Thus, using secondary data didn't allow for an "easy" project. In fact, on reflection having to come into a project with little knowledge of the area or the data I found overwhelming and at times isolating. To address this, I used supervision to ask questions about the data and to reflect on my experience. Furthermore, the PhD students also working on the data were extremely supportive during this process.

Coding the mother-infant interaction videos was extremely interesting but also challenging at times. I had never coded videos before and had to have thorough understanding of the coding scheme to ensure accurate ratings. Supervision was used to reflect on any uncertainties and I often reviewed ambiguous videos several times to feel confident with my ratings. At times, the coding process felt highly subjective but I was reassured when a second rater provided their scores for inter-rater reliability. In regard to the analysis, despite having used quantitative research methodology prior to the doctorate, I had to re-learn and update my knowledge on the majority of statistical techniques for the current project. I spent several days updating my knowledge of statistics before starting the analyses; this experience also felt isolating and challenging yet satisfying when completed.

One of the central challenges I faced was managing the competing demands of academic work, clinical work and the current research project. Supervision undertaken with both the research team and my clinical supervisors was highly valuable as it provided a safe space for guidance and support to allow the development of critical thinking for research alongside effective clinical

development. I also took the time to reflect on what prior trainees had spoken about in my Masters research project and, despite experiencing challenges, this made me feel grateful to be in a position where my own knowledge and skills can have a significant impact at both a clinical and research level.

If I had the opportunity to carry out the research again, I would be interested to examine whether results differed within mothers who have a clinical diagnosis of anxiety compared to those with non-clinical symptoms of anxiety. I would also be interested to investigate other mechanisms of effect such as infant temperament to examine whether this mediates or moderates the relationship between maternal perinatal anxiety, parenting and child emotional outcomes. Other child developmental outcomes could also be considered. It would be interesting to see whether maternal perinatal anxiety has an impact on children's behavioural and cognitive outcomes as well as emotional outcomes. This would allow for a broader scope of the impact that maternal experiences of anxiety in pregnancy and the postnatal period could have on children's development.

Conducting the systematic review and empirical study has afforded me the opportunity to reflect on how it will impact on my clinical work. I am hoping to secure a position working in child and adolescent mental health services and the current research will impact on my assessment and formulation of children who present with emotional problems. I will ensure I include mothers in the assessment process and ask whether they experienced symptoms of anxiety in pregnancy. It has highlighted that some children may be predisposed to emotional problems and this needs to be kept in mind whilst working with them. Similarly, the importance of recognising women who may be experiencing anxiety and planning a family or are pregnant and providing them with psychological interventions to manage their mood is important for the mother, mother-infant relationship and the child. I would like to share my findings with both perinatal and child and adolescent mental health services in the hope of increasing awareness of the impact of maternal perinatal anxiety and promoting collaboration between these services.

Conducting research for Undergraduate, Masters and now Doctoral thesis has heightened my understanding of clinical psychology as an academic discipline. I have learned to take a critical approach to research literature and am able to competently evaluate whether or not a given conclusion is valid and applicable to a clinical setting. Furthermore, I have learnt to write concisely for publication, liaise with researchers and analyse quantitative data. I now look forward to continuing to utilize these skills in delivering evidence-based interventions and to develop empirically informed services for people who need them.

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## **Appendices**

**Appendix A:** Author guidelines for submission to European Child and Adolescent Psychiatry

**Appendix B:** The Adult Wellbeing Scale

**Appendix C:** Email confirmation of ethical approval from Cardiff University ethics committee

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## European Child & Adolescent Psychiatry

Editor-in-Chief: Johannes **Hebebrand**

ISSN: 1018-8827 (print version)

ISSN: 1435-165X (electronic version)

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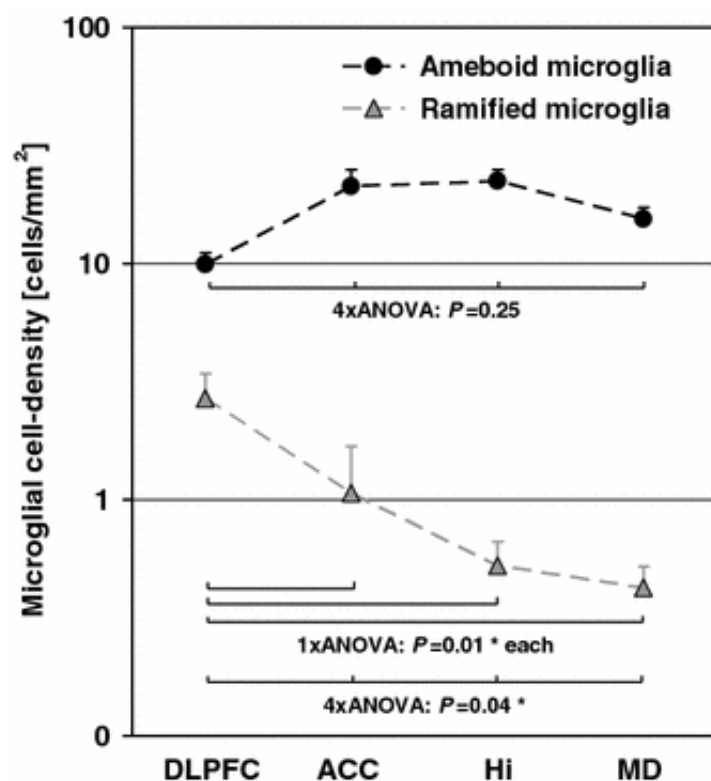
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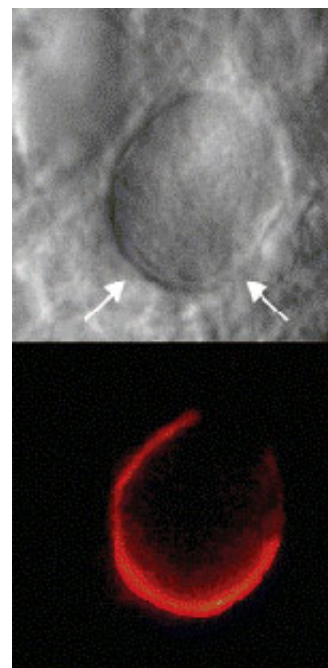
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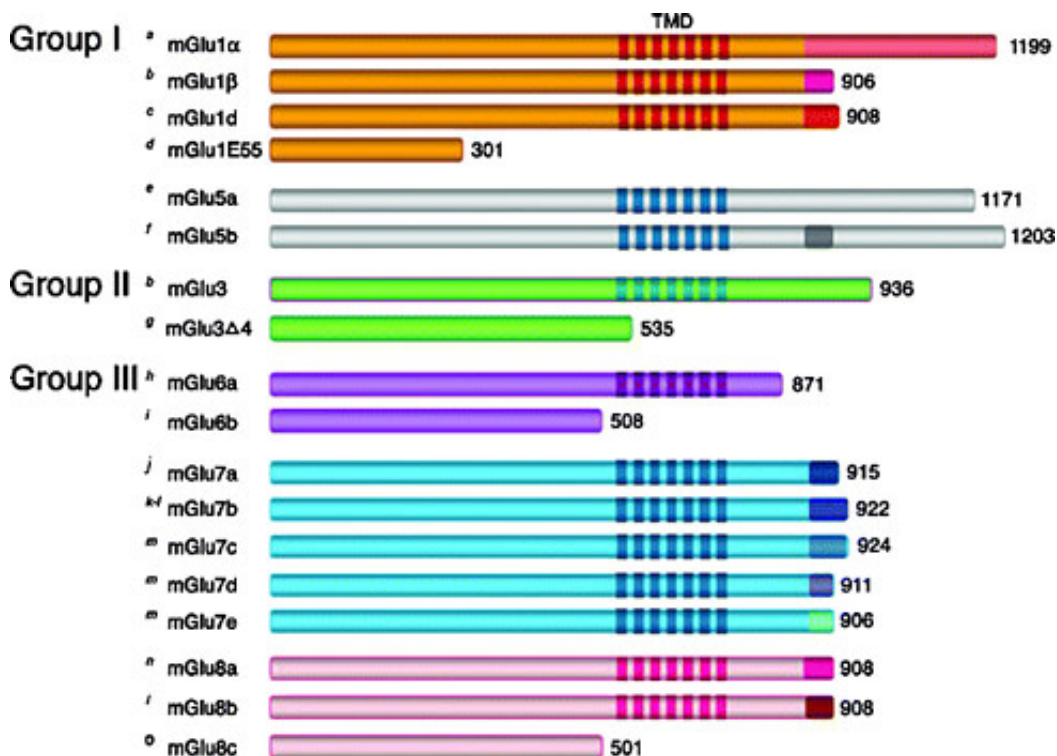
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# Adult Wellbeing

## THE SCALE

Name of Child:

---

Completed by:

---

Relationship to child:

---

Date:

---

## ADULT WELLBEING SCALE

This form has been designed so that you can show how you have been feeling in the past few days.

Read each item in turn and UNDERLINE the response which shows best how you are feeling or have been feeling in the last few days.

Please complete all of the questionnaire.

### 1. I feel cheerful

Yes, definitely      Yes, sometimes      No, not much      No, not at all

### 2. I can sit down and relax quite easily

Yes, definitely      Yes, sometimes      No, not much      No, not at all

### 3. My appetite is

Very poor      Fairly poor      Quite good      Very good

### 4. I lose my temper and shout and snap at others

Yes, definitely      Yes, sometimes      No, not much      No, not at all

### 5. I can laugh and feel amused

Yes, definitely      Yes, sometimes      No, not much      No, not at all

### 6. I feel I might lose control and hit or hurt someone

Sometimes      Occasionally      Rarely      Never

### 7. I have an uncomfortable feeling like butterflies in the stomach

Yes, definitely      Yes, sometimes      Not very often      Not at all

### 8. The thought of hurting myself occurs to me

Sometimes      Not very often      Hardly ever      Not at all

### 9. I'm awake before I need to get up

For 2 hours or more      For about 1 hour      For less than 1 hour      Not at all. I sleep until it is time to get up

### 10. I feel tense or 'wound up'

Yes, definitely      Yes, sometimes      No, not much      No, not at all

### 11. I feel like harming myself

Yes, definitely      Yes, sometimes      No, not much      No, not at all

### 12. I've kept up my old interests

Yes, most of them      Yes, some of them      No, not many of them      No, none of them

### 13. I am patient with other people

All the time      Most of the time      Some of the time      Hardly ever

### 14. I get scared or panicky for no very good reason

Yes, definitely      Yes, sometimes      No, not much      No, not at all

### 15. I get angry with myself or call myself names

Yes, definitely      Yes, sometimes      Not often      No, not at all

### 16. People upset me so that I feel like slamming doors or banging about

Yes, often      Yes, sometimes      Only occasionally      Not at all

### 17. I can go out on my own without feeling anxious

Yes, always      Yes, sometimes      No, not often      No, I never can

### 18. Lately I have been getting annoyed with myself

Very much so      Rather a lot      Not much      Not at all

## Scoring

19. The sheet accompanying the questionnaire indicates the method of scoring the 4 subscales.
20. Use of cut-off scores gives indicators of significant care needs with respect to depression, anxiety, and inwardly and outwardly directed irritability.
21. Inward irritability can point to the possibility of self-harm. Outward irritability raises the possibility of angry actions towards the child(ren).
22. As with any screening instrument, interpretation must be in the context of other information. Some respondents will underreport distress, others exaggerate it. A high or low score on any scale does not guarantee that a significant level of need is present.
23. Most value is obtained by using the scale as a springboard for discussion.

## Reference

Snaith RP, Constantopoulos AA, Jardine MY & McGuffin P (1978) A clinical scale for the self-assessment of irritability. *British Journal of Psychiatry*. 132: 163–71.



# Adult Wellbeing

## GUIDANCE ON USING THE SCALE

## ADULT WELLBEING SCALE

### Background

1. Parent/Caregiver mental health is a fundamental component of assessment.
2. There is evidence that some people respond more openly to a questionnaire than a face to face interview, when reporting on their mental health.
3. A questionnaire gives caregivers the opportunity to express themselves without having to face another person, however sympathetic that person may be.
4. A questionnaire is no substitute for a good relationship, but it can contribute to the development of a rapport if discussed sensitively.
5. During piloting the use of the questionnaire was found to convey the social worker's concern for the parent's wellbeing. This can be particularly valuable where the parent feels their needs are not being considered.

### The Scale

6. The scale is the Irritability, Depression, Anxiety (IDA) Scale developed by Snaith *et al* (1978).
7. This scale allows respondents four possible responses to each item.
8. Four aspects of wellbeing are covered: Depression, Anxiety and Inwardly and Outwardly directed Irritability.

### Use

9. In principle the questionnaire can be used with any adult, who is in contact with the child whose development and context are being assessed. In practice this will usually be the main caregiver(s).
10. In piloting, social workers reported that use of the scale raised issues on more than half the occasions that it was used. Probable depression was found amongst almost half the caregivers, and significant anxiety in a third.

11. Where social workers were new to the family situation they said they learnt things they did not know. 'It helped me to be aware of the carers' needs', and 'highlighted stresses'. It helped focus on 'parents' needs and feelings'.
12. Even when parents were known to the workers it gave topics an airing and clarified areas to work on; it 'released tension'.
13. Progress can also be registered. It was 'useful to measure when things were calmer'.
14. Used flexibly it can provide openings to discuss many areas including feelings about relationships with partners and children.

### Administration

15. It is vital that the respondent understands why they are being asked to complete the scale. Some will be concerned that revealing mental health needs will prejudice their chances of continuing to care for their child. For example, it can be explained that many carers of children experience considerable stress, and it is important to understand this if they are to be given appropriate support.
16. The scale is best filled out by the carer themselves in the presence of the worker, but it can be administered verbally.
17. It takes about 10 minutes to complete.
18. **Discussion is essential.** Usually this will be when the questionnaire has been completed, so the respondent has an opportunity to consider their own needs uninterrupted. However, there will be times when an important clue to how the caregiver feels may be best picked up immediately. One example occurred during piloting, when a respondent expressed distaste for questions about self-harm.

## SCORING THE ADULT WELLBEING SCALE

1. **Depression** – Questions 1,3,5,9 and 12 look at depression. The possible response scores that are shown below run from the left to the right – i.e. for question 1 'I feel cheerful', the scores would be looked at from 'yes, definitely' (0), 'yes, sometimes' (1), 'no, not at all' (3). A score of 4–6 is borderline in this scale and a score above this may indicate a problem

QU1	QU3	QU5	QU9	QU12
0,1,2,3	3,2,1,0	0,1,2,3	3,2,1,0,	0,1,2,3,

2. **Anxiety** – Questions 2,7,10,14 and 17 look at anxiety. A score of 6–8 is borderline, above this level may indicate a problem in this area.

QU2	QU7	QU10	QU14	QU17
0,1,2,3	3,2,1,0	3,2,1,0	3,2,1,0,	0,1,2,3,

3. **Outward directed irritability** – Questions 4,6,13 and 16 look at outward directed irritability. A score of 5–7 is borderline for this scale, and a score above this may indicate a problem in this area.

QU4	QU6	QU13	QU16
3,2,1,0	3,2,1,0	0,1,2,3	3,2,1,0,

4. **Inward directed irritability** – Questions 8,11,15 and 18 look at inward directed irritability. A score of 4–6 is borderline, a higher score may indicate a problem.

QU8	QU11	QU15	QU18
3,2,1,0	3,2,1,0	3,2,1,0	3,2,1,0,

Use of cut-off scores gives indicators of significant care needs with respect to depression, anxiety, and inwardly and outwardly directed irritability. Inward irritability can point to the possibility of self-harm. Outward irritability raises the possibility of angry actions towards the child(ren).

As with any screening instrument, interpretation must be in the context of other information. Some respondents will underreport distress, others exaggerate. A high or low score on any scale does not guarantee that significant level of need is present.

Most value is obtained by using the scale as a springboard for discussion.



# Adult Wellbeing

## SCORING THE SCALE



**Appendix C: Email confirmation of ethical approval from Cardiff University ethics committee**

From: psychethics <psychethics@cardiff.ac.uk>

Subject: Ethics Feedback - EC.16.06.14.4545

Date: 29 June 2016 at 10:43:50 BST

To: Sarah Rees <ReesS31@cardiff.ac.uk>, Dale Hay <HayDF@cardiff.ac.uk>

Cc: Sue Channon <ChannonS2@cardiff.ac.uk>, Cerith Waters  
<WatersCS@cardiff.ac.uk>

Dear Sarah,

The Ethics Committee has considered your PG project proposal: The Impact of Maternal Perinatal Anxiety on Mother-Infant Interaction at Six Months Postpartum and Children's Psychological Problems at Age Three and Seven (EC.16.06.14.4545).

The project has been approved.

Please note that if any changes are made to the above project then you must notify the Ethics Committee.

Best wishes,  
Mark Jones