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**DOCTORATE IN CLINICAL PSYCHOLOGY**  
**MAJOR RESEARCH PROJECT**

**Maternal Postnatal Depression, Expressed Emotion and Associated Child Internalising and Externalising Problems Aged 2-Years**

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### Abstract

**Background:** Maternal postnatal depression (MPND) has been associated with child emotional, behavioural and cognitive problems, placing them at greater risk for later psychopathology. Therefore research into mechanisms of risk transmission is important. This longitudinal study considers the emotional quality of the mother-child relationship, using a measure of Expressed Emotion (EE), as a potential mechanism explaining the link between MPND and child emotional and behavioural problems in the postnatal period. It was predicted mothers with higher depressive symptoms at 3-months would show more negative EE and their child would have more internalising and externalising problems at 2-years, with maternal EE acting as a mediator. **Methods:** Data from the longitudinal Oxford Father's Project for 130 (of 192 originally recruited) mother-child dyads was used. Mother's depressive symptoms were measured using the Edinburgh Postnatal Depression Scale at 3-months. Maternal EE, specifically critical and positive comments, was coded from the Preschool Five Minute Speech Sample measured at 2-years. Maternal, paternal and independently rated child outcomes were measured at 2-years using the Child Behaviour Checklist for ages 1.5-5. **Results:** Mothers, fathers and "others" rated child problems similarly. EE-positive comments showed stability from 1-2 years. Mothers with more depressive symptoms at 3-months showed more EE-criticism at 2-years especially towards boys and rated their children higher in internalising and externalising problems. Maternal EE-criticism predicted child internalising and externalising problems at 2-years. EE was not a significant mediator between maternal depressive symptoms and child problems. **Conclusions:** Children of mothers with more depressive symptoms 3-months post-birth experience more maternal EE-criticism and show more internalising and externalising problems aged 2-years. Given the long-term consequences of early childhood problems, postnatal depression should be screened and treated early to reduce EE-criticism and negative

child outcomes. Research should consider why mothers experiencing postnatal depression may be more critical of male children and how this may impact on development.

**Keywords:** Maternal, Postnatal Depression, Expressed Emotion, Child

**Abbreviations:**

Maternal Postnatal Depression (MPND)

Expressed Emotion (EE)

## Maternal Postnatal Depression, Expressed Emotion and Associated Child Internalising and Externalising Problems aged 2-Years

MPND is concerning for mother and child because infancy and pre-school are important stages of development where cognitive, affective and physiological systems are developing rapidly (Goodman & Gotlib, 1999). The mother-child relationship also begins to form in the postnatal period when the mother is typically the primary environment for the dependent infant (Murray & Cooper, 1997). Problems in early development are concerning because they are predictive of later psychopathology (Goodman, 2007) and therefore the impact of MPND on infant development may have lasting negative effects (Essex, Klein, Cho, & Karemer, 2009). It is crucial research explores pathways through which MPND affects infants to identify factors to target in early intervention and prevent poor long-term outcomes.

MPND is not included as a distinct diagnosis in diagnostic systems (World Health Organisation, 2007; American Psychiatric Association, 2000) but Mann, Gilbody and Adamson (2010) suggest the Scottish Intercollegiate Guidelines Network (2002) provide a useful definition of MPND as: “any non-psychotic depressive illness of mild to moderate severity occurring during the first postnatal year.” Prevalence rates range from 10-15% (Department of Health, 2010) and risk factors include stressful life events, unemployment, low income, low educational achievement, and history of depression. Symptoms include low mood, irritability, tiredness, sleeplessness, appetite changes, inability to enjoy activities and parenting difficulties (DirectGov, 2010).

Children of mother's who experience depression in the postnatal period have more emotional, behavioural and cognitive problems (Murray & Cooper, 1997), putting them at greater risk for later psychopathology (Campbell, 1995). In a large cohort study, MPND six-

months post-birth was associated with difficult child temperament at 24-months (Hanington, Ramchandani, & Stein, 2010) and exposure to depression from the postnatal period to early childhood is associated with increased child internalizing and externalising symptoms (Trapolini, McMahon, & Ungerer, 2007). The effects of maternal depression later in childhood are similar (Goodman & Tully, 2006), with increased adolescent externalising problems (Spieker, Larson, Lewis, Keller, & Gilchrist, 1999), depression, anxiety, substance-misuse (Gallerani, Garber, & Martin, 2010), and negative interpersonal relationships (Hammen & Brennan, 2001). Child internalizing problems seem more related to maternal rather than paternal depression, demonstrated in a meta-analysis of 134 samples with over 60,000 parent-child dyads, although effect sizes were small, .16 and .14 for mothers and fathers respectively (Connell & Goodman, 2002).

The “Integrative Model for the Transmission of Risk to Children of Depressed Mothers” (Goodman & Gotlib, 1999) explains associations between maternal depression and child outcomes via four interacting mechanisms including; heritability; innate dysfunctional neuroregulatory mechanisms; exposure to stressful environments; and exposure to mother’s negative and/or maladaptive cognitions, behaviours and affect through parenting. According to this last mechanism, mothers experiencing negative cognitions and affect may behave more negatively towards the child (Lovejoy, Graczyk, O’Hare, & Neuman, 2000), have more critical perceptions of them and express these in more verbally critical mother-child relationships (Goodman, Adamson, Riniti, & Cole, 1994). Verbal criticism towards the child may mediate the relationship between maternal depression and negative child outcomes, suggesting maternal EE is a potential risk pathway between mother and child.

EE is a construct of the emotional quality of the relationship between a relative and identified individual (Vaughn & Leff, 1976). It can be measured with structured interviews or from coded speech samples. It is thought the way a person talks about another person reflects

how they treat them in daily life. EE is usually a negative construct and found to be stable over time (Hooley, 2007). Two main dimensions are typically measured, “criticism”, which encompasses feelings of negativity and resentment and “emotional over-involvement”, including extreme self-sacrificing and over-protective behaviours (Magana et al., 1986). The original measure was the Camberwell Family Interview (CFI; Brown & Rutter, 1966). An alternative measure used in child research is the Five-Minute Speech Sample (FMSS; Magana et al., 1986), which has construct validity against observations of mother-child interaction and self-report (McCarty, Lau, Valeri, & Weisz, 2004; Park, Garber, Ciesla, & Ellis, 2008; Cruise, Sheeber, & Tompson, 2011). The Pre-school Five-Minute Speech Sample (PFMSS; Daley, Sonuga-Barke, & Thompson, 2003) is an adapted version of the FMSS designed to measure attitudes towards very young children. The parent is asked to talk for five-minutes about their thoughts and feelings towards their child and their relationship over the last six months. The way they talk about the child in the speech sample is thought to reflect the emotional quality of the parent-child relationship with construct validity against observed interactions (Daley et al., 2003). The PFMSS includes adapted elements of the FMSS as well as ratings of ‘warmth’ and ‘positive comments’ thought to be developmentally important for young children (Daley et al., 2003). Due to the young age of the child and research findings detailed below, this study focuses only on EE critical and positive comments measured by the PFMSS.

Originally developed to understand family processes involved in schizophrenia relapse (Brown, Birley, & Wing, 1972), negative EE in the home has been found to worsen prognosis for people with mental health problems (Butzlaff & Hooley, 1998; Hooley, 2007) and medical illness and is a risk factor for developing mental health problems (Hooley & Gotlib, 2000). Because EE presents a risk for developing mental health problems, it seems important to examine in the postnatal period when infants are developing socially and

emotionally. Exposure to criticism in the postnatal period may result in children developing negative self-schemas, self-doubt and self-criticism as well as beliefs about relationships being conflictual (Miklowitz, 2004). Positive comments could also be important for very young children and may relate to development. St John-Seed and Weiss (2002) found more positive comments reduced the likelihood of children developing internalising problems. In adolescents, positive mother-child relationships predict resilient outcomes even when they are exposed to maternal depression (Brennan, Le Broque, and Hammen, 2003). Therefore it seems important to consider whether MPND increases criticism and reduces positive comments towards young children and whether this increases child emotional and behavioural problems where the effects may be long lasting. Research considering this potential causal pathway could highlight factors to include in early intervention.

Little research has been conducted on EE and the effects on very young children in the postnatal period. The limited research shows some support for the mechanism outlined by Goodman and Gotlib (1999), suggesting MPND increases negative maternal EE (Barnes et al., 2007) which increases child problems (St-John-Seed & Weiss, 2002; Rogosch, Cicchetti, & Toth, 2004). Barnes et al. (2007) found negative and critical remarks about 3-month-old infants were associated with current MPND. However, St- John-Seed and Weiss (2005) found MPND was not associated with criticism but family satisfaction was. In low birth-weight children, negative EE was a significant predictor of child internalising problems, and positive comments and warmth reduced the likelihood of developing internalising problems (St-John-Seed & Weiss, 2002). In their cross-sectional study, Rogosch et al. (2004) found mothers who experienced MPND had higher EE-criticism regarding their child, themselves and their spouse and rated their child as having more behaviour problems at 20-months compared to control families. This suggests MPND and high EE-criticism in the postnatal period contributes to child behaviour problems in very young children. Only mothers

reported more child behaviour problems however, suggesting a possible bias to over-report with MPND. Indeed mothers with depression have been found to report more child problems than fathers, teachers and caregivers (Miner & Clarke-Stewart, 2008; Trapolini et al., 2007; Gartstein, Bridgett, Dishion, & Kaufman, 2009). Alternatively mothers may spend more time with their young children and provide more accurate responses.

A longitudinal study found maternal negativity measured from interactions at 25-months mediated the relationship between MPND in the first 18-months and child externalizing behaviour at 34-months. The study compared 50 mothers who had experienced MPND with 51 who had never experienced depression (Dietz, Jennings, Kelley, & Marshal, 2009). This suggests MPND influences children through maternal negativity. It seems important to extend this longitudinal study using sensitive standard measures of EE for very young children such as the PFMSS and multiple ratings of child behaviour.

Research with older children also suggests critical EE is associated with more child externalising problems (Vostanis, Nicholls, & Harrington, 1994; Eisenberg et al., 2001; McCarty & Weisz, 2002; Peris & Hinshaw, 2003; Hastings, Daley, Burns, & Beck, 2006), depression (Schwartz, Dorer, Beardslee, Lavori, & Keller, 1990; Asarnow, Tompson, Woo, & Cantwell, 2001; Jacquez, Cole, & Searle, 2002; McLeod, Weisz, & Wood, 2007; Silk et al., 2009), increased anxiety and decreased self-concept (Kwon et al., 2006). Some suggest maternal depression precedes negative EE and child problems (Bolton et al., 2003; Goodman et al., 1994; Tompson et al., 2010; Nelson, Hammen, Brennan, & Ullman, 2003). Others found negative EE is dependent on child characteristics rather than maternal psychopathology (Hibbs et al., 1991; Frye & Garber, 2005; Psychogiou, Daley, Thompson, & Sonuga-Barke, 2007; Hale et al., 2011).

EE-criticism may be most relevant to study with young children as indicated by the described postnatal studies (Dietz et al., 2009). EE over-involvement was the same in

depressed and non-depressed families, suggesting it may not be developmentally appropriate to investigate in very young children where it is necessary for parents to be very involved with their child (Rogosch et al., 2004; Dietz et al., 2009). As discussed, EE-criticism and positive comments may therefore be most crucial to investigate in the postnatal period.

Child gender might also be important to consider in postnatal research because a meta-analysis found MPND resulted in more negative outcomes for boys (Murray & Cooper, 1997). Essex et al. (2009) found boys exposed to maternal depression in infancy showed more internalising but more externalising if they were also exposed to marital conflict. Female children showed more internalising when exposed to maternal depression and marital conflict. Cummings, Keller and Davies (2005) found maternal depression was associated to peer exclusion for pre-school aged girls only. This suggests MPND may affect male and female children differently. Mothers with MPND may also show different EE to boys and girls resulting in differing child problems which requires investigation.

This study examines whether maternal depressive symptoms 3-months post-birth (measured using the Edinburgh Postnatal Depression Scale; EPDS; Cox, Holden, & Sagovsky, 1987) predict more EE critical comments and less positive comments towards the child (measured using the PFMSS; Daley et al., 2003) and more child internalising and externalising problems aged 2-years (measured using the Child Behaviour Checklist for ages 1.5-5 years; CBCL/1.5/5; Achenbach & Rescorla, 2000), and whether EE-criticism mediates the relationship between maternal depressive symptoms and child emotional and behaviour problems. The study extends previous work (Barnes et al., 2007; St-John-Seed & Weiss, 2002; Rogosch et al., 2004; Dietz et al., 2009) by using longitudinal methodology, sensitive measures of EE for very young children and examining the differential effects of child gender. Child emotion and behaviour was rated by mothers, fathers and an individual who knows the child well to reduce possible reporting bias found in previous research. Only

positive and critical comments were examined due to previous research suggesting they are most important to study with young children. Because measuring EE towards very young children is a relatively new concept, the stability of EE critical and positive comments from 1-2 years was examined.

The following hypotheses were tested:

- 1) Children of mothers who experienced more depressive symptoms at 3-months will have more internalising and externalising problems aged 2-years.
- 2) Mothers who experienced more depressive symptoms at 3-months will show more EE-criticism and less EE-positive comments towards their child at 2-years.
- 3) Children of mothers experiencing more EE-criticism and less EE-positive comments at 2-years will have more internalising and externalising problems at 2-years.
- 4) EE-criticism will mediate the relationship between mother's depressive symptoms at 3-months and child externalising and internalising at 2-years.
- 5) These effects will be moderated by child gender.

## Method

### Design

The study uses data previously collected for the Oxford Fathers Project (OFP); a longitudinal community study examining the effects of paternal postnatal depression on infant development in an initial sample of 192 families. The primary focus of the OFP was fathers but measures were completed for both parents. Father depression data is analysed elsewhere. Data from mothers is used in this study.

### Sample

Families were recruited from maternity wards of the John Radcliffe Hospital in Oxford, and the General Hospital in Milton Keynes, UK. They were approached by trained staff, given information about the study and asked for permission to be contacted. The OFP had obtained ethical approval for data collection and the large project.<sup>1</sup> Ethical approval by Exeter School of Psychology Ethics Committee was obtained for this study.<sup>2</sup>

Fathers who gave their consent were contacted 7-weeks post-birth and sent the EPDS (Cox et al., 1987). All fathers scoring 10 or above and a random sample of those scoring below 10 were invited to participate with their child's mother. To be eligible for inclusion, participants had to be 18-years or over at the child's birth and able to speak English. Infants were born at 37 weeks or more, had no abnormalities and a birth weight of at least 2,500 grams. This study accesses data for 192 mother-child dyads minus drop-out, resulting in 130 mother-child pairs. At 3-months, the mean age of the 130 mothers was 33.27 (SD 4.71; range 0-26). 7.2% had GCSEs, 10.4% had 'A' levels, 19.2% had a diploma, 32.8% had a degree and 30.4% had a postgraduate qualification ( $N=125$ ), indicating a highly educated sample.

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<sup>1</sup> See Extended Appendix D1 for OFP ethical approval letter, p.75

<sup>2</sup> See Extended Appendix D2 and D3 for Exeter University School of Psychology ethics application and approval letter, p.77 & p.80

One mother was single and all others were married or living with their partner ( $N=129$ ). Only one of the families had unemployed status at this time. There were no significant differences on these variables or mothers and fathers 3-month depression scores between families included in the analysis and the 62 families who had dropped out of the study at 2-years.<sup>3</sup>

## Measures

### Depressive symptoms

Mother's depressive symptoms were measured at 3-months using the EPDS (Cox et al., 1987), a 10-item self-report questionnaire specifically designed to detect postnatal depression that takes five minutes to complete. Mothers select one of four responses for each question based on their experience over the last seven days. Items are scored on a 4-point scale (0-3) with seven items reverse scored. Higher scores indicate higher levels of depressive symptoms with scores above a threshold of nine (used in this study) indicating clinical levels of depression with few false-negatives. The EPDS has good psychometric properties, and was valid, reliable, sensitive and specific when tested on a community sample and compared to diagnostic interview (Cox et al., 1987).

### Expressed Emotion

Maternal EE was measured when the child was 2-years-old using the PFMSS (Daley et al., 2003), an adapted version of the FMSS (Magana et al., 1986) specifically designed for relatives of very young children. The parent is asked to talk for five minutes, without interruption or prompts, about their thoughts and feelings towards their child and their relationship over the last six months<sup>4</sup> and recorded on audio cassette. Speech samples are

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<sup>3</sup> See Appendix B, Extended Results for analysis comparing participants retained and those who had dropped out at 2-years, p.70

<sup>4</sup> See Extended Method, Appendix A4 for instructions for participants for the PFMSS, p.60

coded on three global scores: initial statement, relationship and warmth (scored positive, neutral or negative) and frequency counts of positive and critical comments. In the present study, additional categories of intermediate critical and positive comments were added because of the young age of the child to capture more subtle forms of positivity and criticism. A comment was rated as intermediate if the parent used a qualifier (i.e., “he is *quite* demanding”). When coding the speech samples, the researcher was blind to the participant’s EPDS score to reduce coding bias. All aspects of EE were coded but total critical and total positive comments were selected for analysis. These are the sum of critical and intermediate critical comments (referred to as “EE-criticism”) and the sum of positive and intermediate positive comments (referred to as “EE-positive comments”). Critical comments are negative comments about the child’s behaviour and/or personality and are scored on the basis of tone and/or critical phrases. Positive comments are statements of praise, approval or appreciation, the majority of which are descriptive words which indicate a positive trait the child has but they can also be rated on tone.<sup>5</sup> The PFMSS has good discriminant validity, differentiating parents of children with behavioural problems from parents of control children (Daley et al., 2003), code-recode, inter-rater and test-retest reliability (Yelland & Daley, 2009) and construct validity against observed interactions (Daley et al., 2003).

Inter-rater and code-recode reliability for this study was conducted two months after initial coding, to be consistent with the OFP. Inter-rater reliability was tested by comparing the author’s scores for EE-criticism and EE-positive comments from a random sample of 20 PFMSS speech samples with another trained coder’s scores using 2-way mixed absolute agreement intraclass correlation. Inter-rater reliability was good for total positive comments (ICC= .979) and total critical comments (ICC=.960). Code-recode reliability was tested by randomly selecting 20 speech samples and re-coding positive and critical comments two

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<sup>5</sup> See Extended Method, Appendix A5 for detailed notes on how critical and positive comments were coded from the PFMSS coding manual, p.61

months after initial coding and compared using 2-way mixed absolute agreement intraclass correlation. Code-recode reliability was good for total positive comments (ICC = .987) and total critical comments (ICC = .994).<sup>6</sup>

### **Child outcomes**

Child emotional and behavioural problems were measured at 2-years using the CBCL/1.5/5 (Achenbach & Rescorla, 2000) completed by the mother, father and “other” rater (someone who knows the child well e.g. nursery teacher or grandparents). The CBCL/1.5/5 and the Caregiver-Teacher Report form (C-TRF) are a set of rating forms for children aged 18-months to 5-years. The CBCL/1.5/5 obtains parent ratings of 99 problem items and the C-TRF obtains ratings from teachers and caregivers. Items are marked on a 3-point scale (0-2) “not true”, “somewhat/sometimes true”, “very true/often true”. Item scores form scores for the following empirically based scales: emotionally reactive, anxious/depressed, somatic complaints, withdrawn (which combine to form the internalising scale), attention problems, and aggressive behaviour (which combine to form the externalising scale). Scales are based on ratings for 1728 children and normed on a US sample of 700 children for the CBCL, and based on 1113 children and normed on 1192 children for the C-TRF. In line with previous research, internalising and externalising scales were used for this study.

Demographic information on infants birth order, mother’s age and education, marital status, employment and child gender was also accessed.

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<sup>6</sup> See Extended Method, Appendix A3 for inter-rater and code-recode reliability for all elements of EE in the PFMSS, p.59

**Procedure**

The data accessed had been collected at home visits and the speech sample was conducted in a separate room to other family members and recorded. The author was trained by Lamprini Psychogiou to code the PFMSS over eight weeks for two hours a week using 20 mother speech samples. The author then coded the 130 five-minute speech samples for all elements of EE over two months, taking approximately 60 hours. Once all speech samples were coded, scores were entered into SPSS. The CBCL scales were calculated from the scores on the 99 items and combined to form the internalising and externalising scales as described above for the mother, father and “other”. Data was analysed as detailed below.

## Results

To ensure the same sample of parent-child dyads was used in all analyses, cases were included from the original sample of 192 when they had a maternal EE speech sample and maternal ratings of child emotion and behaviour at 2-years, resulting in 130 mother-child dyads. Of these, two mothers were missing an EPDS score. Within these dyads, there was 126 father and 101 “other” ratings of child internalising and externalising. Cases were excluded pairwise.

### Preliminary analysis

#### Missing data

Two researchers checked the database and entered values of 99 for missing data. On the CBCL, where participants had missed a maximum of two items from a scale, the median average for that participant on that scale was taken (due to ordinal level data) and substituted into the missing item. This was to prevent the participant’s whole CBCL being lost. If more than two items were missed, the missing value of 99 was entered. In all but three cases on mother rated scales, the median entered was zero, indicating “no problems” on that item. Two had a median of one and one had a median of 0.5. For father rated scales, three participants had a median of one and one had a median of 0.5. One median was one in the “other” rated scales.<sup>7</sup>

#### Descriptive Statistics

The mean, standard deviation and range for the variables included in the analysis are shown in Table 1.

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<sup>7</sup> See Extended Method, Appendix A6 for a detailed description of how missing data was handled for the Child Behaviour Checklist, p.64

Table 1

*Mean, Standard Deviation and Range*

	Mean	Standard deviation	Range
Mother's 3-month EPDS score		(N=128)	
Maternal depressive symptoms	5.98	3.93	0 - 20
1-year Maternal Expressed Emotion		(N=128)	
EE-criticism	.87	1.29	0 - 6
EE-positive comments	5.27	2.89	0 - 16
2-year Maternal Expressed Emotion		(N=130)	
EE-criticism	2.08	2.24	0 - 11
EE-positive comments	9.55	4.37	0 - 23
Mother rated CBCL scales		(N=130)	
Child internalising	6.53	5.67	0 - 35
Child externalising	11.26	6.16	1 - 31
Father rated CBCL scales		(N=126)	
Child internalising	5.98	5.07	0 - 34
Child externalising	11.69	5.93	0 - 28
"Other" rated CBCL scales		(N=101)	
Child internalising	4.48	4.77	0 - 22
Child externalising	5.69	5.59	0 - 20

Note: N= Indicated in brackets; EPDS= Edinburgh Postnatal Depression Scale (Cox et al., 1987); CBCL= Child Behaviour Checklist for ages 1.5-5 years; CBCL/1.5/5; (Achenbach & Rescorla, 2000)

Scores on the EPDS ranged from 0-20 and 35 (27%) of the 128 mothers who completed the EPDS had scores in the clinical range of nine or above (Cox et al., 1987). The average score for EE-criticism was lower than the average score for EE-positive comments. Mothers, fathers and "others" rated higher child externalising behaviour than internalising on average. Father and mother means were similar for internalising and externalising whereas other's ratings of externalising were lower.

### Tests of normality and outliers

Boxplots were created to identify any outliers. Histograms were created for the continuous variables used in the analysis and visually examined for skewness and kurtosis. Skewness and kurtosis were also calculated and converted to z-scores as recommended by Field (2011) by dividing by their standard error. The resulting scores were above 1.96 indicating the variables were significantly different from normal apart from kurtosis on EE-positive comments and mother and other rated child externalising, and skewness and kurtosis on father rated child externalising. The Kolmogorov-Smirnov statistic was then applied, as shown in Table 2 and was significant for all target variables, suggesting the scores in this data set were significantly different to those of the normal population.

Table 2

*Results of the Kolmogorov-Smirnov (D) Test of Normality*

	<i>D</i>	<i>P</i>
Mother's 3-month EPDS score	.137 (128)	.000
2 year EE-criticism	.207 (130)	.000
2 year EE-positive comments	.077 (130)	.054
Mother rated CBCL internalising	.125 (130)	.000
Mother rated CBCL externalising	.086 (130)	.019
Father rated CBCL internalising	.163 (126)	.000
Father rated CBCL externalising	.088 (126)	.019
Other rated CBCL internalising	.184 (101)	.000
Other rated CBCL externalising	.180 (101)	.000

Note: *df*= Indicated in brackets; EPDS= Edinburgh Postnatal Depression Scale (Cox et al., 1987); CBCL= Child Behaviour Checklist for ages 1.5-5 years; CBCL/1.5/5; (Achenbach & Rescorla, 2000)

Attempts were made to transform the data, which was positively skewed, using the function 'squareroot' as suggested by Tabachnick and Fidell (2001). This resulted in some but not all

z-scores for skewness and kurtosis falling within normal limits. Repeating the Kolmogorov-Smirnov test suggested some variables still significantly differed from normal. Given this and the controversy over transforming variables, the data was left in its original state and non-parametric zero order correlations were applied followed by multiple regressions which are robust to deviations from normality, requiring only normally distributed residuals.

The assumptions of regression were checked according to Field (2011) as follows. For sample size, Green (1991) suggests to test the model overall, the sample required is  $50+8k$  ( $k$ =number of predictors). This was 66 ( $50+8 \times 2$ ) for the mediation analysis and 74 ( $50+8 \times 3$ ) for the moderation analysis. To test individual predictors he suggests the sample required is  $104+k$ , therefore 106 ( $104+2$ ) for mediation and 107 ( $104+3$ ) for moderation. To look at both, he suggests using the larger of the two values (107) so the sample of 128 was sufficient. Outliers were checked by looking at the standardized residuals to determine if any were above 3.3 or less than -3.3. Non-zero variance was checked by ensuring predictors did not have a standard deviation of zero. Multicollinearity was checked by looking at the correlation table to ensure predictor variables did not correlate above .90. The residual scatter plots were checked for linearity and homoscedasticity and showed no non-linear relationships or funnelling. The residual histograms and normal P-plots were examined and indicated no major deviations from normality in the residuals. Durbin –Watson statistics were checked to examine independence of the residuals checking there were no values below 1 and above 3.

### **Stability of Expressed Emotion**

Because measuring EE towards very young children is a relatively new concept, Spearman's Rank Order 2-tailed correlations were used to examine the stability of EE-criticism and EE-positive comments from 1-2 years. Mother's 1-year and 2-year EE-criticism

were not significantly correlated ( $r_s(128) = .157, p = .078$ ). Mother's 1-year and 2-year EE-positive comments were significantly correlated ( $r_s(128) = .178, p = .045$ ).

### **Zero Order Correlations**

Because the data was not normally distributed, non-parametric tests of correlation (2-tailed Spearman's Rank Order Correlations, Table 3) were applied to the data to:

- 1) Compare mother, father and other rated child internalising and externalising because mothers' ratings of child problems have been found to differ from fathers and caregivers.
- 2) Test hypotheses one to three, examining whether:
  - a) Mother's depressive symptoms at 3-months were associated with child internalising and externalising problems at 2-years (test of hypothesis one)
  - b) Mothers depressive symptoms at 3-months were associated with more EE-criticism and less EE-positive comments towards their child at 2-years (test of hypothesis two)
  - c) More maternal EE-criticism and less EE-positive comments at 2-years were associated with more child internalising and externalising problems at 2-years (test of hypothesis three)

Table 3  
*2-tailed Spearman's Rank Order Correlations Showing Relationships between Maternal Postnatal Depression, Expressed Emotion and Child Internalising and Externalising*

	1	2	3	4	5	6	7	8	9
1. Mother's 3-month EPDS score	-	.262** (128)	-.176* (128)	.283** (128)	.191* (128)	.150 (124)	.111 (124)	.026 (99)	.008 (99)
2. 2-year EE-criticism		-	-.153 (130)	.297** (130)	.185* (130)	.207* (126)	.189* (126)	.194 (101)	.196* (101)
3. 2-year EE-positive comments			-	-.141 (130)	-.124 (130)	-.118 (126)	-.010 (126)	-.056 (101)	-.037 (101)
4. Mother rated CBCL internalising				-	.672** (130)	.334** (126)	.272** (126)	.330** (101)	.185 (101)
5. Mother rated CBCL externalising					-	.292** (126)	.425** (126)	.344** (101)	.359** (101)
6. Father rated CBCL internalising						-	.635** (125)	.142 (97)	.133 (97)
7. Father rated CBCL externalising							-	.152 (98)	.292** (98)
8. Other rated CBCL internalising								-	.695** (101)
9. Other rated CBCL externalising									-

Note: *N* = indicated in brackets. \**p* < .05 \*\**p* < .01 EPDS= Edinburgh Postnatal Depression Scale (Cox et al., 1987); CBCL= Child Behaviour Checklist for ages 1.5-5 years; CBCL/1.5/5; (Achenbach & Rescorla, 2000)

### **Mother, Father and Other Rated Child Internalising and Externalising**

Table 3 shows mother rated child internalising and externalising significantly correlated with father and other rated child internalising and externalising. Father and other rated externalising significantly correlated but father and other internalising did not. Correlations were small to medium in size (Cohen, 1988).

### **Tests of Hypotheses One to Three**

Table 3 shows there was a small positive correlation between mother's depressive symptoms at 3-months and mother reported child internalising and externalising at 2-years with higher depression associated with more child problems. There was also a small positive correlation between mother's depressive symptoms at 3-months and maternal EE-criticism at 2-years with more depressive symptoms associated with more criticism of the child. There was a small negative correlation between maternal depressive symptoms at 3-months and EE-positive comments with more depressive symptoms associated with less positive comments. There was a small positive relationship between EE-criticism at 2-years and mother and father rated child internalising with more EE-criticism associated with more child internalising. Finally there was a small positive relationship between EE-criticism at 2-years and mother, father and other rated child externalising with more criticism associated with more child externalising.

To examine whether the associations between maternal depressive symptoms at 3-months and maternal EE-criticism, EE-positive comments, mother rated child internalising and externalising at 2-years were significant after controlling for infant's birth order, mother's age and education and father's depressive symptoms on the 3-month EPDS, factors identified as important in previous research, hierarchical regressions were used. Factors to be

controlled were entered together into step one of the hierarchical regressions and mother's depressive symptoms were entered into step two. As shown in Tables 4 to 7 mother's depressive symptoms at 3-months significantly predicted child internalising, externalising and maternal EE-criticism but not EE-positive comments when controlling for the factors defined above.

Table 4

*Predictors of Mother Rated Child Internalising Behaviour at 2-Years*

Variable	Mother rated child internalising behaviour		
	Model 1 $\beta$	$\beta$	95% CI
Infant birth order	-.055	-.058	[-1.986-1.011]
Mother's age	-.014	-.008	[-.232-.213]
Mother's qualification (N=125)	-.082	-.060	[-.775-.383]
Father 3 month EPDS score	.214*	.148	[-.036-.375]
Mother 3 month EPDS score (N=128)		.308***	[.193-.696]
$R^2$	.055	.144	
$F$	1.711	3.951**	
$\Delta R^2$		.090	
$\Delta F$		12.261***	

Note:  $N=130$  unless specified. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$  CI= Confidence Interval

Table 5

*Predictors of Mother Rated Child Externalising Behaviour at 2-Years*

Variable	Mother rated child externalising behaviour		
	Model 1 $\beta$	Model 2	
		$\beta$	95% CI
Infant birth order	-.160	-.162	[-3.161-.200]
Mother's age	.132	.137	[-.071-.428]
Mother's qualification (N=125)	.043	.058	[-.442-.857]
Father 3 month EPDS score	.097	.054	[-.164-.297]
Mother 3 month EPDS score (N=128)		.204*	[.038-.602]
$R^2$	.046	.085	
$F$	1.417	2.181	
$\Delta R^2$		.039	
$\Delta F$		5.044*	

Note: N=130 unless specified. \* $p < .05$ ; CI= Confidence Interval

Table 6

*Predictors of Maternal EE-Criticism at 2-Years*

Variable	Maternal total critical comments		
	Model 1 $\beta$	Model 2	
		$\beta$	95% CI
Infant birth order	.057	.054	[-.437-.800]
Mother's age	-.130	-.125	[-.151-.033]
Mother's qualification (N=125)	.032	.049	[-.175-.302]
Father 3 month EPDS score	.008	-.041	[-.103-.066]
Mother 3 month EPDS score (N=128)		.229**	[.027-.234]
$R^2$	.015	.065	
$F$	.445	1.614	
$\Delta R^2$		.050	
$\Delta F$		6.210**	

Note: N=130 unless specified. \* $p < .05$  \*\* $p < .01$ ; CI= Confidence Interval

Table 7

*Predictors of Maternal EE-positive comments at 2 years*

Variable	Mother rated child internalising behaviour		
	Model 1 $\beta$	Model 2	
		$\beta$	95% CI
Infant birth order	-.109	-.108	[-1.922-.513]
Mother's age	.049	.046	[-.138-.244]
Mother's qualification (N=125)	.012	.003	[-.462-.478]
Father 3 month EPDS score	-.137	-.110	[-.264-.070]
Mother 3 month EPDS score (N=128)		-.127	[-.345-.064]
$R^2$	.032	.048	
$F$	.989	1.169	
$\Delta R^2$		.015	
$\Delta F$		1.860	

Note:  $N=130$  unless specified. CI= Confidence Interval

To examine whether the associations between maternal EE-criticism and child internalising and externalising were significant after controlling for infant's birth order, mother's age and education, hierarchical regressions were used. Factors to be controlled were entered together into step one and mother's EE-criticism was entered into step two.

Associations between maternal EE-criticism and father and other rated child problems were not explored further because they were not associated to maternal depressive symptoms at 3-months. As shown in Tables 8 to 9 mothers EE-criticism at 2-years significantly predicted child internalising and externalising when controlling for the factors defined above.

Table 8

*Predictors of Mother Rated Child Internalising Behaviour at 2-Years*

Variable	Mother rated child internalising behaviour		
	Model 1 $\beta$	Model 2	
		$\beta$	95% CI
Infant birth order	-.039	-.051	[-1.980-1.122]
Mother's age	.030	.058	[-.158-.298]
Mother's qualification (N=125)	-.110	-.117	[-.977-.210]
Maternal EE-criticism		.213*	[.092-.988]
$R^2$	.012	.057	
$F$	.497	1.809	
$\Delta R^2$		.045	
$\Delta F$		5.688*	

Note:  $N=130$  unless specified. \* $p < .05$ ; CI= Confidence Interval

Table 9

*Predictors of Mother Rated Child Externalising at 2-Years*

Variable	Mother rated child externalising		
	Model 1 $\beta$	Model 2	
		$\beta$	95% CI
Infant birth order	-.152	-.164	[-3.165-.164]
Mother's age	.153	.178	[-.012-.478]
Mother's qualification (N=125)	.031	.024	[-.550-.724]
Maternal EE-criticism		.200*	[.067-1.029]
$R^2$	.037	.076	
$F$	1.550	2.475*	
$\Delta R^2$		.039	
$\Delta F$		5.096*	

Note:  $N=130$  unless specified. \* $p < .05$ ; CI= Confidence Interval

**Test of Hypothesis Four**

To test whether EE-criticism mediated the relationship between mother's depressive symptoms at 3-months and mother rated child externalising and internalising at 2-years (hypothesis four), multiple regression using the steps to test mediation outlined by Baron and Kenny (1986) were used and are detailed below. The steps were conducted for each Dependent Variable (DV; child internalising/externalising) and results are reported in Table 10. Mediation analysis was not conducted to test EE-positive comments as a mediator because it did not relate to child outcomes.

Step 1: Regress child internalising/externalising (DV) on maternal 3-month depression score (predictor) to test whether maternal depressive symptoms at 3-months predict more child internalising/externalising at 2-years.

Step 2: Regress EE-criticism (mediator) on maternal depressive symptoms (predictor) to test whether maternal depressive symptoms at 3-months predicts more EE-criticism at 2-years.

Step 3: Regress internalising/externalising (DV) on maternal depressive symptoms and EE-criticism (simultaneous predictors) and perform the Sobel test to examine whether EE-criticism significantly mediates the relationship between maternal depressive symptoms at 3-months and child internalising and externalising at 2-years.

Table 10

*Analysis of EE-Criticism as a Mediator Between Mother's Depressive Symptoms and Child Internalising and Externalising using the Baron and Kenny Steps*

	B	SE B	$\beta$	P value	$R^2$	F
Child internalising						
Step 1. EPDS on internalising	.496	.121	.344**	.000	.118	16.863
Step 2. EPDS on EE-criticism	.123	.050	.216**	.014	.047	6.178
Step 3. EPDS and EE-criticism on internalising:						
EPDS	.453	.123	.314***	.000	.136	9.849
EE-criticism	.349	.216	.138	.108		
Child externalising						
Step 1. EPDS on externalising	.322	.137	.206*	.020	.042	5.566
Step 2. EPDS on EE-criticism	.123	.050	.216**	.014	.047	6.178
Step 3. EPDS and EE-criticism on externalising:						
EPDS	.275	.139	.176*	.050	.061	4.047
EE-criticism	.383	.244	.139	.119		

Note:  $N=128$  \* $p < .05$ ; \*\* $p < .01$ ; EPDS = Mother's depression score on the Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987).

The mediation analysis showed maternal EE-criticism was not a significant mediator between maternal depressive symptoms and child internalising and externalising. Because mediation was not significant, the Sobel test was not performed.

### **Tests of Hypothesis Five**

To test whether the associations between maternal depressive symptoms at 3-months, maternal EE-criticism, and mother rated child internalising and externalising were moderated by child gender (hypothesis five), the following calculations were performed. First, mother's EPDS scores and EE-criticism were centred by creating a new variable and then subtracting

the mean for each variable from each variable. Interaction terms were then created by multiplying child gender with each of the centred variables. Hierarchical regressions were then performed by entering variables in the steps outlined in Tables 11-12<sup>8</sup>.

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<sup>8</sup> See Appendix B, Extended Results for a detailed description of the steps conducted for moderation analysis, p.71-72

Table 11

*Analysis of Moderation by Child Gender for Relationships Between Mothers EPDS Depression Score and Mother Rated Child Internalising and Externalising and EE-Criticism*

	B	SE B	$\beta$	P value	$\Delta R^2$	$\Delta F$
Child gender as a moderator between mother's EPDS depression score and child internalising						
Step 1. Child gender	1.753	1.008	.153	.084	.023	3.024
Step 2. Child gender	.731	.998	.064	.465		
Mothers EPDS (N=128)	.471	.126	.326***	.000	.098	14.002
Step 3. Child gender	.768	1.022	.067	.751		
Mother's EPDS	.432	.252	.299	.089		
Child gender*mothers EPDS (N=128)	.053	.292	.031	.857	.000	.032
Child gender as a moderator between mother's EPDS depression score and child externalising						
Step 1. Child gender	-.704	1.104	-.057	.525	.003	.406
Step 2. Child gender	-1.516	1.122	-.122	.179		
Mothers EPDS (N=128)	.373	.141	.239**	.009	.053	7.003
Step 3. Child gender	-1.691	1.147	-.136	.143		
Mothers EPDS	.560	.282	.358*	.049		
Child gender*mothers EPDS (N=128)	-.250	.328	-.133	.448	.004	.579
Child gender as a moderator between mother's EPDS and mother's EE-criticism						
Step 1. Child gender	.588	.399	.130	.143	.017	2.169
Step 2. Child gender	.346	.409	.077	.399		
Mothers EPDS (N=128)	.111	.052	.195*	.033	.035	4.650
Step 3. Child gender	.165	.411	.037	.689		
Mother's EPDS	.304	.101	.534**	.003		
Child gender*mothers EPDS (N=128)	-.259	.118	-.380*	.029	.036	4.856

Note: N = 130 unless specified, \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$ ; EPDS= Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987).

Table 12

*Analysis of Moderation by Child Gender for Relationships Between EE-Criticism and Mother Rated Child Internalising and Externalising*

	B	SE B	$\beta$	P value	$\Delta R^2$	$\Delta F$
Child gender as a moderator between mother's EE-criticism and child internalising						
Step 1. Child gender	1.753	1.000	.153	.082	.023	3.072
Step 2. Child gender	1.471	.994	.129	.141		
Mother's EE-criticism	.479	.220	.189*	.031	.035	4.732
Step 3. Child gender	1.461	1.000	.128	.146		
Mother's EE-criticism	.531	.366	.210	.149		
Child gender*mothers EE-criticism	-.082	.459	-.026	.858	.000	.032
Child gender as a moderator between mother's EE-criticism and child externalising						
Step 1. Child gender	-.704	1.096	-.057	.522	.003	.413
Step 2. Child gender	-1.007	1.090	-.081	.357		
Mother's EE-criticism	.516	.241	.188	.034	.035	4.580
Step 3. Child gender	-1.115	1.083	-.090	.305		
Mother's EE-criticism	1.064	.396	.387**	.008		
Child gender*mothers EE-criticism	-.863	.497	-.249	.085	.022	3.012

Note:  $N=130$ , \* $p < .05$  \*\* $p < .01$

The results in Tables 11-12 show child gender did not significantly moderate the relationships between mother's depressive symptoms and child internalising and externalising, or maternal EE-criticism and child internalising. The relationship between maternal EE-criticism and child externalising moderated by child gender was approaching significance, indicating a possible trend. Child gender significantly moderated the relationship between mother's depressive symptoms at 3-months and maternal EE-criticism at 2-years. Modgraph (Jose, 2008) was used to plot the interaction (Figure 1). Figure 1 illustrates for each level of maternal depressive symptoms (low=1SD below the mean,

medium = mean, high = 1SD above the mean), maternal EE-criticism increases more for male children.

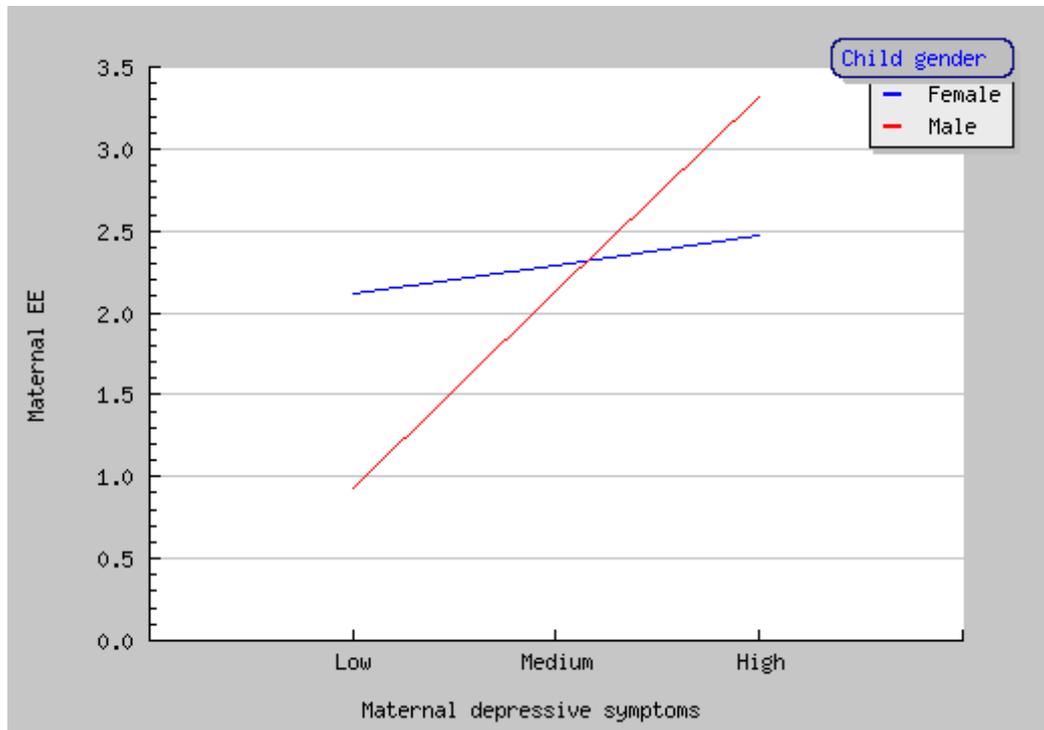


Figure 1. The relationship between maternal depressive symptoms and maternal EE-criticism moderated by child gender

To determine whether the relationship was significantly stronger for male or female children, simple regressions regressing maternal EE-criticism on mother’s depression score were conducted separately for male and female children. The regressions indicated for male children, maternal depressive symptoms at 3-months significantly predicted EE-criticism at 2-years ( $\beta = .416, t(52) = 3.299, p = .002$ ) and maternal depressive symptoms at 3-months explained a significant proportion of the variance in EE-criticism scores for male children ( $R^2 = .173, F(1, 52) = 10.881, p = .002$ ). For female children, maternal depressive symptoms at 3-months did not significantly predict EE-criticism at 2-years ( $\beta = .092, t(72) = .787, p = .434$ ) and maternal depressive symptoms at 3-months did not explain a significant proportion

of the variance in EE-criticism scores for female children ( $R^2 = .009$ ,  $F(1, 72) = .620$ ,  $p = .434$ ) as demonstrated Figure 1. Moderated mediation analysis was not conducted because step one of moderated mediation analysis, the pathway between mother's depressive symptoms at 3-months and child internalising and externalising, was not significantly moderated by child gender.

## Discussion

This study extends previous research by using a longitudinal design, measures of maternal EE designed for the postnatal period and three ratings of child emotion and behaviour. The average score for EE-criticism was lower than the average for EE-positive comments although similar to other postnatal findings (St John-Seed & Weiss, 2005) which may suggest parents are not typically critical of very young children. However, as discussed below, even low levels of criticism may relate to child outcomes and criticism is increased by MPND. Mothers, fathers and “others” rated higher child externalising than internalising on average, perhaps because externalising behaviour is easier to observe in very young children or is particularly apparent at 2-years. EE-positive comments but not EE-criticism showed stability between one and two years, contrasting with research in older children showing EE stability (Hooley, 2007). However, power may have been reduced by the non-parametric correlations.

Data was collected from fathers and “others” to explore the potential inflation of child problems by mothers experiencing MPND implied by previous research (Rogosch et al., 2004; Trapolini et al., 2007; Miner & Clarke-Stewart, 2008; Garstein et al., 2009). Mother rated child internalising and externalising significantly correlated with father and other ratings, suggesting similar scoring. However, mother’s depressive symptoms did not correlate with father and other ratings of child emotion and behaviour but did correlate with mother’s ratings. This may indicate mothers with depression inflate symptoms, that mothers, fathers and others have different views of the child or that mother’s ratings are more accurate because they are likely to spend more time with their child in the first 2-years post-birth, having more opportunity to be exposed their emotion and behaviour, although this cannot be confirmed without measuring involvement. There was also more missing data for fathers and others. Depressed mothers may provide more accurate ratings of child behaviour as indicated

in a study comparing depressed and non-depressed mother's ratings against interviewer's observation and child reports (Conrad & Hammen, 1989).

As hypothesised, maternal depressive symptoms at 3-months were significantly associated with more mother rated child internalising and externalising problems at 2-years (hypothesis one). This endorses previous research suggesting children have more emotional and behavioural problems when exposed to MPND (Rogosch et al., 2004; Trapolini et al., 2007; Hanington et al., 2010) and research showing similar relationships in later childhood (Spieker et al., 1999; Hammen & Brennan, 2001; Goodman & Tully, 2006). Maternal depressive symptoms predicted child internalising and externalising after controlling for infant birth order, maternal age, education and father's depression, suggesting mother's postnatal depression specifically increases child problems regardless of paternal postnatal depression. This is in line with a meta-analysis that found child internalising problems were more related to maternal depression (Connell & Goodman, 2002) and contrasts with research that found paternal depression had an additive effect (Brennan, Hammen, Katz, & Le Brocque, 2002; Rogosch et al., 2004; Mezulis, Hyde, & Clark, 2004). It is concerning aged 2-years, children of mothers experiencing more depressive symptoms early in the postnatal period were already showing more emotional and behaviour problems because increased scores on the CBCL internalising and externalising scales predict children at high risk for later psychopathology (Petty et al., 2008) and may therefore place these children at risk for problems in later childhood and adulthood (Essex et al., 2009).

Also, as predicted, more maternal depressive symptoms at 3-months were associated with more maternal EE-criticism and less EE-positive comments towards their child at 2-years (hypothesis two), extending previous cross-sectional research that found MPND is associated to more EE-criticism (Rogosch et al., 2004; Barnes et al., 2007) and contrasting with Dietz et al. (2009) who found positive EE was unrelated to MPND. It endorses research

suggesting negative cognitions and affect experienced by mothers with depression may be expressed in more verbally critical mother-child relationships (Goodman et al., 1994).

Mothers may project their own vulnerability onto the child, resulting in negativity towards them (Miklowitz, 2004). After controlling for infant birth order, maternal age and education and father's depression, maternal depression predicted maternal EE-criticism but not EE-positive comments, suggesting maternal depression at 3-months specifically predicted maternal EE-criticism at 2-years. This is important because exposure to child-directed criticism at this young age when children are in the process of forming attachment relationships and developing a sense of an autonomous self may negatively influence the child's developing internal representations of self and others (Miklowitz, 2004), which may have a long-term impact on development and relationships. Increased EE-criticism associated to maternal depression may also relate to insecure attachment which is itself a risk factor for the development of childhood and subsequent difficulties (Radke-Yarrow, Cummings, Kuczynski, & Chapman., 1985; Jacobson, Hibbs, & Ziegenhain, 2000; Green, Stanley, & Peters, 2007).

Importantly, this effect was moderated by child gender. More maternal depressive symptoms at 3-months predicted more EE-criticism towards male but not female children at 2-years. Therefore, only male children may experience the negative effects of exposure to criticism early in life detailed above which has implications for their development and later functioning. There may be a number of reasons why mothers experiencing depressive symptoms are more critical of their male children. Non-depressed mothers typically show increased responsiveness to male children possibly because they are more difficult to soothe and mothers are aware of their vulnerability to difficult behaviour (Murray, Kempton, Woodgar, & Hooper, 1993). The speech of depressed mothers has been found to be much less infant-focused towards male children than controls (Murray et al., 1993). Mothers

experiencing negative cognitions and affect associated with depression may be unable to show increased responsiveness to male children and instead respond to male characteristics with criticism, potentially making them more vulnerable to difficult behaviour. Indeed, this study found a trend towards significance for the relationship between EE-criticism and more male externalising which requires further investigation. Additionally, depressed mothers often have inharmonious marital relations and may have less empathy towards male children who may be seen to represent the father (Murray et al., 1993; Caspi et al., 2004). Women experiencing MPND may direct their criticism of male partners towards their male children. Future research is necessary to explore this further.

Again, as predicted, more maternal EE-criticism was significantly associated with more mother and father rated child internalising and more mother, father and other child externalising at 2-years (hypothesis three) and mother's EE-criticism predicted child internalising and externalising when controlling for infant birth order, maternal age and education. EE-positive comments were not significantly related to child outcomes. This endorses previous postnatal research that suggests maternal EE-criticism is associated with increased child problems (St-John-Seed & Weiss, 2002; Rogosch et al., 2004). The finding is also similar to research with older children where negative maternal EE related to child externalising (Vostanis et al., 1994; Eisenberg et al., 2001; McCarty & Weisz, 2002; Peris & Hinshaw, 2003; Hastings et al., 2006), depression (Schwartz et al., 1990; Asarnow et al., 2001; Jacquez et al., 2002; McLeod et al., 2007; Silk et al., 2009), increased anxiety and decreased self-concept (Kwon et al., 2006). However, because measures of maternal EE-criticism and child internalising and externalising were taken at the same time, it remains unclear whether maternal-EE precedes child problems or vice versa and a complex bi-directional relationship may exist. Some previous research with older children that found EE was elicited by child characteristics (Hibbs et al., 1991; Frye & Garber, 2005; Psychogiou et

al., 2007; Hale et al., 2011). Miklowitz (2004) suggested there may be mutually influential cycles of interaction associated with EE. What may be important is not what came first but how intervention can prevent negative cycles of interaction.

Mediation analysis exploring whether maternal EE-criticism explained the relationship between mother's depressive symptoms at 3-months and child internalising and externalising at 2-years (hypothesis four) was non-significant, suggesting maternal EE-criticism was not the causal pathway through which maternal depressive symptoms increased child emotion and behaviour problems. This contrasts with Dietz et al. (2009) who found negativity mediated the relationship between MPND and child problems although they used an interaction measure of negativity and measured the mediator at a central time-point. The finding also contrasts with research with older children that found maternal depression preceded negative EE and child problems (Goodman et al., 1994; Bolton et al., 2003; Nelson et al., 2003; Tompson et al., 2010).

The mediation analysis may have been non-significant because the power was reduced by measuring EE and child outcomes at the same time. Mediation should be re-tested in future research measuring EE at a mid-point.<sup>9</sup> Also, a third unmeasured variable may account for both maternal EE-criticism and child internalising and externalising. As mentioned, marital conflict and satisfaction might be important. Cummings et al. (2005) found marital conflict mediated the relationship between parental depression and child outcomes and Essex et al. (2009) found marital conflict had an additive effect on maternal depression, increasing boys externalising and girls internalising problems. A recent cohort study found marital conflict partially mediated the relationship between MPND and child outcomes (Hanington, Heron, Stein, & Ramchandani, 2011). Rogosch et al (2004) found mothers experiencing postnatal depression had less marital satisfaction, were more critical of

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<sup>9</sup> EE was measured at 1-year for the OFP but was reported elsewhere so was not included in the mediation analysis

their spouse, child and themselves and reported more child problems. St John-Seed & Weiss (2005) found family satisfaction was associated to less criticism of the child. It appears marital conflict and satisfaction should be included in future research considering the relationship between MPND, EE and child emotion and behaviour.

As mentioned, when child gender was explored as a moderator (hypothesis five), more maternal depressive symptoms at 3-months predicted more EE-criticism for male but not female children at 2-years. The other relationships were not significantly moderated by child gender so moderated mediation was not explored. These findings differ from previous research with older children that found child gender moderated the effects of maternal depression on child outcomes (Murray & Cooper, 1997; Cummings et al., 2005). However, because male and female children had similar levels of increased internalising and externalising when exposed to maternal depressive symptoms, this may have resulted in the path between EE-criticism and child problems not being significantly moderated by child gender. However, there was a trend between maternal EE-criticism and child externalising problems moderated by child gender. Male and female children may arrive at similar levels of increased internalising and externalising differently. For boys, increased maternal criticism following exposure to more maternal depressive symptoms may be key as indicated in this study whereas for girls there could be a direct pathway between maternal depression and child problems or another unmeasured variable may be responsible. Further research exploring the effects of child gender, MPND and maternal EE-criticism is necessary and may increase understanding about why male and female children develop different disorders following exposure to maternal psychopathology.

## Limitations

Whilst the significant findings in this study are interesting, the correlations were small in size and the relationships did not account for large parts of the variance, suggesting there are other contributing variables to consider. Based on previous research, these are likely to include father's depression (Ramchandani, Stein, Evans, & O'Connor, 2005; Ramchandani, O'Connor, Heron, Murray, & Evans, 2008; Ramchandani et al., 2011), father's EE (Brennan et al., 2002) and marital conflict and satisfaction as discussed, which should be explored in future research.

The sample was a highly educated community sample as opposed to clinically diagnosed depressed women compared to a control group so generalisability of findings may be limited. However, 27% of the sample had postnatal depression symptoms in the clinical range according to the cut-off for the EPDS (Cox et al., 1987). Although this is a self-report measure rather than a clinical interview, the authors argue it has important validity because it is specifically designed for postnatal depression and is valid, reliable, sensitive and specific when tested on a community sample and compared to diagnostic interview (Cox et al., 1987). The fact relationships were found between maternal depressive symptoms, maternal EE-criticism and child outcomes within this highly educated community sample suggests these effects require further investigation.

As mentioned, measuring EE and child problems at the same time reduced the power of the mediation analysis. In future, the mediator should be measured at a central time-point. Additionally, there was no observation measure of mother-child interaction to compare to maternal EE. However, previous research by Park et al. (2008) found convergence among self-report measures, observed interactions and the FMSS in a sample of 240 mother-child dyads and a recent study found EE-criticism was associated to observed critical behaviour (Cruise et al., 2011), suggesting EE is similar to observed interactions. It is interesting such a

short measure can detect increased criticism towards children from mothers experiencing more depressive symptoms and that this relates to child problems.

Perhaps the study is also limited because it only considered two elements of EE, critical and positive comments. This was because EE-criticism and positive comments have been found most important in research with very young children although some suggest warmth is also key in determining child outcomes (Quinton & Rutter, 1985). Warmth may be important to consider in future postnatal research.

There was no observation measure of child emotion and behaviour which should be added in future research. There were problems with some items on the CBCL scales. Some mothers, fathers and other raters missed one or two questions on the CBCL<sup>10</sup> and when examining those missed, they were typically questions such as “Looks unhappy without good reason” and “Nausea, feels sick without medical cause”. It may be that these items are inappropriate for very young children who may be non-verbal and unable to express such concepts and whose parents may struggle to determine whether sickness has no medical cause or if a child has no reason to be unhappy.

### **Clinical Implications**

Despite limitations, the findings of this study have important clinical implications. It seems crucial that mothers receive early screening and treatment for postnatal depression to prevent the development of critical mother-child relationships and poor child outcomes as much as possible. This is important given the negative long term outcomes of early childhood problems (Petty et al., 2008) and the potential for criticism to result in the development of negative internal representations of the self and others (Miklowitz, 2004). Treatment may be especially important for depressed mothers of male children. However, some studies have

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<sup>10</sup> See Extended Method, Appendix A6 for a description of how missing data was handled for the Child Behaviour Checklist, p.64

found treating maternal depression does not improve child outcomes (Murray, Cooper, Wilson, & Romaniuk, 2003; Forman et al., 2007), and parenting interventions show more promising results (Cooper, Murray & Halliagn, 2010). Therefore, although EE was not confirmed as a mediator, perhaps it is a product of MPND that could be included as part of these parenting interventions aiming to reduce negative child outcomes. Clinicians should be aware engaging mothers with MPND and high EE-criticism in intervention may be problematic as Calam, Bolton and Roberts (2002) found mothers of children referred for therapy for behaviour problems who scored higher on negative EE and depression did not attend therapy.

### **Conclusion**

The findings of this research suggest it is important to study maternal EE and its relationship with MPND and child emotion and behaviour in the early postnatal period. Mothers experiencing more postnatal depression at 3-months describe more child internalising and externalising problems at 2-years and express more EE-criticism towards male children. This extends previous cross-sectional research. Maternal EE-criticism at 2-years predicted more child internalising and externalising problems although EE was not a significant mediator between maternal depressive symptoms and child problems. Future longitudinal research could retest mediation when EE is measured at a midpoint. Observation measures of child problems may be important. Research is also needed to establish whether marital satisfaction and conflict influence these relationships. Additionally, research should consider why male children receive more criticism when exposed to MPND and how this may impact on development. Given the long-term consequences of early childhood problems, MPND should be screened and treated early to reduce negative child outcomes and EE-criticism towards the child and may be especially important for mothers of male children. Research on parenting programmes for MPND might also consider including EE as a target.

**Key points**

- Maternal postnatal depressive symptoms at 3-months predict more maternal EE-criticism of the child at 2-years and more child internalising and externalising problems at 2-years.
- Maternal EE-criticism at 2-years predicts more child internalising and externalising problems at 2-years.
- Mothers of male children who experience more depressive symptoms at 3-months are more critical of them at 2-years.
- There is a need for early screening and intervention with mothers experiencing postnatal depression to prevent negative child outcomes and critical mother-child relationships being set up which may be especially important for mothers of male children.

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### **Extended Appendices**

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### **Appendix A - Extended Method**

The methods section of the manuscript provides information on the design, sample, measures and procedure. The extended method aims to provide further information on the measures and methodology and includes:

A1	Rationale for using the EPDS to measure maternal depression	Page 59
A2	Further information on learning to code the PFMSS	Page 60
A3	Inter-rater and code-recode reliability for all elements of Expressed Emotion	Page 61
A4	Instructions for participants for the PFMSS	Page 62
A5	Detailed notes on how critical and positive comments were coded from the PFMSS coding manual.	Page 63
A6	Description of how missing data was handled for the CBCL	Page 66
A7	The Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987)	Page 70

Please note: A copy of the Child Behaviour Checklist for ages 1.5-5 years (CBCL/1.5/5; Achenbach & Rescorla, 2000) is not included due to copyright.

### **A1. Rationale for Using the EPDS to Measure Maternal Depression**

Because the main focus of the Oxford Father's project was on fathers, participants were selected based on fathers rather than mother's depression scores. Therefore, it was felt that the scores for the EPDS should be used so that the whole sample could be analysed rather than splitting the sample according to scores on the Structural Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 2002) which may have resulted in low numbers of mothers with depression to compare with those who were not depressed. It was also felt that the EPDS is good at capturing depressive symptoms specifically in the postnatal period as suggested by Cox, Holden, and Sagovsky (1987) and 27% of mothers used in the analysis reached the clinical cut-off of nine for postnatal depression according to this measure.

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## **A2. Further Information on Learning to Code the Pre-school Five Minute Speech**

### **Sample (PFMSS; Daley, Sonuga-Barke, & Thompson, 2003)**

This study required the coding of the PFMSS samples which involved:

- Being trained to code the speech samples (six weeks, two hours a week). The author was trained with another researcher doing a similar project on fathers and therefore trained using 20 mothers and 20 father's speech samples.
- Coding the 130 speech samples – each five minute speech sample took 20-30 minutes to code. In total, coding took approximately 60 hours over two months. Test-re-test and inter-rater reliability was conducted two months after this in order to be consistent with the timescale used to test reliability in the large scale longitudinal Oxford Fathers Project. The researcher was blind to the participant's depression score when coding the speech samples to reduce bias.

Although only total critical and total positive comments were used in the analysis, all elements of EE were coded from the 130 speech samples.

### **Reference**

Daley, D., Sonuga-Barke, E.J.S., & Thompson, M. (2003). Assessing expressed emotion in mothers of preschool AD/HD children: psychometric properties of a modified speech sample. *British Journal of Clinical Psychology*, 42, 53-67.

### A3. Inter-Rater and Code Recode Reliability for all Elements of Expressed Emotion

Inter-rater and code-recode reliability was conducted for each element of Expressed Emotion (EE). Two trained coder's scores for each element of EE from a random sample of 20 PFMSS speech samples were compared using Cohen's kappa for categorical variables and Pearson's Product Moment correlation for continuous variables to test inter-rater reliability. Twenty speech samples were randomly selected and re-coded two months after initial coding and compared using the same statistics to test for code-recode reliability. The results shown in Table 1 indicate highly significant inter-rater and code-recode reliability for total positive and total critical comments. There was moderate inter-rater agreement for initial statement, warmth and relationship and near perfect agreement for code-recode reliability of initial statement, warmth and relationship.

Table 1

*Inter-Rater and Code-Recode Reliability for the Elements of Expressed Emotion*

Element of Expressed Emotion	Inter-rater	Code-recode
Cohen's kappa ( $\kappa$ )		
Initial statement	.512 (CI=.186-.839)	.897 (CI=.702-1)
Warmth	.596 (CI=.241-.950)	1 (CI =1-1)
Relationship	.471 (CI=.118-.825)	.857 (CI=.678-.997)
Intraclass Correlation		
Total positive comments	.979	.987
Total critical comments	.960	.994

Note.  $N=20$  CI=Confidence Interval

**A4. Instructions for Participants for the PFMSS (Daley et al., 2003)**

“I would like to hear your thoughts and feelings about (*child's name*) over the last six months. When I ask you to begin, I would like you to talk for five minutes without me interrupting you with any questions or comments. I would like you to talk for five minutes telling me what sort of child (*child's name*) is and how the two of you have been getting along together over the last six months. But before we begin do you have any questions?”

**A5. Detailed Notes on How Critical and Positive Comments were Coded from the  
PFMSS (Daley et al., 2003) Coding Manual.**

**Coding Critical Comments**

Critical comments are negative comments about the child's behaviour and/or personality.

They can be scored on the basis of a) tone b) critical phrases.

- a) Tone – critical comments can be scored on the basis of tone even if the content of the statement is not critical. Establish a baseline level of tone for the respondent and then it will be possible to notice fluctuations. Rate conservatively, if in doubt, do not rate a critical comment.
- b) Critical phrases – This is a frequency count of statements that criticise or find fault with the child. They are generally descriptive words indicative of a negative trait that the child has such as aggression or irritability and generally in a negative tone, for example: “George is such hard work”

**Do not include:**

- Stereotyped phrases e.g. “he’s a little terror” unless accompanied by negative tone.
- Statements in the past tense
- Statements that are the opinion of someone else for example: “Jack’s teacher says he is naughty”.

**For strings of critical comments:**

Parents may make several critical comments in one phrase:

- Statements about unrelated behaviours are coded as separate critical comments, for example: “Philip is a very bad tempered boy, always grumpy and he’s disobedient”

Two unrelated behaviours (bad temper and disobedience) have been described so two critical comments are scored.

- Statements about similar or related behaviours are scored as one critical comment, for example: “He’s destructive, he destroys my plants, his toys, he destroys everything.” All the statements relate to destruction so one critical comment is scored.

### **Coding Positive Comments**

Positive comments are statements of praise, approval or appreciation. The majority of these will be descriptive words which indicate a positive trait the child has but they can also be rated on tone.

- a) Tone – It is possible to score a positive comment based on tone even if the content of the statement is not positive. Establish as baseline for the participant so that you can note fluctuations. Rate conservatively, if in doubt, do not rate a positive comment.
- b) Positive phrases – this is a frequency count of statements which praise, or indicate appreciation or approval of the child. Generally, these are descriptive words indicative of a positive trait which the child has such as intelligence or sociability, typically said in a positive tone, for example: “Jack is very intelligent”

Some mothers may talk around these issues rather than using descriptive words for example: “Jack is very good at doing puzzles and jigsaws” or “she’s very close to me, always giving me hugs”

#### **Do not include:**

- Positive comments coined in the negative: “he’s great, not”
- Statements in the past tense.

**Strings of positive comments:**

- Statements about unrelated behaviours are coded as separate positive comments, for example: “Jack is a clever boy, sporty too”

Because two unrelated behaviours have been described (intelligence and athleticism) two positive comments are scored.

- Statements about similar or related behaviours are scored as one positive comment, for example: “He’s very musical, he plays the piano and sings”

Because all the statements are about musical ability, one positive comment is scored.

**Reference**

Daley, D., Sonuga-Barke, E.J.S., & Thompson, M. (2003). Assessing expressed emotion in mothers of preschool AD/HD children: psychometric properties of a modified speech sample. *British Journal of Clinical Psychology*, 42, 53-67.

#### **A6. Description of How Missing Data was Handled for the Child Behaviour Checklist for Ages 1.5-5 years (CBCL/1.5/5; Achenbach & Rescorla, 2000)**

The raw data from the 99 items from the CBCL from the mother, father and “other” was available and items needed to be combined to form the different scales of the CBCL: emotionally reactive, anxious/depressed, somatic complaints, withdrawn (which combine to form the internalising scale), attention problems, and aggressive behaviour (which combine to form the externalising scale). This was completed for the mother, father and “other” rated scales. There were some participants who had missed some items on the scales but had completed the majority of the questionnaire. The decision was made that in order to retain as much data as possible, the median (due to ordinal level data) for the scale where the item was missing would be calculated and entered into the missing variable. If participants had missed a maximum of two items for a scale, their scores for that scale were recorded, placed in order, smallest to largest and the median was taken and substituted in the missing score (see below for a more detailed description). For participants missing more than two items for a scale, the scale score was recorded as missing with a value of 99. Once the medians and missing data had been entered, the scales were combined as suggested above to form the internalising and externalising scales.

#### **Mother’s Rated CBCL Scales – Missing Data**

For the mother’s scales, all substituted medians were zero except one participant who had a median of 0.5 on the somatic scale, and two participants who had medians of one for the aggressive scale. No items were missed for the attention problems scale. All but one participant only missed one item per scale. One participant missed two items on the somatic scale.

**Fathers Rated CBCL Scales – Missing Data**

For the father's scales, all substituted medians were zero except one participant who had a median of 0.5 on the emotionally reactive scale, two who had medians of one on the anxious depressed scale, and one had a median of one on the somatic complaints scale.

**“Other” Rated CBCL Scales – Missing Data**

For the other scales, all substituted medians were zero except one participant who had a median of one on the attention problems scale.

Table 2 shows the items of the CBCL that were missing on each scale and how many participants were missing these items.

Table 2  
*CBCL Items that Participants Missed that were Substituted with the Mean*

<b>Mothers</b>		<b>Fathers</b>		<b>“Other”</b>	
Items missing	No. Missing	Items missing	No. missing	Items missing	No. Missing
<b>Internalising:</b>		Emotionally reactive scale			
CBCL 46	1	CBCL 21	1	CBCL 21	1
CBCL 92	1	CBCL 46	3	CBCL 46	2
		CBCL 51	4	CBCL 51	1
		CBCL 92	1	CBCL 79	1
				CBCL 82	1
				CBCL 83	1
				CBCL 92	2
				CBCL 97	1
				CBCL 99	1
		Anxious depressed scale			
CBCL 37	1	CBCL 33	3	CBCL 43	18
CBCL 43	23	CBCL 43	19		
		Somatic complaints scale			
CBCL 24	4	CBCL 1	1	CBCL 1	1
CBCL 39	1	CBCL 24	2	CBCL 39	1
CBCL 45	24	CBCL 39	1	CBCL 45	20
		CBCL 45	20		
		Withdrawn scale			
CBCL 4	1	CBCL 2	1	CBCL 23	2
		CBCL 4	1	CBCL 70	1
		CBCL 71	1	CBCL 71	1
<b>Externalising:</b>		Attention problems scale			
N/A	0	N/A	0	CBCL 5	2
				CBCL 95	1
		Aggressive behaviour scale			
CBCL 20	1	CBCL 18	1	CBCL 15	1
CBCL 27	1	CBCL 27	1	CBCL 20	2
CBCL 58	1	CBCL 35	1	CBCL 27	1
CBCL 81	2	CBCL 58	2	CBCL 35	1
				CBCL 44	1
				CBCL 81	1
				CBCL 96	2

Items that large amounts of participants missed were items 43 (“Looks unhappy without good reason”) and 45 (“Nausea, feels sick without medical cause”). It may be that these items are inappropriate for very young children who may be non-verbal and whose parents may struggle to determine whether sickness has no medical cause or if a child has no reason to be unhappy.

## Reference

Achenbach, T.M., & Rescorla, L.A. (2000). *Manual for the ASEBA preschool forms and profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth and Families.

**A7. Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987)****Edinburgh Postnatal Depression Scale<sup>1</sup> (EPDS)**

Name: \_\_\_\_\_ Address: \_\_\_\_\_

Your Date of Birth: \_\_\_\_\_

Baby's Date of Birth: \_\_\_\_\_ Phone: \_\_\_\_\_

As you are pregnant or have recently had a baby, we would like to know how you are feeling. Please check the answer that comes closest to how you have felt **IN THE PAST 7 DAYS**, not just how you feel today.

Here is an example, already completed.

I have felt happy:

- Yes, all the time
- Yes, most of the time      This would mean: "I have felt happy most of the time" during the past week.
- No, not very often      Please complete the other questions in the same way.
- No, not at all

In the past 7 days:

- |  |   |
|--|---|
| <p>1. I have been able to laugh and see the funny side of things</p> <p><input type="checkbox"/> As much as I always could</p> <p><input type="checkbox"/> Not quite so much now</p> <p><input type="checkbox"/> Definitely not so much now</p> <p><input type="checkbox"/> Not at all</p> | <p>*6. Things have been getting on top of me</p> <p><input type="checkbox"/> Yes, most of the time I haven't been able to cope at all</p> <p><input type="checkbox"/> Yes, sometimes I haven't been coping as well as usual</p> <p><input type="checkbox"/> No, most of the time I have coped quite well</p> <p><input type="checkbox"/> No, I have been coping as well as ever</p> |
| <p>2. I have looked forward with enjoyment to things</p> <p><input type="checkbox"/> As much as I ever did</p> <p><input type="checkbox"/> Rather less than I used to</p> <p><input type="checkbox"/> Definitely less than I used to</p> <p><input type="checkbox"/> Hardly at all</p>     | <p>*7. I have been so unhappy that I have had difficulty sleeping</p> <p><input type="checkbox"/> Yes, most of the time</p> <p><input type="checkbox"/> Yes, sometimes</p> <p><input type="checkbox"/> Not very often</p> <p><input type="checkbox"/> No, not at all</p>  |
| <p>*3. I have blamed myself unnecessarily when things went wrong</p> <p><input type="checkbox"/> Yes, most of the time</p> <p><input type="checkbox"/> Yes, some of the time</p> <p><input type="checkbox"/> Not very often</p> <p><input type="checkbox"/> No, never</p>                  | <p>*8. I have felt sad or miserable</p> <p><input type="checkbox"/> Yes, most of the time</p> <p><input type="checkbox"/> Yes, quite often</p> <p><input type="checkbox"/> Not very often</p> <p><input type="checkbox"/> No, not at all</p>  |
| <p>4. I have been anxious or worried for no good reason</p> <p><input type="checkbox"/> No, not at all</p> <p><input type="checkbox"/> Hardly ever</p> <p><input type="checkbox"/> Yes, sometimes</p> <p><input type="checkbox"/> Yes, very often</p>                                      | <p>*9. I have been so unhappy that I have been crying</p> <p><input type="checkbox"/> Yes, most of the time</p> <p><input type="checkbox"/> Yes, quite often</p> <p><input type="checkbox"/> Only occasionally</p> <p><input type="checkbox"/> No, never</p>  |
| <p>*5. I have felt scared or panicky for no very good reason</p> <p><input type="checkbox"/> Yes, quite a lot</p> <p><input type="checkbox"/> Yes, sometimes</p> <p><input type="checkbox"/> No, not much</p> <p><input type="checkbox"/> No, not at all</p>                               | <p>*10. The thought of harming myself has occurred to me</p> <p><input type="checkbox"/> Yes, quite often</p> <p><input type="checkbox"/> Sometimes</p> <p><input type="checkbox"/> Hardly ever</p> <p><input type="checkbox"/> Never</p>   |

Administered/Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

<sup>1</sup>Source: Cox, J.L., Holden, J.M., and Sagovsky, R. 1987. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150:782-786 .

<sup>2</sup>Source: K. L. Wisner, B. L. Parry, C. M. Piontek, Postpartum Depression N Engl J Med vol. 347, No 3, July 18, 2002, 194-199

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## Edinburgh Postnatal Depression Scale<sup>1</sup> (EPDS)

Postpartum depression is the most common complication of childbearing.<sup>2</sup> The 10-question Edinburgh Postnatal Depression Scale (EPDS) is a valuable and efficient way of identifying patients at risk for "perinatal" depression. The EPDS is easy to administer and has proven to be an effective screening tool.

Mothers who score above 13 are likely to be suffering from a depressive illness of varying severity. The EPDS score should not override clinical judgment. A careful clinical assessment should be carried out to confirm the diagnosis. The scale indicates how the mother has felt *during the previous week*. In doubtful cases it may be useful to repeat the tool after 2 weeks. The scale will not detect mothers with anxiety neuroses, phobias or personality disorders.

Women with postpartum depression need not feel alone. They may find useful information on the web sites of the National Women's Health Information Center <[www.4women.gov](http://www.4women.gov)> and from groups such as Postpartum Support International <[www.chss.iup.edu/postpartum](http://www.chss.iup.edu/postpartum)> and Depression after Delivery <[www.depressionafterdelivery.com](http://www.depressionafterdelivery.com)>.

### SCORING

#### QUESTIONS 1, 2, & 4 (without an \*)

Are scored 0, 1, 2 or 3 with top box scored as 0 and the bottom box scored as 3.

#### QUESTIONS 3, 5-10 (marked with an \*)

Are reverse scored, with the top box scored as a 3 and the bottom box scored as 0.

Maximum score: 30  
Possible Depression: 10 or greater  
Always look at item 10 (suicidal thoughts)

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### Instructions for using the Edinburgh Postnatal Depression Scale:

1. The mother is asked to check the response that comes closest to how she has been feeling in the previous 7 days.
2. All the items must be completed.
3. Care should be taken to avoid the possibility of the mother discussing her answers with others. (Answers come from the mother or pregnant woman.)
4. The mother should complete the scale herself, unless she has limited English or has difficulty with reading.

<sup>1</sup>Source: Cox, J.L., Holden, J.M., and Sagovsky, R. 1987. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150:782-786.

<sup>2</sup>Source: K. L. Wisner, B. L. Parry, C. M. Piontek, Postpartum Depression N Engl J Med vol. 347, No 3, July 18, 2002, 194-199

### **Appendix B - Extended Results**

All data was analysed using IBM SPSS Statistics Version 19. Data entry for EE was observed by another researcher to reduce error. CBCL scores were calculated and checked against another researcher's scores. The whole database was checked for errors with the other researcher.

#### **Comparisons of Participants Retained at 2-Years and Those who Dropped-Out**

Cases were only selected if they had an Expressed Emotion (EE) score and mother CBCL score at 2-years. This was to ensure the same families were used in all analyses. Analyses were also conducted on all participants first excluding cases pairwise and significant and non-significant results were the same. Additionally, analysis was conducted to determine whether any differences existed on key variables and demographics for those participants who were excluded from the analysis who had dropped out of the study by 2-years. T-tests were conducted for continuous variables and Pearson's Chi-squared were conducted for categorical variables. There was no significant difference between those who were included in this study ( $M = 5.97$ ,  $SD = 3.39$ ) and those who dropped out ( $M = 6.75$ ,  $SD = 4.39$ ) on the mother's EPDS depression score at 3-months ( $t(186) = 1.21$ ,  $p < .05$ ); those included ( $M = 7.19$ ,  $SD = 5.02$ ) and those who dropped out ( $M = 8.06$ ,  $SD = 4.99$ ) on the father's EPDS depression score at 3-months ( $t(189) = 1.13$ ,  $p < .05$ ); those included ( $M = 33.27$ ,  $SD = 4.71$ ) and those who dropped out ( $M = 33.3$ ,  $SD = 5.16$ ) for mother's age ( $t(188) = .085$ ,  $p < .05$ ); those included ( $M = 1.53$ ,  $SD = .76$ ) and those who dropped out ( $M = 1.45$ ,  $SD = .76$ ) for infants birth order ( $t(190) = -.801$ ,  $p < .05$ ); marital status ( $\chi^2(1, N = 189) = .00$ ,  $p < .05$ ), Socioeconomic Status ( $\chi^2(3, N = 190) = 2.48$ ,  $p < .05$ ) or mothers education ( $\chi^2(4, N = 182) = 5.55$ ,  $p < .05$ ). There were no significant differences between those

participants retained at 2-years and used in the analysis and those who dropped-out of the study.

### **Detailed Description of the Hierarchical Regressions to Test Moderation**

To test whether child gender moderates the relationship between maternal depressive symptoms on the EPDS and child internalising variables were entered in steps in this order:

Step 1 –Child gender

Step 2 –Centred EPDS

Step 3 –Interaction (gender\*centred EPDS)

To test whether child gender moderated the relationship between maternal depressive symptoms on the EPDS and child externalising variables were entered in steps in this order::

Step 1 – Child gender

Step 2 –Centred EPDS

Step 3 –Interaction term (gender\*centred EPDS)

To test whether child gender moderated the relationship between maternal EE-criticism and child internalising variables were entered in steps in this order::

Step 1 – Child gender

Step 2 –EE-criticism

Step 3 –Interaction (gender\*centred EE-criticism)

To test whether child gender moderated the relationship between maternal EE-criticism and child externalising variables were entered in steps in this order::

Step 1 –Child gender

Step 2 – EE-criticism

Step 3 –Interaction (gender\*centred EE-criticism)

To test whether child gender moderated the relationship between maternal depressive symptoms at 3-months and maternal EE-criticism at 2-years variables were entered in steps in this order:

Step 1 – Child gender

Step 2 –Centred EPDS

Step 3 –Interaction term (gender\*centred EPDS)

To test whether child gender moderated the relationship between maternal EE-positive comments and child internalising variables were entered in steps in this order:

Step 1 – Child gender

Step 2 – EE-positive comments

Step 3 –Interaction (gender\*centred EE-positive comments)

### **Appendix C - Extended Discussion**

Recordings of EE were on cassette and were sometimes very difficult to hear. In future a digital recording is necessary.

Using data from a larger study was an advantage in terms of allowing a longitudinal design and large collected amounts of data to be accessed. However it also limited the scope of the project to some extent in terms of what data was available for analysis. Although Expressed Emotion (EE) was measured at a mid-point of 1-year which would have been more appropriate for the mediation analysis, this was being analysed in another study. Additionally, although marital conflict was measured for the Oxford Fathers Project, again it was being analysed elsewhere and so was unavailable to include in this study. In future, conducting a study from the beginning would allow key variables to be identified, measured and included in analysis.

**Appendix D - Ethical Documentation**

D1.	Oxford Father's Project Ethical Approval Letter	Page 77
D2.	Exeter University School of Psychology Ethics Application	Page 79
D3.	Exeter University Psychology Research Ethics Committee Approval Letter	Page 82

## D1. Oxford Father's Project Ethical Approval Letter



### Oxfordshire REC A

2nd Floor, Astral House  
Chaucer Business Park  
Granville Way  
Bicester  
OX26 4JT

Telephone: 01869 604077  
Facsimile: 01869 604055

27 June 2006

Dr Paul Ramchandani  
Senior Research Fellow  
University of Oxford  
Department of Psychiatry  
Warneford Hospital  
Oxford  
OX3 7JX

Dear Dr Ramchandani

**Full title of study:** Fathers and their children in the postnatal period.  
**REC reference number:** 06/Q1604/63

Thank you for your letter of 16 June 2006, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

#### Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

#### Ethical review of research sites

The Committee has designated this study as exempt from site-specific assessment (SSA). There is no requirement for Local Research Ethics Committees to be informed or for site-specific assessment to be carried out at each site.

#### Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

#### Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Application	5.1	29 March 2006
Investigator CV	Paul Ramchandani	28 March 2006
Protocol	v1	28 March 2006
Covering Letter		28 March 2006
Summary/Synopsis	Flowchart	

06/Q1604/63

Page 2

Letter from Sponsor	University of Oxford	03 April 2006
Letter from Sponsor	University of Oxford	31 March 2006
Peer Review		09 December 2005
Compensation Arrangements	Insurance letter	31 March 2006
Interview Schedules/Topic Guides	v1 (Questionnaire)	28 March 2006
Questionnaire	Dyadic	
Letter of invitation to participant	1 (Father present)	01 June 2006
Letter of invitation to participant	v1 (Non-present fathers)	28 March 2006
Letter of invitation to participant	2 (Non-present father)	16 June 2006
GP/Consultant Information Sheets	2 (with depression)	26 May 2006
GP/Consultant Information Sheets	2 (without depression)	26 May 2006
Participant Information Sheet:	2	15 June 2006
Participant Information Sheet: Initial Contact	2 (Initial contact)	30 May 2006
Participant Information Sheet: For nursery teachers	1	06 June 2006
Participant Information Sheet: For mothers	1	01 June 2006
Participant Consent Form: For nursery teachers	1	26 May 2006
Participant Consent Form: For mothers	1	26 May 2006
Participant Consent Form	v1 (Contact - Mother)	28 March 2006
Participant Consent Form:	2	26 May 2006
Participant Consent Form: Contact - Father	v2	30 May 2006
Response to Request for Further Information		16 June 2006
Outcome measures	v1	28 March 2006
Covering letter	Insurance	04 April 2006
Letter from Funder	Wellcome Trust	03 January 2006

#### Research governance approval

You should arrange for the R&D department at all relevant NHS care organisations to be notified that the research will be taking place, and provide a copy of the REC application, the protocol and this letter.

All researchers and research collaborators who will be participating in the research must obtain final research governance approval before commencing any research procedures. Where a substantive contract is not held with the care organisation, it may be necessary for an honorary contract to be issued before approval for the research can be given.

#### Statement of compliance

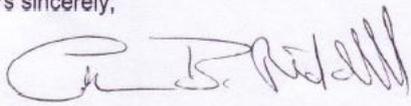
The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

06/Q1604/63

Please quote this number on all correspondence

With the Committee's best wishes for the success of this project,

Yours sincerely,

  
 Dr Brian Shine  
 Chair



12	Do participants fall into any of the following special groups? If they do, please refer to BPS guidelines, and tick box B overleaf. <b>Please note that you may also need to gain satisfactory CRB clearance or equivalent for overseas participants.</b>	School children (under 18 years of age)		x	
		People with learning or communication difficulties		x	
		Patients		x	
		Those at risk of psychological distress or otherwise vulnerable		x	
		People in custody		x	
		People engaged in illegal activities (e.g. drug taking)		x	

**There is an obligation on the lead researcher to bring to the attention of the Departmental Ethics Committee projects with ethical implications not clearly covered by the above checklist. PLEASE TICK EITHER BOX A or BOX B BELOW AND PROVIDE THE DETAILS REQUIRED IN SUPPORT OF YOUR APPLICATION, THEN SIGN THE FORM.**

**Please tick:**

<b>A.</b> I consider that this project has <b>no</b> significant ethical implications to be brought before the Departmental Ethics Committee.	√
<p><b>In less than 150 words, provide details of the experiment including the number and type of participants, methods and tests to be used (i.e. the procedure).</b></p> <p>Data from the longitudinal Oxford Fathers Project on paternal postnatal depression has already been collected with NHS ethical approval from an initial sample of 192 mothers and fathers. My study analyses the mother's "five minute speech samples" collected at time point three where they are asked to talk about their relationship and their child for 5 uninterrupted minutes. The audio speech samples will be coded by me for Expressed Emotion and analysed by regression analysis to consider the longitudinal relationship between maternal postnatal depression (measured at time point one –3 months), expressed emotion including criticism, and child externalising and internalising behaviour (measured at time point three – 2-years), looking at whether expressed emotion mediates the relationship between maternal depression and child development. The study will also look at child gender as a potential moderator.</p> <p><i>This form (and any attachments) should be submitted to the Departmental Ethics committee where it will be considered by the Chair before it can be approved.</i></p>	
<b>B.</b> I consider that this project <b>may</b> have ethical implications that should be brought before the Departmental Ethics Committee, and/or it will be carried out with children or other vulnerable populations.	
<p><b>Please provide all the further information listed below in a separate attachment.</b></p> <ol style="list-style-type: none"> <li>1. Title of project.</li> <li>2. Purpose of project and its academic rationale.</li> <li>3. Brief description of methods and measurements.</li> <li>4. Participants: a) Human research: Recruitment methods, number, age, gender, exclusion/inclusion criteria b) Animal research: location of study site, method of obtaining / marking / identifying subjects, handling procedures for field experiments.</li> <li>5. Consent and participant information arrangements, debriefing. (Not relevant for animal research) <b><i>Please attach intended information and consent forms.</i></b></li> <li>6. A clear but concise statement of the ethical considerations raised by the project and how you intend to deal with them.</li> </ol>	

7. Estimated start date and duration of project.  
*This form should be submitted to the Departmental Ethics Committee for consideration.*  
***If any of the above information is missing, your application will be returned to you.***

I am familiar with the BPS Guidelines for ethical practices in psychological research (and have discussed them with other researchers involved in the project.)

Signed.....Print Name: Amy Bryant..... Date: 19/04/11  
(UG/PG Researcher(s), if applicable) Email: aeb218@exeter.ac.uk

Signed..... Print Name: Dr Lamprini Psychogiou Date: 19/04/11  
(Lead Researcher or Supervisor) Email: L.Psychogiou@exeter.ac.uk

**D3. Exeter University Psychology Research Ethics Committee Approval Letter**



Psychology Research Ethics  
Committee

Psychology, College of Life &  
Environmental Sciences

Washington Singer Laboratories  
Perry Road  
Exeter  
EX4 4QG

Telephone  
Fax +44 (0)1392 264623  
Email  
Marilyn.evans@exeter.a  
c.uk

**To: Amy Bryant**  
**From: Chris Burgess**  
**CC: Dr. Lamprini Psychiogiou & Dr Heather O'Mahen**  
**Re: Application 2010/229 Ethics Committee**  
**Date: August 28, 2012**

The School of Psychology Ethics Committee has now discussed your application, **2010/229 Maternal postnatal depression, expressed emotion and child internalising and externalising aged 2 years**. The project has been approved in principle for the duration of your study.

The agreement of the Committee is subject to your compliance with the British Psychological Society Code of Conduct and the University of Exeter procedures for data protection (<http://www.ex.ac.uk/admin/academic/datapro/>). In any correspondence with the Ethics Committee about this application, please quote the reference number above.

I wish you every success with your research.

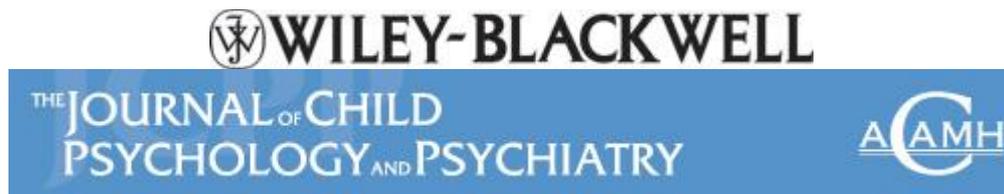
A handwritten signature in black ink, appearing to read 'Chris Burgess', with a horizontal line underneath.

Chris Burgess  
Chair of Psychology Research Ethics Committee

### **Appendix E- Dissemination Strategy**

The results of this study will be shared initially via a presentation to other 2009 trainees and their research supervisors. This will ensure results are disseminated internally within the Exeter University Clinical Psychology Department. Following the viva and corrections, results from this study will be shared with the research team of the Oxford Father's Project and their procedure for dissemination of results to participants will be followed. Although the results of this study could be submitted for publication alone, in order to strengthen the paper for publication, the results will be combined with parallel research looking at fathers with postnatal depression at 3-months and written up according to the specification of the nominated journal in a combined paper. The paper will be sent to the Journal of Child Psychology and Psychiatry for peer review. Results will also be presented at a relevant conference when appropriate.

**Appendix F - Instructions to Authors - The Journal of Child Psychology and Psychiatry**



**Edited by:**

Edmund Sonuga-Barke

**Print ISSN:** 0021-9630

**Online ISSN:** 1469-7610

**Frequency:** Monthly

**Current Volume:** 52 / 2011

**ISI Journal Citation Reports® Ranking:** 2010: Psychiatry: 21 / 126; Psychiatry (Social Science): 11 / 107; Psychology, Developmental: 6 / 66

**Impact Factor:** 4.36

**Notes for Contributors**

**Why submit your article to *The Journal of Child Psychology and Psychiatry*?**

- The leading, international journal covering both child and adolescent *psychology and psychiatry*
- Provides an interdisciplinary perspective to the multidisciplinary field of child and adolescent mental health, through publication of high-quality empirical research, clinically-relevant studies and highly cited research reviews and practitioner review articles
- Impact Factor 4.36 (2010); 5-Year Impact Factor 5.85 (2010)
- ISI Journal Citation Reports © Ranking: 2010:66 (Psychology Developmental); 11/107 (Psychiatry (Social Science)); 21/126 (Psychiatry)
- Ranked in the Top 20 journals in psychiatry and psychology by citation impact over the last decade (Thomson Reuters, Essential Science Indicators)
- Over 7,000 institutions with access to current content;

- Massive international readership; approximately half a million articles downloaded every year (42% North America, 40% Europe, 10% Asia-Pacific)
- State of the art online submission site, simple and quick to use:-  
<http://mc.manuscriptcentral.com/jcpp-camh>; dedicated journal Editorial Office for easy, personal contact through the peer review and editorial process; proof tracking tool for authors
- Articles appear on Early View before the paper version is published - Click [here](#) to see the [Early View](#) articles currently available online; Epub entries on PubMed and widely indexed/abstracted, including MEDLINE, EMBASE and ISI Citation Indexes
- Acceptance to Early View publication approx. 3 months; Acceptance to print publication approx. 7 months;
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