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**Short report**

**Title page**

**Postnatal paternal depressive symptoms associated with fathers' subsequent parenting: Findings  
from the Millennium Cohort Study**

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## **Summary/abstract**

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

## **Declaration of interest**

None

## **Report**

Impaired parenting may be an influence along the causal pathway between paternal depression and children's developmental outcomes.<sup>1</sup> Therefore, it is important to understand which aspects of parenting behaviours are influenced by paternal depressive symptoms. Some literature has categorised parenting behaviours as positive (warmth, closeness, sensitivity, responsiveness) and negative (hostile, intrusive, conflicted, detached) with parental involvement (time spent with child) also given importance.<sup>2</sup> A meta-analysis of 28 studies reported paternal depression to be associated with reduced positive (such as reading with their child) and increased negative parenting behaviours (such as smacking).<sup>2-3</sup>

Using the Millennium Cohort Study (MCS), Malmberg and Flouri<sup>4</sup> reported that higher levels of paternal depressive symptoms when the children were 9-months old were associated with lower overall positive father-child relationship quality at 3 years old. Furthermore, a recent Australian study suggested that higher levels of paternal depressive symptoms might influence fathers' negative parenting rather than positive parenting<sup>5</sup>. Higher postnatal paternal depressive symptoms were associated with increased hostility towards children at 5 years old, but no association with warmth was detected. The current study aimed to test whether higher levels of paternal depressive symptoms were independently associated with positive parenting (warmth), negative parenting (conflict) or the amount of time devoted to parenting activities (involvement), after controlling for a number of possible covariates (family related and socio-economic factors), and to test whether any of these covariates may moderate any such association. We predicted that higher levels of paternal depressive symptoms would be associated with increased negative parenting and decreased positive parenting and involvement.

## **Methods**

Secondary data analysis was carried out using the first four waves of the MCS. This is a large-scale (n=18,552) survey of infants when they were 9 months (MCS1), 3 years (MCS2), 5 years (MCS3) and 7 years old (MCS4)<sup>6</sup>. Full details of the measures, survey, objectives, content of survey and sampling can be found elsewhere<sup>7-9</sup>.

## Measures

The predictor variable was paternal depressive symptoms at MCS1 measured using the *Rutter's 9-item Malaise Inventory* (shortened version)<sup>10-11</sup>. It included self-report items measuring depressive symptoms such as “feel tired most of the time”, “feel miserable or depressed” and “easily upset or irritated”. Higher scores on the scale between 0-9 indicated more depressive symptoms. The outcome measure of fathers' parenting at MCS2 was assessed using the *Child-Parent Relationship Scale*, which measured two constructs of father-child relationship based on father's report of warmth and conflict. Fathers' parenting activity (involvement) was measured as outcomes at in MSC3 and MSC4 using fathers' answers to the amount of parenting activities they undertook with their child such as reading, storytelling, playing music, drawing, physical activities and playing games. Items were summed to create a total score of fathers' parenting activity at both sweeps with higher scores indicating less involvement and lower scores indicating more involvement.

Covariates were *family and socioeconomic factors* including continuous scales of maternal depressive symptoms, child temperament, marital relationship, family income, paternal age, and dichotomous scales for child gender (boy/girl), paternal education (with qualifications/no education), fathers' employment (employed/unemployed), family housing (tenants/property owners). All measures were reported at MCS1 (9-months) and have all been found to have an influence on fathers' depression<sup>4,12,13</sup>.

## Statistical analysis

Sampling weights were used in analyses which adjust for complex sample design and attrition over time, as the sample was stratified to make it representative of the UK population as a whole<sup>8, 14</sup>. Analyses were conducted using Stata 13.

Linear regressions were conducted to test the relationship of paternal depressive symptoms (predictor) with father-child conflict/warmth relationship (outcomes at MCS2) and fathers' parenting activities (outcome at MCS3 and MCS4). Covariates were selected a priori based on previous literature<sup>4,5,12,13</sup>. To check whether family context and socioeconomic covariates were associated with the outcomes a further series of linear regressions were conducted. Covariates that were significantly ( $p < 0.05$ ) associated with fathers' parenting outcomes were taken forward into a series of adjusted multivariable linear regression models to test if the predictor paternal depressive symptoms (MCS1) were independently associated with father-child warmth/conflict relationship and fathers' parenting activities. Each outcome was tested in a separate model. Sensitivity analysis was conducted using multiple imputation to determine the effect of missing data. The following covariates were tested for moderating effects based on previous literature<sup>1,4,5,12</sup> (maternal depressive symptoms, child temperament, child gender, marital relationship, fathers' employment and age).

## Results

In the unadjusted analysis, higher paternal depressive symptoms significantly predicted higher levels of father-child conflict, lower warmth scores, and lower levels of involvement (Table 1). Descriptive statistics for the outcome variables are provided in the online data supplements (Table 2). All covariates apart from fathers' employment status were significantly associated with fathers' parenting activities and all apart from education were also significantly associated with father-child conflict and warmth. After adjustment for potential confounders and weighted to account for survey design and attrition, higher levels of paternal depressive symptoms were independently associated with more father-child conflict. This finding was also replicated with un-weighted analysis and imputed data (online supplements Table 3). The overall model explained 16% of the variance in father-child conflict ( $R^2=0.16$ ).

**Table 1:** *The association between paternal depressive symptoms at MCS1 and fathers' parenting activity/relationship unadjusted and adjusted for sampling, attrition, family context and socioeconomic factors*

Paternal depressive symptoms (MCS1)	Father-child relationship				Parenting activities			
	Conflict (MCS2)		Warmth (MCS2)		MCS3		MCS4	
	Coefficient (95% CI)	p	Coefficient (95% CI)	p	Coefficient (95% CI)	p	Coefficient (95% CI)	p
Unadjusted N	0.85(0.75-0.96) 7755	<0.001	-0.12(-0.16- -0.07) 7663	<0.001	0.30(0.21-0.40) 7542	<0.001	0.29(0.19-0.39) 6621	<0.001
Adjusted N	0.72 (0.59-0.84) <sup>a</sup> 4430	<0.001	0.00 (-0.07-0.08) <sup>b</sup> 4372	0.960	0.08 (-0.06-0.22) <sup>c</sup> 4306	0.266	0.11 (-0.04-0.26) <sup>c</sup> 3871	0.162

<sup>a</sup> After adjusting for maternal depressive symptoms, child temperament, child gender, marital relationship, fathers' employment, family housing, family income and paternal age

<sup>b</sup> After adjusting for maternal depressive symptoms, child temperament, child gender, marital relationship, paternal education, fathers' employment, family housing, family income and paternal age

<sup>c</sup> After adjusting for maternal depressive symptoms, child temperament, child gender, marital relationship, paternal education, family housing, family income and paternal age

Only maternal depressive symptoms ( $Coefficient=-0.11$ ,  $p=0.006$ ,  $95\% CI=-0.18- -0.03$ ) and marital conflict ( $Coefficient=-0.12$ ,  $p=0.037$ ,  $95\% CI=-0.24- -0.01$ ) appeared to moderate the association between paternal depressive symptoms and father-child conflict after adjustment. The influence of paternal depressive symptoms on father-child conflict scores was lower in families with high marital conflict and when mothers had high depressive symptoms, than for families with low marital conflict and mothers with fewer depressive symptoms (see online data supplements Figure 1 and 2).

## Discussion

The findings show that paternal depressive symptoms may be associated with higher levels of father-child conflict, which replicates previous findings<sup>5,15</sup> and suggests that paternal depressive symptoms influence negative, rather than positive parenting. Paternal depressive symptoms were not associated with paternal involvement, suggesting that the quality of parenting is influenced by depressive symptoms but the duration of time spent with child is not altered. Both maternal depressive symptoms and marital conflict moderated the association between paternal depressive symptoms and father-child conflict, whereas within-child factors did

not. Paternal depressive symptoms were associated with more father-child conflict in families with low marital conflict and where mothers had lower levels of depressive symptoms. Maternal influence on fathers' parenting style replicate previous literature<sup>4,12</sup> and the current findings suggest that in families with low marital conflict and low levels of depressive symptoms in mothers, fathers might be more available to have negative interactions with their children. Thus, this might increase the likelihood of more father-child conflict potentially resulting from their depressive symptoms. This finding is not expected from previous maternal and paternal literature<sup>1</sup>, but it fits well with our findings that paternal depressive symptoms were not associated with a reduction of father's parenting activities. Thus, fathers' depressive symptoms may not reduce their involvement, but influences the quality of their interactions with their children. However, when there are high levels of maternal depressive symptoms combined with high levels of marital conflict, father-child conflict may be lower, because negative interaction might become focused on the mother rather than the child. Moreover, previous research suggests that paternal depressive symptoms influence maternal depressive symptoms, which may increase children's emotional and behavioural problems<sup>1,4,16</sup>. Thus, paternal depressive symptoms might also indirectly influence children via effects on their mothers. Although this is an interesting finding, these results may have been due to the use of conventional regression analysis of effect modification which assumes linear relationships between variables based on mean responses in the sample population. Further research is needed perhaps using more statistically advance techniques that test complex interactions and non-linear slopes.

Our study has a number of strengths. Firstly, the MCS collected data on a very large representative sample of fathers in the UK. Secondly, the study used well validated measures and maintained a high response rate<sup>7,8</sup>. Finally, sampling weights were applied to account for stratified sampling and attrition<sup>8,14</sup>. Findings however, were based solely on self-report questionnaires from fathers. Results could have been affected by shared method bias; that is, fathers with depressive symptoms may be more likely to report negative than positive behaviours. Additionally, no clinical diagnoses for depression were available. These issues are common to all large cohort studies, where the use of in-depth measures would be impractically time-consuming, expensive, increase attrition and risk introducing selection bias due to participant burden. Findings from secondary data analysis studies can inform future experimental and longitudinal studies in clinical samples that should include direct observation and structured diagnostic assessment. If our findings were replicated, parenting interventions for depressed fathers should focus on the reduction of father-child conflict as well as promoting positive parenting. The influence of mothers' depressive states and marital conflict would also seem important; practitioners should consider the needs of the partners of parents they treat for depression in terms of support they might need.

Despite reports showing the huge costs of paternal depression, parenting interventions are still primarily targeted towards mothers<sup>17</sup>. Taking our findings into account, we advocate a more family centred approach<sup>16</sup> and provided that appropriate support and services are put in place, we would suggest routine screening for postnatal depressive symptoms in fathers, as is currently the case for mothers. Additionally, using clinical sample of depressed fathers, further studies need to be undertaken to establish whether fathers' elevated scores on screening measures constitute depression or a normal but difficult adjustment phase. In both cases, support for fathers need to be put in place.

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### Contribution of each author statement

**Dr Selina Nath:** Conception and design, data analysis, interpretation of data, write-up of article, revising it critically for important intellectual content and final approval of the version to be published.

**Dr Ginny Russell:** Conception and design, provided guidance with data analysis, interpretation of data and analysis, revising it critically for important intellectual content and final approval of the version to be published.

**Prof Tamsin Ford:** Conception and design, interpretation of data and analysis, revising it critically for important intellectual content and final approval of the version to be published.

**Prof Willem Kuyken:** Interpretation of data and analysis, revising it critically for important intellectual content and final approval of the version to be published.

**Dr Lamprini Psychogiou:** Conception and design, interpretation of data and analysis, revising it critically for important intellectual content and final approval of the version to be published.

### Ethical approval

MCS had ethical approval and informed consent from participants<sup>8</sup>. As our work comprised secondary analysis of anonymised data that is publically available (<http://discover.ukdataservice.ac.uk/series/?sn=2000031>) with no direct contact with the individual participants, therefore further ethical approval was not considered necessary.

**Online data supplements Table 2:** Descriptive statistics of parenting outcome variables by low and high depressive symptoms for fathers at MCS1

Paternal depressive symptoms MCS1	MCS2	MCS2	MCS3	MCS4
	Parent-child conflict <sup>a</sup>	Parent-child warmth relationship <sup>b</sup>	Parenting activities <sup>c</sup>	Parenting activities <sup>c</sup>
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
<b>Low depressive symptoms</b>	17.82 (5.40)	32.59 (2.55)	21.63 (5.07)	23.35 (5.29)
<b>High depressive symptoms</b>	20.63 (5.71)	32.18 (2.73)	22.89 (5.88)	24.53 (5.60)

<sup>a</sup> Higher score indicate higher levels of father-child conflict

<sup>b</sup> Higher scores indicate higher levels of father-child warmth

<sup>c</sup> Higher scores indicate lower participation in parenting activities

**Online data supplements Table 3:** The association between paternal depressive symptoms at MCS1 and fathers' parenting activity/relationship showing weighted analyses (unadjusted and adjusted), unweight adjusted analysis, and imputed data analyses

Paternal depressive symptoms (MCS1)	Father-child relationship				Parenting activities			
	Conflict (MCS2)		Warmth (MCS2)		MCS3		MCS4	
	Coefficient (95% CI)	p	Coefficient (95% CI)	p	Coefficient (95% CI)	p	Coefficient (95% CI)	p
Unadjusted (weighted) N	0.85(0.75-0.96) 7755	<0.001	-0.12(-0.16- -0.07) 7663	<0.001	0.30(0.21-0.40) 7542	<0.001	0.29(0.19-0.39) 6621	<0.001
Adjusted (weighted) N	0.72 (0.59-0.84) <sup>a</sup> 4430	<0.001	0.00 (-0.07-0.08) <sup>b</sup> 4372	0.960	0.08 (-0.06-0.22) <sup>c</sup> 4306	0.266	0.11 (-0.04-0.26) <sup>c</sup> 3871	0.162
Adjusted (non-weighted) N	0.74(0.62-0.86) <sup>a</sup>	<0.001	-0.01(-0.07-0.04) <sup>b</sup>	0.599	0.07(-0.04-0.19) <sup>c</sup>	0.192	0.12(0.00-0.25) <sup>c</sup>	0.048
Adjusted (imputed) <sup>d</sup> N	0.70(0.61-0.80) <sup>a</sup> 12,396	<0.001	-0.02(-0.06-0.02) <sup>b</sup> 12,396	0.263	0.15(0.06-0.25) <sup>c</sup> 12,396	0.001	0.15(0.06-0.25) <sup>c</sup> 12,396	0.002

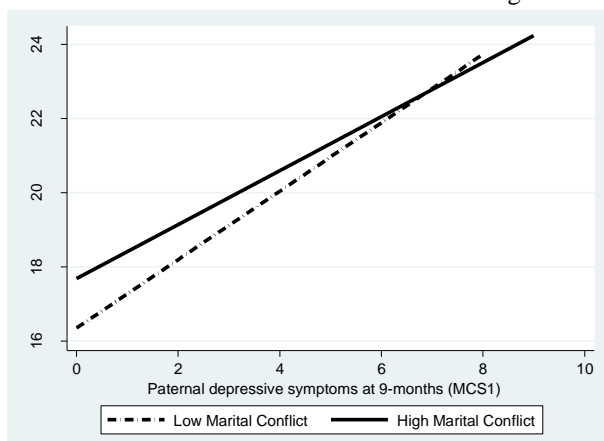
<sup>a</sup> After adjusting for maternal depressive symptoms, child temperament, child gender, marital relationship, fathers employment, family housing, family income and paternal age

<sup>b</sup> After adjusting for maternal depressive symptoms, child temperament, child gender, marital relationship, paternal education, fathers employment, family housing, family income and paternal age

<sup>c</sup> After adjusting for maternal depressive symptoms, child temperament, child gender, marital relationship, paternal education, family housing, family income and paternal age

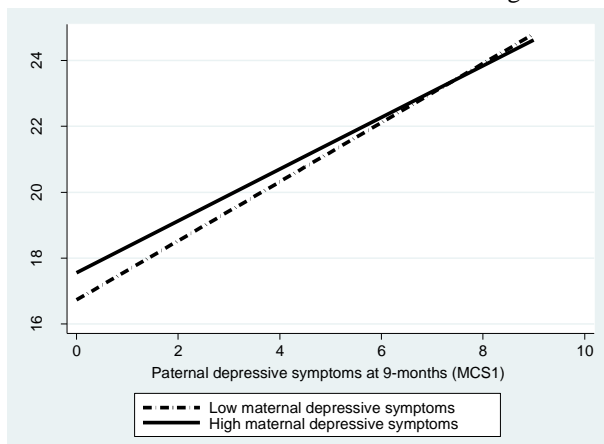
<sup>d</sup> All predictor and outcome variables were used as predictors in the imputation model (set for 25 imputations)

**Online data supplements Fig 1:** Interaction graph showing the effect of paternal depressive symptoms on father-child conflict in families with low and high levels of marital conflict<sup>a</sup>



<sup>a</sup> The graph uses dichotomised scales to illustrate the interaction but the analysis uses the continuous measure

**Online data supplements Fig 2:** Interaction graph showing the effect of paternal depressive symptoms on father-child conflict in families with low and high levels of maternal depressive symptoms <sup>a</sup>



<sup>a</sup> The graph uses dichotomised scales to illustrate the interaction but the analysis uses the continuous measure