

**Impact of Depression on Maternal Sensitivity to
One-Year-Old Infants**

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Thesis Declaration Form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Overview

This thesis investigated the relationship between postnatal depression (PND) and maternal sensitivity. Part one is a systematic literature review. This review summarizes the evidence regarding the relationship between PND and a number of maternal parenting behaviour constructs, including maternal sensitivity. There seemed to be more evidence of a negative association between PND and some maternal parenting behaviour constructs more than others. Part two describes a cross-sectional study of the relationship between PND and maternal sensitivity in a disadvantaged and high risk sample of 86 mothers. The findings revealed no evidence of an association between PND and maternal sensitivity, though there was some evidence of an association between antenatal depression and sensitivity. Finally, a critical appraisal of the entire research is presented in part three. Therein, reflections are proffered on issues related to the coding of sensitivity, the role for qualitative research in this area as well as further clinical implications and directions for future research. This was a joint thesis undertaken in conjunction with Roberts (2018), whom coded half of the data for sensitivity (please see Appendix A for further details).

Impact Statement

This research furthers prior academic work on the potential effects of maternal depression on maternal sensitivity. It substantiates some existing findings within the area, whilst contradicting others. Both the literature review and the empirical study coalesce at their highlighting inconsistencies in the operationalisation of maternal parenting behaviour constructs within prior studies. Furthermore, both parts of this thesis also call for greater consistency, and suggest a method for doing so (i.e., utilizing a previously developed framework), which would facilitate better comparisons within the field and more rigorous conclusions to be drawn. By controlling for sociodemographic factors, the empirical study provides an added level of robustness to the literature in this area. In addition, by foregrounding the impact of income on maternal sensitivity, the study provides an impetus for future studies to explore this relationship further, including attempting to elucidate what may be driving this effect of income on sensitivity. This study also builds on existing findings to demonstrate the reliable use of the NICHD Sensitivity scale (NICHD, 1997) within the current high risk sample. The literature review provides an important contribution in regard to its conclusion that the relationship between postnatal depression and maternal parenting behaviour may vary according to the maternal parenting behaviour construct that is assessed. This has not been emphasized a great deal within the extant literature. It, therefore, also calls attention to the need to quantify, for instance through meta-analytic reviews, the relative strengths of the association between postnatal depression and each construct of maternal parenting behaviour.

Overall, this thesis proffers important clinical implications. It highlights the need to screen routinely not only for postnatal depression but also for prenatal

depression and, potentially, for difficulties within the mother infant dyad. Further, the independent prediction of maternal sensitivity by income foregrounds the importance of also assessing and attempting to address such contextual risk factors. Moreover, this finding suggests that contextual factors like income need to be the focus of service provision in addition – or even at times, in preference – to any interventions for maternal mental health problems. This is, then, a rather novel finding that provides further impetus for the necessity of viewing mothering as intimately tied to the sociodemographic and socio-political contexts in which it takes place.

Should such implications as these become realised in routine clinical practice, it would help in the early identification and subsequent treatment of mental health problems within the mother-infant dyad as well as contextual factors, such as financial burden, that put dyads at risk. Given the multifarious outcomes associated with early attachment to primary caregivers such early interventions may help to reduce the burden of mental and physical health problems, both for families and for society at large (e.g., the economic costs of psychological problems). Furthermore, given extant findings of the positive correlation between attachment security and academic success, as well as negative correlations of attachment security with conduct problems, one can envisage some far-reaching positive impacts, at a societal level, from such early intervention, namely, through helping to ensure infants are helped to get on better developmental trajectories.

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Part 1: Literature Review

The Relationship Between Postnatal Depression and Maternal Parenting Behaviour

Abstract

Aims: This paper presents a systematic review of literature that has examined the relationship between postnatal depression (PND) and maternal parenting behaviour using objective direct observation.

Methods: Electronic databases were systematically searched, with 16 studies meeting predefined inclusion criteria.

Results: 12 of the 16 reviewed studies reported a direct or indirect relationship between PND and maternal parenting behaviour, across four constructs, with more evidence that PND is associated with lower responsiveness and positive regard than with sensitivity and stimulation.

Conclusions: The small number of reviewed studies and considerable methodological variation limit conclusions. Nevertheless, the evidence is quite consistent in indicating that PND negatively impacts maternal parenting behaviour. Suggestions are made for future research and clinical practice.

Introduction

A recent epidemiological study by Ko, Rockhill, Tong, Morrow, and Farr (2017). found that approximately 11% of mothers experience clinically significant symptoms of depression during the first year postpartum or what is more succinctly referred to as postnatal depression (PND). This research by Ko and colleagues (2017) updated a prior longitudinal study of 90,000 mother-infant dyads which reported the prevalence to be 14% (Dave, Petersen, Sherr, & Nazareth, 2010). Importantly, Dave et al. (2010) found evidence to suggest that levels of maternal depression are highest in the first year of life. PND, then, represents a significant public health issue, especially when this relatively high prevalence is taken alongside extant research demonstrating its association with multifarious adverse outcomes for the infants concerned. There is, for example, meta-analytic evidence that PND is associated with increased internalizing and externalizing psychopathology, increased negative affect, and reduced positive affect among children (Goodman et al., 2011). Infants of depressed mothers have also been shown to be at increased risk for emotional and behavioural dysregulation (Maughan, Cicchetti, Toth, & Rogosch, 2007; Van der Waerden et al., 2015), impaired cognitive- (Stein, Malmberg, Sylva, Barnes, & Leach, 2008), endocrinological- (Goodman, 2007; Khoury et al., 2016) and neuro-development (Koutra et al., 2013; see Murray, Fearon, & Cooper, 2015 for a review). Finally, infants of mothers experiencing PND appear at greater risk of being classified as having an insecure or disorganised attachment (Fearon & Belsky, 2016; Hayes, Goodman, & Carlson, 2013).

En masse then, these findings attesting to the deleterious sequelae that PND may have for infants highlight the need to elucidate the mechanisms through which

PND leads to such outcomes. Given the very considerable time that an infant usually spends with its mother (though, of course, mothers are not always the primary caregiver), it seems that the mother-infant relationship would be a prudent starting point for the investigation of such mechanisms. One of the most researched constructs that helps to consolidate and organise findings in this area, both theoretically and empirically, is that of maternal sensitivity.

Maternal sensitivity is, perhaps, one of the most common operationalisations of maternal behaviour. Originally delineated by Mary Ainsworth who collaborated with, and developed the pioneering work of, John Bowlby (see for e.g., Ainsworth & Bowlby, 1991) maternal sensitivity was defined broadly as a mother's ability to detect, correctly interpret and respond effectively to her infant's cues (Ainsworth, Bell, & Stayton, 1971). Though originally conceived of as a major predictor of attachment security, there have been some contradictory findings regarding the strength of this relationship. A detailed account of these findings is, however, neither pertinent nor useful for the current discussion (for a review see Fearon & Belsky, 2016; see Verhage et al., 2016, for the latest meta-analysis).

Maternal sensitivity has been found to be associated with a variety of infant outcomes, including social and emotional competence (Kok et al., 2013), academic achievement (Raby, Roisman, Fraley, & Simpson, 2015), and physical health (Anderson, Gooze, Lemeshow, & Whitaker, 2012). More germane to the current review, however, are studies suggesting that maternal sensitivity is impaired in mothers experiencing PND. Notably, two meta-analytic reviews found evidence that mothers with PND were less sensitive than their non-depressed counterparts, with one

of these, which analysed the findings of 11 studies, concluding that this relationship was moderate in size ($r = .32$, Beck, 1995). In the second meta-analysis, which involved 46 studies, Lovejoy, Graczyk, O'Hare, and Neuman (2000) found that mothers experiencing PND were more coercive, intrusive and disengaged as well as less warm than mothers who were not depressed. Subsequent cross-sectional studies have replicated this significant effect of PND on maternal sensitivity (e.g., Musser, Ablow, & Measelle, 2012). In their review of the literature on the processes through which maternal depression may affect mothering, Dix and Meunier (2009) found some evidence consistent with the work of Ainsworth and colleagues conducted several decades previously: namely, that a mother's ability to notice, interpret and respond appropriately and effectively to her infant may be impaired by her experience of depression. In a notable longitudinal study, Kemppinen, Kumpulainen, Moilanen, and Ebeling (2006) assessed mothers for depressive symptoms across four time-points from the 37th week of pregnancy to four months postpartum. Whilst there were no differences in the sensitivity ratings (at seven weeks postpartum) received by mothers who reported depressive symptoms at two weeks postpartum, there was a significant difference in the sensitivity of mothers who reported them at four months postpartum. This was true only, however for those mothers who reported 'major depressive symptoms', which here denotes scores ≥ 13 on the Edinburgh Postnatal Depression Scale (EPDS). Additionally, only when mothers reporting PND at two weeks postpartum were removed from the analysis, were mothers who experienced PND at any one time-point significantly less sensitive than their non-depressed counterparts. This study adds some nuance to the picture, demonstrating that depressive symptoms reported soon after birth - commonly termed 'baby blues'- appears to not have the

effect on maternal parenting behaviour that similar symptoms reported several months later (Kemppinen et al., 2006).

The authors attribute the lack of association between PND and sensitivity at two weeks postpartum to the transition to motherhood that they suggest may, in some women, involve transient and minor depressive symptoms that do not markedly impact their caregiving capacities (Kemppinen et al., 2006). This presents the question of when such ‘normal’ depressive symptomatology may become an ‘abnormal’, clinically significant, depressive episode or disorder. Here another longitudinal study by Pridham, Lin, and Brown (2001) is particularly helpful, as they assessed PND only two weeks later than Kempinnen et al. (2006) – at one month postpartum (as well as at two, four, eight and 12 months postpartum). Like Kempinnen and colleagues, Pridham et al. (2001) found no significant effect of PND on ratings of maternal sensitivity, when controlling for sociodemographic factors. Similarly, another longitudinal study by Campbell, Cohn, and Meyers (1995) found there to be no significant differences in maternal sensitivity, during free-play, toy-play or feeding assessed – as a composite variable – at two, four and six months between mothers with PND and those without it. PND was diagnosed at two months postpartum. There was also no significant difference between these two groups when the PND was chronic and persisted through to the six-month assessment (Campbell et al., 1995). Overall, then these three longitudinal studies suggest – in contrast to the abovementioned meta-analytic and cross-sectional findings – that there is no significant relationship between PND and sensitivity.

With respect to another maternal parenting behaviour construct, namely that of maternal affect or what is oftentimes referred to as “positive regard” (a quantitative measure of a mother’s display of positive affect toward her infant), Campbell et al. (1995) did, however, find a significant effect of PND, when it was chronic. Specifically, the authors found that this group of mothers expressed less positive affect whilst playing with and feeding their infants. Other research groups have reported similar findings, in terms of the duration and frequency of positive affect (Hoffman & Drotar, 1991) as well as affectionate touch (Feldman & Eidelman, 2007).

Taken together then, these findings appear to suggest that mothers experiencing PND may be more impaired in one maternal parenting behaviour construct than in another. Arriving at such conclusions, however, is hampered significantly by widespread variations in the operationalisations of these various constructs of parenting, with, for instance, the same observational measures of parenting being denoted as assessing maternal ‘sensitivity’ by one research group and as ‘responsiveness’ by another group (Dix & Meunier, 2009; De Wolff & Ijzendoorn, 1997). Moreover, a review by Mesman and Emmen (2013) of the measures used to assess maternal sensitivity showed in sharp relief this considerable variation, with some measures deviating from the original sensitivity construct as expounded by Mary Ainsworth, through, for instance, the inclusion of positive affect as an indicator of sensitivity. Such inconsistency in definition and operationalisation constrains progress within the field, adding noise to data analyses and hampering the replication process. This issue has been noted much earlier in the literature, such that De Wolff and Ijzendoorn (1997) attempt to consolidate and organise constructs of parenting used in the literature. They achieved this through testing, statistically, the consensus of

“experts” regarding the conceptual homogeneity of various parenting constructs. They concluded there to be nine distinct constructs of maternal parenting behaviour, namely, sensitivity, responsiveness (termed “contiguity of responses”), physical contact, cooperation, synchrony, mutuality, support, attitude and stimulation. This analysis by De Wolff and Ijzendoorn (1997), therefore, provides a useful framework for consolidating the findings in the literature and comparing studies.

The current review utilises this framework produced by De Wolff and Ijzendoorn (1997) to facilitate such a comparison of studies. Utilising this empirically-derived framework seems a beneficial addition to the field, especially in light of the fact that the most recent and largest of the aforementioned meta-analyses, conducted by Lovejoy and colleagues (2000), organised findings by three ad-hoc categories of maternal parenting behaviour (Positive, Negative and Disengaged) which were devised non systematically by the authors and, thus, alongside being less reliable, may have been unable to discern the relative strengths of the evidence for distinct constructs of maternal parenting behaviour. Further, given that these meta-analyses were published 15-20 years ago and that (at the time of searching) no systematic reviews of the literature could be found, it seemed useful to undertake such a review which includes studies which have been carried out since these meta-analyses. The current review aimed to provide this update to the field by systematically reviewing the available research investigating the relationship between PND and maternal parenting behaviour.

Method

Search Strategy

An initial literature search on PsycINFO, Medline and Embase was conducted using terms related to PND and maternal parenting behaviour. The latter included “sensitivity”, “responsiveness” as well as more general terms, such as “parenting quality”, and others (see Table 1, below, for a full list of the terms used). The search was restricted to studies in English and which involved children. In order to examine, with greater specificity, the potential effects of PND on maternal behaviours, studies which utilised scales assessing dyadic behaviour, such as synchrony or mutuality, and did not include a measure of maternal behaviour, were excluded. This search returned an unmanageable number of studies. As this searched the full text of articles, a final search was, therefore, conducted which applied only to Titles and Abstracts. The final search returned a more reasonable number of studies which could be reviewed for suitability. Firstly, the titles and abstracts of studies were used to remove obviously irrelevant studies. Secondly, the full text was consulted with reference to the review’s inclusion criteria. Namely, these were:

1. PND assessed within the first 12 months of life using an instrument with established psychometrics properties.
2. Maternal parenting behaviour was assessed also within the first 12 months of life with an established observational measure of any of a number of constructs which are coherent with Ainsworth’s original conception of maternal sensitivity and the findings of De Wolff and Ijzendoorn (1997). This includes maternal sensitivity, warmth, responsiveness, and other commonly used terms in the literature (see Table 1, for a full list of these).

3. Inferential statistics tested the association between the two constructs of interest.

Table 1. Search Terms and Results Returned for Preliminary and Final Publication Searches

Search (Strategy)	Search term and restrictions used in PsycINFO, Medline and Embase electronic databases	Results
<i>Preliminary search</i> (Full Text Search)	("maternal sensitiv*" or "maternal responsive*" or "mother* sensitiv*" or "mother* responsive*" or "parent* sensitiv*" or "parent* mutuality" or "maternal mutuality" or mutuality or "parent* warmth" or "maternal warmth" or warmth or "parent* synchrony" or "maternal synchrony" or synchrony or responsive*" or "parenting quality" or "parent?child relations" or "mother?child relations") AND ("post?natal depress*" or "maternal depress*" or "depress* and mother*" or "depress* and maternal" or "postpartum depress*") <i>Restricted to research with humans, in English and involving children.</i>	1755
<i>Final search</i> (Abstract and Title Search)	("maternal sensitiv*" or "maternal responsive*" or "mother* sensitiv*" or "mother* responsive*" or "parent* sensitiv*" or "parent* mutuality" or "maternal mutuality" or mutuality or "parent* warmth" or "maternal warmth" or warmth or "parent* synchrony" or "maternal synchrony" or synchrony or responsive*" or "parenting quality" or "parent?child relations" or "mother?child relations") AND ("post?natal depress*" or "maternal depress*" or "depress* and mother*" or "depress* and maternal" or "postpartum depress*") <i>Restricted to research with humans, in English and involving children.</i>	762

Note: All searches were carried out by searching for each search term individually and then using the Boolean term "AND" to run the combined search.

Assessing Methodological Quality

A formal scale for the assessment of methodical quality was not used in the present review. In making judgements regarding the quality of the studies reviewed, therefore, particular attention was paid to the sampling of participants, methods of controlling for potential confounds (either statistically or through a control group),

validity and reliability of the measures used, the defensibility of the statistical testing and the subsequent interpretation of the results.

Organisation of Results

Given the proliferation of constructs of parenting behaviour within the literature, alongside the considerable variation in operationalisation of these, it is difficult to be assured of the precision of attempts at grouping these constructs for comparison. This difficulty has been noted already by many in the field, such that De Wolff and Ijzendoorn (1997) tested statistically the consensus of “experts” regarding the conceptual homogeneity of these constructs. Their analysis, was, therefore, considered in the organisation of the studies reviewed here into constructs which are consistent with the findings of De Wolff and Ijzendoorn (1997). Specifically, the four constructs under which the studies being reviewed are grouped correspond to four of the constructs concluded by De Wolff and Ijzendoorn (1997) to be conceptually and statistically distinct, namely Maternal Sensitivity, Responsiveness, Positive Attitude and Stimulation. These four were utilised simply because these were all of the constructs utilized across the 16 studies – none of the other 5 constructs elucidated by De Wolff and Ijzendoorn (1997) were mentioned. It is noteworthy, however, that to the current author’s knowledge this analysis by De Wolff and Ijzendoorn (1997) has yet to be replicated by other researchers.

Maternal Sensitivity is taken to be as originally defined by Ainsworth: a mother’s ability to notice, interpret and respond appropriately and effectively to her infant’s cues. Responsiveness, differs notably from sensitivity in that it does not include any assessment of the appropriateness of the mother’s behaviour (i.e., does it

soothe or help the infant?) but rather simply refers to the promptness and/or frequency of the mother's responses to her infant. Central to the construct of Positive Attitude is the mother's Affective Quality (Zaslow, Rabinovich, Suwalsky, & Klein, 1988). Zaslow et al. (1988, p. 290) defined this concept as "the mother's expression of positive affect to the baby, the mother's expression of negative affect to the baby, and the degree to which mother and infant engaged in reciprocal interactions." This, therefore, encapsulates findings regarding maternal affective quality, expression and affectionate touch. Stimulation denotes any actions taken by the mother directed toward her infant (De Wolff & Ijzendoorn, 1997).

Finally, for clarity and expediency, some terms used by original authors to denote a parenting construct have been reclassified in accordance with this system of categorisation. Thus, for instance, where Hoffman and colleagues (1991) refer to their coding of maternal "responsiveness/sensitivity", a review of the description of the measure used shows that it is more consistent with the definition of responsiveness mentioned above.

Results

Based on the above inclusion criteria, the titles and abstracts of 762 publications were screened for eligibility. It was possible to exclude 702 articles during this stage as they either were focused on another research question entirely or were not quantitative, empirical studies. Thus, 60 publications were reviewed in detail. Unlike the meta-analytic review of Lovejoy and colleagues (2000), which included current and lifetime experiences of depression, no child age-limit and scales assessing dyadic behaviour (i.e., not just parental behaviour), the current review, as delineated above, had narrower inclusion criteria, in order to maximise the internal validity in assessing the association between PND and maternal parenting behaviour. Namely, this review included only current experiences of PND, infants aged 12 months or younger, and measures of maternal parenting behaviour. Because of these narrower inclusion criteria, therefore, the current review involved fewer studies than the 46 reviewed by Lovejoy et al. (2000). Sixteen studies were selected for inclusion in this review (see Figure 1, below, for a flowchart of study selection). As mentioned above, when inspected, these 16 studies utilised four of the nine constructs of maternal parenting behaviour elucidated by De Wolff & Ijzendoorn (1997). The findings of these 16 studies are summarized in Table 2.

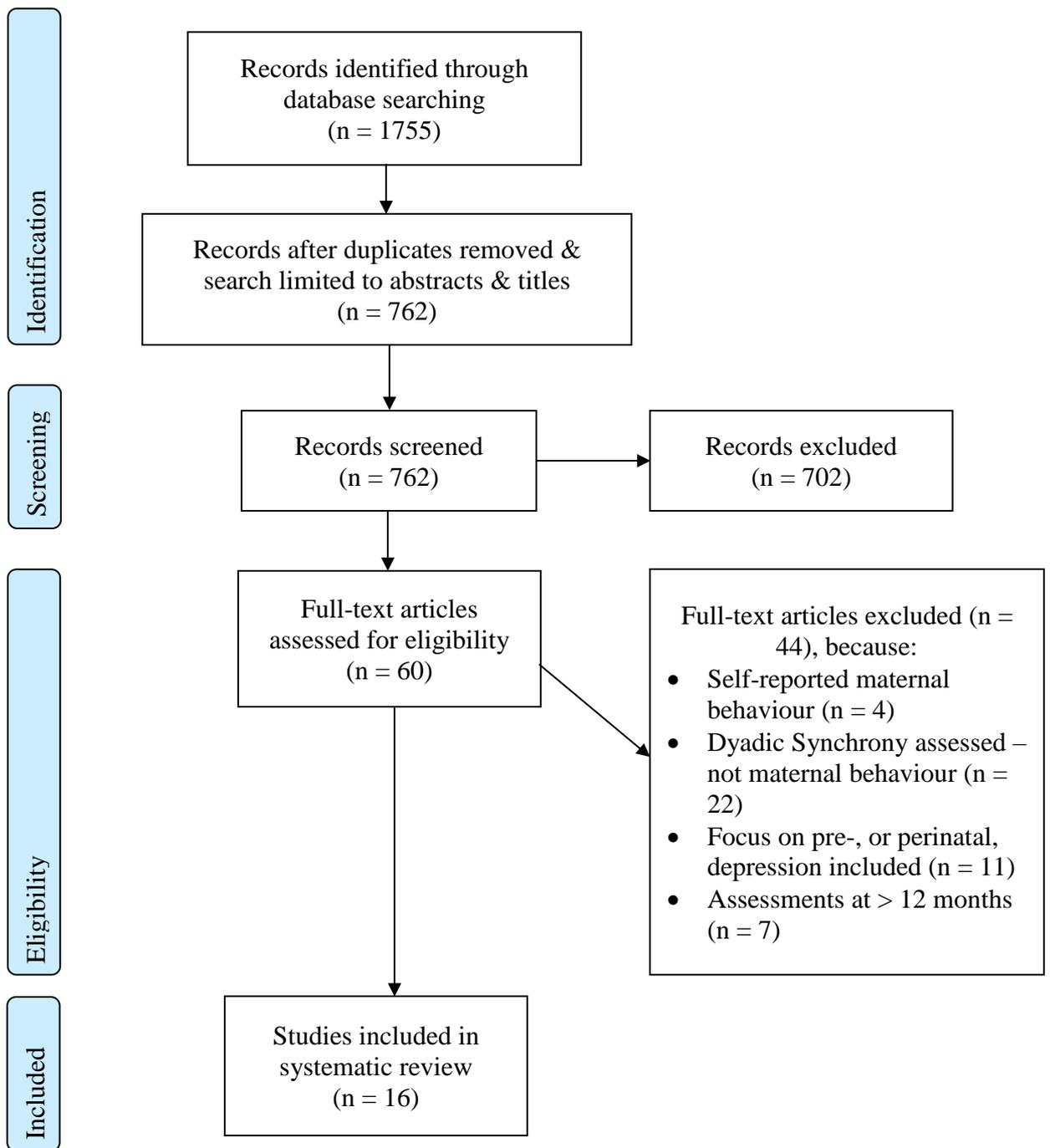


Figure 1. *Process of Retrieval of Publications for Review*

Table 2. Findings of Reviewed Studies

Year	Study	Country	Design	N	Type	Sample Characteristics				Observation Context (Sensitivity Measure)	Depression Measure	Relationship b/w variables {Parenting Construct - relationship}
						M Maternal Age	M Infant Age in Months	% Ethnic Minority	% Impoverished			
2013	Alvarenga et al.	Brazil	LT	38	Community	29	8	100%	100% 'Low-income'	Unstructured (Bornstein, 2001)	BDI	S - No
1996	Cassidy et al.	Canada	CS	21	Community	17.7	13	48%	90% on Low income	Unstructured Play (CARE-Index)	EPDS	S - Yes R - No
1995	Campbell et al.	USA	LT	130	Community	29.3	4	0%	All middle-class	Structured & Unstructured (Tronick's monadic phases (Cohn & Tronick, 1987; Izard's Affex (Izard, Dougherty, & Hembree, 1983)	Diagnostic Interview: SADS; Centre for Epidemiological Studies Depression Scale (CES-D)	S - No PR - Yes
1990	Cohn et al.	USA	CS	46	Community; Recruited from Obstetrics clinic	29.4	4.3	0%	All middle-class	Unstructured Play (Ainsworth Scales)	Diagnostic Interview: SADS	S - No PR- Yes
2017	Esposito et al.	USA	CS	60	Community	31.8	5.6	40%	All middle-class	Unstructured (Bornstein, 2001)	BDI; SCID-I	R - Yes
2010	Flykt et al.	Finland	LT	59	Community	29	7	0%	All middle-class	Unstructured Play (CARE-Index)	EPDS	R - Yes S - No

2007	Feldman & Eidelman	Israel	LT	108	Community	29.4	6	100%	All middle-class	Unstructured (Coding Interactive Behaviour Manual; Feldman, 1998)	BDI	PR - Yes
1992	Gelfand et al.	USA	CS	124	Community	28.9	7.3	6%	All middle-class	Multiple Contexts (Ainsworth Scales)	Diagnostic Interview & BDI; Therapists gave diagnosis (unclear on what basis)	S - Yes
1991	Hoffman & Drotar	USA	CS	22	Community	29.8	2	“Predominately White”	All middle-class	Unstructured Play (GDRS; Hoffman, 1988); Greenspan-Lieberman Observation Scale (GLOS; Greenspan & Lieberman, 1980)	BDI; Depression Adjective Checklist, Lupin, 1965 (DACL)	R - Yes PR- Yes St - No

1994	Hossain et al.	USA	CS	26	Community	20.5	4.4		100% 'low' socioeconomic status (based on the Hollingshead Index)	Unstructured Play (Interaction rating scale)	BDI	S - No
2006	Kemppinen et al.	Finland	LT	78	Community	28.6	2	NR	24% lower class (including unemployed)	Unstructured Play (CARE-Index)	GHQ; EPDS; Clinical contact	S - Yes
2004	Milgrom et al.	Australia	LT	90	Inpatient	30.8	4	'Broad socio-geographic range'	'Broad socio-geographic range'	Unstructured Play (unpublished scale - Scales adapted from Censullo, Lester, and Hoffman (1985) and Brazelton, Koslowski, and Main (1974))	EPDS	R - Yes

2009	Paris et al.	USA	CS	35	Community	32.4	4	21.9	All middle-class	Multiple Contexts (Coding Interactive Behaviour Manual; Feldman, 1998)	Post-Partum Depression Screening Scale	R - Yes
2012	Pearson et al.	UK	LT	872	Community	29	13.5	Broadly representative of general population	Broadly representative of general population	Structured Book reading (Thorpe Interaction Measure ;Thorpe et al., 2003)	EPDS	R - No
2011	Sidor et al.	Germany	CS	106	Community	26.3	4.6	NR	78.5% 'low income'	Unstructured Play (CARE-Index)	EPDS;PSI-SF	S – No
2007	Van Doesum et al.	Netherlands	CS	84	Community	30	5.7	18%	25% 'low socioeconomic status'	Structured, bathing (Emotional Availability Scales)	BDI	S – No

Note. LT = Longitudinal; CS = Cross-sectional; S = Sensitivity; R = Responsiveness; PR = Positive Regard; St = Stimulation; EPDS = Edinburgh Postnatal Depression Scale; CES-D = Centre for Epidemiological Studies Depression Scale; BDI = Beck Depression Inventory; GDRS = Global Dimensions Rating Scale; SADS = Schedule for Affective Disorders and Schizophrenia; CARE = Child-Adult Relational Experimental; SCID-IV = Structured Clinical Interview for DSM-IV; SCL-90-R = Symptom Checklist-90-R.

Overview

The 16 independent samples included in this review included a total of 1899 mother-infant dyads. Sample sizes ranged from 21 (Cassidy, Zoccolillo, & Hughes, 1996) to 872 (Pearson et al., 2012). Seven (44%) studies were conducted in North America. In the sections that follow, the design and sample characteristics of the studies are described, before turning to the main findings regarding the association between PND and constructs of maternal parenting behaviour.

Design

Nine (56%) of the studies reviewed were cross-sectional. The remaining studies were longitudinal, with the longest assessment period being that of Flykt, Kanninen, Sinkkonen, and Punamäki (2010), who assessed mother-infant dyads over three time-points, from the third trimester of pregnancy to 14 months postpartum (on average). Only one study (Paris, Bolton, & Weinberg, 2009) assessed a sample that was concurrently engaged in a home-visiting program which aimed to improve maternal and infant outcomes.

Four (25%) studies involved mothers receiving treatment for mental health problems. The mothers involved in the study of Gelfand, Teti, and Radin-Fox (1992) and van Doesum, Hosman, Riksen-Walraven, and Hoefnagel (2007) were all currently in psychotherapy for their PND. Mothers experiencing PND in Milgrom, Westley, and Gemmill (2004) were all receiving treatment for their depression on the inpatient ward to which they were admitted. Finally, in Sidor, Kunz, Schweyer, Eickhorst, and Cierpka

(2011) all dyads had not received the intervention for PND: assessments were carried out before the intervention commenced.

Sample Characteristics

There was considerable variation across studies in terms of socioeconomic risk factors. Four (25%) studies (Alvarenga, Dazzani, Lordelo, Alfaya, & Piccinini, 2013; Cassidy et al., 1996; Hossain et al., 1994; Sidor et al., 2011) targeted ‘at risk’ mothers, all of which were low-income families alongside other sociodemographic risk factors, (e.g., poverty, substance abuse, social isolation, teenage mothers and maternal psychological problems). The samples of nine (56%) studies were exclusively or mostly middle or high-income middle class (though most did not report on precise income). Finally, the remaining two studies had samples which were broadly representative of the general population (Milgrom et al., 2004; Pearson et al., 2012).

Notably, 13 out of the 16 studies reviewed did not report on the ethnicities included in their samples. The exceptions were Hoffman and Drotar (1991), who reported that their sample was “Predominately White”, and Paris et al. (2009) and Esposito, Manian, Truzzi, and Bornstein (2017), both of whom tested for differences across groups of mothers in terms of ethnicity (i.e., in five categories: Caucasian, Black, Latina, Asian, Bi-racial).

Controlling for Potential Confounds

Most of the studies (12) either matched groups for demographic variables or otherwise controlled for them in their analyses (i.e., including these variables as covariates or controlling for them in regression models). The remaining four studies did not report controlling for demographic variables in any way (Alvarenga et al., 2013; Cassidy et al., 1996; Gelfand et al., 1992; Sidor et al., 2001).

Age

The mothers in 13 of the studies reviewed had mean ages of 29-32, with the remaining three studies involving younger mothers. Cassidy et al. (1996) reported the lowest mean age, of 18. The mean ages of the mothers in Hossain et al. (1994) and Sidor et al. (2001) were 21 and 27, respectively.

Co-morbidity

Five (32%) of the studies reviewed assessed for co-morbid mental health problems, all of which utilised standardised psychometric measures for this purpose. There was, however, considerable variation in how comprehensive such assessments were. Specifically, two of these studies used broad diagnostic interviews namely the DSM-III-R Diagnostic Interview Schedule (Cassidy et al., 1996; to assess for historical conduct disorder, current anti-social personality disorder and psychoactive substance dependence) and the Mini International Neuropsychiatric Interview (Van Doesum et al., 2007). The remaining three studies utilised assessments of common psychiatric disorder, with Alvarenga et al. (2013) utilising the Self-Report Questionnaire

of Minor Psychiatric Disorders, Paris et al. (2009) the Brief Symptoms Index and Sidor et al. (2011) the Parenting Stress Index.

There was considerable variation in how studies accounted for the potential impact of co-occurring psychological problems on the quality of mother-infant interactions and this is discussed in more detail within the main findings, below.

Measurement

Postnatal Depression

In line with the inclusion criteria of this review, PND was defined as depression which occurs within the first year postpartum. Fifteen (94%) studies utilised a least one standardized self-report measure of PND. The exception was Cohn, Campbell, Matias, and Hopkins (1990), who assessed PND solely through diagnostic interview (Schedule for Affective Disorders and Schizophrenia, SADS, Endicott, & Spitzer, 1978).

Observation Characteristics

The mean age of infants at the time of assessment varied across and, in some cases (e.g., Cassidy et al., 1996; Flykt et al., 2010), within studies. Eleven of the studies involved infants who were six months of age, or under, with the remaining studies involving infants between six and 13.5 months.

Sixty-nine percent (11) of the studies observed mother-infant dyads at home, with three studies conducting observations in hospital clinics (Cassidy et al., 1996; Hossain et al., 1994; Pearson et al., 2012) and one in a baby laboratory (Hoffman & Drotar, 1991).

Observations of maternal parenting behaviour varied in length from three (Cohn et al., 1990; Hossain et al., 1994; Campbell et al., 1995; Sidor et al., 2011) to 35 minutes (Gelfand et al., 1992), with the modal length being three minutes and the mean being 6.8 minutes.

Twelve studies utilised purely unstructured observational contexts (i.e., asking mothers to play with their infants as they normally would), whilst two studies involved only structured activities, for instance playing with a set of toys, feeding or bathing (Pearson et al., 2012; Van Doesum et al., 2007). Two studies involved both structured and unstructured observations (Campbell et al., 1995; Paris et al., 2009).

Measures of Maternal Parenting Behaviour

A variety of measures of maternal parenting behaviour were utilised across the studies, with differing definitions and coding schemes. All studies, however, utilised previously standardised coding schemes. The commonest construct of parenting assessed was maternal sensitivity, albeit with considerable variation across studies in terms of precise definition and coding scheme (this is discussed further below). Only two studies utilised more than one coding scheme. These two studies combined scores from the two coding schemes either by creating a composite variable (Hoffman & Drotar, 1991) or achieving this statistically through factor analysis (Campbell et al., 1995).

In 14 of the studies, the coders were shown to exhibit adequate inter-rater reliability on the current sample. In the remaining two studies (Cassidy et al., 1996; Milgrom et al., 2004) only one observer coded the entire sample but was trained to sufficient inter-rater reliability (on other data) with developer of the scales in question.

In two studies, the coders were blind to maternal characteristics and reliability was assessed through a portion of the videos being double-coded by another trained coder (Flykt et al., 2010; Hoffman & Drotar, 1991). Cohn et al. (1990) assessed reliability through the same method but neither of the coders were blind. Six further studies also assessed reliability through a second coder rating a portion of the sample but it was not stated whether these coders were blind to maternal characteristics (Alvarenga et al., 2013; Esposito et al., 2017; Hossain et al., 1994; Kempainen et al., 2006; Paris et al., 2009; Sidor et al., 2011). Two studies reported that a portion of the sample was coded by four observers, with one study stating that they were also blind to maternal characteristics (Van Doesum et al., 2007) and one not reporting on this (Pearson et al., 2012). Both Campbell et al. (1995) and Feldman and Eidelman (2007) did not report the overall number of observers involved in coding maternal behaviour, though they did state they were blind. Of the two studies in which the entire sample was coded by one observer, in one of these they were blind (Cassidy et al., 1996) and this was not reported on in the other (Milgrom et al., 2004). Finally, Gelfand et al. (1992) did not video record the interactions between mother and infant, but rather coded the interactions in real-time, thereby precluding a robust coding of maternal parenting behaviour.

Overall, the studies reviewed here were of good quality with the majority (12) involving a coherent design, robust assessments of both constructs of interest and clearly defined control groups which were matched for demographic variables or otherwise controlling for these in their analyses. The methodological quality of the remaining four studies (Alvarenga et al., 2013; Cassidy et al., 1996; Gelfand et al., 1992; Sidor et al., 2001) was poorer due to their not reporting on any controls for demographic factors. A shortcoming of all the reviewed studies, however, was the lack of randomisation as well as assessment and controls for co-occurring psychiatric disorder and ethnicity. Fifteen of the studies described and justified their analytical methods appropriately and drew reasonable conclusions from their analyses, the notable exception being Flykt et al., (2010), who conducted post-hoc analyses without any controls for Type-I Error. Finally, whilst there was relative consistency in the assessment of PND, there was considerable variation in the assessment of maternal parenting behavioural, not only in terms of the scale used but also in the duration, blinding of raters, and observational context.

Main Findings

The results are summarised in the sections below by describing groups of studies that focused on a common maternal parenting behaviour construct. As mentioned above, the four constructs under which the reviewed studies are grouped are Maternal Sensitivity, Responsiveness, Positive Attitude and Stimulation.

Maternal Sensitivity

Of the nine studies reporting on maternal sensitivity, three reported a negative association with measures of PND (i.e., with higher depression associated with lower sensitivity), whilst five studies did not find evidence of any association between PND and sensitivity. Finally, one study found a partial/indirect association between these two variables.

Direct Association

Cassidy et al. (1996)

In their sample of adolescent mothers, Cassidy et al. (1996) investigated the relationship between PND and maternal parenting behaviour as assessed by the CARE-Index. Cassidy and colleagues found a strong negative correlation between PND and maternal sensitivity, $r = -.56, p < .01$. This effect appears to be independent of the effect of anti-social symptoms – also measured – as the authors state that there was “little or no relationship between the two measures” of PND and antisocial personality disorder/conduct disorder symptoms (Cassidy et al., 1996, p.4). However, as there was neither a control group, nor any statistical controls for covariates, it is unclear whether these effects would remain if other associated factors were also taken into account. Other relevant factors include demographic variables, co-occurring psychopathology (for e.g., about half of the sample met DSM diagnostic criteria for substance dependence, though the authors state that this was mostly concentrated in those with conduct disorder) and sexual and physical abuse (half of the sample reported abuse, which has been shown to affect – whether directly or indirectly – observed maternal caregiving in infancy; see Vaillancourt, Pawlby, & Fearon, 2017 for a review). Moreover, as the authors

themselves point out, the EPDS was originally validated for use up to three months postpartum, however their sample varied between 2.5 -23.5 months and thus the EPDS may not be a valid measure of PND in this sample.

Gelfand et al. (1992)

Gelfand and colleagues investigated the sensitivity of parenting in mothers with a diagnosis of depression as well as those without such a diagnosis. They reported that diagnosis of PND was made in accordance with DSM-III by the mothers' therapists, however, the authors do not provide information about what instrument was used - whether structured interview or clinician-rated psychometric assessment. Nevertheless, the diagnosis was supported by a group difference in self-reported depression assessed with the Beck Depression Inventory, $F(1,122) = 101.49, p < .0001$. Another potential confound is that almost half of the depressed group (44%) were taking "psychoactive" medication (the specific kinds of medications were not reported) during the study.

Gelfand et al. (1992) found that mothers in the depressed group were significantly less sensitive than their non-depressed counterparts, $F(1, 120) = 11.88, p = .001$, as rated on scales developed by Lyons-Ruth, Zoll, Connell, and Grunebaum, (1986), and based on Ainsworth's original conception of sensitivity (Ainsworth et al., 1978). The former, however, reported significantly less marital harmony and social support as well as more daily hassles, than the latter (*all* $p < .001$). The non-depressed group also had both higher income, $F(1, 115) = 12.78, p < .001$, and educational status, $F(1, 122) = 4.34, p = .039$, than the depressed group. Given that these third variables were not controlled for in the

analysis there is ambiguity about whether the effect of PND on depression would remain if such potential confounds were taken into account.

Kemppinen et al. (2006)

Kemppinen et al. (2006) assessed mothers across four time-points from the 37th week of pregnancy to four months postpartum, using the GHQ, EPDS and clinical contact with public health nurses as part of the families' first visit to the well-baby clinic at six weeks postpartum. At four months, the authors reported a significant difference between mothers who reported 'major depressive symptoms' (≥ 13) on the EPDS, ($p = .02$), but not those reporting 'minor symptoms' (≥ 10), and their non-depressed counterparts in their ratings of sensitivity. Mothers reporting either major or minor depressive symptoms at two weeks postpartum, however, were not rated as significantly different in terms of sensitivity to mothers not reporting depressive symptoms. When compared with mothers who did not report depressive symptoms, mothers who reported major or minor depressive symptoms at one or more time-points were rated as less sensitive, ($t(78) = 5.206, p < .001$), as assessed using the CARE-index at 6-8 weeks postpartum.

Only when mothers reporting PND at two weeks postpartum were removed from the analysis, mothers who experienced PND at any one time-point were rated as significantly less sensitive than their non-depressed counterparts, $F(3,74) = 3.04, p = .033$. Finally, it was noteworthy that 75% of the mothers who were rated as 'at risk level' in sensitivity reported depressive symptoms.

There was considerable variation in the assessment of depression across the four time-points of this longitudinal research. One of these methods – the clinical contact with

the public health nurse – was unstandardised: the authors do not report on the nurses receiving additional training in the use of a structured diagnostic interview, for example. Additionally, there was no assessment of potential co-morbid psychiatric disorder.

Partial Association

Van Doesum et al. (2007)

In their community sample of clinically depressed mothers, Van Doesum et al. (2007) were unique among the studies reviewed here in their comprehensive assessment of co-morbidity: the authors reported that 72% met criteria for some other disorder alongside PND. They found no significant correlation between maternal sensitivity – as assessed using the sensitivity scale of the emotional availability scales – and the severity of PND. They did, however, report a significant interaction of depression severity and age on maternal sensitivity, ($R^2 = 2.83\%$, $\beta = 0.20$, $p < .05$), with younger mothers with higher levels of PND being rated as less sensitive than their older counterparts with lower levels of PND. Noteworthy is that this effect was not assessed after other covariates had been controlled for.

No Association

Alvarenga et al. (2013)

Alvarenga et al. (2013) investigated the impact of PND, measured at one-month postpartum, on maternal sensitivity, measured at eight months postpartum. Conducting both correlation and regression analyses of the data revealed no significant effects of PND on maternal sensitivity – neither on mothers' total sensitivity score, nor any of the

subscales assessed during this study, which were taken from measures developed by Bornstein (2001) and Piccinini, Alvarenga, and Frizzo (2007). Uniquely amongst the studies reviewed here, Alvarenga et al. (2013) assessed the independent contribution of PND in explaining the variance in maternal sensitivity, controlling for co-morbid psychiatric disorder and maternal-infant attachment in their regression analysis.

Cohn et al. (1990)

Cohn and colleagues investigated the effect of PND in a community sample of mothers at two months postpartum, using a set of measures of maternal parenting behaviour, including Ainsworth's original sensitivity scales and Tronick's Monadic phases (Cohn & Tronick, 1987). Maternal parenting behaviour was coded in two ways during a home observation. Firstly, it was coded retrospectively (from memory) by researchers following their visits with the mother-infant dyad. These researchers were not blind to the mother's PND diagnosis and they received little training on the use of the scales and the authors do not mention any assessment of inter-rater reliability. Secondly, a three-minute video recording of mother-infant interactions was also made, which was later rated by trained observers who were blind and trained to adequate inter-rater reliability. Both sets of ratings were subjected to factor analysis which produced two factors: Maternal Affect (discussed below) and Maternal Sensitivity. It is worth bearing in mind these multiple limitations and their likely impact on the robustness of the study's findings. Regarding maternal sensitivity, the authors found that there were no differences across the groups of depressed and non-depressed mothers (Cohn et al., 1990).

Campbell et al. (1995)

In their longitudinal study Campbell et al. (1995) observed mother-infant dyads during unstructured interactions, feeding and toy play at two, four and six months. They utilised a variety of established measures, including Tronick's monadic phases (Cohn & Tronick, 1987) and Izard's Affex coding system (Izard, Dougherty, & Hembree, 1983), and computed composite scores through combining codes and factor analysis. The composite maternal parenting constructs were maternal sensitivity, maternal affect and feeding (competence).

Campbell et al. (1995) found no significant effects of PND, as assessed at two months, on maternal parenting constructs at the three time-points. Furthermore, there was no significant effect of PND on maternal sensitivity, even when the depression was chronic.

Flykt et al. (2010)

In their Finnish community sample, Flykt and colleagues (2010) assessed mothers for pre- and postnatal depression during pregnancy, at 4-5 months and 14 months postpartum. The authors constructed separate summary variables for both pre- and postnatal depression and examined the impact these had on maternal sensitivity, which was assessed at 14 months. This longitudinal research also investigated the possible moderation of this relationship by the mother's attachment style. There was no evidence of a significant association between PND and the maternal sensitivity scale of the CARE-Index, once prenatal depression and sociodemographic variables had been accounted for.

Flykt et al. (2010) report a significant moderation of the relationship between PND and maternal sensitivity by maternal attachment style ($F(2, 49) = 53.67, p < .05$) with univariate tests showing that the moderation concerned maternal sensitivity ($F(2, 49) = 53.67, p < .05$) and child co-operation ($F(2, 49) = 53.89, p < .05$). That is, among mothers assessed to be in a secure-autonomous state of mind with respect to attachment, the level of maternal sensitivity remained adequate despite increased depressive symptoms. Additionally, insecurely attached mothers (both preoccupied and dismissive attachment styles) who were experiencing PND showed the lowest sensitivity. It is worth mentioning, however, that the multivariate analysis conducted on the three constructs of maternal behaviour by Flykt et al. (2010) was not significant so this was a post-hoc analysis without controlling for Type-I Error.

Sidor et al. (2011)

In their sample of at-risk mothers (from poverty, substance abuse, social isolation, teenage mothers and maternal psychological problems), Sidor et al. (2011) reported no significant relationships between maternal behaviours, as assessed with the CARE-Index, and PND, when analysed using both bivariate and regression models. Furthermore, post-hoc comparisons of the 'extremely low' and 'extremely high' PND scores also evidenced no significant effects on maternal parenting behaviours. The authors also found no significant effect of infant gender on maternal behaviours, nor a significant interaction effect with PND.

Sidor and colleagues (2011) reported a significant relationship between parental distressed reported by mothers and PND, which could be suggestive of stress due to the parental role or an alternative psychological problem which was not assessed for.

Maternal Responsiveness

There were eight studies that assessed the relationship between PND and maternal responsiveness. Of these eight, four studies reported evidence of a negative association between PND and responsiveness and one research group found a partial association. The remaining three studies did not find any evidence of an association between the two variables.

Direct Association

Esposito et al. (2017)

In an assessment of maternal care-giving in the context of infant crying, Esposito et al. (2017) found that mothers diagnosed with depression at five months were less responsive (coded using a scheme developed by Bornstein, 2001) to their infants when they were crying than mothers who did not meet diagnostic criteria for depression, $F(1,41) = 8.79, p = .005$. This effect was shown to be independent of infant age, gender, and birth order; mother education, age, and working status; father co-residence in the household. A strength of this study which adds to its rigor is the 50-minute-long video-recorded interaction which was used to assess maternal behaviour and which, according to the meta-analysis conducted by Holden and Miller (1999), falls within the optimal time frame for observations of parenting behaviour. The authors did not, however, assess or control for co-morbid psychiatric disorder.

Hoffman and Drotar (1991)

In their community sample, Hoffman and colleagues (1991) computed three summary index variables from their Global Dimensions Rating Scale (Hoffman, 1988) and Greenspan-Lieberman Observation Scale (Greenspan & Lieberman, 1980), namely maternal responsiveness, positive affect and stimulation. They reported that the interactions with the infants of mothers experiencing PND were rated as significantly less optimal than the non-depressed mothers on the Overall Positive Interaction Index, $t(20) = 2.87, p < .009$. Regarding maternal responsiveness, Hoffman and colleagues reported that mothers experiencing PND were rated as less responsive to their infants' behaviour than their non-depressed counterparts, $t(20) = 2.75, p < .01$. These effects appear to be independent of sociodemographic factors as there were no significant differences in these across the depressed and non-depressed groups of mothers.

Milgrom et al. (2004)

In their comparison of mothers admitted to a mother-baby unit experiencing PND and a community control group, Milgrom et al. (2004) found mothers experiencing PND were rated as less responsive to their six-month-olds than their counterparts in the community who were not experiencing PND, ($p = .024$). Maternal responsiveness was rated using a scale developed by Milgrom and Burn (1988), based on scales by Censullo, Lester, and Hoffman (1985) and by Brazelton, Koslowski, and Main (1974). This difference seems unlikely to be due to demographic variables given that there were no differences between the groups in age, education or infant sex.

It is worth noting that the authors do not report on any co-morbid psychological disorder in their sample, the absence of which is, perhaps, more significant given that their

sample are inpatients on a mother-baby unit at the time of assessment, and thus may be more likely than a community sample to be experiencing other forms of distress aside from PND.

Paris et al. (2009)

Paris et al. (2009) recruited a clinical sample of mothers who were currently receiving a home-based psychotherapy intervention owing to depression, social isolation or “extreme difficulties in parenting infants”. In order to investigate the prevalence and effect of suicidality in mothers experiencing PND in this sample, Paris et al. (2009) grouped their participants into high and low suicidality groups, based on their scores on the suicidal ideation sub scale of the Postpartum Depression Screening Scale. As one would expect, the high suicidality group scored significantly higher on Postpartum Depression Screening Scale than the low suicidality group, $t = -5.79, p \leq .001$. The authors utilised the Coding Interactive Behaviour manual (Feldman, 1998) to code maternal responsiveness and intrusiveness (i.e., physical manipulation and mother forcing infant to do something). Regarding the latter, the authors reported no significant differences between the groups during either structured or unstructured activities. The authors also reported that there were no significant differences in sociodemographic factors – age, education, income, marital status, first-time mother – across their groups of mothers. Importantly, and uniquely amongst the studies reviewed here, Paris et al. reported on the racial composition of their sample and found there to also be no difference in terms of this demographic factor across the groups.

Paris and colleagues (2009) found a significant difference in maternal responsivity across the low and high suicidality groups with mothers in the high suicidality group being rated as significantly less responsive than their low suicidality counterparts during unstructured observations ($t = 2.11, p \leq .05$) but not during structured activities (e.g., asking the parent to guide the infant in following a rattle). The authors attribute this finding to the concomitant depressive symptomatology that mothers in the high suicidality group are experiencing which may impair their ability to be as sensitive as their low suicidality (and low depressive symptomatology) counterparts and may obtain principally in situations where the mother must rely on her own problem-solving capacities. They also note the possibility that, through keeping greater distance from their infants than low suicidality mothers, mothers in the high suicidality group may have been attempting to protect their infants from “their toxic thoughts and feelings” (Spielman, personal communication as cited in p.319/11, Paris et al. 2009).

Approximately half of the sample had started taking anti-depressant medication before the study finished, though they reported no improvements in mood because of this. Nonetheless this may have had an impact on the findings reported. Finally, though the authors did assess for co-morbid psychiatric symptoms, they did not utilise this data in their analysis to control for the potential effect of this third variable.

Partial Association

Flykt et al. (2010)

Flykt et al., (2010) found a significant association between a combination of prenatal depression and PND and the maternal unresponsiveness scale of the CARE-Index, $F(41, 1) = 4.25, p < .05$. This effect remained once pre- and postnatal depression as well as relevant sociodemographic factors – but not co-morbid psychological problems – had been partialled out.

No Association

Hossain et al. (1994)

Hossain et al. (1994) investigated how infants interacted with their mothers who were experiencing PND compared with their non-depressed father in a low SES sample. Depression was assessed using the BDI and parenting behaviour was coded using the Interaction Rating Scale (Field, 1980). Although they did not report on tests for significant differences in maternal responsiveness across the depressed and non-depressed groups of mothers, using the reported descriptive statistics to do so revealed there to be no significant difference, $p = .10$.

Pearson et al. (2012)

In their longitudinal research, which utilised a large, and broadly-representative population sample of 872 mother-infant dyads, Pearson et al. (2012) reported no significant effect of PND at eight months on maternal responsiveness, as measured using the Thorpe Interaction Measure (Thorpe, Rutter, & Greenwood, 2003). Notably, this logistic regression controlled for an extensive list of both infant and maternal demographic variables, including maternal age, education, perinatal alcohol consumption, gestation at

birth, breastfeeding and infant temperament, all of which have been previously associated with maternal responsiveness (see Field, 2010; Lovejoy et al., 2000; Page et al., 2010). The authors reported on a “trend” that mothers whose depression persisted from the perinatal to postnatal period may have an increased risk of being non-responsive/neutral. These results may be limited, however, by the timing of the assessments, given that maternal responsiveness was assessed on average 3.5 months after PND was measured, as well the fact that no assessment of co-morbidity was conducted.

Cassidy et al. (1996)

Cassidy et al. (1996) did not find a significant relationship between maternal depression and maternal unresponsiveness, though – as mentioned earlier – they utilised –the EPDS outside of the age for which it was developed and this may therefore have constrained their ability to detect significant effects.

Positive Regard

All five of the studies that investigated the effect of PND on maternal positive regard found a negative association between the two variables.

Direct Association

Campbell et al. (1995)

Campbell et al. (1995) reported a significant effect of PND on maternal affect when it was chronic. That is, mothers whose experience of PND persisted to a clinically significant level through to the six-month point were less positive with their babies during face-to-face interactions than women whose depression remitted, $F(2, 46) = 3.39, p < .05$.

This group of mothers were also found to be less competent during feeding interactions ($F(2, 52) = 4.60, p < .01$) and showed less positive affect during toy play with their four-month-old infants, $F(2, 54) = 13.18, p < .001$.

Cohn et al. (1990)

Cohn et al. (1990) report findings on the association of PND and affective expressions across both working and non-working mothers. The authors used a microanalysis paradigm, based on Tronick's monadic phases system (Tronick, Als, & Brazelton, 1980) and Izard's system for identifying affect expressions by holistic judgments (Izard, Dougherty, & Hembree, 1983) to code videotaped interactions. Cohn and colleagues found that non-working mothers experiencing PND exhibited significantly more 'negative expressions' (i.e., irritation or disinterest) than their no-depressed counterparts, $F(1, 40) = 5.15, p < .05$. The authors did not report a comparable analysis within the group of working mothers.

In relation to positive affective expressions, non-working depressed mothers of male – but not female – infants exhibited a significantly lower proportion of positive affect than non-working mothers of boys who were not experiencing PND, $F(1, 40) = 4.12, p < .05$.

The effects observed could not be explained by demographic variables as the depressed and non-depressed groups were matched for age, education as well as the infant's gender, age and birth weight. Finally, the authors statistically controlled for work status, given that the group were not matched for this. One central limitation of this study

is, however, the absence of an assessment of co-occurring psychological problems, leaving some ambiguity as to whether the reported association between PND and maternal affective expressions would remain if the presence of other psychiatric disorders was assessed and controlled for.

Hoffman and Drotar (1991)

Hoffman and Drotar (1991) found that mothers experiencing PND expressed less positive affect, both in terms of frequency and duration, than their non-depressed counterparts $t(20) = 3.30, p < .004$.

Feldman and Eidelman (2007)

In their Israeli sample of pre-term and full-term infants, Feldman and Eidelman (2007) found that in mothers of both groups of infants, PND was negatively correlated with both the Mother Affectionate Touch ($r = -.35$ and $-.36$, respectively) and the Maternal Affiliative Behaviour scales, ($r = .33$ & $-.29$; all $p < .05$) of the Coding Interactive Behaviour Manual (Feldman, 1998).

Given that the authors segregated their sample into groups of pre-term and full-term infants, and not vis-à-vis the mothers reporting of PND, the authors did not control for sociodemographic variables in their analysis of the relationship between PND and maternal behaviour. It, therefore, remains ambiguous whether these correlations would remain were such variables accounted for. A further limitation arises from the fact that PND was assessed at two days postpartum/37 weeks gestational age (full/pre-term infants) whereas maternal behaviour was rated at three months (corrected age for preterm infants).

This interim period of almost three months between measurements makes the inference of a causal relationship between these two variables more difficult, especially when taken alongside extant findings – reviewed above – that depressive symptoms reported during the first two weeks postpartum – unlike symptoms reported/persisting thereafter – may have no significant effects on maternal sensitivity (Kemppinen et al. 2006).

Stimulation

No Association

Hoffman and Drotar (1991)

Hoffman and Drotar (1991) reported no significant difference in terms of mothers' stimulation of their infants across their groups of depressed and non-depressed mothers.

Discussion

Four of the nine studies which investigated the association of PND and maternal sensitivity found a direct or indirect negative association, whilst five of the eight which assessed the relationship between PND and maternal responsiveness reported a direct or indirect negative association. All four studies on PND and positive regard reported a negative association. Finally, the only study to assess stimulation found no evidence of an association with PND.

Of the nine studies reporting on maternal sensitivity, three reported a negative association with measures of PND and five found no association. The remaining study by Van Doesum et al. (2007) found an indirect/partial association between PND and sensitivity. There were, however, some limitations within the studies that reported significant associations. All four of these studies (Cassidy et al., 1996; Gelfand et al., 1992; Kemppinen et al., 2006; Van Doesum et al., 2007) did not control for potentially confounding third variables such as co-morbid psychopathology, marital harmony, social support or substance dependence. This is especially noteworthy given that in two of these studies there were significant differences in certain of these third variables across the groups of mothers. Namely, the depressed and non-depressed groups in the research by Gelfand et al. (1992) differed significantly in their respective levels of marital harmony and social support and about half of the mothers in Cassidy et al. (1996) met criteria for substance misuse and a similar proportion reported abuse. The only longitudinal study to find a direct association between PND and maternal sensitivity, namely that of Kemppinen et al. (2006), similarly did not control for sociodemographic factors, since these were not

assessed. Moreover, there was considerable variation in how Kemppinen and colleagues (2006) assessed PND across the four time-points, including an unstandardised measure (“clinical contact” with a public health nurse). Finally, only two of these four studies (Cassidy et al., 1996; Van Doesum et al. 2007) assessed for co-morbid psychopathology but they did not control for this in any way.

Eight papers examined the relationship between PND and maternal responsiveness. Of these, four studies (Esposito et al., 2017; Hoffman & Drotar, 1991; Milgrom et al., 2004; Paris et al., 2009) reported evidence of a negative association between PND and responsiveness, whilst one (Flykt et al., 2010) found a partial association. The remaining three studies found no evidence of an association between the two variables. Again, as with the research concerning maternal sensitivity, the studies which reported significant associations between PND and responsiveness should be interpreted with some caution given that, in all cases, co-morbid psychiatric disorder was not controlled for. All five of these studies, however, found no evidence of differences across the depressed and non-depressed groups in terms of sociodemographic factors so these results do seem to be independent of such factors. Moreover, it is worth detailing the effort by Esposito et al. (2017) to address the potential effects of such third variables. Namely that, uniquely amongst the studies reviewed here, Esposito and colleagues (2017) included these variables as covariates in their analyses.

All four of the studies (Campbell et al., 1995; Cohn et al., 1990; Hoffman & Drotar, 1991; Feldman & Eidelman, 2007) which investigated the relationship between PND and positive regard reported a negative association between the two variables. These effects

generally appeared to be independent of sociodemographic factors, as these four studies reported no significant variation in these factors within their samples. As with the majority of studies included in this review, however, these findings from these be limited by the fact that they did not control for co-occurring psychological problems. Finally, Hoffman and Drotar (1991) was the only study to investigate the relationship between PND and maternal stimulation. They found no evidence of an association between these two variables.

En masse, then, the studies included in this review appear to indicate that there is more evidence of a significant effect of PND on maternal responsiveness and positive regard than on the other constructs of parenting. In the case of the former, this is bolstered by the fact that all the studies which reported this significant effect controlled for sociodemographic factors, something which is not the case for any group of studies reporting significant effects in any of the other constructs of parenting reviewed here. There also seems to be some evidence (Kemppinen et al., 2006) that symptoms reported in the first two weeks postpartum reflect transient, and relatively short-lived, difficulties in the transition to motherhood (sometimes referred to as ‘baby blues’) whereas those reported after this period tend to be indicative, not of a transient mood drop, but an instance of recurrent depression, whether incomplete recovery from a previous depressive episode or an impending one (Condon & Watson, 1987; Judd, Paulus, Wells, & Rapaport, 1996).

With 12 significant effects reported across the 16 reviewed studies, the findings of this review seem, therefore, somewhat consistent with previous meta-analytic reviews

which found moderate (Beck, 1995) and small-to-moderate (Lovejoy et al., 2000) effects of PND on maternal parenting behaviour. Of course, an average effect size for the reviewed studies would need to be computed to substantiate this conclusion and without such quantification, comparison of the results of the current systematic review with prior meta-analytic ones must remain tentative. Notwithstanding, it is interesting to note that contrary to the moderation effects of socioeconomic status, length and type of observation on the relationship between PND and maternal parenting behaviour reported by Lovejoy and colleagues (2000), there appeared to be no obvious evidence of such moderation in the studies reviewed here. It is possible that these inconsistencies are merely a product of the divergent methods employed to organise findings, however, as Lovejoy and colleagues reported these moderation effects only within their group of findings pertaining to “positive maternal behaviours”. A similarity with the results reported by Lovejoy et al. (2000), however, was that in the studies reviewed here there was also no evidence suggestive of a moderating effect of definition of depression (i.e., diagnostic versus self-report measures) on the relationship between PND and maternal parenting behaviour.

It is interesting that the only two studies which utilised exclusively structured observational tasks both did not find a significant effect of PND on maternal parenting behaviour, a finding similar to that reported by Lovejoy and colleagues (2000; in relation to “positive maternal behaviours”, as mentioned above). It may be prudent for future reviews in this area to explore whether the observational contexts in which sensitivity is assessed may moderate the relationship between PND and maternal parenting behaviours. This may be worthwhile especially given extant findings suggestive of such a moderation effect in relation to attachment security: namely, that maternal sensitivity seems to relate

more strongly to attachment security when the former is assessed in the context of infant distress (Leerkes, Weaver, & O'Brien, 2012; McElwain & Booth-LaForce, 2006). The field, therefore, might benefit from future reviews undertaking such an examination, as well as determining, via meta-analytical methods, the average effect sizes for each observational context and testing for any potential differences in these across observational contexts.

Clinical Implications

Overall, the results of this review highlight the importance of routine assessment for depressive symptoms in the postnatal period. This may be particularly worth highlighting in the U.K., where a recent nationally-representative survey reported that 22% of mothers were not asked about their emotional wellbeing at all during their six-week postnatal check-up with their GP and 20% did not feel able to disclose their psychological problem (National Childbirth Trust, 2017). Research conducted by Ko et al. (2017), in the U.S.A., however, indicates that addressing this issue can have a positive impact on the incidence of PND. The authors attribute an observed decrease in the incidence of PND of 25%, from 2004 to 2012, in part to increased screening and treatment of the disorder (Ko et al., 2017).

More specifically, the findings of this review present the possibility that maternal responsiveness and positive regard may be more affected by PND than maternal sensitivity. Of course, future researchers need to determine the robustness of this finding. Should it prove to be replicable, it may suggest that interventions for mother-infant dyads

at risk would be well-served through targeting these two constructs of parenting in particular.

11 out of the 13 studies that reported either a direct or indirect association between PND and maternal parenting behaviour showed that this effect seemed to be independent of the effect of sociodemographic factors, such as maternal age, education, employment-status, infant age and birth order. This might be seen to suggest that service provision should focus on provision of treatments for PND as well as interventions to improve parenting behaviour as opposed to focusing on contextual factors. It is essential to note, however, that this should remain a tentative recommendation for service provision since these findings do not exclude the possibility that addressing such contextual, sociodemographic factors might exert positive downstream effects on maternal parenting behaviour. Indeed, such positive effects of more ‘distal’ factors on more ‘proximal’ ones are consistent with Jay Belsky’s (1984) process model of parenting (for a recent review of the pertinent evidence see Fearon & Belsky, 2016). Thus, it remains essential for future research and reviews to seek to clarify this issue further before a recommendation such as this for service provision is made more definitively.

Limitations

As mentioned above, no other research teams have replicated the analysis of parenting behaviour constructs carried out by De Wolff and Ijzendoorn (1997), which was a central organising framework for the current systematic review. Such replication is, therefore, much needed to establish whether the constructs elucidated by these two researchers proves reliable and to bolster the recommendation herein that future research

in this area should utilise this framework. A further limitation of the current review is the absence of an objective quality grading system, which would be a worthwhile addition to future reviews, not only to generate a more rigorous estimation of the quality of the literature reviewed but also to examine whether the association between PND and maternal parenting behaviour might be moderated by study quality. In addition, future reviews may also be well-served by including a broader age-range of mothers than the rather narrow mean age in the present review (mean age of 13 of the studies included here was 29-32), with the latter limiting the generalisability of the current findings. Given the meta-analytic evidence suggesting that maternal parenting behaviour is more stable over time when observations are between 30 – 59 minutes in length (Holden & Miller, 1999), the current review may be limited by the modal observational length being three minutes. This limitation is offset to some degree, however, by the fact that all of the coding instruments used were previously found to demonstrate adequate validity and reliability and the coders involved in the studies were also shown to be reliable. In addition, some of the studies (e.g., Campbell et al., 1995) reviewed utilized a microanalysis paradigm wherein interactions are coded frame-by-frame, in more fine-grained detail and, thus, invariably involve a shorter observation length than other instruments which entail more coarse-grained coding over a longer period.

Although some of the limitations to the research reviewed here have already been alluded to, it is worthwhile to expound on some in further detail. Firstly, as with any research involving self-report and observational assessments, the potential effects of social desirability represent a possible source of error (Kaminska & Foulsham, 2013; Nederhof, 1985). The effect of this may be diminished to some degree in home-based

assessments, given that mothers are likely to feel more comfortable and at ease in their own home than a laboratory setting, especially if the observation period is longer (see Holden & Miller, 1999). Future work in this field would, therefore, benefit from the inclusion of a measure of social desirability (for e.g., The Social Desirability Scale, Crowne & Marlowe, 1960 or Maryland Parent Attitude Survey, Pumroy, 1966) which could be included as a covariate in analyses (see Bornstein et al., 2007; Tolor, 1967).

Secondly, the studies reviewed here may be limited by the particular observational contexts that were included. That is, certain observational contexts may be more likely to elicit certain parenting responses or more validly assess one construct of parenting than another. For instance, most observational measures of parenting do not include a task that is designed to elicit some frustration/distress, such as playing with a difficult toy (Mesman & Emmen, 2013), something which is made more difficult by the fact that infants are oftentimes unlikely to become upset in free-play observational assessments given that mothers are generally quite skilled at curtailing their infants' distress in such circumstances (Leerkes, 2010). This is especially problematic as it precludes an assessment of maternal sensitivity in this context of infant distress, which has been found to relate more strongly to attachment security than measures of sensitivity in other observational contexts (Leerkes, Weaver, & O'Brien, 2012; McElwain & Booth-LaForce, 2006). Thus, through an assessment of sensitivity which may be less strongly related to attachment security, it might be argued that most measures of sensitivity are less representative of the quality of the relationship between the mother-infant dyad. This is especially problematic for the current review given that none of the studies included tasks designed to elicit infant distress. It would be prudent for future studies to include such

tasks to explore whether these measures of maternal sensitivity which are more closely related to attachment security might also be more affected by the mothers' experience of PND.

Thirdly, only five of the studies reviewed here (Alvarenga et al., 2013; Cassidy et al., 1996; Paris et al., 2009; Sidor et al., 2011; Van Doesum et al., 2007) assessed for co-morbid psychological problems, something which, given that estimates of concurrent co-morbidity are as high as 50% (Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Merikangas et al., 2010), likely constrains the internal validity of the majority of studies in this review. Similarly, none of the studies asked participants whether they had experienced abuse, which a recent review has concluded likely impacts maternal sensitivity either directly or indirectly, with the latter possibly mediated by depressive symptoms (Vaillancourt et al., 2017). Hence, future investigations in this area would be well-served by including comprehensive assessments for both co-morbid psychiatric disorder as well as historical abuse. On a related note, in line with the substantial and accumulating evidence for sequential psychiatric co-morbidity (Caspi et al., 2014; Conaway, Raposa, Hammen & Brennan, 2018; Hyland et al., 2018; Oltmanns, Smith, Oltmanns, & Widiger, 2018), such research should ideally be longitudinal and involve multiple assessments over time. This would help to better understand the trajectory of PND, including the elucidation of concurrent and sequential co-morbidity as well as examining the potentially differential effects of single-episode and recurrent presentations of PND (see Caspi et al., 2014; Kapur, Phillips, & Insel, 2012).

Future Directions

Although the samples of four studies (Alvarenga et al., 2013; Cassidy et al., 1996; Hossain et al., 1994; Sidor et al., 2011) reviewed here were low-income mothers, the vast majority of the participants in the studies included were socioeconomically advantaged. Of these four studies, three reported no significant effect of PND on maternal parenting behaviours, which is somewhat inconsistent with other research suggesting that in low-income populations the effects of PND on infant development are worsened (Sohr-Preston & Scaramella, 2006; Stein et al., 2008) as well as predicting poorer maternal parenting behaviour (NICHD, 1999). Future research may help to clarify this inconsistency through not only investigating further the effect of PND in socioeconomically disadvantaged mothers but also adopting the representative sampling approach utilised by two of the studies in the current review (Milgrom et al., 2004; Pearson et al., 2012) which, when combined with large-enough samples, would allow the effects of income and deprivation to be better understood. Such research would also benefit from investigating the potential effects of ethnicity, something which 13 of the studies did not report on. Furthermore, this recommendation for future research is bolstered by the conclusion of Mesman, van Ijzendoorn, and Bakermans-Kranenburg, (2012) that the observed lower maternal sensitivity of ethnic-minority parents is explained not by differences in race/ethnicity but by concomitant social and economic-deprivation.

One important avenue for future research to explore, and which was outside the remit of the current review, is the effect of prenatal depression on observed parenting behaviour. It is worth highlighting that two of the studies reviewed here did, in fact, report on this. In one of these studies, Flykt et al., (2010) found that prenatal depression

(gestational age at assessment not reported) had a more deleterious effect on maternal sensitivity than did PND, given that the R^2 change was significant at Step 2, when prenatal depressive symptoms were added into the model ($R^2 = 50.13$, $F(1, 43) = 57.32$, $p < .01$), but not when postnatal depressive symptoms were added at Step 3. Similarly, Pearson and colleagues (2012) found that prenatal depression at 18 weeks, but neither PND nor a combination of both were significantly associated with an increased risk of being rated as less responsive at one year postpartum (Odds Ratio = 1.31, $p = .03$). The findings of both studies, then, suggest that prenatal depression may have an effect on maternal parenting behaviours independently to that of PND, though it should be noted that in Pearson et al. (2012) maternal parenting behaviour was coded several months after depressive symptoms were reported and this constrains causal inferences to at least some degree. Future research would, therefore, benefit from examining this further, ideally utilising a longitudinal design with several, concurrent assessments of both parenting behaviour and maternal depressive symptoms in order to build a more comprehensive picture of the trajectories of both variables.

Such a design would also help address a broader issue raised, and left unanswered, by all the studies included in the current review, namely, the degree to which temporal fluctuations in maternal parenting behaviour may be closely associated with temporal fluctuations in maternal depressive symptoms. Examining this question further would facilitate a more nuanced understanding of the mechanisms by which a mother's experience of depression affects her observed parenting behaviour, through enabling a detailed tracking of symptom variation and observed parenting behaviour. It would help, for instance, to address the question of whether parenting behaviour varies more closely

with particular symptoms (e.g., cognitive or somatic) of depression (see, for e.g., Santos et al., 2018 for a useful exemplar of modelling maternal depression over time).

In reviewing the extant literature, it is notable that there appears to be no study which statistically tests for differences in the correlations between PND and various maternal parenting behaviours. Future research would be well served by undertaking to do so, since this would, amongst other things, constitute an empirical assessment of the respective strength of the associations between PND and various constructs of maternal parenting behaviour. This would thus provide a much-needed quantitative dimension in arriving at conclusions, such as those proffered above, regarding the relative strengths of the associations between PND and parenting behaviour across the various constructs of maternal parenting behaviour.

Finally, a post-hoc analysis, without controlling for Type-I Error, reported by Flykt et al. (2010) found a significant moderation of the relationship between PND and maternal sensitivity by maternal attachment style, such that where the mother was assessed to be in a secure-autonomous state of mind with respect to attachment, the level of maternal sensitivity remained adequate, despite increased depressive symptoms. It would be useful for future studies to determine whether such a moderation effect is reliable with controls for Type-I Error. This would also further our understanding of the mechanisms through which PND exerts its influence on parenting. Moreover, should this moderation effect prove replicable, it would have important clinical implications. For example, for mother-infant dyads affected by PND, it might suggest a focus of treatment on the mother's state of mind with respect to attachment (e.g., with Video-feedback Intervention to Promote

Positive Parenting with a “representational” component (VIPP-R), Juffer, Bakermans-Kranenburg, & van Ijzendoorn, 2007) in addition to observed maternal sensitivity – which on many current interventions focus. The use of VIPP-R may, however, be contraindicated by the findings of Juffer et al. (2007), who reported that those mothers with insecure attachment styles had poorer outcomes in terms of maternal sensitivity than those who received the standard sensitivity-focused VIPP. It is for further research to explore this issue in relation to mothers with PND, perhaps determining whether another attachment state of mind/representational intervention may be better suited than VIPP-R.

Conclusions

This review aimed to explore the association between PND and various constructs of maternal parenting behaviour. Overall, there was evidence to suggest a negative association between PND and maternal parenting behaviours. This association was evident mostly regarding maternal responsiveness and positive regard, with the majority of studies investigating the effect of PND on maternal sensitivity, and the one study investigating maternal stimulation reporting no evidence of significant associations between PND and either of these constructs of parenting behaviour. It emerged that research of a longitudinal design, with comprehensive assessments of depressive symptoms, co-morbid psychiatric symptoms, and sociodemographic factors, across various observational contexts is needed. It is through gathering such nuanced data that the complex interplay between depressive symptoms and parenting behaviour can be better understood. In doing so, the window of opportunity that infancy represents for support and intervention could be better taken advantage of to strengthen and enrich the mother-infant bond and thereby also the outcomes for both mother and infant.

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Part 2: Empirical Paper

The Impact of Depression on Maternal Sensitivity to One-Year-Old Infants in a Socioeconomically Disadvantaged Population

Abstract

Aims: Recurrent findings suggest a relationship between postnatal depression (PND) and lower maternal sensitivity. This study sought to build on these findings to examine 1) whether this relationship was evident in a high risk sample and 2) the pattern of associations between these two variables when sensitivity is coded during each of five observational tasks designed to elicit domain-specific parenting.

Methods: Data from the one-year assessment of an ongoing longitudinal randomised controlled trial were utilised. The video-recorded interactions of 86 mother-infant dyads were coded for maternal sensitivity using the NICHD sensitivity scale and maternal depression was assessed with the Edinburgh Postnatal Depression Scale.

Results: PND depression was not associated with either overall sensitivity or sensitivity in any of the five domains of parenting. Antenatal depression was associated with overall maternal sensitivity as well as sensitivity in the domain of limit-setting but both effects were not evident when sociodemographic factors were controlled for. Income was an independent predictor of sensitivity across all analyses.

Conclusions: The present data largely diverge from many extant findings and may do so, at least in part, due to prior studies failing to control for income. Limitations of the current research are discussed alongside directions for future research and implications for clinical practice.

Introduction

In August, 2016, NHS England launched its ‘Perinatal Community Services Development Fund’, which is part of a wider initiative that aims to increase the availability of peri- and postnatal mental health services which meet the standards of care recommended in national guidelines, standards which currently fewer than 15% of such services meet (National Health Service England, 2016; see also Leadsom, Field, Burstow & Lucas, 2013). The impetus for this initiative comes from two sources. Firstly, there is growing awareness that postnatal mental health problems often go undiagnosed and untreated, with a recent nationally-representative survey finding that 22% of mothers were not asked about their emotional wellbeing at all during their six-week postnatal check with their General Practitioner (GP) and 20% did not feel able to disclose their psychological problem (National Childbirth Trust, 2017). Secondly, the extant and accumulating evidence indicates that peri- and postnatal mental health problems are associated with significant, and sometimes serious, adverse outcomes for both mother and infant (Fonagy, Sled & Baradon, 2016; Oates, 2003).

Perhaps the most widely researched and, indeed, publicised of these maternal mental health problems is that of postpartum or postnatal depression (PND; Fonagy et al., 2016). Although depression affects about 8% of women of childbearing age (Weissman, Warner, Wickramaratne, & Prusoff, 1988), PND has been estimated to affect between 10-22% of mothers in the first year of birth (Cox, Murray, & Chapman, 1993; Gress-Smith, Luecken, Lemery-Chalfant, & Howe, 2012; Liberto, 2012). In line with these findings are those from a noteworthy prospective cohort study, involving almost 90,000 mothers,

which found that levels of maternal depression were highest in the first year of life, at a prevalence rate of 14% (Dave, Petersen, Sherr, & Nazareth, 2010).

A large body of literature substantiates the adverse effects that PND has on infant wellbeing, including predicting higher levels of both internalising and externalising psychopathology (Barry et al., 2015; Goodman et al., 2011; Halligan, Murray, Martins, & Cooper, 2007; Hammen, Hazel, Brennan & Najman, 2012) as well as impaired cognitive- (Stein, Malmberg, Sylva, Barnes, & Leach, 2008), and neuro-development (Koutra et al., 2013; for a review see Murray, Fearon, & Cooper, 2015). Furthermore, there is some evidence that these deleterious effects of PND on infants' development are worsened in socioeconomically disadvantaged families (Sohr-Preston, & Scaramella, 2006; Stein et al., 2008).

Indeed, a robust association has been reported in several studies of an elevated risk of PND in mothers who are socioeconomically disadvantaged compared with those who are not (Collins, Zimmerman, & Howard, 2011; Gress-Smith et al., 2012). Other, often related, contextual factors which have been shown to be associated with an increased risk of PND include being unpartnered, unemployed or socially isolated, and experiencing partner violence (Fisher et al., 2012; Luthar, & Ciciolla, 2015; Milgrom et al., 2008). Further, there seems to be differential effects on child outcomes when socioeconomic disadvantage is considered alongside PND. In their review of the literature, Murray and colleagues concluded that in terms of cognitive development, the adverse effect of PND seems to obtain principally in the context of wider socioeconomic adversity (Murray et al., 2015). In contrast, PND was found to predict increased rates of psychological and

behavioural problems regardless of socioeconomic status (SES) – although this effect was greater for disadvantaged mothers (Murray et al., 2015). Consistent with this evidence are findings that socioeconomic status (SES) seems to moderate the effect of PND on maternal caregiving (NICHD, 1999; Stein et al., 2008). There is little research, however, which has focused on high risk samples, which are facing not only financial burden but also other contextual risk factors, such as histories of trauma or social isolation.

Extant research attests to the sensitivity of infants to their early interpersonal context (Barry et al., 2015; Cirulli, Berry, & Alleva, 2003; Kolb & Gibb, 2011; Murray, 2014; Moutsiana, et al., 2015; Moutsiana, et al., 2014), which is most often comprised (at least in Western countries) primarily of their mother (Murray et al., 2015). In line with this research, it appears the most well-evidenced mechanism through which PND may have deleterious effects on infant health and development is the quality of parenting that the mother provides, including her attentiveness and the consistency of her responses (Fonagy et al., 2016; Murray et al., 2015). This putative effect of PND on maternal parenting behaviour is consistent with recurrent findings – including meta-analytic ones – that PND is associated with attachment insecurity (Aitkinson et al., 2000; Cicchetti, Rogosch, & Toth, 1998; Hipwell, Goossens, Melhuish, & Kumar, 2000; Martins & Gaffan, 2000; cf. Stacks et al., 2014 for a contradictory finding). More direct evidence of this effect of PND on maternal parenting behaviour is, however, found in the conclusion of a review of this literature, by Fearon and Belsky (2016), stating that it seems this relationship between PND and attachment insecurity is mediated by the impact that PND has on maternal sensitivity. Indeed, alongside findings of the adverse effects of PND on the quality of mother-infant interactions (Belsky & Jaffee, 2006, Cohn, Campbell, Matias,

& Hopkins, 1990; Cohn, Matias, Tronick, Lyons-Ruth, & Connell, 1986; Donovan, Leavitt & Walsh, 1998), a number of studies — including meta-analytic ones — have reported evidence that PND is associated specifically with decreased maternal sensitivity (Agostini, Neri, Dellabartola, Biasini, & Monti, 2014; Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007; Campbell, Cohn, & Meyers, 1995; Kaplan, Danko, Cejka, & Everhart, 2015; Pauli-Pott, 2008; see Lovejoy, Graczyk, O’Hare & Neuman, 2000 for a meta-analytic review).

Mary Ainsworth’s original description of maternal sensitivity centred on the mother being “capable of perceiving things from [her infant’s] point of view” (Ainsworth, Bell, & Stayton, 1971, p.43). More specifically, it comprised three core facets of maternal behaviour, namely, her ability to 1) notice her child’s signals, 2) interpret these signals correctly: for instance, alleviating distress and 3) respond to these signals promptly and appropriately (Ainsworth et al., 1978). Since this research by Ainsworth and her colleagues, a vast literature has utilised this construct, including that which has shown it to be associated with a multitude of outcomes for the infants concerned, including child temperament, specifically mood and sociability (Kivijärvi, Räihä, Kaljonen, Tamminen, & Piha, 2005), social and academic competence (Raby, Roisman, Fraley, & Simpson, 2015), obesity (Anderson, Gooze, Lemeshow, & Whitaker, 2012) and internalising problems (Kok et al., 2013).

Within this literature, which has developed over the past four decades, there has also been some critique of the construct of maternal sensitivity. Namely, several authors have contended that the definition provided in the seminal work of Ainsworth and

colleagues (Ainsworth et al., 1971) is rather broad and somewhat coarse-grained, a long-standing implication of which has been a lack of consensus in the literature regarding the maternal behaviours which constitute maternal sensitivity (Fonagy, Steele, Steele, Higgitt & Target, 1994; Meins, 1997; Seifer, & Schiller, 1995). Moreover, it has been proposed that this state of affairs may contribute to the overall failure to replicate the strength of the relationship between sensitivity and attachment security (see De Wolff et al., 1997; Goldsmith & Alansky, 1987) reported in the original research of Ainsworth and colleagues (Meins, Fernyhough, Fradley, & Tuckey, 2001; Seifer, et al., 1995).

Due to this multiplicity in both the definition of, and the infant outcomes related to, sensitivity, there is a growing impetus within the field to focus on the investigation of differential associations between maternal sensitivity and specific developmental outcomes (De Wolff et al., 1997; Meins et al., 2001; Mesman & Emmen, 2013; Seifer et al., 1995), including how these may be affected by PND (Toth et al., 2009). Elucidating a more nuanced understanding of the relationship between PND, sensitivity and infant outcomes in this way would help to inform the development and provision of effective treatments to mothers experiencing mental health problems, something which, as mentioned at the outset, is currently a key priority for the UK government (National Institute for Health and Clinical Excellence, 2010, 2015).

Some progress has already been made in regard to such an elucidation by a review of the literature on PND in 2015 by Murray and colleagues. They reported that PND-related difficulties with maternal responsiveness (or contingency) – that is the parent’s ability to notice and respond to her infant’s cues – seems to emerge as a consistent

predictor of cognitive development, particularly amongst boys (Murray et al., 2015). Behavioural and emotional regulation outcomes, on the other hand, appear to be associated with maternal sensitivity to the infant's emotions, namely being affectively attuned to the infant's behaviour and able to supportively contain difficult emotions. Here it may be prudent to consider the proposition, extended by some researchers in the field (e.g., Mesman & Emmen, 2013), that the measures of maternal sensitivity commonly utilised may need to be developed further if they are to elucidate a nuanced understanding of the relationship of maternal sensitivity with both maternal variables, like PND, and infant outcomes. In particular, if it is the case that some parenting behaviours are more influential than others for certain developmental outcomes, it may be necessary to consider which measures, and which contexts of measurement, are most appropriate and robust for assessing them.

A systematic review of observational measures of maternal sensitivity found that the majority were utilised in the context of free-play, with four out of the eight most commonly used also incorporating a demanding task, such as puzzle solving or clean-up (Mesman & Emmen, 2013). There is a clear dearth of research which uses measures of maternal sensitivity in assessment contexts which are designed to elicit domain-relevant parenting, for instance, one in which the infant is likely to become distressed. Indeed, a further source of impetus for utilising such an approach comes from recent evidence suggesting that sensitivity may relate more strongly to attachment security when observational measurements are taken specifically in the context of the mother's interaction with her distressed child and when the measurement focuses on the mother's behaviour related to distress cues (Leerkes, Weaver, & O'Brien, 2012; McElwain &

Booth-LaForce, 2006). Moreover, it has been suggested that this is something which may not occur in free-play contexts, or in other contexts, given the skill of some mothers in preventing or curtailing their infant's distress (Leerkes, 2010). The paucity of research which utilises such an approach to assessing maternal sensitivity extends also to the literature on PND, where there is no research (at the time of writing) that has directly investigated whether certain domains of parenting (e.g., when the infant is distressed or there is conflict [affective domain] or playing/focusing attention [cognitive domain]) are more affected by PND than others. Such investigations may help to unpick, in line with a developmental psychopathology perspective (e.g., Cicchetti & Toth 2009; Cicchetti, & Rogosch, 1996), the question of whether PND may affect maternal sensitivity in certain domains of parenting more than in other domains.

The current study aims to help address this paucity of research, through incorporating a range of measures of maternal sensitivity, including ones in which the contexts for observation are designed to elicit domain-specific parenting. In addition, given the multifarious operationalisations of maternal sensitivity within prior research, this study aimed to facilitate greater comparability across studies through utilising an operationalisation and measure of maternal sensitivity which concurs with De Wolff and Ijzendoorn's (1997) operationalisation in their empirically-derived framework of parenting behaviour constructs. Their framework was produced by testing the consensus of "experts" regarding the conceptual homogeneity of various parenting behaviour constructs used in the literature. This research will also focus on women who are not only socioeconomically disadvantaged, a group which – as detailed earlier – has been shown to be at greater risk of PND and the associated adverse effects on infant outcomes, but

who are facing additional contextual stressors. It will do so through using data from a randomised controlled trial of a community-based home visiting programme, whose participants were young mothers facing multiple contextual stressors, including domestic violence, histories of trauma and socioeconomic disadvantage, and which aimed to help improve maternal sensitivity and mental health as well as that of the infant.

Utilising a correlational design, this research aims to investigate the association between PND and the quality of the mother's parenting, operationalised as maternal sensitivity, and assessed via video-recorded mother-infant interactions when her infant is one-year-old. Maternal sensitivity will be assessed both as an overall score, across the entire recorded interaction, as well as across several domains of parenting. The latter will be assessed through deliberately arranging the observational context in order to elicit parenting that is specific to each of several domains. These domains include a) supporting attention and general cognitive development, measured via a joint book-sharing task, b) support for the infant's autonomous engagement, measured via a task involving the infant playing with a difficult-to-manipulate toy, c) managing conflicts and setting limits, measured via a challenging task in which the child is not permitted to touch a desirable toy, d) support for attachment-related emotions, which was measured via another joint book-sharing task, in which the mother is invited to explain what mothers and children, depicted in the book, might be feeling during strong attachment-related scenarios and e) support for play, measured via a task where mothers were simply invited to play with their infants as they would at home.

As alluded to above, this novel incorporation of tasks designed to elicit domain-specific parenting will be incorporated in order to test whether maternal sensitivity within certain of these domains of parenting are more affected by PND than are others.

The primary research questions to be investigated are, therefore:

1. In a high-risk population of young disadvantaged mothers, are postnatal depressive symptoms reliably associated with lower overall parental sensitivity in mother-infant interactions?
2. What is the specific association between PND and maternal sensitivity in each of these domains of parenting?

Method

Study Design

This study utilised a cross-sectional design to explore the relationship between PND and maternal sensitivity. Although this study used data from a longitudinal RCT, it did not investigate treatment effects in any way. As the final waves of data collection were still being collected, no member of the research team had access to the unblinded group allocation.

Participants

This study recruited mothers through antenatal clinics in hospitals in three UK cities. The following eligibility criteria were used when recruiting participants:

1. *Inclusion criteria:*

- Women expecting their first baby
- Aged 19 or under, or aged between 20 to 25 and currently eligible for means-tested benefits (or someone they live with and depend upon, such as a partner or parent, is eligible for means tested benefits)

2. *Exclusion criteria:*

- Expectant mothers with (any of the following):
 - a psychotic illness
 - substance abuse disorders/chronic drug dependence
 - profound or severe learning disabilities
- Expectant mothers who would require the use of an interpreter
- Expectant parents with a life-threatening illness

- Expectant parents whose baby is expected to be born with a life-threatening illness or profound disability

Table 3 presents the participants sociodemographic data. One hundred and forty mother-infant dyads initially entered the study, of whom 98 were followed up for relevant data collection at 12 months postpartum. Of these, 86 gave permission to be video recorded for assessments of sensitivity. These mothers were, on average, aged 22, at this point. In keeping with the high risk nature of the current sample, 55% earned less than £10,000 per year, and 11% had an undergraduate or postgraduate degree.

Table 3. *Sociodemographic Characteristics of Participants*

	<i>M (SD)</i>	Range
Age of mother	22.19 (2.54)	16 - 27
Infant age (in years; at one-year follow-up)	1.14 (0.19)	0.96 - 2.04
	<i>n</i>	%
Education		
GCSEs/O-levels	31	32%
A-levels	11	12%
NVQ, HND	33	34%
Degree	8	8.3%
Postgraduate Degree	3	3%
Ethnicity		
White	80	83%
Asian	7	7%
Black	6	6%
Mixed	4	4%
Co-habiting		
Yes	42	43%
No	56	57%
Household income		
Less than £10,000 pa	50	55%
£10,000- £20,000 pa	18	20%
£20,000 - £30,000 pa	14	15%
£30,000- £50,000 pa	8	9%
£50,000 - £70,000 pa	1	1%

Note. GCSE = General Certificate of Secondary Education; A-Level = Advanced Level Certificate of Secondary Education; NVQ = National Vocational Qualification; HND = Higher National Diploma

Measures

Maternal sensitivity

Maternal sensitivity was measured using the sensitivity scale from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development, which has demonstrated adequate validity and reliability (NICHD, 1997). As the current study focused on maternal behaviour, the child ratings originally present in this scale were omitted. Maternal behaviour was rated on each of the subscales: Sensitivity to non-distress, Sensitivity to distress, Intrusiveness, Detachment/disengagement, Stimulation of development, Positive regard for the child, Negative regard for the child and Flatness of affect. Each of these was scored on a four-point rating scale (1 = *not at all characteristic* to 4 = *very characteristic*), and all of which were used to compute the maternal sensitivity score.

Three raters coded the videos. Two raters were previously trained by an experienced research psychologist (the third rater) to adequate reliability using this scale on other data. These two raters coded the majority of the videos, with every 5th video coded by these raters as well as the research psychologist, to ensure adequate inter-rater reliability was being maintained throughout. All raters were blind to maternal characteristics and group assignment (treatment versus control - as part of the ongoing RCT).

In order to assess maternal sensitivity across the various domains of parenting, the NICHD sensitivity measure (NICHD, 1997) was used to code sensitivity for each of the

mother-infant interaction tasks, designed to elicit parenting specific to each domain. The first two tasks focused on maternal support for cognitive development. The first of these cognitive tasks involved a joint book-sharing task, in which the content was an engaging farm scene with interactive sensory elements (e.g., animals' fur). This task was designed to elicit the parent's capacity to support the child's attention and to be actively involved in the child's interest and efforts. The second cognitive domain task involved playing with a difficult-to-manipulate toy – the infant playing on their own to begin with and then mothers being invited to join in after a few minutes. This task aimed at assessing the mother's ability to support her infant's autonomous engagement with a trying cognitive task. To assess maternal behaviour relevant to limit-setting and managing conflict (i.e., the behaviour problems domain) a challenging task in which the child is not permitted to touch a desirable toy was used, with the aim of eliciting variation in mothers' capacities to sensitively set limits and manage negative affect in the child.

To assess maternal capacity for intimate dyadic interaction and attunement, a further book-reading observation was used, in which the content of the book involved strong attachment-related scenarios and mothers were invited to talk to the baby about what is happening in the story and what the mothers and children in the photos might be feeling. This task aimed to elicit rich variations in how parents manage attachment-related emotions and, in particular, how the parent is able to communicate maternal reflective function within an intimate interaction with her child. Finally, to assess sensitivity during play, mothers were simply asked to play with their infant as they normally would at home, without the use of toys. All mother-infant dyads completed these five tasks in the same order.

Following the coding of maternal sensitivity for each of the tasks, raters also coded each mother's overall sensitivity, based on their observations across the entire video-recorded interaction. In regard to inter-rater reliability, the average inter-class correlation for overall sensitivity was 0.84, whilst the reliability for the individual sensitivity tasks ranged from 0.71 (support for attachment) to 0.91 (free-play).

Maternal Depression

Maternal depression was assessed both during pregnancy and at 12 months postpartum, using the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987). This is a ten-item questionnaire screening for maternal depression, which is well validated for assessing depression both postnatally (Cox et al., 1987) and antenatally (Murray & Cox, 1990). Jomeen and Martin (2005) reported a Cronbach's Alpha reliability estimate for the EPDS of 0.82. Additionally, both sensitivity and specificity have been shown, by several studies, to be in the 70-85% range, across both antenatal and postnatal assessments (Figueira, Corrêa, Malloy-Diniz, & Romano-Silva, 2009; Gibson et al., 2009; Murray & Crowther, 1990; Santos et al., 2007).

Procedure

Researcher assistants went to participants' homes, both during pregnancy and at one-year postpartum, to complete a series of psychometric measures and, in the one-year follow up only, observational measures. The EPDS was completed at both visits to assess antenatal and postnatal depression. During the one-year visit, the researchers conducted

video-recordings of mother-child interactions, from which maternal sensitivity was coded across the series of tasks, as detailed above. These video-recorded interactions between mother-infant dyads were subsequently coded by an experiencing research psychologist and two trained raters: the current author and Roberts (2018), who investigated the role of sensitivity in the impact of antenatal stress on later infant temperament (see Appendix A).

Power Calculation

Power analysis for this study was informed by the work Murray, Fiori-Cowley, Hooper and Cooper (1996) who explored the impact of PND on sensitivity, in addition to its effects on cognitive outcomes. This study's total recruited sample comprised 98 mother-infant dyads. Murray et al. (1996) found a large effect size for the difference in sensitivity between mothers with and without PND – 20 participants would be required to detect such an effect at $\alpha = .05$, with 80% power. Assuming an effect size of half that value, and given the lower rates of depression in the current sample, would lead to an estimation that 50 participants would be required to have 80% power at $\alpha = .05$.

Data Analysis

The criteria for assessing normality of data were: skewness and kurtosis scores were between ± 1.96 , the Kolmogorov-Smirnov test or Shapiro-Wilk test was not significant at $p < .01$, and the histogram did not deviate markedly from a normal distribution. In order to test for the assumptions of linearity, normality and homoscedasticity in the regression analyses, scatterplots and histograms were plotted and examined. Collinearity statistics also tested for multicollinearity (if VIF value lies between

1-10, there is no multicollinearity) and the Durbin-Watson's test was carried out to test for auto-correlation of the data (if $d = 2$, there is no auto-correlation).

In order to obtain an overall maternal sensitivity score which best captured the variability in the individual sensitivity task scores, a single latent variable was computed. This was computed using Mplus Version 7.4. For factor loadings, please see the Results section, below.

As it would be included as a covariate in further analyses, seven missing values for income were imputed, using the Expectation-Maximization (EM) algorithm, based on education, occupational status and marital status. There were also missing values for maternal sensitivity but as imputation of the dependent variable remains controversial this was not carried out.

All other analyses were conducted using the software package IBM SPSS, version 25.0 (Windows version). Associations between depressive symptoms and overall maternal sensitivity were tested using linear regression, controlling for several covariates (i.e., family income, maternal age and education). Tests of differential effects were carried out first testing the individual linear association between each domain and maternal depressive symptoms to identify variation in the magnitude of association and second by entering one of the sensitivity domains as a dependent variable and the others as independent variables in the regression analysis, with the independent effect of PND symptoms being the primary outcome of interest. As the primary research questions

concerned the variation in maternal sensitivity explained by maternal depression, R squared was chosen as the main outcome metric.

In order to test whether there was an indirect effect of income on maternal sensitivity, through maternal depression, the SPSS plugin, PROCESS (Hayes, 2018) was used. PROCESS is a tool for SPSS used to compute observed variable ordinary least squares and logistic regression path analyses (Hayes, 2018).

Because of the widespread practice of utilising a cut-off for the EPDS, the regression analyses were also run using a categorical EPDS variable. These regression models were built in the same manner as those which precede them, with the only difference being that in place of a continuous EPDS variable a categorical one was used. In line with a review by Matthey, Henshaw, Elliott, & Barnett (2006), who concluded that, for the most robust psychometric properties, the extensively validated threshold of ≥ 13 should be used, this categorical variable was computed using this ≥ 13 cut-off point.

Ethical Approval

Ethical approval was obtained from the Dulwich NHS Research Ethics Committee (Ethics Committee Reference: 13/LO/1651).

Results

Distributional Checks

Prior to data analysis, distributions of the main study variables were examined. No transformations were necessary, as both maternal sensitivity and maternal depression (both Antenatal and Postnatal EPDS) were found to be sufficiently normally distributed. There was also no evidence of no multicollinearity or auto-correlation.

An overall maternal sensitivity score which best captured the variability in the individual sensitivity task scores, a single latent variable was computed. All of the individual sensitivity scores for each task loaded onto this overall sensitivity latent variable. To compute this, maximum likelihood estimation was used to estimate a single factor model using the package Mplus Version 7.4. The model chi-squared was 2.33 (4 df), $p = .67$ (RMSEA $<.01$; SRMR = $.02$). The standardized loadings ranged between $.60$ and $.70$ (all significant $<.001$). .

Sample Descriptives

Table 4 presents the means, standard deviations and ranges for the study variables. Notably, 37% of mothers scored above the lower clinical cut off (≥ 10) for depression during the antenatal period whilst 32% met this threshold at the one-year postnatal assessment.

Table 4. *Descriptive Statistics for Study Variables*

	<i>n</i>	<i>M (SD)</i>	Range
1. Sensitivity 1 (<i>Support for attachment</i>)	86	10.34 (1.79)	6 - 14
2. Sensitivity 2 (<i>Support for attention</i>)	86	11.85 (1.87)	7 - 17
3. Sensitivity 3 (<i>Support for autonomy</i>)	85	11.78 (1.80)	7 - 15
4. Sensitivity 4 (<i>Support for limit setting</i>)	81	10.65 (1.68)	7 - 15
5. Sensitivity 5 (<i>Support for play</i>)	85	10.54 (2.05)	7 - 15
Overall Sensitivity	86	10.31 (1.93)	7 - 17
EPDS Antenatal	98	8.83 (5.46)	0 - 26
<i>Clinical Caseness (≥10)</i>	36 (37%)		
<i>Clinical Caseness (≥13)</i>	23 (24%)		
EPDS Postnatal	98	8.06 (5.84)	0 - 23
<i>Clinical Caseness (≥10)</i>	31 (32%)		
<i>Clinical Caseness (≥13)</i>	21 (22%)		

Note. EPDS = Edinburgh Postnatal Depression Scale. *M* = Mean. *SD* = Standard Deviation

Associations across study variables

Correlations were run to examine the associations across the study variables, and are reported in Table 5. These are discussed further below.

Table 5. *Pearson's Correlations for Maternal Sensitivity, Maternal Depression, Age and Income*

	1	2	3	4	5	6	7	8	9	10
1. Sensitivity 1 (Support for attachment)	—									
2. Sensitivity 2 (Support for attention)	.36**	—								
3. Sensitivity 3 (Support for autonomy)	.41**	.34**	—							
4. Sensitivity 4 (Support for limit setting)	.43**	.36**	.61**	—						
5. Sensitivity 5 (Support for play)	.46**	.44**	.31**	.42**	—					
6. Overall Sensitivity	.71**	.62**	.77**	.83**	.69**	—				
7. Antenatal EPDS	-.15	-.21	-.15	-.31**	-.19	-.28**	—			
8. Mother Age	.16	.05	.01	.06	.22*	.14	-.01	—		
9. Postnatal EPDS	-.15	.01	-.06	-.16	-.19	-.16	.64**	-.09	—	
10. Income	.14	.19	.25*	.35**	.13	.30**	-.32**	.20*	-.24*	—

Note. EPDS = Edinburgh Postnatal Depression Scale.

* $p < .05$. ** $p < .01$.

Postnatal Depression and Overall Maternal Sensitivity

Research Question 1. In a high-risk population of young disadvantaged mothers, are postnatal depressive symptoms reliably associated with lower overall parental sensitivity in mother-infant interactions?

In order to explore the first research question, regarding the prediction of sensitivity by maternal depression, the association between PND and maternal sensitivity was tested first using bivariate correlation. As shown in Table 5, PND was not associated with any measures of maternal sensitivity. Given the possibility that computing a regression equation can, in some circumstances, elucidate a relationship between two variables that was not evident when using correlation (Darlington, 1968; Smith, Ager, & Williams, 1992), a hierarchical regression analysis was also conducted. This regression tested whether PND predicted maternal sensitivity, whilst controlling for sociodemographic factors. These factors were maternal age, education and income, which were entered into the first block, with PND entered in the second.

As Table 6 shows, the sociodemographic variables entered in step 1 significantly predicted maternal sensitivity ($F(3,80) = 3.37, p = .02$), accounting for 11% of the variance. Noteworthy here is that income was the only predictor which significantly explained unique variation in sensitivity, whilst controlling for the other two sociodemographic factors ($\beta = 0.26, t = 2.53, p = .01$). The addition of PND in Step 2 did not significantly improve the model ($\Delta F_{1,79} = 0.15, p = .70, \Delta R^2 = .002$)¹.

¹ This regression was re-run, including only income – the only covariate that was associated with overall sensitivity at the univariate level – in block 1. This produced the same pattern of findings.

Table 6. Hierarchical Multiple Regression Predicting Overall Sensitivity from Demographic Variables and Postnatal Depression

Predictor	ΔR^2	β	p	95% CI
<i>Step 1</i>	0.11			
Maternal Age		0.14		[-0.03, 0.14]
Education		0.01		[-0.17, 0.18]
Income		0.26*	.01	[0.06, 0.46]
<i>Step 2</i>	<0.01			
Postnatal EPDS		-0.04		[-0.04, 0.30]
<i>Total R²</i>	0.11			

Note: $N=84$. EPDS = Edinburgh Postnatal Depression Scale. CI = Confidence Interval.

* $p<.05$.

In contrast to PND, antenatal depression was associated with lower overall Sensitivity ($r = -.28, p = .01$, see Table 5). A second hierarchical regression, shown in Table 7, was conducted to test whether antenatal depression might be associated with sensitivity after controlling for covariates. The analysis revealed that the sociodemographic factors significantly predicted sensitivity ($F(3,81) = 2.87, p = .04$), but antenatal depression did not significantly improve the model ($\Delta F_{1,80} = 3.60, p = .06, \Delta R^2 = 0.04$), although the p-value was approaching significance. Again, income was the only predictor which significantly explained variation in sensitivity, whilst controlling for the other two sociodemographic factors ($\beta = 0.26, t = 2.48, p = .02$)².

Table 7. Hierarchical Multiple Regression Predicting Overall Sensitivity from Demographic Variables and Antenatal Depression

Predictor	ΔR^2	β	p	95% CI
<i>Step 1</i>	0.96			
Maternal Age		0.109		[-0.04, 0.13]
Education		-0.01		[-0.18, 0.16]
Income		0.28*	.02*	[0.05, 0.46]
<i>Step 2</i>	0.04			
Antenatal EPDS		-0.21		[-0.74, 0.30]
<i>Total R²</i>	0.19			

Note: $N=84$. EPDS = Edinburgh Postnatal Depression Scale. CI = Confidence Interval.

* $p<.05$.

² This regression was re-run, including only income – the only covariate that was associated with overall sensitivity at the univariate level – in block 1. This produced the same pattern of findings.

In light of these findings, it appeared prudent to test the possibility that it may be the shared variance between income and antenatal depression that is responsible for the significant prediction of sensitivity by income. Testing this possibility of an indirect effect (using the SPSS plugin, PROCESS, Hayes, 2018) did not, however, find any reliable evidence that there was an indirect effect of income on maternal sensitivity, through antenatal depression, although the effect only just crossed the zero mark ($\beta = 0.06$, 95% CI [-0.01, 0.15]).

Maternal Depression and Maternal Sensitivity Across Tasks

Research Question 2. What is the specific association between PND and maternal sensitivity in each of these domains of parenting?

Bivariate correlations, reported in Table 5 above, were run in order to explore the second research question regarding the prediction of maternal sensitivity in each of the sensitivity tasks by PND. PND was not associated with any of the individual sensitivity scores of the five tasks. Each of these associations were tested further using hierarchical regression. Similar to prior regression models, sociodemographic variables were entered in block 1 before PND in block 2, in order to test whether PND would predict sensitivity in each of the sensitivity tasks above and beyond the variance explained by these sociodemographic factors. Applying a Bonferroni correction to control for Type I Error revealed that PND did not predict sensitivity in any of these tasks, after controlling for the three sociodemographic factors.

Examination of Table 5, however, shows that antenatal depression was associated specifically with sensitivity in the support for limit setting task (task 4; $r = -.3$, $p = .01$) and not the other tasks. Hence, a hierarchical regression was run, entering

sociodemographic variables in block 1 before antenatal depression in block 2, in order to test whether antenatal depression would predict sensitivity in this task above and beyond the variance explained by these contextual factors. As shown in Table 8, the sociodemographic variables entered in step 1 significantly predicted maternal sensitivity ($F(3,76) = 3.47, p = .02$), accounting for 12% of the variance. As with the regressions computed above, income was the only predictor which significantly explained variation in sensitivity, whilst controlling for the other two sociodemographic factors ($\beta = 0.35, t = 3.1, p = .003$). The addition of antenatal depression in Step 2 did not significantly improve the model, ($\Delta F_{1,75} = 3.59, p = .62, \Delta R^2 = 0.04$)³.

Table 8. Hierarchical Multiple Regression Predicting Sensitivity in Task 4 from Demographic Variables and Antenatal Depression

Predictor	ΔR^2	β	p	95% CI
<i>Step 1</i>	0.12			
Maternal Age		0.02		[-0.13, 0.16]
Education		-0.03		[-0.17, 0.18]
Income		0.35**	<.00	[0.18, 0.86]
<i>Step 2</i>	0.04			
Antenatal EPDS		-0.22		[-0.12, 0.00]
<i>Total R²</i>	0.16			

Note: $N=84$. EPDS = Edinburgh Postnatal Depression Scale. CI = Confidence Interval.

** $p < .01$.

As with overall sensitivity, the possibility that it may be the shared variance between income and antenatal depression that is responsible for the significant prediction of sensitivity in the support with limit setting task by income was tested. Using the SPSS plugin, PROCESS, (Hayes, 2018) to test this, did not find any evidence that there was

³ This regression was re-run, including only income – the only covariate that was associated with overall sensitivity at the univariate level – in block 1. This produced the same pattern of findings.

an indirect effect of income on maternal sensitivity in the support with limit setting task (4), through antenatal depression ($\beta = 0.19$, 95% CI [-0.02, 0.40]).

Categorical Maternal Depression Variables Findings

Because of the widespread practice – both within clinical and research domains – of using a clinical threshold or cut-off point for the EPDS, it seemed prudent to re-run the analyses conducted above, but this time replacing the continuous maternal depression variables (both antenatal depression and PND) with categorical ones. Despite the inconsistencies in the literature regarding the most appropriate clinical cut-off point for the EPDS, a review by Matthey, Henshaw, Elliott, & Barnett (2006) concluded that, for the most robust psychometric properties, the extensively validated threshold of ≥ 13 should be used. In line with this conclusion, and the fact that the prior analyses which utilised a continuous depression measure would have tested the effect of more minor depressive symptoms, this threshold was used in the re-run analyses with computed categorical depression variables. The pattern of findings produced by these re-run analyses remained the same across all of analyses: neither antenatal depression nor PND were significant predictors of maternal sensitivity after income was controlled for (see Appendix B)⁴.

⁴ These regressions were re-run, including only income – the only covariate that was associated with overall sensitivity at the univariate level – in block 1. These re-run regressions produced the same pattern of findings.

Discussion

PND affects around 14% of women in the ‘developed’ world (O’Hara & Swain, 1996) and rates are highest within the first year postpartum (Dave et al., 2010). A large body of research has examined the effect of PND on maternal parenting behaviour, including maternal sensitivity, with many investigations finding that PND is associated with lower maternal sensitivity (Campbell et al., 2007; Campbell et al., 1995; Kaplan et al., 2015), a finding that has been substantiated by meta-analysis (Lovejoy et al., 2000). Few studies have, however, been carried out with high risk populations facing multiple stressors. Numerous authors have also noted that findings in this area are complicated, and possibly confounded, by the substantial variation in operationalisations of maternal sensitivity within the extant literature (Fonagy et al., 1994; Meins, 1997; Mesman & Emmen, 2013). Alongside this, research has suggested the possibility that the relationship between PND and maternal sensitivity may vary according to the observational domains of parenting that sensitivity is assessed within (Leerkes et al., 2012; Leerkes, 2010; Murray et al., 2015). The testing of these potential differential effects has, however, been constrained by the fact that the majority of studies assess sensitivity within one observational domain of parenting – free-play (Mesman & Emmen, 2013). The present study sought to address these issue through a) utilising an operationalisation (and measure) of maternal sensitivity which concurs with De Wolff and Ijzendoorn’s (1997) operationalisation of this construct, in their empirically-derived framework of parenting behaviour constructs and b) incorporating five observational tasks which were designed to elicit domain-specific parenting and during each of which sensitivity would be assessed. Thus, the present study aimed to address two research questions:

1. In a high-risk population of young disadvantaged mothers, are postnatal depressive symptoms reliably associated with lower overall parental sensitivity in mother-infant interactions?

2. What is the specific association between PND and maternal sensitivity in each of the domains of parenting that was assessed?

Regarding the first of these research questions, no evidence was found that PND predicted overall maternal sensitivity. Household income was found to be a significant predictor of sensitivity, whilst controlling for the effects of the other two sociodemographic factors (maternal age and education). However, an association was found between *antenatal* depression and maternal sensitivity. Regression analyses showed that antenatal depression was not a significant predictor of sensitivity above and beyond the variance explained by sociodemographic factors. Income, once again, was the only individual predictor of sensitivity and a test of indirect effects confirmed that this effect of income on sensitivity was not due to the variance that income shared with antenatal depression. Exploring the second research question revealed an association between antenatal (but not postnatal) depression and sensitivity in the domain of support for limit setting (task 4). This effect was not evident, however, when the sociodemographic variables were controlled for, using hierarchical regression. As with other analyses, in this regression income was the only significant predictor of sensitivity.

The lack of relationships between PND and overall maternal sensitivity as well as sensitivity across the five domains of parenting in the present sample was not as had been expected given previous meta-analytic studies reporting an effect of PND on

maternal sensitivity (Beck, 1995; Lovejoy et al., 2000), although not all studies have found evidence of such an effect (Flykt et al., 2010; Pridham, Lin & Brown, 2001). This result also runs contrary to the meta-analytic finding that the association of PND with lower scores on measures of “positive maternal behaviours” is moderated by socioeconomic status, with this association only evident in “disadvantaged” (i.e., income below the poverty line) families (Lovejoy et al., 2012), as well as some evidence that the relationship between PND and lower maternal sensitivity is similarly moderated by income (NICHD, 1999). It is worth noting, however, that 12 (26%) of studies in Lovejoy et al. (2012) were classified as “disadvantaged” and none of these appear to include samples also facing additional contextual stressors (e.g., history of trauma, partner domestic violence etc.), as this may help to explain the inconsistent findings within the current high risk sample. It may also be that this inconsistency with prior findings could be related to the fact that, whilst most studies seem to control for sociodemographic factors in some way, several prior studies which report a significant effect of PND on maternal sensitivity did not control for income in the manner the present study did (Agostini et al., 2014, Challacombe et al., 2016, Milgrom et al., 2008; Musser, Ablow & Measelle, 2012; Pauli-Pott, 2008; Pearson et al., 2012). It, therefore, remains ambiguous whether the effects reported in these studies would remain if income was partialled out: it may be that, as with the current data, these effects would prove not to be independent of the variance in sensitivity which is explained by income. This is an essential issue for future research to address, through ensuring that income is controlled for, either through sociodemographic matching of a control group or statistically, during the analyses.

The failure to find an association between PND and the five sensitivity tasks is, more specifically, inconsistent with some evidence implicating differential effects of PND across various domains of parenting (reviewed by Murray et al., 2015). It is crucial to note that this review by Murray and colleagues (2015) also included measures of mother-infant dyadic behaviour (e.g., synchrony), which the current study did not. This may account, to some degree, for the discrepancy between the current findings and those of prior studies. It would be prudent for researchers to address this issue further. It is worth testing, for example, the possibility that the significant effects of PND may obtain principally when maternal parenting constructs other than maternal sensitivity (e.g., maternal responsiveness) and/or dyadic behaviour are assessed. In addition, future investigations of this kind might, then, be in a position to also assess the relative strengths of the associations between PND and maternal parenting behaviour across the various parenting constructs. That is, testing, for instance, whether the effect of PND on maternal responsiveness is statistically greater than its effect on maternal sensitivity.

Whilst several previous studies have not controlled for the effects of income, there is some evidence, within the few studies that have, that is in keeping with the present finding of income predicting sensitivity. Namely, the study by Van Doesum et al. (2007), who reported that income predicted sensitivity independently of the variance explained by PND as well as maternal education and “competence”. Interpreted alongside the fact that, in all of the regression analyses, income was the only independent predictor of sensitivity, the current data suggest that, within this high risk sample, the level of contextual stressors associated with financial burden exert a powerful effect on maternal behaviour. The nature of these concomitant stressors

associated with financial burden remains, however, unclear. Thus, exploring what may be driving this effect of income on sensitivity is an important avenue for future studies. Within such a high risk sample, a multitude of factors could contribute to explaining this association, including the number of adults living in the house contributing to the overall income of the household, the employment and health status of the mother and her cohabitants. All of these constitute potential confounding factors and, thus, it would be worth future studies attempting to control for these. Another potential factor is co-occurring psychiatric disorder (e.g., anxiety, with an estimated prevalence of 4% during the perinatal period, Ban et al. 2012), which the current study did not control for, and which a UK study found low-income mothers to be at an increased risk of developing (Ban et al., 2012). It might also be important to consider here findings of an increased risk of developing perinatal mental problems in the presence of contextual risk factors, including being unpartnered, lower education, unemployment, social isolation, partner violence, and having a history of mental health problems (Fisher et al., 2012; Milgrom et al., 2008), all of which may apply, to varying degrees, to the current high risk sample. Thus, factors such as these are also worth investigating. Furthermore, given the possibility that the association between antenatal depression and maternal sensitivity may be closely linked with income (the association did not remain whilst controlling for income) it would be helpful for these future investigations to also attempt to better understand the independent and shared contributions of antenatal depression and income in predicting sensitivity.

On a related note, it is worth considering that in both tests of the indirect effect of income – on sensitivity through antenatal depression – the lower-bound confidence interval just crossed the zero mark (-0.01 and -0.02). As such, it is possible the current

study lacked the necessary statistical power to identify an association independently of income. This possibility may also be suggested by the correlations of antenatal depression with both overall sensitivity and sensitivity in the domain of support with limit setting in the current sample. It would, therefore, be important to examine these associations in studies with larger samples in the future. Such future explorations are bolstered by studies reporting an effect of antenatal depression on maternal sensitivity. Flykt et al., (2010), for instance, found that antenatal depression had a more deleterious effect on maternal sensitivity than did PND. Similarly, in a notable longitudinal study of over 900 mother-infant dyads, Pearson et al. (2012) found that antenatal depression at 18 weeks, but not PND, nor a combination of both, was associated with lower maternal responsiveness (a similar construct to sensitivity, but measuring only quantity of responding) at one-year postpartum. Pearson and colleagues (2012) postulate that their results may be due to antenatal depression curtailing the development of crucial neurocognitive precursors of maternal parenting behaviour, which, importantly, develop between the first and last trimester (Pearson, 2010; Pearson et al., 2009), hence the lack of an association of maternal parenting behaviour with PND. This postulation of Pearson et al. (2012) is substantiated elsewhere, as antenatal depression has, for instance, been associated with mothers' decreased attention to infant faces (Pearson, Cooper, Penton-Voak, Lightman, & Evans, 2010) and with dysregulated maternal physiological response to infant cries (Pearson et al., 2010). This latter finding is particularly relevant to the present results, where antenatal depression was correlated with maternal sensitivity during the support with limit setting task, in which toys were withheld and, thus, infants were likely to become distressed. More specifically, that antenatal depression was correlated with sensitivity only when infants were more likely to become distressed is consistent with Pearson et al. (2010), as it may have been

related to a similar maternal physiological dysregulation in the current samples response to their infants' distress. It may be worth future studies attempting to test this further. Similarly, the lack of such a correlation with PND in the present data is also in line with the findings and hypotheses of Pearson and colleagues (2012). Moreover, this absence of a correlation is in keeping with other research which suggests that antenatal depression is more reflective of a mother's general predisposition towards depression whereas assessments of PND may tend to capture a more transitory, and less pathogenic, mood disturbance which is related to the life-cycle transition to motherhood (Tamminen, 2001).

En masse, then, when interpreted in light of the extant literature on the effects of antenatal depression, the current findings suggest that future research would be well served by investigating the effects of both antenatal depression and PND, including the potential indirect effect of income and related contextual factors on sensitivity through antenatal depression. In order to do so, such investigations would need to address a central limitation of the current study. Namely, alongside a larger sample, several assessments of both antenatal depression and PND would need to be incorporated, as this would facilitate a more robust testing of whether it is the timing of the assessment of depression within the antenatal period that is driving its (potential) effect on sensitivity or if it is related to whether the depression is antenatal or postnatal, as hypothesized by Pearson and colleagues (2012) and discussed above.

Future investigations of this kind would also be well placed to test whether, in addition to the established independence of the effects of antenatal and PND on infant outcomes (Evans et al., 2012; Field et al., 2004; O'Connor, Heron, & Glover, 2002;

O’Conor et al., 2005) these two forms of depression might also constitute separate, additive risk factors for maternal parenting behaviour. In addition, this would facilitate a better understanding of the mechanisms involved in the effects of maternal depression on the parenting behaviour as well as on later infant outcomes. Through also including assessments of infant outcomes, for instance, these studies could test whether the differential predictive power of antenatal depression and PND on infant outcomes is mediated through similarly differential effects on maternal parenting behaviour.

Should future research follow the current study in also incorporating assessments of sensitivity across various domains of parenting, it would be prudent to employ a longitudinal design, testing sensitivity at multiple time-points. This facilitates a more robust assessment of the potential differential effect of PND on maternal sensitivity across various domains of parenting. Related to this, emerging research should seek to substantiate existing findings which suggest differential effects of PND on infant outcomes across various domains of parenting (see Murray et al., 2015) through assessing child outcomes. Specifically, to explore further the tentative conclusions in the review of the literature by Murray and colleagues (2015) that PND may impact on cognitive outcomes primarily through its adverse effect on mother’s contingent responding to her infant, particularly in the areas of attention and regulation, whereas PND may lead to later emotional and behavioural difficulties through its effect on sensitivity, specifically in relation to the infant’s distress.

It would also be interesting for future research to address other questions left unanswered by the current study. For instance, although problematic to measure, it

would be helpful to assess the potential impact of a mother's feelings about the pregnancy, as it seems plausible that whether or not a pregnancy was planned or expected and the strength (or presence) of a mother's wish to become a mother may affect the experience of maternal depression. Indeed, both unwanted and unplanned pregnancies have been found to be associated with an increased risk of antenatal depression (Bunevicius et al., 2009; Honjo et al., 2003). Taken alongside the association of antenatal depression with sensitivity within the current data, this suggests it would be useful for future research to examine the effect of whether a pregnancy is wanted and planned on not only antenatal depression but also later sensitivity.

Another useful avenue for future research is to explore other potential mechanisms which may account for how antenatal depression exerts its effect on maternal parenting behaviour. The incorporation of an assessment of infant temperament would help address one such competing – or perhaps complimentary – mechanism, namely, that the effect of antenatal depression on maternal sensitivity may be driven, not by its effect on the neurocognitive precursors of maternal parenting behaviour (cf. Pearson, 2010), but rather by an indirect effect on infant temperament. This indirect effect on temperament may be related to the altered physiological profiles in infants that mimic their depressed mothers', including elevated cortisol, lower levels of dopamine and serotonin, and lower vagal tone (see Field, Diego, & Hernandez-Reif, 2006; Field et al., 2004).

Like the majority of the extant literature in this area, the current study used a purely quantitative approach. Qualitative methods are much needed, therefore, to

enrich our understanding of the experiences of mothers living in chronically disadvantaged circumstances, which would provide vital clues to what parenting processes are most adversely affected by maternal depression. Such methods also have the added benefit of suggesting quantitatively-testable hypotheses; as such, both observational measures and accounts of lived experience could explore this subject from different but complementary angles.

The current study also did not control for the potential carryover effects in the coding of sensitivity across the five tasks, where the coding of the first tasks completed by a particular mother-infant dyad may have unduly influenced the coding of subsequent tasks completed by the same dyad. Future studies could ameliorate these potential effects through avoiding the sequential coding of all tasks completed by each mother-infant dyad, as carried out in this study. Instead, each sensitivity task could, for instance, be coded in turn across all mother-infant dyads, thereby preventing the sequential coding of the same mother-infant dyad across multiple sensitivity tasks and limiting the potential for such carryover effects.

The current study tested an exclusively low-income, high-risk sample. In order to investigate whether any associations between maternal depression and parenting act differently depending on level of psychosocial risk a large, stratified sample would be invaluable in future research. Finally, in order to facilitate comparison across studies, it is crucial that there is greater uniformity in the operationalisation of maternal parenting behaviour constructs. Further research within this field could, therefore, follow the current study, in utilising the helpful framework produced by De Wolff and Van Ijzendoorn (1997) to help achieve this.

Notwithstanding its limitations, the present study highlights the need for clinicians to screen not only for PND but also for antenatal depressive symptoms. The most pressing finding arising from the current data, however, seems to be the role of income in predicting maternal sensitivity, independently from the effects of both antenatal depression and PND. This somewhat unexpected finding is noteworthy and timely, especially given that the second wave of funding for NHS England's 'Perinatal Community Services Development Fund' is currently being awarded (National Health Service England, 2018), foregrounding as it does the necessity that broader contextual factors, such as income, are not overlooked in service provision and clinical practice, especially where other background risk factors pertain. Indeed, it seems vital that financial burden is not viewed merely as 'background context' in the treatment of maternal mental health problems as it may exert an independent effect on a mother's ability to tune in to her infant. Financial problems, therefore, necessitate direct intervention if mother and infant are to be afforded the best chance for a more helpful developmental trajectory together.

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Part 3: Critical Appraisal

Introduction

In this third and final section, further considerations and reflections will be made on the first two sections, that is Part A: the systemic literature review and part B: the empirical study. Firstly, I expound on an overall methodological consideration regarding the purchase that qualitative methods may proffer in further exploring this area of research. I then move on to describe several observations to do with the coding of maternal sensitivity for the empirical study and, finally, I end by discussing some broader implications of both the literature review and the empirical study for clinical practice as well as some further potential avenues for research which is emerging in this area to explore.

An Overall Methodological Consideration

It's worthwhile to mention an important epistemological caveat to both the literature review and the empirical paper: namely that both were rooted in a logical positivist tradition that presupposes that one can accurately assess the construct of postnatal depression (PND) via psychometrics. There is an assumption, therefore, that the scores on such measure are a useful proxy for the lived-experience of the depressed mother. My prior experience in qualitative research methods contributed to my wondering what may be added to this positivist methodology, particularly through future studies incorporating a more 'experience- near' exploration of the lived experience of mothers suffering through depression. As alluded to in the empirical paper, I think it would be worthwhile for research emerging in this area to incorporate qualitative methods. Although analysing interviews with mothers experiencing depression using a thematic analytic approach (Braun & Clarke, 2006) or interpretative phenomenological analysis (see Willig & Rogers) would be more than adequate, I feel

research seeking to address this issue would be best served through incorporating a discourse analytic approach. This particular qualitative methodological recommendation is based on the view that qualitative endeavours should attempt to understand the lived experience of maternal depression as well as how the speech of those experiencing it informs the construction of maternal depression, postnatal depression and related constructs. A critical discourse analytic perspective proffers such a method for attempting to understand speech as on situated social practice which actively constructs social objects and is reflective of the operation of power relations and the privileging of certain worldviews (Fairclough, 2003; Potter, 1997). The use of such a method to understand the interaction between the ongoing process of social construction and lived experience of maternal depression is also timely given the increasing publicity of maternal mental health, in particular postnatal depression, over the last few years (National Childbirth Trust, 2017), with the treatment of such problems becoming a key priority within the UK health and social care services (National Institute for Health and Clinical Excellence, 2007, 2010).

Coding Maternal Sensitivity

Some issues in coding the data

During the sensitivity coding training I needed to review each of the videos several times as consulting the coding guidelines. Naturally enough, at the outset I needed to review each video several more times than I did at the end of the training, at which point I was coding reliably with an experienced research psychologist at the Anna Freud Centre. The videos used for this training were that of the original (NICHD, 1999) study, for which the sensitivity measure was developed. What seemed like an immensely difficult task at the outset became clearer near the end of the training and

my confidence was bolstered by my final reliability set codes closely matching that of the research psychologist teaching us. My confidence quickly faded, however, once I began coding the videos for the empirical study. I quickly found that I was viewing each video at least twice as many times as I was during my coding of the final reliability set on the NICHD videos. Where I had left the Anna Freud Centre content I had a good 'feel' for the various competent scales on the sensitivity measure having finished my training, when coding the video of the mother-infant dyads for the empirical study I found myself suddenly not sure what many of them meant. I couldn't seem to fit the mother's I was viewing into the coding scheme of the measure: there was so many more disruptions in these videos than those that I was trained using. This included, other family members becoming involved, multiple languages being spoken and the camera being obscured by one of the many people that were often present. In addition, many of the mothers in this sample seemed to be more impaired and/or distressed than the mothers than those I had viewed during the training such that I found myself wondering about their circumstances and the multitude of contextual stressors that I know were relevant for this high risk sample. Fortunately, the research psychologist was very giving of her time and talked me through some of the questions that suddenly emerged to me about the measure (not in relation to the video of mothers in the empirical study though). This helped a great deal regain my confidence in coding the mothers in the current sample. The coding remained, however, as labour intensive throughout, with my needing to watch videos many times to arrive at the codes I thought fit the mother best. I think the coding process was also influenced the at-times quite evocative nature of the video, with infants screaming and mothers responding in what I experienced as a dismissing manner. In addition, I also noticed that when I began the training in the sensitivity measure I became aware of my power in making,

what I sometimes experienced as, judgments on the mothers. This was mostly linked to my sense that perhaps I may be being ‘too harsh’ or that were I more experienced in the use of the particular measure that I could have done a better job. At other times, early on, I felt pulled to be ‘on the side of the infant’ and voice my concerns through coding the mother more harshly than I should have, perhaps. Talking both of these issues through with the research psychologist at the Anna Freud Centre was an invaluable experience: it helped me gain a greater appreciate of the potential influence that one’s experience of viewing the videos may have on coding, and thus, how important it is to have a supportive supervisor/trainer to talk through these issues with in order to ensure that once one progressed to the coding of the dataset in question, that this can be carried out in the most objective and fair way possible.

Reflecting on my sense of ‘judging’ the mothers I realise that some of this is very likely tied to my being a white man, in a rather middle-class profession, making judgments about young mothers living in – or, at least, very close to – poverty. Naturally enough, then this made me feel uncomfortable given the intrinsic power imbalance that was associated with my position vis-a-vis these mothers. Indeed, I do wonder what my experience would have been if I had been researching paternal sensitivity – a term which, incidentally, I have never read in the extant literature. And it is notable that there seems, to my knowledge, to be relatively little research on the experience of fathers, as primary or secondary care-giver, especially in regard to their sensitivity.

There was one observational task that was undertaken but excluded near the end of coding, given that it was not possible to code sensitivity during this task. This

was the questionnaire task, procedure pioneered by Smith and Pederson (Smith & Pederson, 1988). In this task, mother and infant are left to explore a relatively empty room, while the mother must also complete a distracting questionnaire. This task assesses the mother's ability to divide her attention between competing demands. It was removed, ultimately, as there was very little variation: that is, there were too few interactions between mother and infant to code for sensitivity. We wondered whether this may be a product of the instructions that these mothers had been given by the research assistants who were visiting them at home to complete the one-year follow up assessment. Indeed, there was some variation across research assistants in how much they explained to the mother about the tasks and in their particular phrasing, sometimes with what appeared to be important variations (e.g., suggesting particular games to play with the infant during the support for play task). Some of these variations were addressed by the main RCT research team (which included the research psychologist at the Anna Freud Centre who trained us in the sensitivity coding) who communicated with the research assistant early on when the one-year follow up assessments were beginning to take place and the first few videos had been viewed. Subsequently, the instructions became my uniform and less directive, however, the coding of the questionnaire task remained impossible. As a result, it was decided that this task should be abandoned at the end of the coding as more than 80% of mothers were not able to be coded for sensitivity for this task.

A central limitation of the sensitivity measure in question that was foreground in this process was the fact that it is a four-point scale. To me it seemed that the variability in maternal sensitivity exhibited by this sample may not have been adequately captured by this measure.

Reflections on Coding

Although at times it made for painful viewing, with infants left crying or dismissed, overall, I found the process of coding to be most interesting and enjoyable one. It felt to like an immense privilege to be able to observe the intimate interactions between mothers and their infants. I think that perhaps my clinical experience may have gotten in the way of the coding, however, especially at the beginning. Specifically, I think that my clinical experience of hypothesizing about what might be going for the mother and the infant may have interfered, at times, with my judgment, skewing it away from a more objective judgment rooted solely in the data that I was viewing. The coding was also a vital learning experience in the other direction: namely, that this research experience informed my later clinical practice in a most helpful manner, I believe. Namely, through giving me a greater appreciation for the variation in what ‘good enough’ parenting may look like. I think that prior to this experience I had a somewhat narrow conception of the variation that would fall within the boundaries of the category of ‘good enough’ parenting. Through the training and the subsequent coding of the videos for the current study, however, I feel that this has been helpfully broadened, learning, as I have done, to place greater importance on the meaning and response of the infant to the mother’s endeavours to tune in to them, rather than my own a priori sense of what ‘good enough’ mothering may look like.

Further Clinical Implications and Future Directions

Central implications of the findings of the empirical paper include, as noted therein, the importance of the assessment for prenatal as well as PND. It may be worth also considering potential screening for relational risks within the mother-infant dyad,

that is assessments of the mother-infant relationship. This is bolstered by a wealth of extant literature documenting the association of attachment security with long-term positive outcomes (see Fraley, 2002; Fearon, Bakermans-Kranenburg, van IJzendoorn, Lapsley, & Roisman, 2010; Groh, Fearon, Bakermans-Kranenburg, Van IJzendoorn, Steele, & Roisman, 2014; Groh, Roisman, van Ijzendoorn, Bakermans-Kranenburg, & Fearon, 2012 ; Van Ijzendoorn, Schuengel & Bakermans-Kranenburg, 1999, for meta-analytic reviews). There is also meta-analytic evidence that positive parent-infant behavioural synchrony is associated with higher subsequent capacity for self-regulation (referring to the capacity to exert control over a numbers of domains, including cognitive, behavioural, interpersonal and emotional regulation, see Calkins, 2007), with a moderate effect size ($r = .32, p < .001$; Davis, Bilms & Suveg, 2017). Whilst routine assessment of the mother-infant relationship may, therefore, seem theoretically a most prudent approach to early identification and treatment of at risk mother-infant dyads, in practice it may not be reasonably feasible, at the moment. This is due to the extant assessment tools being costly and labour intensive. Research emerging in this area would be well- advised to explore the development relational assessment tools which would better lend themselves to the role of a screening instrument for routine clinical practice. In the interim, however, it may be worth considering other potential proxy or ersatz measures. One such measure is that of infant relational withdrawal, which is associated with relational difficulties in the mother-infant dyad and sleep disorders, which can be assessed with the Alarm Distress Baby Scale or ADBB (Guedeney, & Fermanian, 2001), has validated psychometric properties and has been shown to be a useful screening tool in routine outpatient postnatal health services (Guedeney, Foucault, Bougen, Larroque & Mentré, 2008). Another option would be a potential proxy measure such as infant preverbal

communication, which has been shown to be closely correlated with relational difficulties in the mother-infant dyad. (Barwick, Cohen, Horodezky, & Lojkasek, 2004) and several tools exist that are readily used for screening purposes, for instance, the Communication and Symbolic Behaviour Scales (Wetherby, & Prizant, 2002).

Findings were mentioned in the empirical paper regarding the association of both unwanted and unplanned pregnancies with increased risk of antenatal depression (Bunevicius et al., 2009; Honjo et al., 2003). On a more speculative note, and of broader relevance, it may be worth future research attempting to explore how the mother's internal working models related to her own attachment history may play a role in this relationship between a pregnancy being unwanted or unplanned and antenatal depression. Such an exploration in research emerging in this area is bolstered by the existing work of Priel and Besser (2000) who found that a mother's own state of mind with respect to attachment is aroused during pregnancy and predictive of the mother's antenatal attachment to their baby, with insecure mothers more likely to have a lower level of antenatal attachment. Where mothers have a history of difficult and insecure attachment histories, which may be more likely amongst high risk samples like that of the current empirical study, this may be particularly relevant to investigate further.

The finding of the current study that income was a significant individual predictor of sensitivity provides the impetus for a further exploration of the what might be driving this effect, as mentioned in the discussion section of the empirical paper. This results also led me to consider extant literature from more far afield regarding what may potentially be driving this effect of income on sensitivity and particularly

how it may relate to (antenatal) depression as suggested, to some degree, by the current findings. In particular, it may be worth considering the large body of research on the effects of social and economic inequality on the prevalence of mental health problems, which the seminal review of the epidemiological literature by Wilson and Pickett (2010), which concluded that the more economically unequal a country is (i.e., the greater the gap between the wealthiest and the poorest) the higher the rates of psychological problems within that society. Further, as they point out, several studies have shown that of the countries which have been included in the extant literature, the UK is, on average, the third most unequal society (Wilson and Pickett, 2000). Marmot (2004; Marmot, & Shipley, 1996) has presented evidence that suggests that this effect of inequality is driven by the effect of status – which refers to the outcome of an evaluative process which produces differences in respect and prominence (Keltner, Gruenfeld, & Anderson 2003) and the concomitant sense of control an individual has over his life (e.g., the wealthier having the option of engaging in, and choosing, recreational activities, including socialising, that those experiencing financial burden may enjoy as much). Indeed, there are recurrent findings of an association between lower status or control and higher rates of depression (Gray-Stanley et al., 2010; Hartley, Vance, Elliott, Cuckler, & Berry, 2008; Infurna, Gerstorf, Ram, Schupp & Wagner, 2011; Jones & Riazi, 2011; Marmot, 2004). Thus, although perhaps more tangentially-related to the empirical study, it may be useful for research being carried in the future in this area to consider the potential role of role and status in the relationship between maternal depression and later sensitivity, especially in high risk samples such as the current one which are likely – by virtue of their low socioeconomic status – to experience less control over the lives and less social status than ‘low risk’ samples. Moreover, the effect of control and status may possibly account for some of

the effect of income on sensitivity in the current study. Were studies in this area to explore the potential effects of sense of control and status, it may also help to elucidate further implications for clinical practice. For instance, were there to be an effect of control it might suggest the need to develop social prescribing, which may help mothers experiencing financial burden or other risk factors to experience a greater sense of control as well as increase the social support that they may have access to (see Abernethy, 2011).

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Appendices

Appendix A: Outline of Contributions to Joint Thesis

This thesis was conducted as part of a joint thesis with Cassie Roberts (2018) who authored “Investigating the Role of Maternal Sensitivity in the Impact of Antenatal Stress on Infant Temperament”. Cassie and I collaborated in the beginning phase of our research in order to ensure that our respective areas of research would be independent of one another as well as, subsequently, in our training in sensitivity coding at the Anna Freud Centre. Aside from this, we worked independently apart from some research meetings together with our shared supervisor Pasco Fearon. We both independently accessed videos for coding at – or via remote online access to – the Anna Freud Centre, which we both coded interpedently. We each coded about half of the data for sensitivity. The resulting codes were individually sent to a research psychologist at the Anna Freud Centre and never shared between us. Alongside the write-up in its entirety, all of our data analyses were conducted separately apart from some collaboration in the scoring of the raw data from some measures, e.g., EPDS. Regarding the latter, we simply each scored 50% of the raw data, which was then collated in one database by our supervisor, Pasco Fearon. Finally, for completeness the specific research questions explored by Cassie Roberts (2018) were:

1. Do antenatal depression and anxiety predict infant temperament at 12 months, whilst controlling for postnatal anxiety and depression?
2. Is postnatal maternal sensitivity associated with antenatal depression and anxiety?
3. Does maternal sensitivity mediate the association between antenatal stress and infant temperament?

4. Is there a moderating effect of maternal sensitivity?

Appendix B: Regression Analyses with Categorical Maternal Depression

Variables

Table 1. *Hierarchical Multiple Regression Predicting Overall Sensitivity from Demographic Variables and Categorical Postnatal Depression*

Predictor	ΔR^2	β	<i>p</i>	95% CI
<i>Step 1</i>	0.11			
Maternal Age		0.14		[-0.03, 0.14]
Education		0.01		[-0.17, 0.18]
Income		0.28*	.01	[0.06, 0.46]
<i>Step 2</i>	0.07			
Postnatal EPDS		-0.01		[-0.54, 0.48]
<i>Total R²</i>	0.11			

Note: N=84. EPDS = Edinburgh Postnatal Depression Scale. CI = Confidence Interval.

**p*<.05.

Table 2. *Hierarchical Multiple Regression Predicting Overall Sensitivity from Demographic Variables and Categorical Antenatal Depression*

Predictor	ΔR^2	β	<i>p</i>	95% CI
<i>Step 1</i>	0.10			
Maternal Age		0.11		[-0.04, 0.13]
Education		0.01		[-0.18, 0.16]
Income		0.28*	.02	[0.05, 0.46]
<i>Step 2</i>	0.01			
Antenatal EPDS		-0.12		[-0.75, 0.21]
<i>Total R²</i>	0.11			

Note: N=84. EPDS = Edinburgh Postnatal Depression Scale. CI = Confidence Interval.

**p*<.05.

Table 3. *Hierarchical Multiple Regression Predicting Sensitivity in Task 4 from Demographic Variables and Categorical Antenatal Depression*

Predictor	ΔR^2	β	<i>p</i>	95% CI
<i>Step 1</i>	0.12			
Maternal Age		0.02		[-0.13, 0.16]
Education		-0.03		[-0.34, 0.27]
Income		0.35*	<.01	[0.18, 0.86]
<i>Step 2</i>	0.02			
Antenatal EPDS		-0.14		[-1.33, 0.30]
<i>Total R²</i>	0.14			

Note: N=84. EPDS = Edinburgh Postnatal Depression Scale. CI = Confidence Interval.

**p*<.01.