An evaluation of the contribution of maladaptive attitudes specific to motherhood and metacognitions in perinatal depression

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A B S T R A C T

The cognitive model of depression suggests that dysfunctional attitudes represent vulnerability towards developing depression. The metacognitive model suggests that metacognitions may play a more important role in predicting depression, compared to cognitions. We tested the relative contribution of dysfunctional attitudes and metacognitions, and their interrelationship, in predicting perinatal depressive symptomatology.

A cross-sectional perinatal sample ($N = 344$) completed questionnaires of dysfunctional attitudes (both general and specific to motherhood), metacognitions, and sociodemographic factors including age, ethnicity, education, marital status, parity and previous history of mental health problems. Correlational analyses indicated that dysfunctional attitudes (both general and specific to motherhood), as well as metacognitions were intercorrelated and all were associated with perinatal depressive symptomatology. Controlling for sociodemographic factors, hierarchical regression analysis showed that general dysfunctional attitudes were weakly associated with perinatal depression. Moreover, maladaptive attitudes specific to motherhood and negative beliefs about the uncontrollability and danger of worry were independently associated with perinatal depressive symptomatology, with the latter variable having the strongest association with the outcome variable. Path analyses demonstrated that negative beliefs about the uncontrollability and danger of worry partially mediated the relationship between maladaptive attitudes specific to motherhood and perinatal depressive symptomatology. The results support the metacognitive conceptualisation of psychopathology which places importance on metacognitions in the maintenance of depression.

1. Introduction

1.1. Prevalence of perinatal depression and risk factors

In the western world, perinatal depression i.e. depression occurring during pregnancy and in the first year post-partum, is estimated to occur in 13–20% of women (Bennett et al., 2004; Gavin et al., 2005). It is not certain whether depression prevalence rates during the antenatal period (i.e. from conception until childbirth) are lower or the same as during the postnatal period (i.e. from childbirth and throughout the first year thereafter), as available evidence is equivocal (Gavin et al., 2005; Heron et al., 2004). During the antenatal period, depressive symptoms can impair maternal health and well-being (Bonari et al., 2004; Henry et al., 2004). In the postnatal period, maternal depression has been found to have an adverse impact on early mother-infant interactions, subsequently affecting long-term child development (Kingston et al., 2012; Murray and Cooper, 1996; Muzik and Borovska,

2010). Due to the adverse outcomes associated with antenatal and postnatal depression and the fact that depression is under-recognised throughout pregnancy and the postnatal period, screening for maternal depression at all points of contact with health professionals during the perinatal period has been recommended (NICE, 2014).

The role of younger age, low income, history of mental health problems, and absence of social support as risk factors for perinatal depression have been established (Biaggi et al., 2016; Eberhard-Gran et al., 2002; Leigh and Milgrom, 2008). Associations between aspects of personality (e.g. neuroticism, self-esteem) and perinatal depression have also been reported, however, evidence of their strength as predictors of increased perinatal depression appears to be equivocal (Leigh and Milgrom, 2008). Due to this equivocal association with perinatal depression, and because some of the above risk factors are difficult to modify, the interest in the field has shifted in recent decades towards theories that examine the role of cognition in maternal psychological distress. Constructs such as maternal cognition, attitudes and

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beliefs, offer more opportunities for psychological intervention.

1.2. The role of maladaptive attitudes in perinatal depression

According to Beck's Cognitive Theory of Depression (Beck, 1967) dysfunctional attitudes represent a vulnerability factor that contributes to the development and maintenance of depression. Environmental triggers, typically in the form of stress-inducing events, which are congruent with the content of the dysfunctional attitudes, are interpreted by vulnerable individuals in ways that give rise to depressive symptoms. Empirical research supports the association between general dysfunctional attitudes (GDA) and, in particular, perfectionism and need for approval by others, and depressive symptomatology in the general population (de Graaf et al., 2009; Reilly-Harrington et al., 1999). There is also empirical evidence that supports the notion that particular stressors (e.g. academic stress) interact with specific dysfunctional attitudes (e.g. attitudes concerning academic competence) and impact on distress levels more, compared to situations where the same stressor is experienced but individuals hold less specific dysfunctional attitudes (Hilsman and Garber, 1995).

In cross-sectional perinatal samples, several researchers have found an association between both GDA and maternal-specific maladaptive attitudes, and increased severity of perinatal distress (Church et al., 2005; Leach et al., 2017; Sockol et al., 2014; Sockol and Battle, 2015). General dysfunctional attitudes have been found to be higher in depressed postnatal women compared to controls (Jones et al., 2010). Church et al. (2005) proposed that general and maternal-specific attitudes represent independent cognitive mediators of the influence of various risk factors on the development of postnatal depression. Sockol et al. (2014) demonstrated that both general and maternal maladaptive attitudes added incrementally to the explanation of the variance in perinatal anxiety and depression, after controlling for socio-demographic factors, and interpersonal variables. Similarly, Leach et al. (2017) found that maladaptive attitudes specific to motherhood were associated with perinatal depressive symptomatology, while controlling for socio-demographic factors and GDA. The association between specific attitudes and perinatal depressive symptomatology was of greater magnitude compared to the association between GDA and perinatal depressive symptomatology (Leach et al., 2017). Thus, in perinatal samples, empirical evidence supports the relevance of Beck's cognitive theory of depression, which highlights the role of both general and maternal-specific dysfunctional attitudes in perinatal depression.

1.3. The role of metacognitions in emotional distress

A different conceptualisation of emotional distress, the metacognitive perspective, grounded in the Self-Regulatory Executive Function (S-REF) model (Wells and Matthews, 1996) proposes that psychological disturbance is linked more to the appraisals and regulation of thoughts held by the individual rather than to the content of thoughts themselves. According to the S-REF model, the knowledge base of emotionally vulnerable individuals predisposes them to select and engage in maladaptive processing of disturbing thoughts, characterised by unhelpful control strategies such as worry, rumination, threat monitoring, and thought suppression. This is known as the Cognitive-Attentional Syndrome (CAS). The activation and persistence of CAS configurations is influenced by the metacognitions held by the individual. Positive beliefs about usefulness of a particular coping strategy (e.g. "Worrying will prepare me") motivate sustained perseverative thinking and other unhelpful strategies of the CAS, whereas metacognitions regarding the uncontrollability and danger of worry (e.g. "My worry is harmful") lead to reduced efforts to control one's thinking, or increased use of maladaptive forms of thought control. In both instances, an escalation of distress will occur.

Wells and Carthwright-Hatton (2004) developed a measure of metacognitions, the Metacognitions Questionnaire 30 (MCQ-30), a short form of their Metacognitions Questionnaire (MCQ, Cartwright-Hatton and Wells, 1997), originally consisting of 65 items. Like the MCQ, the MCQ-30, measures five dimensions of metacognitions: (a) positive beliefs about worry (e.g. "Worrying helps me to avoid problem in the future"); (b) negative beliefs about uncontrollability and danger of worry (e.g. My worrying is dangerous for me"); (c) cognitive confidence (e.g. "I have little confidence in my memory for words and names"); (d) need to control thoughts (e.g. "I should be in control of my thoughts all the time"), and (d) cognitive self-consciousness (e.g." I constantly examine my thoughts").

There is a significant body of evidence supporting the role of metacognitions across various psychological conditions, including anxiety and depression (Wells, 2009). In a recent meta-analysis by Sun et al. (2017) comparing psychiatric patients suffering from range of conditions (including anxiety and mood disorders, schizophrenia, eating disorders and addiction among others) to healthy individuals, all metacognitions were elevated in psychiatric patients compared to controls, but the largest group effects were reported for negative beliefs about uncontrollability and danger of worry, and need to control thoughts. Negative beliefs about uncontrollability and danger of worry were markedly elevated in major depressive disorder patients as well as across most other psychopathologies, which suggests that they might be 'universal' dysfunctional metacognitions. Additionally, metacognitions have been found to predict symptoms of disorders more strongly than cognitions in different conditions, including generalised anxiety (Khawaja and McMahon, 2011; Wells and Carter, 2001), health anxiety (Bailey and Wells, 2013; 2015), post-traumatic stress-disorder (Bennett and Wells, 2010), depression (Papageorgiou and Wells, 2009; Spada et al., 2008), alcohol use disorder (Spada et al., 2009) and Parkinson's disease (Brown and Fernie, 2015). Most recently, for example, Purewal and Fisher (2018) reported that, amongst a cross-sectional sample of individuals with diabetes, negative beliefs concerning uncontrollability and danger of worry made the largest independent contribution to the explanation of distress in this patient group, after controlling for diabetes illness representations.

To date, no studies have examined the role of metacognitions in perinatal distress. Circumstances such as being pregnant or having given birth to a baby may trigger a sense of self-discrepancy between one's current state and one's desired state, relating to how one should or ought to be as a mother. In vulnerable individuals, dysfunctional attitudes may become activated and influence the appraisal of ones' mothering ability or behaviour, increasing distress. Furthermore, and in accordance with the S-REF model (Wells and Matthews, 1996), the distress experienced is likely to be magnified by the presence of metacognitions as they are associated with the activation of mental control efforts, which give rise to increased threat from cognition itself, and in that way, exacerbate distress (Wells, 2009).

1.4. Aims of the current study

There are several aims for the current study derived from the literature reviewed above. First, we wanted to examine whether there is an association between metacognitions and perinatal depressive symptomatology. We hypothesised that all five dimensions of metacognitions will be positively associated with perinatal depressive symptomatology, in line with the findings by Sun et al. (2017), but that the magnitude of this association would be greatest for negative beliefs concerning uncontrollability and danger of worry and beliefs about the need to control thoughts. Secondly, we wanted to examine the association between negative beliefs concerning uncontrollability and danger of worry, as well as the beliefs about the need to control thoughts, and dysfunctional attitudes (both general and specific to motherhood). We hypothesised that these two metacognitive dimensions would be associated with dysfunctional attitudes, both general and specific to motherhood. Thirdly, we aimed to examine the
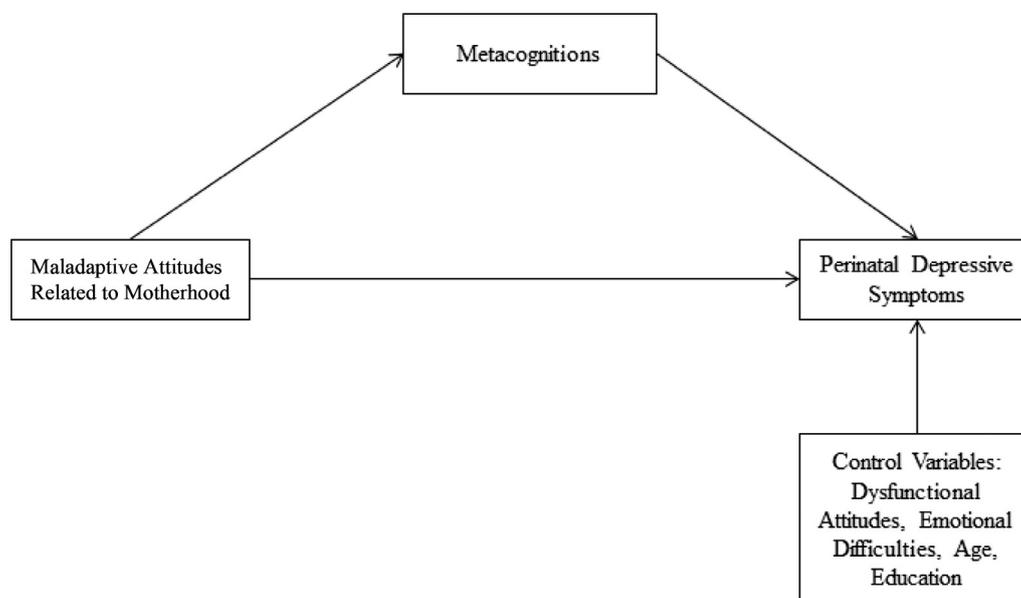
Fig. 1. Proposed theoretical model predicting perinatal depression.

incremental contribution of beliefs about uncontrollability and danger of thoughts and need to control thoughts over and above attitudes specific to motherhood, whilst controlling for demographic factors, and social support, in explaining perinatal depressive symptom severity. The S-REF model as well as the empirical evidence to date suggest that negative beliefs concerning uncontrollability and danger of worry are the most significant and 'universal' metacognitions across pathologies. Thus, we wanted to test whether negative beliefs concerning uncontrollability and danger of worry mediate the relationship between maladaptive attitudes specific to motherhood and perinatal depressive symptomatology (see Fig. 1), whilst controlling for demographic factors and GDA. If this is the case, then the effect of maladaptive attitudes specific to motherhood would exert its impact through negative beliefs concerning uncontrollability and danger of worry, in the case of full mediation. The effect of maladaptive maternal attitudes on perinatal depressive symptomatology could also be direct as well as indirect, suggesting, should latter be the case, that negative beliefs concerning uncontrollability and danger of worry partially mediate the relationship between cognitive content and perinatal depressive symptoms.

2. Methods

2.1. Participants

A cross-sectional sample of 344 participants, ages 19–47 years, were recruited for this study. A convenience sample was recruited online ($n = 199$, 57.8%) and a consecutive antenatal clinic sample was recruited through a UK hospital ($n = 145$, 42.2%). Inclusion criteria for the study were: women of 18 years of age or older, residing in the UK, comprehend English, and either pregnant (62%) or had given birth in the last six months (38%). The majority of participants were Caucasian (90%) whilst the others identified themselves Asian, Hispanic, Black or mixed race (10%). Significant majority were educated at University degree level or above (69%), were in either full or part-time employment (78%), and 64% reported being married. Out of 344 women, 49% were primiparous. A minority (42%) reported having a history of consultation with a GP or a psychiatrist for emotional difficulties. This sample of women was also used for the psychometric refinement of the Pregnancy Related Beliefs Questionnaire (PRBQ-8; Leach et al., 2018).

2.2. Instruments

2.2.1. Measure of depression

The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) is a 10-item questionnaire that measures perinatal depression severity. The EPDS is often used as a screening tool, to identify women at risk for perinatal depression. Respondents are provided with 10 statements (e.g. "I have been so unhappy that I have been crying") and asked to choose from four answers (scored 0–3) that most closely represents how they have been feeling over the past seven days. Scores range from 0–30, with higher scores indicating more severe depressive symptoms (Cox et al., 1987). This scale has sound psychometric properties and has been used widely in perinatal samples.

2.2.2. Measure of general dysfunctional attitudes

The Dysfunctional Attitudes Scale (Form A) Revised (DAS-A-17; de Graaf et al., 2009) is a 17-item measure of the presence and intensity of GDA, including perfectionism/performance evaluation and need for approval by others. Respondents are asked to rate the extent to which they agree or disagree with 17 statements ("If I fail partly, it is as bad as a complete failure"), representing beliefs and attitudes that people sometimes hold, using a 7-point Likert-style scale. Scores range from 17–119. Higher scores indicate the presence of more GDA. The DAS-A-17 has sound psychometric properties (de Graaf et al., 2009).

2.2.3. Measure of dysfunctional beliefs specific to the perinatal period

The Pregnancy Related Beliefs Questionnaire-Revised (PRBQ-8; Leach et al., 2018) is an 8-item questionnaire used to measure maladaptive attitudes specific to motherhood. Respondents are asked to rate the extent to which they agree or disagree with each of the eight statements provided (e.g. "If my baby is unhappy, I will feel that it is my fault") using a 7-point Likert-style scale, with answer options ranging from totally agree (1) to totally disagree (7). Scores range from 8–56. Higher scores indicate the presence of more maladaptive attitudes specific to motherhood. The scale has been demonstrated to have sound psychometric properties (Leach et al., 2018).

2.2.4. Measure of metacognitions

The Metacognitions Questionnaire-30 (MCQ-30; Wells and Cartwright-Hatton, 2004) consists of five replicable sub-scales assessed by 30 items in total. The five sub-scales measure the following dimensions of metacognition: (1) positive beliefs about worry (e.g.

Table 1
Descriptive statistics and correlations of study variables (*N* = 344).

Descriptive statistics of study variables				
	Mean	SD	Range	Cronbach's α
EPDS	8.53	5.38	0–29	0.89
DAS-A-17	49.05	18.14	17–96	0.93
PRBQ-8	25.44	9.14	8–54	0.86
MCQPOS	10.75	4.18	6–24	0.91
MCQNEG	11.06	4.50	6–24	0.89
MCQCC	9.98	4.32	6–24	0.90
MCQCT	9.30	3.47	6–22	0.82
MCQCSC	13.54	3.87	6–24	0.80

Spearman's Rho correlations								
	1	2	3	4	5	6	7	8
(1) MCQPOS	1	0.40	0.21	0.34	0.40	0.34	0.39	0.35
(2) MCQNEG		1	0.35	0.55	0.50	0.60	0.46	0.44
(3) MCQCC			1	0.42	0.26	0.34	0.33	0.34
(4) MCQCT				1	0.45	0.43	0.40	0.47
(5) MCQCSC					1	0.35	0.24	0.23
(6) EPDS						1	0.52	0.49
(7) DAS-A-17							1	0.75
(8) PRBQ-8								1
All are significant at < 0.01								

Note: All *p* < 0.01; MCQ-POS = Metacognitions Questionnaire-30, positive beliefs about worry; MCQ-NEG = Metacognitions Questionnaire-30, negative beliefs about thoughts concerning uncontrollability and danger; MCQ-CC = Metacognitions Questionnaire-30, cognitive confidence; MCQ-CT = Metacognitions Questionnaire-30, beliefs about the need to control thoughts; MCQ-CSC = Metacognitions Questionnaire-30, cognitive self-consciousness;; EPDS = Edinburgh Postnatal Depression Scale; DAS-A-17 = Dysfunctional Attitudes Scale-Revised; PRBQ-8 = Pregnancy Related Beliefs Questionnaire-Revised.

"Worrying helps me to solve problems"), (2) negative beliefs about uncontrollability and danger of worry (e.g. "I cannot ignore my worrying thoughts"), (3) cognitive confidence (e.g. "I have a poor memory"), (4) beliefs about the need to control thoughts ("Not being able to control my thoughts is a sign of weakness"), and (5) cognitive self-consciousness ("I think a lot about my thoughts"). Respondents are asked to read a series of 30 statements and indicate the extent to which they agree with each statement, using a four-point Likert-style scale, with answers ranging from "do not agree" (1) to "agree very much" (4). Scores range from 30–120, with higher scores indicating more dysfunctional metacognitions. The MCQ-30 possesses good internal consistency and convergent validity, as well as acceptable test-retest reliability (Wells and Cartwright-Hatton, 2004).

2.2.5. Study-developed questionnaire

The researchers developed questions to assess demographic information, such as age, education, ethnicity, marital status, and parity. Participants were also asked whether they had ever consulted their GP or a psychiatrist for emotional difficulties. Those who answered "yes" and listed a problem were deemed to have a past history of mental health difficulties (PHMHD).

2.3. Procedure

A brief advertisement was placed on social media sites for mothers (e.g. Facebook groups for mothers) and mumsnet.com in order to recruit participants online. The advertisement invited women who met the inclusion criteria, to participate in the study on "maternal attitudes and depression." Those who were interested followed a hyperlink to access the information sheet and the battery of questionnaires. The information sheet outlined the purpose of the study, the anonymity of responses, and explained that consent would be assumed when participants submitted their responses. Recruitment at the UK NHS Hospital took place in the antenatal clinic waiting room. Following the

presentation of the information sheet, women who expressed interest in participating were given the option to complete the questionnaire online or via hard copy. Participants who requested to complete the questionnaires online were emailed a hyperlink, where they could access the questionnaires. Participants who requested a hardcopy were provided with a copy of the questionnaires and asked to complete and return them in the provided stamped and addressed return envelope. All participants were given the option to enter into a draw to win one of two £50 Amazon vouchers.

2.4. Analyses

A series of Kolmogorov-Smirnov tests of normality were conducted on the data, which suggested that our variables were significantly different than normal. As a result, a series of non-parametric, Spearman's Rho correlation analyses were conducted to examine the associations between the five factors of the MCQ-30 and EPDS, DAS-A-17, and PRBQ-8 scores. Hierarchical regression analysis was ran in which the EPDS scores were the dependent variable and the predictor variables were entered stepwise in the following order: demographics, PHMHD, and DAS-A-17 scores (Step 1); PRBQ-8 scores (Step 2); MCQ-NEG and MCQ-CT scores (Step 3); and MCQ-POS, MCQ-CC, and MCQ-CSC scores (Step 4). Path analysis was used to examine the pattern of relationships as specified by our theoretical model (Fig. 1). The Lavaan package (Rosseel, 2012) of the software R (R Core Team, 2013) was used and a single observed score for each construct was included in the model. Specifically, the covariance matrix of the observed variable was analysed with the Maximum Likelihood method estimator. The Sobel test (also known as the product of coefficients approach; Baron and Kenny, 1986; Hayes, 2009) was used to test for mediation. To evaluate the goodness of fit of the model we considered the R^2 of each endogenous variable and the total coefficient of determination (TCD; Bollen, 1989; Jöreskog and Sörbom, 1996). In the tested model, perinatal depression (EPDS) was the dependent variable, maladaptive attitudes related to motherhood (PRBQ-8) were the independent variables, metacognitions were the mediators between PRBQ-8 and EPDS, and dysfunctional attitudes (DAS-A-17), emotional difficulties (PHMHD), age, and education were included as control variables (Fig. 1).

3. Results

3.1. Correlations

Results of the correlation analyses, along with the means, standard deviations, and ranges for our variables of interest are presented in Table 1. All five factors of the MCQ-30 were positively associated with perinatal depression. All five dimensions of metacognition were also significantly associated with increased dysfunctional attitudes (general and specific to motherhood). Negative beliefs about thoughts concerning uncontrollability and danger, and beliefs about the need to control thoughts were the two dimensions of metacognition most strongly associated with perinatal depression and dysfunctional attitudes (general and specific to motherhood).

3.2. Hierarchical regression analysis

Results from the regression analysis showed that MCQ-NEG was the strongest predictor of depression symptoms, followed by PRBQ-8, DAS-A-17, and PHMHD (Table 2). As can be seen in Table 2, PRBQ-8, DAS-A-17, and PHMHD explained 40% of the variance of EPDS (model 2). MCQ-NEG (entered in the third step) explained a further 10% of the variance, whereas MCQ-CT was not significantly associated with EPDS, as well as none of the other metacognitions (entered in the fourth step).

Table 2
Hierarchical regression analysis with EPDS as the outcome variable.

	β	t	p
Model 1			
Age	0.01	0.25	0.803
Education	0.11	2.18	0.03
PHMHD	0.22	4.86	<0.001
DAS-A-17	0.52	10.91	<0.001
R² = 0.35; F change = 47.59			
Model 2			
Age	-0.001	−0.03	0.976
Education	0.10	2.09	0.037
PHMHD	0.21	4.83	<0.001
DAS-A-17	0.29	4.20	<0.001
PRBQ-8	0.31	4.66	<0.001
R² = 0.40; F change = 21.72			
Model 3			
Age	−0.05	−1.14	0.26
Education	0.06	1.35	0.18
PHMHD	0.12	2.92	0.004
DAS-A-17	0.18	2.89	0.004
PRBQ-8	0.19	2.91	0.004
MCQ-NEG	0.37	6.38	<0.001
MCQ-CT	0.06	1.07	0.285
R² = 0.50; F change = 34.31			
Model 4			
Age	-0.05	−1.12	0.264
Education	0.06	1.37	0.173
PHMHD	0.12	2.84	0.005
DAS-A-17	0.18	2.86	0.005
PRBQ-8	0.19	2.91	0.004
MCQ-NEG	0.35	5.67	<0.001
MCQ-CT	0.05	0.88	0.381
MCQ-POS	-0.01	−0.12	0.903
MCQ-CC	0.01	0.29	0.774
MCQ_CSC	0.03	0.50	0.616
R² = 0.50; F change = 0.12			

Note: N = 344; EPDS = Edinburgh Postnatal Depression Scale; Age and Education were entered as continuous variables; PHMHD = Past history of mental health difficulties: Yes = 0, No = 1; DAS-A-17 = Dysfunctional Attitudes Scale-Revised; PRBQ-8 = Pregnancy-Related Beliefs Questionnaire-8; MCQ-POS = Metacognitive Questionnaire-30, positive beliefs about worry; MCQ-NEG = Metacognitive Questionnaire-30, negative beliefs about the uncontrollability and danger of worry; MCQ-CC = Metacognitive Questionnaire-30, cognitive confidence; MCQ-CT = Metacognitive Questionnaire-30, need to control thoughts; MCQ-CSC = Metacognitive Questionnaire-30, cognitive self-consciousness.

3.3. Path analysis

A first version of the theoretical model (Fig. 1) was tested including all the variables of interest. Six path coefficients did not reach statistical significance and were removed step-by-step i.e. the links between EPDS and (i) four metacognitions (MCQ-POS, MCQ-CC, MCQ-CT, MCQ-CSC), and (ii) two control variables (age and education). Therefore, a second version of the model was evaluated in order to show the best model fitting the data (Fig. 2). In this final model all path coefficients were significant at least at the $p < 0.01$ level. As shown in Fig. 2, PRBQ-8 scores were directly linked to EPDS scores and to all five metacognitions factors; however, the only dimension of metacognition associated with the outcome was MCQ-NEG. Two control variables (DAS-A-17 and PHMHD) were also linked, though weakly, to EPDS scores. Along with the direct paths, the Sobel test indicated that the PRBQ-8 was also indirectly linked to the EPDS via MCQ-NEG ($\beta = 0.18$, $p < 0.001$).

The squared multiple correlations for the endogenous variables indicate that the model accounts for 46% of the variance of EPDS, 30% for MCQ-CT, 26% for MCQ-NEG, and for less variance of other metacognitions (i.e., 13% for MCQ-POS, 11% for MCQ-CC, and 7% for MCQ-CSC). Finally, the total amount variance explained by the model (TCD = 0.54) indicated a good fit to the observed data. In terms of effect size, TCD = 0.54 corresponds to a correlation of $r = 0.73$.

According to the Cohen's (Cohen, 1988) traditional criteria, this is a large effect size.

4. Discussion

4.1. Associations between metacognitions and perinatal depression

The results from this study revealed that all five dimensions of metacognitions, as assessed by the MCQ-30, were positively associated with perinatal depressive symptoms, confirming our first hypothesis. The associations between these metacognitive dimensions and depression in the general population have previously been demonstrated (Spada et al., 2008). In psychiatric patients, all five metacognitions have been found to be elevated compared to healthy controls and, in patients with major depressive disorder, uncontrollability and danger beliefs have been found to be particularly heightened (Sun et al., 2017). Out of the five metacognitions examined by the MCQ-30 in our study, negative beliefs concerning uncontrollability and danger of worry and beliefs about the need to control thoughts were the metacognitions found to be most strongly associated with perinatal depressive symptoms.

4.2. Associations between metacognitions and dysfunctional attitudes

Our second hypothesis was also supported by the findings that negative beliefs concerning uncontrollability and danger of worry, and beliefs about the need to control thoughts, had the strongest associations with maladaptive cognitive content. Other metacognitions were also positively associated with dysfunctional attitudes, both general and specific to motherhood. These results suggest that individuals who hold dysfunctional metacognitions are also likely to hold more GDA, such as perfectionism and the need for approval, as well as maladaptive attitudes specific to motherhood. In the current study, negative beliefs concerning uncontrollability and danger of worry, and beliefs about the need to control thoughts, had the strongest associations with dysfunctional cognitive content. Recent empirical evidence (Sun et al., 2017) also points to the importance of these two subtypes of metacognitions as being most salient across various psychopathologies. According to the S-REF model, metacognitive beliefs about the need to control thoughts may be associated with the use of thought suppression which in turn will lead to an increase in distressing cognitive content. Negative beliefs concerning uncontrollability and danger of worry will escalate perceptions that one's thinking is out of control and in turn amplify negative emotional states.

4.3. Relationship between maladaptive attitudes, metacognitions, and perinatal depression

In order to examine whether two subtypes of metacognitions, that is, negative beliefs concerning uncontrollability and danger of worry and the need to control thoughts contributed to the explanation of depressive symptomatology independently from GDA and maladaptive attitudes specific to motherhood, we conducted a hierarchical regression analysis in which other relevant demographic variables were controlled for. The findings suggested that negative beliefs concerning uncontrollability and danger of worry contributed additional 10% of the variance in the explanation of perinatal depressive symptoms. Need to control thoughts was not a significant predictor of depressive symptomatology and neither were other metacognitions entered in the final step of the hierarchical regression analysis. In the final model, both GDA as well as the maladaptive attitudes specific to motherhood remained significant, in addition to the PHMHP, but the magnitude of the association was greatest for negative beliefs about uncontrollability and danger of worry.

A further test of the proposed mediation model was also significant. In this model we hypothesised that maladaptive attitudes specific to
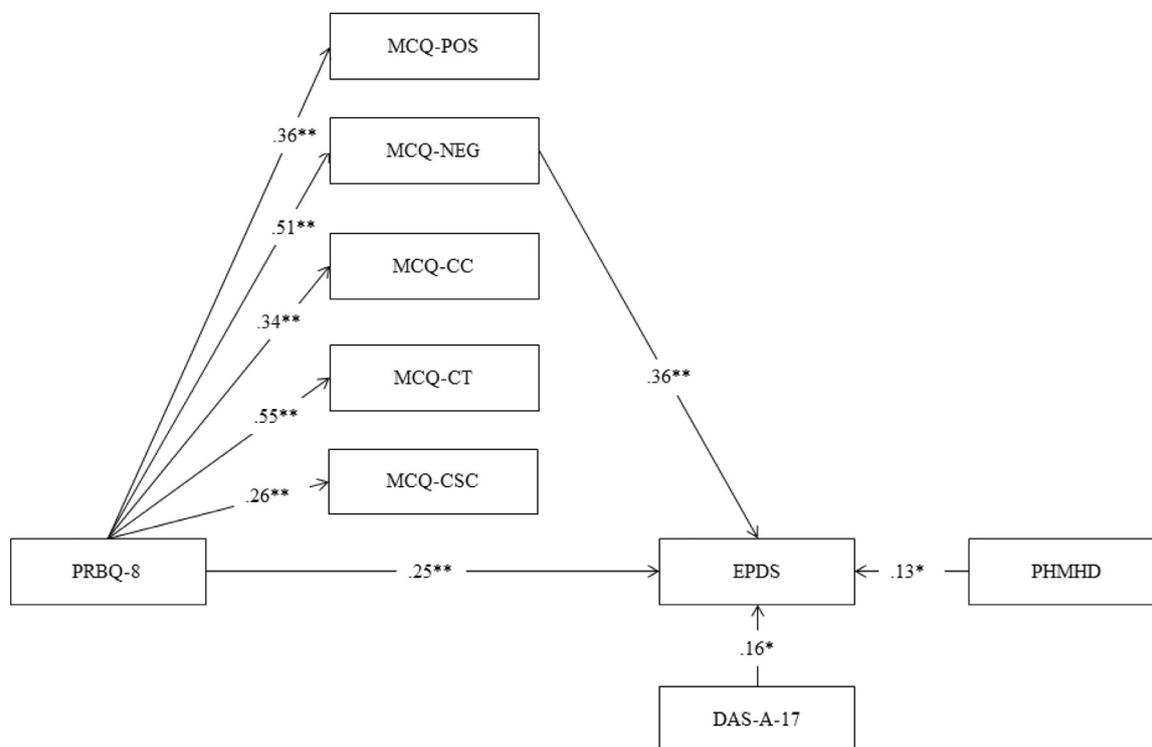
Fig. 2. Final model of the inter-relationships between the study variables.

Notes: N = 344; * *p* < 0.01; ** *p* < 0.001. PHMHD = Past history of mental health difficulties: Yes = 0, No = 1; EPDS = Edinburgh Postnatal Depression Scale. DAS-A-17 = Dysfunctional Attitudes Scale-Revised; PRBQ-8 = Pregnancy Related Beliefs Questionnaire-Revised; MCQ-POS = Metacognitions Questionnaire-30, positive beliefs about worry; MCQ-NEG = Metacognitions Questionnaire-30, negative beliefs about thoughts concerning uncontrollability and danger; MCQ-CC = Metacognitions Questionnaire-30, cognitive confidence; MCQ-CT = Metacognitions Questionnaire-30, beliefs about the need to control thoughts; MCQ-CSC = Metacognitions Questionnaire-30, cognitive self-consciousness.

motherhood will be mediated by negative beliefs concerning un-controllability and danger of worry in the prediction of perinatal de-pressive symptomatology, whilst simultaneously controlling for GDA and background factors, such as women's age, education, and PHMHD. We found that a partial mediation model, rather than a full mediation model, was supported by the data. This model suggested that negative beliefs about uncontrollability and danger of worry had a stronger as-sociation with perinatal depressive symptomatology, compared to the association of maladaptive attitudes about motherhood, with perinatal depressive symptoms. General dysfunctional attitudes and PHMHD were weakly, albeit significantly, associated with perinatal depression. No background variables examined in this study were found to be significantly associated with perinatal depressive symptoms. The total amount of the explained variance in perinatal depressive symptoms was 54%, and a large effect size was found. These results are in accordance with the metacognitive approach to understanding psychopathology (Wells, 2009; Wells and Matthews, 1996), which suggests that it is not negative thoughts but the way that they are appraised and controlled, which plays a central role in modulating emotional distress. Metacog-nitions held by the individual will have a crucial role in influencing the response style to the negative or distressing thoughts; when the re-sponse style is marked by CAS activation (rumination, worry, and threat monitoring) it will exacerbate negative emotional state. In our study, elements of the CAS were not measured, but we argue that ele-vated metacognitions are a marker of such CAS activation and hence mediate the impact of cognition on depressive symptoms.

The cognitive conceptualisation of depression (Beck, 1967, 2002) suggests that specific dysfunctional attitudes are more relevant in de-pression compared to GDA and our findings support that. However, although they both had a direct influence on depression severity, the magnitude of their association was not as strong as that of negative beliefs concerning uncontrollability and danger of worry. These

findings highlight the role of appraisal processes and the extent to which they can contribute to the development and maintenance of distress in vulnerable individuals, as proposed by the S-REF model (Wells, 2009; Wells and Matthews, 1994; 1996). Negative beliefs con-cerning uncontrollability and danger of worry appear to be one of the most consistently identified metacognitions across psychopathologies, highlighting the transdiagnostic nature of this particular dimension (Sun et al., 2017), and our findings support that.

The findings of the current study are novel in that they demonstrate the relevance of the metacognitive conceptualisation of psycho-pathology in explaining depression during the perinatal period. Metacognitions and, in particular, negative beliefs concerning un-controllability and danger of worry were found to bear the strongest association with perinatal depression of all the variables considered in our study. These results are important, as metacognitions are amenable to change through Metacognitive Therapy (MCT), which has been shown to be effective in the treatment of depression (Norman et al., 2014; Wells et al., 2009) and has already shown some promising out-comes with perinatal samples (Bevan et al., 2013). Our findings suggest that it may be more relevant to target strongly held negative beliefs concerning uncontrollability and danger of worry in psychological therapy, rather than maladaptive cognitive content, in order to prevent some of the harmful outcomes associated with perinatal emotional distress. Identifying metacognitive beliefs about the uncontrollability and danger of worry through MCT, and modifying them, may have a direct positive impact on emotional states. In MCT this is typically achieved through the use of innovative therapeutic techniques such as detached mindfulness and attention training (Wells, 2009). These techniques have been developed to potentiate metacognitive control leading to the development of the metacognitive perspective in relation to one's disturbing thoughts. Development of such metacognitive per-spective enables the individual to experience disturbing thoughts

simply as thoughts, i.e. passing events in the mind that do not need to be controlled through unhelpful coping efforts such as worry and rumination.

4.4. Limitations and future directions

The cross-sectional nature of this study limits the conclusions we can make regarding causation. This means that it is impossible to determine whether elevated metacognitions lead to increased perinatal depression, or whether depressive symptoms lead to increased metacognitions. Indeed, the cross-sectional design also precludes definitive answers regarding whether the proposed mediation model is the 'true' model of the relationship between cognition, metacognition and distress. Alternative models could also be proposed. For example, metacognitions could give rise to both depression symptoms and maladaptive attitudes specific to motherhood. Using longitudinal study designs would enable a clearer understanding of the relationship between these variables. Another limitation of this study was the lack of diversity in the sample. The majority of our participants self-identified as "Caucasian" and had completed a University degree; therefore, the results should not be generalised to a more diverse population.

Despite the above limitations, this study is the first to examine the role of metacognitions in the perinatal period. Future research should explore the role of metacognitions in the perinatal period prospectively, in order to determine the directionality of these results and in order to obtain further evidence regarding the causal role that metacognitions play in the escalation of distress in vulnerable individuals. Such efforts could also be extended to include the examination of the role of metacognitions in perinatal anxiety, a condition that typically co-occurs with perinatal depression. In addition, to date, there have been limited efforts (Alfaraj et al., 2009) to examine the role of specific metacognitions regarding rumination in perinatal samples. Focussing on the examination of positive and negative metacognitions regarding rumination as well as measurement of rumination in perinatal depression would provide a further test of the S-REF model specific to depression. This model has received support in the empirical literature with patients suffering with major depression (Papageorgiou and Wells, 2009) and could be tested with perinatal samples in future studies.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2019.02.012.

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