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Rumination decreases parental problem-solving effectiveness in dysphoric postnatal mothers

Heather A. O'Mahen*, Alex Boyd, Caroline Gashe

University of Exeter, Mood Disorders Centre, Exeter, EX4 0AD, England, UK

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ABSTRACT

Background: Postnatal depression is associated with poorer parenting quality, but there are few studies examining maternal-specific cognitive processes that may impact on parenting quality. In this study, we examined the impact of rumination on parental problem-solving effectiveness in dysphoric and non-dysphoric postnatal mothers.

Methods: Fifty-nine mothers with a infant aged 12 months and under, 20 of whom had a Beck Depression Score II (BDI-II) score $\geq$ 14, and 39 who scored less than 14 on the BDI-II were randomly assigned to either a rumination or distraction condition. Problem-solving effectiveness was assessed post-induction with the "Postnatal Parental Problem-Solving Task" (PPST), which was adapted from the Means Ends Problem-solving task. Parental problem-solving confidence was also assessed.

Results: Dysphoric ruminating mothers exhibited poorer problem-solving effectiveness and poorer confidence regarding their problem-solving compared to dysphoric distracting, non-dysphoric distracting, and non-dysphoric ruminating mothers.

Limitations: A self-report measure of depressed mood was used.

Conclusions: Rumination may be a key mechanism associated with both depressive mood and maternal parenting quality during the postnatal period.

1. Introduction

Postnatal depression (PND) affects between 10 and 15% of women (Gavin et al., 2005) and has been associated with adverse effects for both mother and child (Cooper & Murray, 1998; Field, 2010). Research has demonstrated that maternal depression has a negative impact on maternal competence, defined as "behaviours, skills and strategies that … promote positive and adaptive child development and outcomes" (p. 346, Jones & Prinz, 2005). Maternal competence, in turn, has been linked longitudinally to problems in emotional, social and cognitive development in the child (Field, 2010; Teti & Gelfand, 1991). Although there is considerable research demonstrating that maternal sensitivity is associated with infant outcomes, there has been comparatively less research on other aspects of parental competence. In this study, we examine the relationship between PND and parental problem-solving. Further, because effective parental problem-solving is predicated on the ability to notice and accurately assess environmental contingencies associated with the problem to be solved, we investigated whether rumination, which may interfere with an individual's ability to notice and engage with their environment, moderated the relationship between PND and parental problem-solving.

Parenting a new infant is a challenging task that places complex and often unfamiliar demands on parents. Babies have rapidly changing needs, frequently providing parents with ambiguous cues regarding the nature of their needs. In addition, infant demands must often be balanced against other, pressing individual and environmental demands. Effective, competent parenting requires the ability to both accurately ascertain the infant's needs and to respond with appropriate action (Belsky & Cassidy, 1994). This can be a challenge to the parent's attentional resources and their behavioural repertoire. Although parental competence is an interactional, learned skilled that increases over time in most parents, this is less true in women with PND (van Doesum, Hosman, Riksen-Walraven, & Hoefnagels, 2007). As nondepressed mothers begin to get to know their new babies, a pattern of behavioural cues and resulting parental behaviours emerge. In circumstances where the parental behaviour results in positive outcomes (e.g., a infant who soothes, or settles into a pattern of behaviour during the day),

* Corresponding author. Tel.: +44 1982 724651.
E-mail addresses: ho215@ex.ac.uk (H.A. O'Mahen), A.Boyd@ex.ac.uk (A. Boyd).

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parental confidence builds. Women with PND, however, are less sensitive to infant cues, and behaviourally have an interactional style characterized by inappropriate withdrawal and intrusiveness that is associated with an increase in emotional and behavioural problems in their infants (Cooper & Murray, 1998). Mothers suffering from PND also report more negative views of their infants (Field, 2010) and have lower levels of reported parenting confidence and self-efficacy (Teti & Gelfand, 1991). These factors are, in turn, associated with poorer parenting competence (Dekovic et al., 2010; Liu, Chen, Yeh, & Hsieh, 2012). Deficits in competence have the potential to have significant consequences. For example, mothers with PND exhibit specific parenting skill and care based deficits that include greater use of emergency medical services, less use of preventative medical services (e.g., vaccinations), reduced safety practices (e.g., using a car seat), and greater use of harsh punishments (i.e., slapping face, spanking with an object) (see Field, 2010 for a review).

Although there is considerable evidence demonstrating mothers with PND are less sensitive to their infants (Cooper & Murray, 1998; Field, 2010), there is less research examining how PND and its associated processes impacts on the specific skills associated with competent parenting. In the broader depression literature there is considerable evidence demonstrating that depressed individuals have social problem solving deficits, defined as the ability to "identify or discover effective or adaptive ways of coping with problematic situations encountered in everyday living" (D'Zurilla & Maydeu-Olivares, 1995, p. 110; Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky, Tucker, Caldwell, & Berg, 1999; Watkins & Baracaia, 2002). In the parenting domain, there is evidence that poor parental problem solving is more prevalent in maltreating mothers compared to nonmaltreating mothers (Azar, Robinson, Hekimian, & Twentyman, 1984), and occurs more frequently in mothers of infants with failure to thrive compared with mothers with normally growing children (Robinson, Drotar, & Boutry, 2001). Although these results suggest that the problem-solving process, which relies on attention to multiple environmental cues relevant to the problem and flexible thinking (D'Zurrila & Maydeu-Olivares, 1995) is an important process in parenting, this has not been directly investigated in relation to PND.

The negative impact of parental depression on problem-solving ability may be particularly important during the postnatal period, when parental caring needs are more intensive, and infants are solely dependent on their carers and without the language capacity to disambiguate their needs. In these conditions, there is particular pressure on maternal capacity to attend to the infant and immediate environment and engage in the types of flexible thinking associated with optimal problem solving.

Although attentional problems are a key symptom of depression, factors that further interfere with the problem-solving process may have a particularly detrimental impact on maternal problem-solving. Recently, Stein, Lehtonen, Harvey, Nicol-Harper, and Craske (2009) have proposed that rumination, defined as "repetitively thinking about the causes, consequences, and symptoms of one's negative affect" (Nolen-Hoeksema, 1991) may, by virtue of its capacity to interfere with mental functioning, attendance and responsiveness to the environment, impede parenting capacities that rely on an awareness of environmental and infant cues. Thus, the self-focused attentional demands of rumination may interfere with the mother's ability to attend to and process relevant cues needed to engage in appropriate problem-solving associated with difficult or challenging parenting situations.

In two previous studies, rumination was associated with bonding. Muller, Teismann, Havemann, Michalak, and Seehagen (2013) found that trait rumination assessed during pregnancy prospectively predicted poorer postnatal maternal self-reported bonding with the infant. Similarly, in an experimental study, mothers who had Generalized Anxiety Disorder (GAD) and were induced to ruminate demonstrated poorer sensitivity to their infant in an observational task than mothers with GAD who were in the control condition, and mothers without GAD, either in the rumination or control condition. There was a similar, although non-significant, pattern of results for depressed mothers (Stein et al., 2012). Rumination may therefore be an important mechanism moderating the relationship between depression and poorer maternal competence. This idea is supported in the broader depression literature, which has robustly demonstrated in a number of experimental studies that dysphoric and clinically depressed individuals who were induced to ruminate exhibited poorer social problem-solving and problem-solving confidence than both nondepressed individuals and dysphoric and depressed persons who were induced to distract (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999; Watkins & Baracaia, 2002).

In this study we aimed to examine whether there was a relationship between parental problem-solving and perceived competence in both dysphoric and non-dysphoric postnatal mothers. We further sought to investigate whether rumination moderated this relationship. We hypothesized that dysphoric mothers who were experimentally induced to ruminate would demonstrate poorer parental problem-solving effectiveness and report lower confidence than both dysphoric postnatal mothers who were induced to distract and non-dysphoric postnatal mothers.

2. Method

2.1. Participants

Fifty-nine post-natal women with an infant aged 12 months and under, who were still caring for the infant, took part in the study. Women were recruited via health visitors, perinatal mental health specialists, informal infant networks (e.g. infant groups and nurseries), internet advertising, and letter following GP record searches for women diagnosed with PND. Women were excluded if English was not their first language or if they were suffering from psychosis. To ensure a broad range of depressive symptoms amongst our participants, we screened women for depressive symptoms using the Edinburgh Postnatal Depression Scale (EPDS, Cox, Holden, & Sagovsky, 1987) and oversampled women with scores of 13 or greater ($n = 20$, $M = 22.4$, $SD = 9$; Scores < 13 $n = 39$, $M = 9.40$, $SD = 5.51$).

2.2. Materials

2.2.1. The postnatal parenting problem solving task (PPST)

Because little research has been conducted on parental problem solving, we developed a measure of postnatal parental problem-solving (PPST) which focused on difficult, ambiguous situations in which the parent was ultimately responsible for the care and outcomes related to the infant. Parental problem solving differs from interpersonal problem-solving in several key ways. In contrast to interpersonal problem-solving, where some degree of responsibility may be attributed to the other, and individuals may avoid problematic situations, even indefinitely, in parental problem-solving the parent retains responsibility for the care of the dependent infant, and frequently problems or situations cannot be avoided due to possible detrimental consequences for infant care and safety. We therefore developed the Parental Problem-Solving Task (PPST) based upon the Means Ends Problem-Solving task (MEPS, Platt & Spivack, 1975) to reflect these both these processes differences and the specific content involved in parenting an infant.

Table 1
Description of PPST problem areas.

Scenario	Problem	Outcome
1	On public transportation with few baby resources, baby has toileting accident	Back at home. Baby okay
2	New to area, attends baby-mum class, baby cries uncontrollably, 2-year bites another child	I make some friends
3	Worried about health condition in 8-month old, Doctor is reassuring, but I am unconvinced.	I have done all I can
4	End of day. Baby is ill, mother is becoming ill and feeling worse when realises she is nearly out of nappies and food	Baby and I are resting

The MEPS is a well-validated, widely used assessment of interpersonal problem-solving. To adapt the MEPS for parental problem solving, we engaged in an iterative process of consultation, modification, and testing with mothers with an infant under the age of 18 months. Women were excluded if English was not their first language or if they were suffering from psychosis. Women were recruited via advertising and informal infant networks (e.g. infant groups). Mothers who participated in the development of the measure were not included in the experimental study examining the impact of rumination on parental problem solving. In the first stage, we generated parenting problem areas and responses from a sample of 5 mothers. Using Braun and Clarke's procedures, trained clinical doctoral trainees iteratively coded the areas and responses until thematic consensus was achieved. These postnatal parental caring themes were: toileting problems, uncontrollable crying, health related issues, competing demands. Four scenarios based on these problem situations were developed, and varied for attributional ambiguity (clear delineations of responsibility, versus ambiguous responsibility; see Table 1). Consistent with the structure of the original MEPS task, women were presented with the beginning and end of the story for each problem and were asked to write a narrative about the middle of each story that connected the beginning of the story with the end of the story. All problem scenarios were presented in the first person. Women were asked to imagine they were experiencing the problem themselves and describe what they would do in the given situation. We asked 4 additional women who were not at risk for depression Pilling (2012) to generate ideal responses. These responses were used to create scoring criteria for "ideal solutions", which were then refined based on feedback from an additional 3 women, consideration of the literature pertaining to post-natal depression, the original MEPS scoring framework, and the modified scoring framework used by Lyubomirsky and Nolen-Hoeksema (1995).

The PPST was scored for solutions and steps to achieving the end of the story by way of additional solutions (this was the same principle as the MEPS scoring for 'means', the enumeration of 'means') in order to reach the given outcome. Following Lyubomirsky and Nolen-Hoeksema's (1995) procedures, participant's responses to each of the four situations received a global rating of problem-solving effectiveness on a 7-point Likert scale (1 = not at all effective, 7 = extremely effective). Ratings were based on the entire set of solutions offered by participants within each problem question. In the PPST, we also scored for obstacles, whether mothers attended to their own and their baby's emotional state, and whether positive attributions were made about themselves, their baby and others. The following are examples of mother-infant related statements 'I would soothe my infant'; 'I would ask another mother if they had experienced this before'. We also scored the percentage of solutions that were model solutions. These two scores (effectiveness + percent) were then averaged together to create an overall problem-solving score.

In the experimental study, problem scenarios were counter balanced across all participants using a Latin matrix approach to avoid any possible order effects. Participant's problem scenarios in the study were scored in the first instance by the first author. To ensure scoring reliability, an independent scorer unaware of the dysphoria or manipulation status of women rated a random ten per cent of answers. Results indicted a high level of agreement between raters, Cohen's Kappa = .79, ($p < .001$).

2.2.2. Mood

The Edinburgh Postnatal Depression Scale (EPDS, Cox et al., 1987) is a 10-item scale designed to screen for depression in postpartum populations. The EPDS was used to screen women for low mood/dysphoria, prior to inviting them to the study. In keeping with recommendations, we used a cut-off of 13 or greater for detecting low mood/dysphoria (Hewitt, Gilbody, Mann, Brealey, 2010). The questionnaire has a sensitivity of 59–100%, specificity of 49–100% and positive predictive value (PPV) of 25–78% (Boyd, Le, & Somberg, 2005; Cox et al., 1987).

The Beck Depression Inventory-II (BDI-II, Beck, Steer, Ball, & Ranieri, 1996) is a 21-question self-report questionnaire designed as a measure of depression symptomology. We use the BDI-II to assess for depressive symptoms within the study, and to avoid testing effects associated with repeated administration of the EPDS. Items are scored on a 0–3, scale, with higher numbers reflecting greater severity. The BDI-II was used to assess current mood state and depression severity at the baseline of the experimental study. The BDI-II has good reliability (Cronbach's alpha = .87) and validity in postnatal populations (Tatano-Beck, Gable, Sakala, & Declercq, 2011). It has a sensitivity of 56–57%, specificity of 94% and PPV of 90–100% (Boyd et al., 2005). All 20 women who screened positive for depressive symptoms also met the 14 or greater cut-off on the BDI.

Mood measure: A visual analogue scale (VAS-M) ranging from 0 (low mood) to 100 (high mood) was used to assess current mood level throughout the experiment (Nolen-Hoeksema, Morrow, & Fredrickson, 1993).

Confidence measure: A visual analogue scale (VAS-C) ranging from 0 (low confidence) to 100 (high confidence) was used to assess current level of parental problem-solving confidence (as used by Lyubomirsky et al., 1999).

2.2.3. Rumination and distraction mood induction

The induction task used was developed by Nolen-Hoeksema et al. (1993) and adapted by Watkins and Baracaia (2002) for a UK population.

The rumination condition asked women to focus upon a number of statements that were designed to promote thoughts related to emotions, behaviours and the self, for example, "think about the physical sensations you feel in your body", "think about what your feelings might mean", "how happy or sad you are feeling". For the distraction condition, statements designed to focus thoughts and attention externally, not related to emotions, behaviours or themselves were used. For example, women were asked to "think about the shape of a large black umbrella", "think about a double-decker bus driving down a street". Women were advised to spend 8 min engaged in thinking about the task.

2.3. Procedure

Women completed the BDI to reassess their mood symptoms. They were then randomly allocated to either the distraction or rumination condition before being asked to read through the list of statements and to spend exactly eight minutes focussing upon the task. Women subsequently completed a mood check (VAS-M) to assess if the induction was successful. This check was followed by two problem-solving scenarios (where no time limit was given).

Mood (VAS-M) and confidence (VAS-C) were then assessed. To ensure the rumination or distraction induction was maintained across the problem scenarios it was repeated after the first two problem scenario for a further eight minutes. Women were then again asked to complete a mood check (VAS-M) to assess the manipulation, followed by two further problem-solving scenarios. Mood (VAS-M) and confidence (VAS-C) ratings were then repeated. Women were then debriefed and a positive mood music induction followed; Mazurka from the ballet "Coppelia" by Delibes, recorded at normal speed, was presented for seven minutes (as used in previous research; Clark & Teasdale, 1982; Yeung, Dalgleish, Golden, & Schartau, 2006). Mood was then reassessed (VAS-M) to ensure the participant's mood had returned to baseline. All participants mood returned to baseline following the positive mood induction.

3. Results

3.1. Analysis notes

Like the MEPS, the PPST took approximately 30 min for mothers to complete. Previous studies of rumination and problem solving have found that the effects of the rumination induction reduced over the course of the study, even after a second induction had been administered. As a result, we first ran analyses on mood, problem-solving effectiveness and confidence separately to test for diminishing effects. In contrast to previous research, we found that the effects remained constant across measurement times. As a consequence, we present the average results of each dependent variable.

To assess the *a priori* hypothesis that women who were dysphoric and were in the rumination condition would have both poorer parental problem solving and lower confidence than women who were dysphoric and in the distraction condition and women who were not dysphoric and in either the rumination or distraction condition, we replicated Lyubomirsky and Nolen-Hoeksema's (1995) analytic approach, using planned contrasts to assess these *a priori* hypothesis. Planned contrasts are most appropriately used when there is previous research supporting specific *a priori* hypotheses, as we had in this study (Seltman, 2013).[1]

3.2. Sample characteristics

Women with elevated EPDS scores of 13 or greater had significantly elevated BDI scores ($M = 22.40$, $SD = 9.03$) compared to women with an EPDS score of less than 13 ($M = 8.18$, $SD = 4.3$), $t(57) = -10.11$, $p < .001$. The average age of the infants of mothers in the study was 5.86 ($SD = 3.76$). The mean age of mothers was 32.14 ($SD = 4.27$, range 22–43), most (67.8%, $n = 40$) were primiparous and educated at University level (78%, $n = 45$). Women's average household income was £50,000 (SD = £33,000).

Table 2
Means and standard deviations of the dysphoria-ruminative groups.

Group	Mean	Standard deviation
Average mood ratings post induction		
Dysphoric-rumination	103.08	32.84
Dysphoric-distracting	129.71	30.76
Nondysphoric-rumination	140.17	26.13
Nondysphoric-distracting	144.09	27.55
Average PPST scores		
Dysphoric-rumination	23.50	17.31
Dysphoric-distracting	42.07	14.56
Nondysphoric-rumination	37.33	11.55
Nondysphoric-distracting	41.00	10.40
Average postnatal parental problem-solving confidence ratings		
Dysphoric-rumination	115.08	25.52
Dysphoric-distracting	139.29	32.75
Nondysphoric-rumination	147.14	20.79
Nondysphoric-distracting	149.41	26.11

3.3. Potential moderators: sleep deprivation and age of infant

Because theories of parental competence posit that parental competence may increase as the mother and infant get to know each other (Liu et al., 2012), we investigated whether age of the infant influenced maternal problem solving (PPST). The relationship between overall PPST scores and age of infant was not significant, $r(58) = .80$, $p = .57$, and the age of infant did not significantly moderate any of the other analyses we conducted. We also conducted analyses examining the impact of sleep on PPST. Sleep deprivation is a common problem in the postnatal period particularly amongst women with PND (Dorheim, Bondevik, Ederhard-Gran, & Bjorvatn, 2009). Lack of sleep is linked to a number of cognitive difficulties, including attention and concentration problems that may be associated with problem solving (Plessow, Kiesel, Petzold, & Kirschbaum, 2011). Women in this study reported significant levels of sleep deprivation (average hours of sleep per night: $M = 5.97$, $sd = 1.25$, range 2.00–8.50). However, sleep deprivation was not related to PPST, $r(58) = .28$, $p = .07$, or EPDS score, $r(58) = -.125$, $p = .344$ and did not moderate any further analyses. As a result, we collapsed both sleep deprivation and age of infant across all analyses.

3.4. Mood manipulation check

Prior to undertaking the experiment, women with higher EPDS scores at screening reported lower mood on the VAS than women with lower EPDS scores $r(58) = -.626$, $p < .000$. There were no significant differences in baseline mood by rumination condition at baseline, $t(57) = .12$, $p = .37$. In order to assess the prediction that women in the dysphoric ruminative group would show lower mood, combined mood scores were assessed. Results of a planned contrast supported the prediction that dysphoric-ruminators had lower reported mood following the rumination induction than the other three groups, $t(55) = 7.17$, $p = .01$. Post-hoc planned comparisons demonstrated that the dysphoric distracting group reported significantly lower mood than the control-distracting group, $t(55) = 6.67$, $p = .02$ and the control-ruminating group, $t(55) = 6.67$, $p = .05$. Means are reported in Table 2.

3.5. Postnatal parental problem-solving effectiveness

Consistent with our predictions, mean ratings of parental problem solving ability demonstrated that dysphoric mothers who ruminated had poorer problem solving than the other three groups.

[1] Although planned contrasts were the most appropriate analyses to examine our *a priori* hypotheses, we also conducted a multiple regression assessing the omnibus interaction of condition by mood on parental problems solving. In step 1 we entered the main effects of condition (rumination, distraction) and dysphoric mood (BDI-II). In step 2 we entered the interaction effect of condition × dysphoria. The model was significant, $F(3,57) = 4.75$, $p = .005$. There was a significant main effect of dysphoria; individuals higher in dysphoria had poorer problem solving, $b = -1.17$, $p = .003$. There was no significant main effect of condition, $b = -.20$, $p = .332$. The main effect of dysphoria was qualified by a significant interaction of dysphoria × condition, $b = 1.066$, $p = .13$. To decompose this interaction, correlations between dysphoria and parental problem solving within each condition were conducted. Within the distraction condition, there was no significant relationship between dysphoria and parental problem solving, $r = .08$, $p = .675$. Within the rumination condition, dysphoria was significantly correlated with parental problems solving, $p = -.540$, $p = .003$, indicating that individuals higher in dysphoria had poorer problem solving than individuals lower in dysphoria.

The results of a planned contrast indicated that dysphoric mothers in the rumination condition provided significantly fewer solutions that were rated as model solutions across all four situations, $t(55) = 3.044$, $p = .004$, supporting the predicted hypothesis (see Table 2 for means). The corresponding effect size, was large *Cohen's* $d = 1.16$. To help ensure that these effects were due to rumination, rather than mood post-induction, we conducted a planned contrast controlling for mood. The results were replicated, $t(54) = 4.44$, $p = .04$. Post-hoc pairwise comparisons indicated that the dysphoric distraction group did not significantly differ from the control distraction group, $t(55) = -.235$, $p = .815$, or from the control ruminative group $t(55) = -1.085$, $p = .283$.

3.6. Postnatal parental problem-solving confidence

Parental problem-solving confidence was significantly related to problem-solving effectiveness, $r = .29$, $p = .02$ and mean mood scores post the rumination induction, $r = .71$, $p = .00$. The results of the planned contrast supported the prediction that dysphoric ruminators would report lower postnatal parental problem-solving confidence than the other three groups $t(55) = 2.681$, $p = .007$. The effect size was large, *Cohen's* $d = 1.11$. Means are reported in Table 2. Pairwise comparisons demonstrated that dysphoric women induced to distract did not differ from non-dysphoric women in the rumination condition $t(30) = -.873$, $p = .387$. Likewise, dysphoric women in the distraction condition had significantly lower ratings of problem-solving confidence than non-dysphoric women in the distraction condition, $t(26) = 1.075$, $p = .287$.

3.7. Attributions

Ratings of attributions for responsibility and emotional valence made about the self, others and infant in the PPST were assessed by means of womens' responses to the four scenarios. The results of a planned contrast indicated that dysphoric ruminating women did not demonstrate more negative attributions for others in the problem solving scenarios (e.g., "They must think I can't handle this.") than the other three groups, $t(55) = .73$, $p = .47$. The pattern of means demonstrated that nondysphoric ruminating mothers ($M = 1.33$, $SD = 1.24$) had fewer negatively valenced attributions, and more positively valenced attributions for others in the problem solving situations, than nondysphoric distracting mothers ($M = .89$, $SD = .96$), dysphoric ruminating mothers ($M = .70$, $SD = .95$), and dysphoric distracting mothers ($M = .67$, $SD = .71$), although these differences were not significant, $F(3, 55) = 1.28$, $p = .29$. There were also no significant differences between attributions for infant between dysphoric ruminating mothers and the other three groups, $t(55) = .55$, $p = .59$. Rates of attributions for infants were low across all four conditions: non-dysphoric ruminating mothers, ($M = .06$, $SD = .24$), non-dysphoric distracting mothers, ($M = .06$, $SD = .24$), dsyphoric ruminating mothers ($M = .12$, $SD = .03$), and dysphoric distracting mothers ($M = .08$, $SD = .01$). Mothers across the conditions did not voice positively or negatively valenced attributions about the infant. Therefore, no further analyses were carried out on this variable.

4. Discussion

In this study we found two main findings. Firstly, women suffering from postnatal dysphoria who were induced to ruminate exhibited poorer parental problem solving on an infant-specific problem-solving task, compared to postnally dysphoric women who were induced to distract, and postnatally non-dysphoric women induced to either ruminate or distract. Our post-hoc tests confirmed that dysphoric mothers who were induced to distract performed similarly on the postnatal problem solving tasks to nondysphoric mothers in either the rumination or distraction conditions.

Secondly, postnally dysphoric women induced to ruminate had lower confidence regarding their problem-solving relative to both postnally dysphoric women who were induced to distract, and postnatally non-dysphoric women induced to either distract or ruminate.

Consistent with previous studies comparing induced rumination and distraction (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999; Watkins & Baracaia, 2002), mothers with postnatal dysphoria who were induced to ruminate also reported lower mood than postnatally nondysphoric mothers or postnatally dysphoric mothers who were induced to distract, indicating that the rumination induction was likely effective.

These results are consistent with previous studies that found that rumination in the context of depressed mood negatively impacts problem solving and problem solving confidence (Donaldson & Lam, 2004; Kao, Dritschel, & Astell, 2006; Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999; Watkins & Baracaia, 2002) and contributes to recent research demonstrating that rumination in new mothers is associated with lower self-reported bonding (Muller et al., 2013), and poorer observed attachment amongst mothers with Generalized Anxiety Disorder (Stein et al., 2012). Together, these studies provide growing support for the role of rumination in parenting, with the findings from this study demonstrating that rumination in mothers suffering from postnatal dsyphoric symptoms may also be an important mechanism explaining poor parental problem-solving associated with parental competence.

Rumination did not significantly affect the types of responsibility attributions mothers made for each scenario across mother, infant, or others. Few mothers, regardless of dysphoria status or rumination condition, attributed responsibility to the infant. In contrast, previous research has demonstrated that depressed mothers with low self-efficacy are more likely to make internal attributions for failure (Cutrona & Troutman, 1986). In this study, however, participants did not have failure experiences per se. Dysphoric ruminating mothers were able to provide solutions to the problem scenarios, although their solutions were of poorer quality and they were less confident in their solutions. It may therefore be useful to further investigate parental causal attributions between success, ambiguous and failure experiences.

In this study we adapted a widely used assessment of interpersonal problem-solving (Platt & Spivack, 1975) to examine parental-problem solving specific to the infant context. Importantly, the paradigm we utilized in this research examined real-life difficulties generated in our development work by postnatal women (see Table 1) and involved situations where the generated solution(s) held impactful repercussions for both the mother and child. The detrimental effects of rumination on postnatal parental problem-solving may subsequently hold consequences for how a mother copes with the demands of parenting and her developing infant. Notably, many of the poorer quality solutions generated by the mothers in this study involved withdrawal and avoidance; behaviours that in depression are associated with further dampening of mood (Carvalho & Hopko, 2011), and in the parenting domain are associated with a reduction in appropriate infant care (Cooper & Murray, 1998; Field, 2010). These findings are consistent with reviews of rumination, which have suggested that rumination may serve as an emotional coping style that interferes with active, problem-focussed coping (Nolen-Hoeksema, Wisco, & Lyubormirsky, 2008). In support of this, recent studies have demonstrated that rumination is negatively associated with

behavioural activation, and that behavioural activation partially mediates the relationship between rumination and depression (Brockmeyer et al., 2010). Thus, one way that rumination may negatively impact on parenting, and more specifically on parental problem-solving, may be to increase avoidance and withdrawal strategies, although additional research is needed to investigate whether these associations function through decreased attentional capacity, or through reduced implementation motivations. However, it is important to note that postnatally dysphoric mothers induced to ruminate in this study also expressed lower confidence in their solutions, suggesting that rumination may indirectly impact solution implementation through decreased confidence in the quality of the solution. This hypothesis is consistent with research demonstrating that dysphoric mothers who have negative beliefs about their ability to carry out competent behaviours (i.e., self-efficacy) have demonstrate poorer parental competence (Teti & Gelfand, 1991).

4.1. Limitations and future directions

Although the MEPS, the measure on which the PPST was based, has been shown to be related to independent global judgments of problem-solving performance in the real world (Platt & Spivack, 1975), there have been few studies comparing the MEPS, or related measures, to actual problem-solving behaviour. As D'Zurilla and Maydeu-Olivares (1995) note, this may in part be due to difficulties establishing reliable and valid criterions of actual problem-solving performance in real life. In addition, problem-solving, which involves a rational process of decision-making around a problem, is notably different from solution implementation, which involves carrying out solutions and is likely related to the range of coping skills in the individual's repertoire, skills that may be independent of problem-solving ability. These latter skills may also be related to perceived self-efficacy, which has been shown to mediate the relationship between maternal depression and maternal competence (Teti & Gelfand, 1991). In the parenting domain there are well-established observational coding schemes that have established longitudinal relationships between parenting behaviour and child outcomes. As such, there are further opportunities to validate the PPST against observable problem-solving and solution-implementation behaviours. Ecological momentary assessment studies may also provide ecologically valid assessments of daily parental problems against which to validate the PPST.

We used change in mood as a manipulation check for the rumination induction. This check mirrors manipulation checks used in previous studies of induced rumination (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999). However, we did not directly assess whether the rumination induction changed ruminative thinking. Although the negative impact of rumination in dysphoric mothers on parental problem solving held when we controlled for mood, it is still possible that changes in parental problem solving were due, at least in part, to changes in mood associated with rumination, rather than rumination per se. Future research may benefit from the addition of no rumination, sad mood induction condition to compare the effects of sad mood versus rumination.

A number of factors may impact rumination in parenting. In this study, we examined the impact of maternal sleep loss and age of the infant. Previous research has demonstrated that rumination is more likely to occur when executive control is low (De Lissnyder et al. 2012; Sumner, 2012), as may happen during periods of sleep loss (Fernández-Mendoza et al., 2010; Zoccola, Dickerson, & Lam, 2009). We did not find a relationship between level of sleep loss and outcomes. However, sleep loss may have a stronger relationship with trait, versus state, rumination. In the current study we did not assess trait rumination. Given that trait rumination has also been demonstrated to moderate the relationship of state rumination, dysphoria and problem solving, such that individuals who were high in trait rumination who induced to distract benefitted less from the distraction condition than individuals who were low in trait rumination (Donaldson & Lam, 2004), future studies would benefit from inclusion of this measure.

We used the EPDS, a widely used, reliable, and validated measure for postnatal depression (Cox et al., 1987) as our screen for depressive mood, and the BDI-II as our measure of dsyphoria. Although our results suggest that rumination has an impact on parental problem solving in mothers with postnatal mood symptoms, future studies may wish to assess the role of rumination in mothers with clinically diagnosed depression. We note, however, that past research has demonstrated that rumination has a similar negative influence on problem-solving and mood in clinically depressed participants (Donaldson & Lam, 2004; Watkins & Baracaia, 2002).

4.2. Conclusion

The current research demonstrates that mothers with postnatal dysphoric mood who ruminate have poorer parental problem skills and problem solving confidence and lower mood than either postnally dysphoric mothers induced to distract or postnatally nondysphoric mothers in either the distraction or rumination conditions. This study builds on a burgeoning literature examining the role of parental cognitive factors, including rumination, involved in parenting. It is the first study we are aware of demonstrating a link between rumination and a specific parenting skill associated with parental competence and provides evidence that rumination may be a key mechanism associated with both depressive mood during the postnatal period and maternal competence.

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